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teaching the MIDAS touch



Bus mechanics are learning to apply high-tech approaches to hands-on work in a training program developed under the direction of Lia Di Bello at the GSUC's Center for Advanced Study in Education (CASE). As a result, the New York City Transit Authority is implementing a new maintenance system that greatly reduces breakdowns. Called MIDAS (Maintenance Information and Diagnostic Analysis System), it enables maintenance workers to utilize on-site computers to track the life span of individual parts and schedule replacement before they break down. Given that the Transit Authority has more than 3,700 buses to maintain, the obstacle course the vehicles have to endure, and the \$5,000 average cost per breakdown, the savings from the program are significant.

Preventive maintenance is generally considered the most efficient way to maintain fleets. The problem is how to go about it. Standard systems of regular maintenance result in down time, and inspections tend to find problems only after parts have become defective—a method more reactive than preventive.

The transportation industry widely agrees that the solution is to use computers to track bus components through their life span, but about half the prior attempts to implement such computerized decision-support systems had broken down and about 80 percent operated below expectations at best. For the system to work, the people who replace the parts also have to play the primary role in inputting and analyzing the data. The problem was that the mechanics and foremen—accustomed to applying hands-on skills to concrete problems—were not properly trained to use the abstract, counterintuitive, technology-based approaches required by the new MIDAS system.

That's where Di Bello and CASE's Workplace Technology Research Group (WTRG) came in. A GSUC doctoral alumna in Developmental Psychology, Di Bello and her colleagues are continuing to develop and apply the work of her mentor, the late Professor Sylvia Scribner, a renowned developmental psychologist who was on The Graduate School faculty. Specializing in adult learning with an emphasis on the workplace, WTRG translates abstract theories of cognitive development into specific training methods that compress a year or two's worth of

incidental on-the-job learning into a few days.

Under Di Bello's direction, WTRG assembled a research and training team incorporating anthropologists, psychologists, engineers, and former tradespeople. The team created workshops for MIDAS, designed to "retool" the thinking of the maintenance workers. Specifically, the workshops began by having participating workers operate a miniature depot, complete with buses, complex parts, inventories, schedules, budgets, and revenues. The model depot was designed so that when the workers tried to resolve problems by employing their prior experience, they encountered a mounting series of crises.

Only after they experienced the inherent problems were the participants introduced to the solution. They learned the logic of the new technologies by doing the computer's operations manually and constructing the necessary data structures, rather than just operating the computer system. The participants then ran their miniature depot again, this time employing MIDAS concepts, with significant, and comprehensible, gains in efficiency and productivity. Ensuing sessions were conducted on site, using the maintenance shop as the classroom, with instructors sometimes working under the buses with the mechanics. In each situation, WTRG continued to modify the workshop design in response to the participants' suggestions and varying needs.

A study compared the performances of teams who were WTRG trained and those who were not as they attempted to implement MIDAS. The WTRG-trained teams achieved a higher and continually improving rate of performance (as measured, for example, by mean distance between bus failures), while the teams that had not been trained by WTRG had a declining rate of performance. Overall, the results achieved by the WTRG-trained workers exceeded expectations. Clearly, the workshop provided the key element to making the new system work.

According to Di Bello, "MIDAS is becoming the most successful implementation of decision-support technology in the transit industry; in fact, the American Public Transportation Association is discussing making the training and methods an industry standard." Ultimately, the project is a win situation all around—a breakthrough in retraining midcareer blue-collar workers that saves management time and money.