

the years, the results of funded research projects have contributed to the development of such diverse specialized courses as highway capacity, goods movement, transportation system safety, and numerous others. Today, the program is more or less stable, and curriculum inputs are geared more to refining existing courses than to introducing new ones, but the role of new courses is just as vital. Only in the case of the program for regional and transportation development did Polytechnic attempt to introduce a large number of new courses at one time without making them available as electives to students in other programs. This remains the sole case in which Polytechnic's programmatic and enrollment expectations have not been met.

It is also necessary to maintain an environment in which faculty members are encouraged to assess existing programs and promulgate new academic and research programs, especially those of an interdisciplinary nature, and to devise innovative and imaginative approaches to the educational process.

Academic programs should be evaluated on a regular basis to determine their future direction or workability. The following guidelines should be used as an aid in determining whether to maintain, initiate, or eliminate academic programs:

1. Is the program academically important?
2. Is there now and will there remain significant student interest to warrant its continuance?
3. Is there a high probability that the program will achieve a high level of excellence?
4. Is there a high probability that the program can be adequately and securely financed?

SOME CHALLENGES FOR THE FUTURE

We would be sorely remiss if, in any paper of this type, we did not treat (even in a cursory way) some of the problems and challenges that are beginning to appear and that will have to be faced within the coming decade.

No problem will be greater than the general national trend of declining graduate enrollment in engineering and science programs. Transportation programs could be severely affected by this trend, since most exist primarily on a graduate level. The reasons for the decline are many and complex and cannot be adequately discussed here, but one principal cause over the past several years has been the extremely high salaries offered to undergraduate engineers. Even with fellowship support, it is difficult to attract as full-time graduate students those who are given initial job offers that pay \$20 000 per year and more. Whether these students ever rejoin a graduate school on a part-time basis is still not clear, but the impact on graduate transportation programs is that

1. A greater percentage of transportation-program students have nontechnical backgrounds,
2. A greater percentage of transportation-program students are from foreign countries, and
3. Total enrollments in transportation programs have leveled off and are declining.

This is indeed a multiple challenge. Although transportation is an interdisciplinary field, it retains a strong engineering component, and the profession requires many transportation specialists who have engineering backgrounds. The problems associated with increasing percentages of foreign students have already been discussed and relate to their special educational needs. Declining enrollments, of course, stifle growth and limit the number of faculty who can be supported in any given program.

One potential solution, which will require careful consideration over the next few years, is the movement of transportation curricula to the undergraduate level, at least for engineers. This may involve new undergraduate degree programs or minors in existing programs. New degree programs would face the problems of professional accreditation and high school recruiting programs in addition to the many internal university problems associated with starting a new undergraduate program, particularly if it were also to be accompanied by a new academic department.

The increasing percentage of nontechnical students may eventually force the issue of separate curricula and the difficult task of differentiating transportation planning from transportation engineering. Indeed, the whole issue of specialization within the transportation field, including such areas as economics, management, law and regulation, operations, and design, must also be faced. Most programs, including Polytechnic's, attempt to merge parts of many of these specialties to provide a broad professional base of knowledge. Further, enrollments to date would not justify multiple programs. If, however, transportation curricula begin to move to the undergraduate level, then the question of graduate specialization would be a real one and each university would have to carefully select its areas of interest.

Of course, if a clear understanding of the needs of the profession existed, i.e., the number and types of professionals needed over the next 20 years, many of these questions would be more easily answered. Such crystal-ball answers, however, are not available, which leaves the university to face the future with only the advantages of foresight, creativity, and perseverance with which to advance. These have always been sufficient in the past and, we trust, will probably continue to be so in the future.

Training of Transport Specialists

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It is generally recognized that the success of any policy or plan depends on the quality of those who administer it; thus the development of human capital becomes one of the important investments in economic growth, especially in the Third World countries, in which the availability of well-trained personnel is often the main obstacle to economic development. This paper reviews a re-

cent experience in training future transport planners and policy administrators in Argentina. A short description of this program is followed by a discussion of the lessons learned and the training options that other such programs should consider.

It is generally recognized that the success of any policy or plan depends on the quality of those who administer it; thus the development of human capital becomes one of the important investments in economic growth, especially in the Third World countries, in which the availability of well-trained personnel is often the main obstacle to economic development. This paper reviews a recent experiment in training future transport planners and policy administrators in Argentina. A short description of this program will be followed by a discussion of the lessons learned and training options that other such programs should consider.

The shortage of transport specialists has been a worldwide phenomenon; in North America, Britain, and western Europe the need for transport economists and transport planners had been met by the expansion of graduate education (including multidisciplinary training centers) and the establishment of numerous transport centers and transport institutes, usually associated with the universities. The research institutes not affiliated with a university are more important on the Continent; their training function, although often indirect or subsidiary to research, is very important. The Third World countries have had to rely on training in the North American or European institutions and large-scale use of foreign consultants. Of course, foreign consultants have their useful place, both as providers of specialized skills and experience that would be impossible or wasteful to develop within a country and as providers of different points of view that open the possibility of a search for different solutions (in this role, foreign consultants can play an important part in any country, including the most advanced). However, in many respects the employment of foreign consultants is bound to be the second-best solution; their understanding of the national constraints and style of operations (what will and what will not work) is bound to be inferior to that of the local professionals (provided that the local professionals have an equivalent level of expertise). In all cases, foreign consultants are more expensive. In a perfect world, the use of foreign consultants would be restricted to a few first-class specialists or firms that have specific expertise.

THE EXPERIMENT

Argentina is one of the more-advanced Third World nations: income is relatively high, potential wealth is vast (probably exceeding that of Australia or Canada), and the educational system is well developed, which includes an established and respected system of national universities. Argentina shares with Australia the problem of relative geographical isolation but, unlike Australia, it lacks well-established links with the scientific and professional centers of the British Commonwealth and North America. In Argentina, during the period after World War II, the development of postgraduate university education and advanced managerial training was neglected; subsequently, there was a shortage of professionals in planning and administrative fields. This shortage has also been felt in the transport sector; thus the government of Argentina decided to establish a training program for young professionals as part of the preparation of the National Transport Plan. Both the foreign component of the preparation of the National Transport Plan and the training program were financed by a loan from the International Bank for Reconstruction and Development (World Bank), which also provided some professional help and program supervision. In the case of the training program, the supervisory unit was the Economic Development Institute (EDI) of

World Bank, which is its branch for training and professional development. Thus, the transport planning and transport economics (TPTE) course was born.

Although EDI has considerable experience in organizing and planning the program for training courses, this experience was not fully transferable in the case of TPTE. In general, EDI programs, both in Washington and in other centers, are geared to the training and upgrading of mid-level and senior professionals and administrators, whereas the TPTE program was designed for junior professionals who had little or no professional experience. Thus typical EDI courses are more like staff courses in government or industry, whereas the TPTE program had many characteristics of graduate training, although of a specialized type.

The program was developed and run as an Argentinian program the responsibility for which was fully accepted by the National Transport Planning Directorate of the Argentinian State Secretariat for Transport and Public Works (Dirección Nacional de Planeamiento de Transporte, Secretaría de Estado de Transporte y Obras Públicas). However, assistance and advice by EDI both at the initial program-development stage and during the course itself were of prime importance. The fine line between advice and assistance on the one hand and control and interference on the other was strictly observed in practice. It must be observed that EDI also cooperates with other countries in programs to train planners in which it also scrupulously observes their national and even ideological characteristics.

The basic choices made at the planning stage of TPTE were as follows:

1. The course was to provide extensive postgraduate specialist training for university graduates who were to be employed as transport planners and policy analysts in the government. The program length was 16 months, which included a practical work period of 2.5 months when the trainees were employed on projects within the Transport Planning Directorate.
2. The languages of instruction were to be English and Spanish. The use of English as the main language of instruction was justified on two grounds: (a) to enable young professionals to have direct access to literature in English, to participate in international conferences, and to work with foreign consultants employed in Argentina and (b) to make it possible to bring in as instructors individuals from outside the Spanish-speaking world and thus extend the range of suitable candidates.
3. The course was to have a strong analytical or methodological core; the accent was to be on the acquisition of analytical tools, which also implied providing the course participants with adequate training to be able to read professional journals to keep themselves up to date.
4. The selection of instructors was based on (a) demonstrated professional and teaching ability (academic criterion) and (b) extensive relevant experience in applied or professional fields (practical-experience criterion). In practice this implied the search for national or international civil servants and consultants who had academic experience and interests or for academicians who had extensive civil service or consulting experience. As was expected, the time constraints of the candidates approached made course scheduling difficult, particularly in the case of academic personnel, whose availability tended to be restricted by the university calendar.

THE PROGRAM

The program was divided into three parts: (a) the preparatory course (curso de nivelacion), which was aimed at giving the participants an adequate knowledge of English and at bringing the trainees to a common level of knowledge; (b) phase 1, devoted mostly to the acquisition of diagnostic skills and tool subjects; and (c) phase 2, devoted mostly to the problems of specific transport media, transport policy, and policy administration. There was a short break between the preparatory course and phase 1 and a period of practical work between phases 1 and 2.

Each stage, in turn, was subdivided into a number of minicourses one to three weeks long (English training during the preparatory course and transport economics in phase 1 were longer); in addition, a number of special lectures on different aspects of Argentinian transport were also arranged.

Each part of the program will now be discussed and the choices that had to be made and the results achieved will be reviewed.

The preparatory course was considered essential if the participants were to follow an intensive program of studies conducted partly in a foreign language. The alternative was to put stringent restrictions on language qualifications of the entrants.

The length of this part of the course was largely predetermined by the language-training requirement, to which about half of the teaching periods were devoted. English-language training, which was provided mainly by the British Council under a contract with the government of Argentina, fully succeeded in meeting its objectives: The trainees could follow lectures in English (by lecturers who had different accents), could use English-language material, and were able to communicate in English on professional matters. Spanish, however, was used for writing answers to tests and for project reports. During the other half of the time (268 teaching hours), the following subjects were taught: economics for engineers, mathematics for economists, advanced mathematics, statistics, introduction to computer programming, microeconomics, accounting and financial analysis, transport economics, and introduction to planning. The program was successful in bringing the group to a good common level of knowledge and its results were most useful in subsequent phases of the course. In retrospect, it appears that some changes would have been useful; for example, greater concentration on fewer subjects and a stress on the basic concepts rather than a survey-course approach would have been more effective.

The objectives of the second part of the course (phase 1) were to provide the trainees with the basic diagnostic and analytical tools and to introduce them to project evaluation and project analysis with special reference to transportation. Whereas the preparatory course was staffed entirely (except for language training) by local lecturers, more than two-thirds of the instructors for phase 1, including World Bank staff, came from abroad.

The basic choice in organizing this part of the training was whether to stress problem-solving skills by using case histories and case studies or whether to stress training in analytical methods. The second option was adopted. It was believed that, if the graduates of the course were not to become quickly out of touch and if they were to interact with foreign experts or consultants on a meaningful professional level, it was necessary to introduce them to the current state of the art as far as analytical techniques were concerned and, equally important, to provide them with the ability to read

current contributions in professional journals. Of course, this choice was not meant to be dogmatic; in fact, the most successful minicourses combined formal teaching of the subject matter with exercises that related to applications of the techniques. In order to do this successfully, however, the length of the minicourses would have had to be extended, which would have caused a reduction in the number of subjects. In general, the concept of the minicourse proved to be successful, and it provided more flexibility than standard university programs do.

As was stated, the main emphasis was put on the diagnostic and related analytical tools. The subjects in this class were as follows:

1. Transportation economics: These questions were stressed: How does the transport system work? What interrelationships have to be considered in transport analysis?

2. Transportation-demand models: These were considered from two points of view: (a) their usefulness for the understanding of transport flows and modal split and (b) their usefulness as forecasting tools. The aim was not to develop model builders but model users and model specifiers.

3. Survey methods: In view of the key part that surveys play in the acquisition of transport information and of the perennial problem of adequacy and quality of data, survey methods are one of the most important diagnostic tools of a transport analyst. The aim of the course was not to teach how to design a survey but to teach how to specify a survey design, i.e., to provide the understanding of the problems of survey design and its interpretation as well as of the strengths and limitations of different approaches.

4. Financial analysis: This was also conceived as a diagnostic tool and was designed as a service course to provide the appreciation of the methods used.

5. Regional analysis and transport and agriculture: These two minicourses were aimed at setting selected transport problems in a wider context of regional development--transport interaction.

The prescriptive or normative part of phase 1 consisted of a minicourse on project evaluation as well as a number of special lectures that dealt with selected policy subjects. In total, phase 1 consisted of 122 teaching sessions (one-half day each) spread over four months.

In order to facilitate the integration of the trainees into the work of the directorate and to provide them with a feel for real-life operations, an interval of more than two months was arranged between phases 1 and 2. As is well known by the organizers of these so-called sandwich programs (training--practical work--training), the organization of a work interval requires considerable preplanning and careful management; experience with the TPTE course fully confirmed the dangers of underestimating these problems.

The last part of the course, phase 2, had the following objectives: (a) to give the trainees a more-thorough understanding of specific areas of transport operations (transport modes and urban transport) and (b) to introduce the trainees to problems of transport policy and implementation. In order to meet these objectives, the organization of phase 2 differed somewhat from that of phase 1: Specific minicourses were shorter, typically of one week's duration (the urban-transport minicourse was a notable exception), and greater use was made of special lectures, usually given by national specialists invited from industry or government. During this phase, class exercises and class projects per-

formed by small groups (to simulate office situations) replaced more-standard tests.

What was achieved? Today the former trainees are working in the Transport Planning Directorate, and feedback is very favorable. A small number of bright and well-motivated Argentinians have an informed interest in transport, demonstrate remarkable competence and self-assurance in tackling some difficult problems, and show a strong ability to get things done. The course director's ambition--to see his former trainees perform as well as his staff in a well-established research directorate in Canada--has been fully satisfied. The quality of the first reports and memoranda produced by TPTE graduates and their on-time production record are as good as those of young professionals in any equivalent office. If the Argentinian Transport Planning Directorate is allowed to continue its professional development (the group as a whole shows good promise and enjoys a remarkable leadership), this office should become a serious center of applied transport studies and gain international recognition.

LESSONS

The training program described above was an experiment. The value of experiments depends on what was learned and on how the lessons can be applied. In order to assess the TPTE experiment, it appears useful to compare the program with other training options.

Program Inside a Country Versus Training Outside

One of the alternatives to a program of this type is graduate training in the universities outside the country. In fact, training in foreign universities is by far the most common way of supplementing education in national universities. The relative advantages are (a) that training at a good foreign institution provides more than professional education--it also gives experience in living and learning in another country and an opportunity to establish friendships and professional contacts--and (b) that an established university provides a good library, a wide range of courses, and programs developed through long experience. Against these advantages, the following disadvantages must be noted: (a) living and studying in a foreign language and in a different culture produces considerable stress, which results in a relatively large rate of incompleting studies, barely completed degrees, and longer-than-anticipated training periods; also, in order to complete a degree, a much higher level of knowledge of the language is necessary; (b) the programs reflect (consciously or subconsciously) concerns, traditions, and institutional patterns of the country in which the university is located and thus they may not be fully geared to the needs of a foreign student; and (c) the advantage of group interaction of young professionals who have common interests and similar career aspirations is lost. On balance, it appears that, valuable as foreign institutional training is, it should be regarded as a complement and not as a substitute for training at home.

Postgraduate Training Versus Training Within a Government Unit

The role of graduate and professional schools in training a country's executive and professional classes is so well established in most of the advanced countries that the search for alternatives is rarely, if ever, considered. Graduate and professional schools are, of course, more than training

centers; their strength stems from a fruitful combination of research and teaching in which there are all types of linkage between fundamental and applied research, sponsored or problem-directed and free research, research and teaching, and graduate and undergraduate training. The combination of these different roles also provides them with more-efficient utilization of facilities (libraries, laboratories, computer centers, common rooms, etc.). Finally, the independence of academic institutions permits them to become centers of new ideas, policy criticism, and policy development. All these are overwhelming advantages and teaching in a combination of research institute and graduate school is most likely the preferred manner of organizing both research and training. However, the problems in following this route are not theoretical but practical. First, it takes years of continuing tradition and adequate provision of resources to develop such institutions; unfortunately, time is short and training needs are immediate. Second, the very strengths of the universities--their multiproduct (teaching and research) characteristics, variety of mutually supportive programs, and quality control by means of strict degree requirements--produce certain rigidities. (For example, in those institutions in which a course system exists, courses tend to be of similar length, e.g., session, semester, trimester, whereas in an independently designed program full flexibility of course length can be achieved.) Third, the rationale for tests and examinations is somewhat different. A standardized (fair) assessment of individual achievements and differentiation among individual results is of secondary importance, whereas development of problem-solving ability by small teams (i.e., simulation of working conditions) becomes of primary interest.

Obviously, differences noted above are somewhat overemphasized to contrast the relative advantages of the two systems of training. A well-designed graduate program can accommodate needs for flexibility and simulated working conditions. On balance, I would prefer to see advanced professional training conducted at a well-established institute devoted to research and graduate work and affiliated with a university; nonetheless, difficulties in organizing and developing such an institution often make this solution impractical in the short run. Under such conditions, a program organized within a government planning or research unit is not only a workable alternative but also a practical interim solution. Furthermore, although the sponsoring unit must bear the costs (both in terms of money and of the lack of time of senior officials) of the training arrangement, it gains not only by the upgrading of its professional staff but also indirectly by the exposure to and interaction with the specialists invited to teach in such a course.

Specialized Versus More-General Training

The program described in this paper was specifically geared to the needs of one government department or one specialized sector of the economy. This solution has both advantages and disadvantages. The advantage is that the program can correspond closely to precisely identified needs of one sector; thus the training is fully relevant for the needs of immediate employment. The disadvantages of this solution are that (a) the needs of a particular department or sector may not justify the continuation of the training program and thus the utilization of the experience gained; (b) future careers of the trainees are impossible to predict and a more-general program would give them somewhat greater flexibility; and (c) there exist opportunities of fruit-

ful transfer of experience between the sectors. For example, work on the peak problem pioneered was in the context of electricity supply, which was and is of direct relevance to transport; work on cost forecasting and learning functions that originated in the airframe production industry has potentially wide applications in the fields of maintenance and forecasting construction costs; and benefit/cost analysis was first developed in water resource management. Also, management, information systems development, and policy administration are not sector specific, and these are the areas in which professional training is particularly needed in most countries.

An example of a workable combination of related sectors would be transport--communications--energy (i.e., an infrastructure-sector program). It is impossible to determine on an a priori basis the balance between advantages and disadvantages of more-specific versus more-general programs. The practical considerations (as usual) have to prevail: What is feasible under the given circumstances? How much interest in a specific program can be generated among senior staff and where do the recognized training needs exist? Clearly, a strong and direct interest by senior staff is essential for the success of a program of this nature. The advantage enjoyed by the TPTE program in Argentina was that both the Transport Planning Directorate and World Bank were interested in its success.

National Versus International (Regional) Program

Argentina is a large, advanced, wealthy country; thus it could afford to develop a program of its own. This is, however, a special situation. The question thus arises, Could the advantages of a national program be maintained if it were organized for a group of countries in the same region that shared similar cultural and institutional backgrounds and similar problems? An international or regional program would obviously enjoy the potential advantages of economies of scale and continuity. The key questions remain: Could the program also generate strong sustained interest within the countries associated in the scheme? Could it acquire a style of its own that would be consistent with the

character of the region or would it become a distant, or foreign international, organization? Who could take the leadership role and how could the leader be prevented from dominating the program to the extent that the feeling of participation by weaker partners would disappear? There exists considerable experience in international (regional) educational research centers that range from well-developed international graduate schools to more-specialized establishments. It would appear that, with the assistance of international institutions, development of more research-training regional centers that specialize in transport-infrastructure planning would meet the long-run needs of many of the Third World regions, provided that they obtained full support of the countries involved and were adopted by them as their own foundations rather than as another set of international (foreign) institutions.

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Who Reads the Transportation Planning Literature?

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This paper reviews the role of professional journals in transportation planning and evaluates the degree to which the literature is used. A stratified random sample of professionals in eight separate work settings was drawn and sent an extensive questionnaire on journal-reading habits, preferences for journal characteristics, and uses made of specific journals. Results show that the most popular journals (based on percentage of professionals who read them) are the Transportation Research Board Record (76 percent), National Cooperative Highway Research Program reports (57 percent), Institute of Traffic Engineers (ITE) Journal (56 percent), the Transit Journal (48 percent), and Traffic Quarterly (48 percent). But overall time spent reading is low; collectively the 17 major journals in transportation are read on the average of 7 h/month by the average professional. Reading professional literature is a low-priority activity; journals are scanned, generally on receipt, for relevant articles, which are rarely read thoroughly. The average professional sees 5.6 journals per month. The ideal journal has middle-of-the road articles that center on a balance of theory, practice, modal focus, and policy subjects. The most popular journals are

those that contain such mixes and provide the professionals with general awareness and information on new practical techniques for use in their own work. The paper concludes that, if transportation professionals are not avid readers of their professional journals, they are at least avid scanners who continuously search a number of sources for relevant material. The incidence of journal use could therefore probably be substantially increased by increasing the direct relevance of the published material to the needs of the practicing professional.

Like other policy-oriented academic fields, transportation planning has come to rely greatly on publications for the interchange of ideas. Government agency publications and a myriad of professional journals have significantly increased the volume of material published in order to serve this role adequately.