

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

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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-

Table 1. Results of curriculum design survey.

Topic	Include	Omit	No Opinion	Emphasize Topic
TA organization, role and responsibility of TA manager	183	7	17	54
Work planning	189	9	9	75
Written and oral communication	198	5	4	101
Interpersonal relations	183	8	15	65
Group dynamics	144	29	34	29
Motivating subordinates	186	11	10	105
Management rights and responsibility under union contract	189	10	8	73
Art of negotiation	124	44	37	31
Budgeting	116	48	43	18
Financial management and analysis	110	56	41	10
Management information systems	170	10	27	37
Inventory control	121	42	37	13
Ridership development	105	45	57	24
Measuring and improving productivity	188	8	10	94
Role of government in transit operations	132	34	41	14

Table 2. Outline of course curriculum.

Day	Time	Course
1	Morning	Conceptual overview of work planning and control
	Afternoon	Case studies in human relations—employee counseling, maintaining morale, and motivating employees
2	Morning	Case studies in work planning and control—rail rapid transit and surface transit
	Afternoon	Case studies in human relations—maintenance schedules and employee disputes
3	Morning	Case studies in work planning and control—group discussions
	Afternoon	Case studies in human relations—evaluating managerial performance and insubordination
4	Morning	Case studies in work planning and control—group discussions and wrap-up
	Afternoon	Case studies in labor relations—inspection procedures
5	Morning	Budgeting and management information systems
	Afternoon	Case studies in labor relations—disciplinary procedures
6	Morning	Conceptual introduction to productivity analysis
	Afternoon	Case studies in labor relations—sick leave disputes, overtime disputes, and holiday disputes
7	Morning	Case studies in productivity—current efforts at NYCTA
	Afternoon	Case studies in labor relations—grievance procedures
8	Morning	Inventory control—NYCTA VISTA system
	Afternoon	Mock grievance hearing—reassigning signal maintainers
9	Morning	Group analysis of current system problems in mass transit
	Afternoon	Mock labor negotiations
10	Morning	Relating to higher levels of management
	Afternoon	Final examination and course evaluation

gram design be based on the perceived needs of managers in the system. The curriculum was developed from the results of the survey, which are summarized in Table 1, and led to the curriculum outline given in Table 2.

Following the design of the curriculum, the course instructors began extensive on-site research in the NYCTA. The instructors developed their cases by interviewing and observing managers at work. Cases were developed from real transit examples, documented by using NYCTA files, records, and case histories.

ASSUMPTIONS AND GUIDELINES FOR TRAINING DESIGN

Interviews with managers from top to middle levels reflected a great deal of controversy regarding the

development of materials. Chief fears included the following assumptions by management.

1. Training for bus personnel would not be helpful to subway people, their jobs are too different.
2. This will be another textbook university course that is useless for practical application.
3. Operations people perceive that all training leads to more paperwork.
4. What good does training do? My boss will not let me try anything new.
5. Basically there are three types of transit managers: bus, subway, and administrative. What is useful to one is not useful to another.
6. Administrative people do not understand the lives of operating managers; the program needs some key top managers who came up through the ranks and are operating people's heroes.
7. On the question of curriculum for work planning, there are no goals, no schedules, and no planning here.
8. The immediate need is for management tools to ease the current bottlenecks.
9. This program has to give the middle-manager a product, something in hand to use, a useful cookbook plan to follow.
10. If the course is general enough to reach across all levels, then it will not be specific enough to meet practical operating needs.
11. Finally, and perhaps most important, transit managers do not like to think, read, or write.

These comments are paraphrased quotes from the many interviews conducted among transit middle-managers in developing the curriculum. They highlight the general mistrust of typical training to which they are normally exposed, but for which they find little practical use.

The following guidelines, taking the above reality into account, became the operative standards for program design. Mixed classes of administrative, bus, and subway personnel are acceptable, even desirable; however, each course must be specialized by function. Maintenance and transportation are the two major functional categories for which separate training classes would be conducted. Within each function separate cases should be developed for subway and bus personnel, except where problems and issues are generic in nature.

During each training class, separated by the main functions listed previously, three different cases would be used to form smaller groups to work on rail, bus, and administrative cases. Case presentations to the larger group would pull the three divisions together but not tie each tediously to an area not of immediate interest. All materials would avoid wordy and academic approaches. The materials will be taken directly from transit reality and explained by examples of each technique. The examples will be solved in small groups formed by interest area and the results of each small group's solution will be shared with the entire training group.

Classroom exercises will emphasize oral communication and discussion, backed up (as appropriate) by written summaries. Cases will emphasize making the best possible use of existing structures and procedures and how to cope with any shortcomings of those procedures. Classroom discussions of cases will lead to consensus opinions on potential solutions or proper actions to be taken by middle-managers. No right or wrong answers will be identified, though the merits and possible outcomes of proposed solutions will be fully explored. Representatives of NYCTA will be used selectively to present specific aspects of procedures or to act as a resource for group discussions.

Figure 1. Results of course evaluation survey.

- 1) This course met $\frac{11}{12}$ my expectations
 exceeded $\frac{12}{1}$
 fell below $\frac{1}{1}$
- 2) Five topics most useful to participants in their jobs: work planning and control (16), labor-mgt. relations (16), disciplinary and grievance procedures (13), human resource mgt. (12), productivity (4).
- 3) Topics least useful to participants in their jobs: productivity (10), budgeting (8), inventory control (5),
- 4) Five topics best presented: labor-mgt. relations (15), work planning and control (13), disciplinary and grievance procedures (9), human resource mgt (6), inventory control (4).
- 5) Topics worst presented: Productivity (10), budgeting (5), work planning and control (3).
- 6) Rate instructors on a scale of 0-10:
 Schrier 8.8
 Allison 8.6
 Falcocchio 6.3
- 7) The use of NYCTA specialists to present details of NYCTA practice was:
 beneficial $\frac{21}{1}$
 not beneficial $\frac{1}{1}$
- 8) Was the case study approach effective?
 Yes $\frac{23}{0}$
 No $\frac{0}{0}$
- 9) Did NYCTA specific cases add or detract from overall course effectiveness?
 add $\frac{22}{1}$
 detract $\frac{1}{1}$
- 10) As a result of this course, your job performance will:
 $\frac{4}{19}$ improve significantly
 $\frac{19}{0}$ improve somewhat
 $\frac{0}{0}$ no impact expected
 $\frac{0}{0}$ deteriorate somewhat
 $\frac{0}{0}$ deteriorate significantly
- 11) Overall course rating (0-10); 8.4

RESULTS

A pilot offering of the training program was given to a group of 24 transit middle-managers. Twenty were from NYCTA, and 4 were from other New York City area operators. The course was given for five straight days beginning January 25, 1982; the remaining five sessions were given on consecutive Wednesdays, ending on March 3, 1982.

Four separate evaluations were conducted on the pilot course, and each was quite favorable. The instructors have all returned to the shop floor of the transit system to improve the design for future courses. The course has received UMTA endorsement under Section 10 of the Urban Mass Transit Act of 1964 (P.L. 88-65), and NYCTA has proposed that Polytechnic make changes specifically for that system. Following those changes, NYCTA middle-managers will be trained separately during additional course offerings. Eventually the program will be transferred from Polytechnic to the NYCTA's own in-house instructors.

Figure 1 summarizes the results of the course evaluation questionnaire filed by participants. Separate evaluations conducted by NYCTA are supportive of these results, as are the comments of instructors and official UMTA and NYCTA observers.

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

The overall results support the initiatives taken by Polytechnic, UMTA, and NYCTA. The findings are based

on carefully designed assumptions, applied research into the needs of mass transit systems for the design of a curriculum for management development, a pilot training course, four evaluations, follow-up course development activities, and plans for extensive course offerings in the near future.

The following conclusions have been formulated:

1. The needs of transit middle-managers are best met by system-specific training, not general management curricula.
2. The case-study approach is an effective tool for the training of middle-managers, who tend to rebel at traditional classroom learning.
3. The development of appropriate cases requires extensive on-site research, and the design of curricula requires the active participation of executives of the transit system.
4. There is a critical need for understanding of the lives of operating managers and to reflect their reality in training. The crucial element is to have instructors conduct need analysis studies and other research on the shop floor in order to develop an empathetic orientation and rapport with the participants in their natural work setting.
5. Training must lead to development of useful tools that can be implemented rapidly by transit middle-managers. These tools should result in improved conditions within a relatively short time frame. The value of new techniques must be quickly reinforced in the work experience.
6. Case studies should be prepared separately

for the primary transit functions, but mixed groups are encouraged. They result in team building and a greater appreciation for overall organizational operation.

Polytechnic's training program is a unique university-industry cooperative effort for training that appears to be successful. It represents just the beginning of appreciation for the potential role that universities are able to play in providing management training to transit systems. Management faculty teamed-up with transportation faculty can offer transit systems state-of-the-art approaches for solving persistent problems that top management has merely adapted to rather than solved.

The specific role for universities shown by this project is as a consultant to managers of training programs. The need for training departments to enter the world of operating managers and develop training programs based on skill deficiencies that cause performance problems is the key element of the program. The role of the university was in the identification of these deficiencies and the design of a curriculum to correct them.

The shift of emphasis in transit training from instruction in general managerial training courses and into the role of internal consultant is the key to success. The strategic orientation of training departments should be based on changing the organization and not on educating it. The new role would then be toward organization development in addition to, not instead of, skills training.

The university offers expertise in the performance of analysis techniques, approaches to behavioral modeling, applications of team building in training (to build empathy and personal networks among managers across functional positions), the application of strategies for organizational change to training courses, and many other state-of-the-art possibilities. Teams of faculty can also provide transit operators with appropriate mixes of exper-

tise in management, transportation, industrial engineering, and other specialties.

One elaboration of the techniques suggested previously, for example, would be the application of strategies for organizational change. One of the many approaches used in private organizations by management consultants is diagnosis of systemic problems based on confidential interviews. This bottom-up approach focuses on the participative formulation of problems by category, impact, and cause. It also protects those participating managers from recrimination in low-trust climates. The formal diagnosis provides management with a map for action. Where problems are based on skill deficiency, training programs may be designed that focus on the skill deficiency that is causing the performance problem.

Diagnostic techniques can be taught to training department personnel on a phase-out agreement with the university team. Where trusting climates exist, systematic group meetings for diagnosis contribute toward the goal of team building as information is gathered for the formal diagnostic report. The overall approach toward helping the organization change is organizational development, just one of the many possible beneficial relations that can be formed between university faculty teams and transit agencies. Where universities and transit operators can form cooperative working teams, the results are seen in more effective training, which increases the potential for significant improvements in performance.

A detailed report on this training program has been submitted to UMTA and is available through the Polytechnic Institute of New York (1).

REFERENCE

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Introduction: Revolution or Evolution in Transportation Education?

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The transportation profession is facing a fundamental change in the approaches used in analysis. The catalyst for this change has been the development and rapid use of microcomputer technology and software throughout the profession. Many of the transportation engineering and planning exercises that were once done manually or required extensive computer application have been adapted to a microcomputer environment--easy to use with rapid turnaround. At a recent seminar sponsored by the Institute of Transportation Engineers, 25 percent of the transportation professionals today were estimated to use microcomputers. Within two or three years this number might reach 50 percent or more.

The rapid introduction of the microcomputer into

the profession places a special burden on transportation educators. Universities must teach students with this new capability and prepare them for this new working environment; however, a dilemma arises over the approach used to present this material. One school of thought argues that the technique provides the answer and all one must do is train students how to use the technology. Another group argues that, although the technology is important, students must still be educated in the approaches and procedures that produce the answers.

The two papers that follow address the issues related to this educational dilemma. These papers represent the beginning of a debate that might last for some time.