

humor of 27 talented faculty members--the participants. They were: M. Alexander, G. Bowser, K. Cook, E. Davis, I. Glover, C. Jones, C. Jordan, E. Leung, D. Lyons, H. Ortiz, W. Porter, C. Smith, J.

Smith, R. Sheck, H. Walton, K. Ankrah, M. Blount, D. Chase, C. Claiborne, K. Dorsett, L. Fitzgerald, C. Harvey, O. Jones, R. Krajick, S. Mahdi, J. Moore, and R. Ward.

Reentry of Women into the Transportation Profession: Program and Potential

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A National Science Foundation Women in Science program for the retraining of women seeking to reenter the job market in the transportation profession is described and discussed. The suitability of transportation as a reentry field is argued, and reentry students are shown to be a potentially large market of new students for graduate transportation programs.

The transportation profession is unique among the technical disciplines in that it can be entered at the graduate level by those who do not have an extensive technological undergraduate background. Many universities admit students to master's and doctoral programs in transportation without requiring undergraduate engineering degrees; however, sufficient background in mathematics is generally required. The multidisciplinary nature of the transportation profession and the high visibility of transportation to the general public make it an ideal field for college-educated men and women who are underemployed or who have become disillusioned with their original specialties, and who would like to enter a technical profession for the first time.

The term reentry has generally been used to describe women who, after an absence of years from the job market, seek to reenter the job market, often in a career substantially different from the one for which they were originally trained. During the 1960s and early 1970s women were most often encouraged to study education, humanities, social sciences, and other nontechnical subjects. A large number of these women are now unemployed or underemployed, yet well-educated adults, trained in fields for which the job market is declining.

Under the sponsorship of the National Science Foundation Women in Science program, Polytechnic developed and implemented a unique program for the retraining of college-educated women in the transportation profession. The program was initiated in January 1981 and continued through June 1982. The program demonstrated (a) the ability of many women to quickly adapt to a technical profession and (b) such women represent a substantial student market potential.

PROGRAM

The special program designed for reentry women had two primary emphases:

1. Remediation and reorientation to the transportation profession, and
2. Earning graduate credits toward the M.S. degree in transportation planning and engineering.

As most of the program participants would have

nontechnical backgrounds, mathematics remediation was a principal concern. All participants, with the exception of a few who had significant mathematics background, took a remedial mathematics course during their first semester, which was Spring 1981. The course, which met for 4 hr/week over a 20-week period, covered what is traditionally referred to as precalculus (i.e., advanced algebra, analytic geometry, and some trigonometry). This was followed by an applied statistics offering during the Summer 1981 session. During this period, all participants took an introductory transportation course for which they received graduate credit.

During the first semester program participants took all courses together, partly to foster group coherence, and partly to avoid causing early frustrations by placing participants in mixed class sections. During the 1981/82 academic year, however, participants attended regular graduate sections with other students.

The three-semester program also included a number of special seminars and short courses, including

1. Career day--An all-day conference and seminar attended by prominent transportation professionals in the New York City metropolitan area to expose participants to the breadth of opportunities in the profession;
2. Planning approach to problem-solving--A seminar discussion of the technical planning approach to solving transportation problems; a discussion of quantitative versus qualitative analysis;
3. Technical writing--A seminar on technical writing and the preparation of technical presentations, including the use of graphics and displays and public speaking; and
4. Resume writing and job search--A full-day workshop on preparation of technical resumes and on job search and interview techniques.

In addition to these special programs, regular bimonthly meetings were held to discuss any problems that participants might be encountering either with the program or with interactions with faculty, other students, or among themselves. Early in the program some intragroup conflicts arose over the remedial mathematics course--some thought it was too advanced, others, too elementary. As the program progressed, however, few such problems arose.

Throughout the program, participants had available special guidance and counseling from the Polytechnic's women's programs office. This office provided a good deal of assistance to participants in adjusting to a technical education and in becoming an active part of the general student body.

The general structure of the three-semester program is summarized in Table 1. Its intent was to gradually introduce participants into the mainstream of the profession and of university life, an objective that was achieved with reasonable success.

Table 1. Outline of program content.

Term	Courses and Seminars	Credits
Spring 1981	Remedial mathematics (precalculus)	0
	Transportation studies and characteristics	3
	Career Day seminar	0
	Planning approach to problem-solving seminar	0
Summer 1981	Applied statistics	3
Fall 1981	Regular graduate courses	9
	Research writing and job seminar	0
	Waterborne transportation seminar	0
Spring 1982	Regular graduate courses	9
	Technical writing seminar	0
Total		24

Note: Twenty-one of the credits were applicable to the M.S. degree.

Figure 1. Advertisement placed in New York Times.

WOMEN.

The Polytechnic Institute of New York announces a tuition-free program that can help you begin a career in Transportation Planning.

Transportation is a rapidly-growing interdisciplinary field offering excellent opportunities in planning, engineering, or management for women who wish to change careers or re-enter the job market.

Polytechnic, under the sponsorship of a National Science Foundation grant, now offers a program aimed at training women for entry-level positions in the transportation profession. Applicants must hold a bachelor's degree (any field).

The program consists of special seminars, workshops, short courses, graduate course work, and special job counseling and placement services. Upon completion, participants receive a graduate certificate and are qualified for entry-level positions in the transportation profession.

Classes will be held in the evening or on Saturdays. Participants will receive a small book allowance.

For further information call Dr. Roess at (212) 643-5526 or 5272, or mail the coupon.

Dr. R. Roess
Polytechnic Institute of New York
333 Jay Street, Brooklyn, N.Y. 11201

Please send information about the Women in Science-Transportation program.

Name _____

Address _____

City _____

State _____ Zip _____

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Polytechnic
INSTITUTE OF NEW YORK

Polytechnic Institute of New York is an equal opportunity higher education institution.

PARTICIPANTS

Participants were sought through a limited advertising campaign, the cornerstone of which was an advertisement placed in the New York Times. The ad, shown in Figure 1, was run three times--in Tuesday's education section (October 14, 1980), Wednesday's home section (October 22, 1980), and Sunday's employment section (October 5, 1980). These placements offered exposure to the maximum audience at reasonable cost. The ads were supplemented by a press release that appeared in several local newspapers and women's publications.

The response to the program was astounding. More than 900 requests for information were received. Each respondent was sent two brochures that describe the program and an application. These requests resulted in 138 applications for the 40 available program slots. Of these, approximately half were eliminated after a review of transcripts; most would have required more extensive remediation than was available through the program. Approximately 70 applicants were interviewed, and final selections were made. Forty-four applicants were accepted into the program, with 8 declining. The program was initiated in Spring 1981 with 36 participants.

The characterization of a typical participant is difficult; they ranged considerably in background. Nevertheless, the average participant could best be described as caucasian, about 30 years of age, single with no children, and having an undergraduate degree in education. Table 2 details the distribution of participant backgrounds.

The response to the program reflects several key factors:

1. Substantial numbers of women remain underemployed;
2. Many such women are anxious to seek new careers, often radically different from the careers for which they were originally educated; and
3. Substantial numbers of women are seeking to reenter the job market, even where families include several children.

The economic realities of the day dictate that more and more women enter, reenter, and remain in the professional work force. This, coupled with the relatively poor employment picture for those in education, or who have general liberal arts degrees, presents a challenge and an opportunity to the transportation and other professions. Note that most of the women who were interviewed, and doubtless most who sought information, had little understanding of what the transportation profession entailed. The ease with which most participants immersed themselves in the field was truly astounding and a testimony to the dedication of reentry students--a dedication that often exceeded that of other students in the Polytechnic's transportation program.

Performance

Of the 36 women who originally enrolled in the program, 24 completed it in June 1982 and received graduate certificates. The result, a two-thirds retention rate, is considered good, compared with an approximately 50 percent rate in other NSF Women in Science programs across the nation. Note that of the 12 dropouts only 5 were due to an inability to understand course material. Others dropped out for a variety of reasons, ranging from health problems to promotions or achievements in their current professions. Three simply decided they were not suf-

Table 2. Distribution of participant backgrounds.

Item	Response	Number
Highest degree earned	Bachelor of arts	19
	Bachelor of science	4
	Bachelor of business administration	1
	Master of arts	4
	Master of science	8
Ethnicity	Black	9
	Hispanic	1
	Caucasian	26
Age	20-30 years	16
	31-40 years	17
	41-50 years	2
	51 or more years	1
Marital status	Married	16
	Single	19
Children	0	20
	1	4
	2	6
	3 or more	5

Table 3. Analysis of grades.

Course	Character of Course	A	B	C	F	INC/W
MA005 Remedial math	Math	2	8	4	2	7
MA551 Applied statistics	Math	19	5	2	0	1
Subtotal		21	13	6	2	8
TR 600 Transportation studies and characteristics	Descriptive	13	7	7	0	1
TR 630 Urban planning	Descriptive	9	4	0	0	2
TR 661 Intercity passenger and freight transportation	Descriptive	2	0	0	0	0
TR 751 Transportation finance	Descriptive	2	3	0	0	0
TR 756 Sociological aspects of transportation	Descriptive	1	1	0	0	1
TR 757 Transportation management	Descriptive	1	1	0	0	0
TR 758 Transportation policy and decision making	Descriptive	3	0	0	0	0
Subtotal		31	16	7	0	4
TR 601 Travel demand forecasting	Analytic	0	5	6	0	1
TR 602 Urban transportation planning	Analytic	1	0	0	0	3
TR 603 Computers in traffic and transportation planning	Analytic	1	1	2	0	0
TR 660 Urban public transportation	Analytic	5	2	0	0	2
TR 701 Traffic operations, control, and management	Analytic	14	3	0	0	1
TR 703 Traffic studies	Analytic	5	5	1	0	1
TR 704 Traffic capacity	Analytic	5	1	2	0	1
TR 750 Transportation economics	Analytic	8	9	1	0	1
TR 845 Analytic techniques in transportation	Analytic	3	0	0	0	0
TR 865 Highway traffic safety	Analytic	3	0	0	0	0
Subtotal		44	26	12	0	10
TR 624 Transportation workshop	Design	6	2	0	0	0
TR 710 Design of traffic facilities	Design	0	0	1	0	2
TR 715 Urban goods movement	Design	1	1	0	0	3
TR 670 Design of terminals	Design	3	1	0	0	1
TR 671 Airport planning and design	Design	1	3	0	0	1
Subtotal		11	7	1	0	7
Total		107	62	26	2	29
Percentage of total for participants		47.3	27.4	11.6	0.9	12.8
Percentage of total for all students		49.1	27.3	10.8	5.0	7.8

ficiently interested in transportation to pursue a career in it.

Table 3 summarizes the grades received by program participants. Courses are grouped into four principal categories based on their content:

1. Courses in basic mathematics,
2. Transportation courses primarily descriptive in content,
3. Transportation courses primarily analytic in content, and
4. Transportation courses that have heavy design content.

Despite the nonanalytic, nontechnical backgrounds of most of the participants, their academic performance was extremely good across-the-board. Though they did slightly better in descriptive courses, they had little difficulty in handling the transportation curriculum and performed well in analytic and design courses. When the grades of participants are compared with those of the entire student body enrolled in transportation programs, there is no significant difference in their performance. Program participants failed courses at a much lower rate than did the general student body but compiled more incomplete grades. The percentage of participants who passed courses and the distribution of passing grades is virtually the same as for the general student body.

The lowest grades were achieved in the remedial mathematics course. Several factors contributed to this:

1. This was the first course in the program,

2. The course was intensive and covered much material in a relatively short time-frame,

3. Math anxiety among participants was high and lessened only with time as confidence was built,

4. The instructor was not as responsive to the particular needs of the participants as he might have been, and

5. The course contained many of the participants who later became dropouts.

Interestingly, grades in the applied statistics course, which followed the remedial math offering, were considerably better. A slower pace, reduced math anxiety, and a change in instructors probably contributed heavily to this improvement.

Participants' reaction to a sudden reorientation to analytic learning was of some concern; therefore, attitudinal surveys were conducted during the first weeks of the program. These surveys evaluated a number of factors regarding individual participants' attitudes toward technical subjects in general, and math in particular. When these attitudinal factors were regressed against the math course grades of participants, the regression coefficient was an amazing 0.954. Those who were having difficulty in mathematics were having such difficulty primarily due to deep-seated negative feelings about their ability to learn math, not due to any basic problem of ability. One of the most gratifying aspects of the program was that many of these negative feelings were overcome by careful remediation and counseling.

Of the 24 women who completed the program, 5 were particularly outstanding. Additional support was found to enable these five to complete their master of science degrees in June 1982. For these five,

Table 4. Summary of survey evaluations.

Program Component	Average Rating
Initial orientation to transportation	3.9
Remedial math course	3.3
Statistics course	3.6
Tutoring, other academic support	3.6
Academic advising	4.0
Regular academic program and courses	4.3
Career counseling	2.9
Assistance with job placement	3.4
Faculty	4.3
Personal counseling	3.2
Overall program	3.8

Note: Ratings range from 1 (very dissatisfied) to 5 (very satisfied).

the full transition to a new profession was completed in only 18 months--a transition from a non-technical profession to one in transportation planning and engineering.

Placement

Placement of participants is difficult to evaluate because the job market in the profession is soft at the present time due to the general state of the economy and shifts in federal transportation policy. Also, many of the participants were not going to seek employment until they completed their master of science degrees. For most this would be June 1983.

Nevertheless, at this writing, the following placements have occurred:

1. Two transportation planners at Vollman Associates,
2. One administrative planner at New Jersey Transit,
3. One transportation planner at Urbitran Associates,
4. Two engineering technicians at the New York City Department of Transportation, and
5. Two full-time fellowship appointments for continued study at Polytechnic.

In addition three participants are currently discussing possible positions with other employers, and one turned down a job offer for personal reasons.

The placement of participants was pursued actively; numerous on-campus visits and interviews were arranged. Clearly, the slow job market has kept placements below their anticipated levels. Indications, however, are that most participants who are seeking placement will find positions within the next few months.

Participant Survey

In July 1982 a survey was sent to all participants, including those who had dropped out of the program, to get their impressions of the program. Part of this questionnaire dealt with placement. Some key responses follow:

1. Of those who responded, all intend to complete at least M.S. degrees in transportation; and
2. About one-third of the respondents were not considering any return to school; two-thirds were considering returning for additional work in other areas; only one participant was considering transportation-related study at the time the program was advertised.

Table 4 presents participants' ratings of various aspects of the program, each rated from 1 (very

dissatisfied) to 5 (very satisfied); recommendations for improvement included better job and career counseling and placement services, a more detailed course on statistics not held over the summer, a better treatment of technical writing and public speaking, more student-faculty interaction in seminar settings, and better tutoring services.

When asked to cite positive aspects of the program, most referred to the opportunity to return to school and the confidence gained by addressing a technical subject with success. Social interactions with other participants and the quality of faculty were also noted.

None of these results is startling. The biggest disappointment was expressed over career counseling and placement, which is to be expected given the current slow job market. None of the women who had dropped out returned the survey questionnaire, so there was no opportunity to examine the reasons for their departures.

The survey shows a generally high degree of satisfaction with the program. As more of the participants are placed, the level of uneasiness and misgivings expressed over placement will diminish. Next year a follow-up survey will again be conducted to begin to trace some of the longer-term impacts of the program on its participants.

CONCLUSIONS

The following conclusions are offered as a result of the Polytechnic experience.

1. A substantial market of potential students for transportation programs exists among women (and possibly men as well) seeking to reenter the job market in new professions.
2. The transportation profession is ideal for reentry at the graduate level because of its interdisciplinary nature and the limited extent of remediation required for students who have a nontechnical background.
3. Remedial programs, although not extensive, must be planned carefully to gradually orient reentry students to technical learning and to overcome math anxiety, particularly in women who have nonanalytic backgrounds.
4. Reentry students are capable of performing as well as more traditional students in transportation planning and engineering programs.
5. Some employers specifically seek transportation professionals who have engineering backgrounds; however, most display equal interest in reentry and traditional students.

A program related to the Women in Science reentry sequence is the recently initiated Transportation Management program at Polytechnic. Many of the women have expressed interest in this aspect of transportation and will pursue M.S. degrees in the new program. A management-oriented transportation program is even more amenable to reentry training than planning and engineering programs that are more analytic in content.

FUTURE EFFORTS

Several institute-sponsored efforts are underway at Polytechnic to attract reentry students to the transportation program. An institutewide policy is currently being formulated that will offer reentry students (male and female) tuition support. A program is already in place in transportation that offers tuition support to employees of city agencies.

The latter has attracted primarily college gradu-

ates who have general backgrounds who are underemployed (many as motormen, bus drivers, and other laborers) and who will seek promotion within their current agencies. Tuition support is critical for these students because New York City offers no reimbursement and their salaries are relatively low.

The institutewide policy will cover several graduate programs that are appropriate for reentry training. Although no final selection has been made, such areas as applied mathematics, environmental psychology, and computer science are being considered. A key factor here will be a tight defini-

tion of reentry student. The intent of tuition support is to attract new students, not subsidize those already attending at full tuition. The amount of tuition support is also being discussed, although one-third to one-half tuition remission is the approximate range being considered.

As graduate engineering enrollments decline nationwide, transportation and other engineering programs will have to seek new student markets. Reentry students, particularly women, are one such market that has been clearly identified and tapped at Polytechnic.

Design of Training Programs for Transit Middle-Managers

DAVID A. SCHRIER, ROGER P. ROESS, AND WILLIAM S. ALLISON

A management training program developed by Polytechnic Institute of New York that is based on specific transit system experience is reviewed in this paper. The program will now be given under the sponsorship of UMTA, under funding from Section 10 of the Urban Mass Transportation Act of 1964. The process of training program design based on need analysis and systematic organization diagnosis has great potential for improving the impact of training on transit system operations. Finally, the concept of teams of university faculty drawn from management, transportation engineering, and industrial engineering disciplines is explored. The maximum potential for helping transit systems to develop state-of-the-art management development and organizational development strategies tailor-made for each transit system is achieved by using this approach.

Initial conversations between representatives of the Transportation Training and Research Center at the Polytechnic Institute of New York and the New York City Transit Authority (NYCTA) during the summer of 1979 revealed a serious need for management training for approximately 450 middle-managers. Middle-managers include a wide range of second-level supervisors of line functions and administrative positions just below department head.

As in most mass transit systems, the predominant background of this group is limited to high school education and in-house training. Almost all of these middle-managers have risen through the ranks and began their careers as maintenance workers, conductors, motormen, and bus drivers. They lack the supervisory skills for the managerial roles they now play. Under the sponsorship of an Urban Mass Transit Administration University Research and Training Grant, Polytechnic undertook the development of a training program to specifically address these needs.

The primary objective of the training program was to improve the performance of middle-managers in addressing problems within the existing management structure of transit agencies. The intent of training was not to change the basic management format of an agency or operator but to optimize the middle-manager's performance within the existing structure, even where the structure may be imperfect or inefficient.

UNIVERSAL THEORY OF MANAGEMENT VERSUS SYSTEM-SPECIFIC TRAINING OF TRANSIT MANAGERS

Normally in the transit industry promotion is based on performance on the job. University degrees are rare for middle-managers, who are predominantly ac-

tion-oriented people. Outside of technical areas, the training departments in transit systems have given in-house courses that are based on the concept of the universality of management thought. Within this area of training, generally referred to as management development, the concept of universality assumes the usefulness of educating managers in the key functions of the management process:

1. Planning,
2. Organizing,
3. Directing,
4. Staffing, and
5. Controlling.

Universality within management thought assumes that management is a science based on principles for the five key functions of management listed previously. These principles are guidelines for all managers in all industries, for all hierarchical levels, and apply across cultural borders.

Considerable dissatisfaction is heard from line transit managers in the evaluation of traditional courses that are based on the universal concept. "All the cases we studied were based on how to get towels cleaned in the housekeeping department of Holiday Inns. The course was a waste of my time..." is a typical remark from a New York area transit manager.

Polytechnic's course attempts to avoid abstraction of thought and aims for the practical transfer of course learning to the job. The course avoids the broad category of education in the general or universal theory of management and is targeted at system-specific training based exclusively on cases and examples drawn from the shop floors of transit systems. This was the central idea for the design of the training program.

DESIGN PROCESS

The point of departure for the program design was the development and use of a need analysis questionnaire. Approximately 330 questionnaires were sent to NYCTA personnel who have the following job titles: supervisors, chief surface line dispatchers, assistant superintendents, and superintendents. The tabulated results formed the empirical base for the design of the training program. The goal of this participative process is that the pro-