

Theodore M. Matson Memorial Award: Continued Professional Development of the Transportation Workforce

Theodore M. Matson contributed greatly to the traveling public through the advancement of traffic engineering and the training of professionals. Mr. Matson was director of the Bureau of Highway Traffic at Yale University and was serving as vice president of ITE when his untimely death occurred in December 1954. He was one of ITE's founders.

The Theodore M. Matson Memorial Award, in recognition of outstanding contributions in the field of traffic engineering, has been awarded annually since 1957. Each year, representatives from the following associations select the award recipient:

- American Association of State Highway and Transportation Officials;
- American Road and Transportation Builders Association;
- Federal Highway Administration;
- Institute of Transportation Engineers;
- Intelligent Transportation Society of America;
- Theodore M. Matson Associates; and
- Transportation Research Board.

BY JOHN M. MASON JR., PH.D., P.E.

I AM HONORED TO HAVE BEEN selected to receive the Theodore M. Matson Memorial Award. Over the years, I have come to learn much about Ted Matson's professional career. I am gratified to have my name associated with someone who accomplished so much in the transportation engineering field.

I also am most appreciative of this award because it acknowledges the integration of professional practice, research, education and training activities within our profession. I want to thank the representatives of the various transportation associations on the selection committee as well as those who were instrumental in my nomination for this noteworthy recognition.

It has been customary for recipients of this award to reflect briefly on their personal background and experiences as a prelude to the opportunity to prepare a feature article for *ITE Journal*. I have been fortunate that my transportation-related experience has come from various perspectives.

I began my career as a highway/traffic engineer in a consulting practice. I then began teaching at a two-year community college while continuing to work with a municipal consulting firm. From there, I moved onto doctoral studies and research, returning to full-time consulting with management responsibilities.

I eventually returned to academia, coordinating broad transportation research programs, expanding university curriculum in transportation and, over the past two decades, regularly participating with several national professional associations to advocate for the continuous transfer and exchange of knowledge across our profession. This latter activity was instilled in me while I was employed at the Texas Transportation Institute at Texas A&M University. I was part of the Design and Implementation Program, directed by Dr. Donald L. Woods.

He and several other professors who also were well-known ITE members (N.J. Rowan and V.G. Stover), mentoring by example, demonstrated the benefits and importance of collaborating outside academia via continuing educational activities. I continue to promote the importance of ensuring the exchange of knowledge in the practice of the transportation profession.

Recognizing that many facets surround workforce development issues in general and that an enormous breadth of individuals is associated with the transportation workforce at large, I have concentrated on the portion of the transportation workforce that requires a post-secondary education.

Additionally, although most of my comments are based on technical and engineering-centered examples, they are relevant to the broad range of transportation professionals necessary to the common mission of safety and mobility.

The goal of this feature is to discuss the attributes of providing continued professional development opportunities for those already in the transportation workforce. As a means to focus on some current trends and add my personal insights, I have selected five areas to address:

- National workforce, science and engineering perspectives;
- Civil engineering trends;
- Transportation workforce issues;
- Transportation workforce development; and
- Transportation continuing and distance education.

These areas originally were presented in a feature article that appeared in the September 2003 issue of *ITE Journal*.¹ I'd like to take this opportunity to provide updates on recent trends, related activities and ongoing challenges in providing continued transportation education and training in our profession.

NATIONAL WORKFORCE, SCIENCE AND ENGINEERING PERSPECTIVES

A 2004 RAND Corporation report to the U.S. Department of Labor described the composition of the 21st-century workforce and summarized the major factors shaping the future of work in the current century and the implications of those factors to the future workforce and workplace.²

The most relevant issue in this context is that as technology continues to impact all aspects of our daily life, the demand for more skilled workers who need training or retraining will rise across all workforce domains. Transportation will be among the professions seeking the means to accommodate individuals in need of additional and timely knowledge.

The size and quality of the overall U.S. science and engineering (S&E) workforce has been an ongoing concern for the past decade. Numerous sources have reported that fewer college students are majoring in the physical sciences, mathematics and engineering than in the past. The National Academies have cited human capital needs as a high-risk issue.³

Additionally, the federal S&E workforce is shrinking. Foreign students are finding challenging job opportunities in their home countries. Complicating these issues is the contention that workforce changes evolve deliberately and require well-coordinated government, industry and university actions.

Although the demand for the engineering workforce remains healthy, the numbers of students planning to enter engineering continues to decline. A recent report issued by the ACT Office of Policy Research argues that the United States needs to ensure that it maintains a strong engineering-based workforce.⁴

Compounding the national technical workforce problem is the decline and loss of the scientific and technological workforce to other countries, which may be creating a looming crisis in the United States.⁵ The need to sustain a knowledgeable and innovative national workforce is simultaneously being realized by all countries seeking to remain competitive via economic growth opportunities.

It is interesting to note that transportation is listed among one of 12 sectors at the national level identified in the "High

Growth Job Training Initiative" of the U.S. Department of Labor Employment and Training Administration. Selected sectors are projecting substantial numbers of new jobs, are being transformed by technology and innovation, or are expecting new and emerging businesses.

The fiscal year 2005 budget request in the president's Job Training Reform Proposal would provide flexibility in training funds and would encourage programs that contain partners from colleges and the public and private sectors in meeting the training needs.⁶

CIVIL ENGINEERING TRENDS

Civil engineering undergraduate programs continue to serve as a primary source of human capital for the transportation technical workforce. Although the transportation professional workforce derives its employees from multiple disciplines, trends and changes in civil engineering directly affect the workforce pool responsible for the physical assets of the built environment.

An American Society for Engineering Education database reports that approximately 10,000 students received civil engineering bachelor's degrees in 1999; by 2004, the number of degrees awarded decreased to 8,470. Future trends for civil engineering programs appear to be moving toward broadly-based core program requirements with transportation courses as electives. A reduced number of total credit hours for graduation is becoming the norm at many institutions of higher education.

Because transportation-specific content knowledge is less likely to be a guaranteed part of a student's formal undergraduate education, it is becoming increasingly necessary to provide pertinent transportation knowledge through on-the-job-training, short courses, or additional formal education programs.

Even when individuals continue beyond formal undergraduate degrees, as graduate students, they tend to focus more narrowly. This is in contrast to the need for broader-based professional programs in demand by practicing professionals.

In support of continued professional development, the American Society of Civil Engineers (ASCE) has adopted Policy Statement 465—Academic Prerequisites for Licensure and Professional Practice—

which states: "ASCE supports the concept of the master's degree or equivalent as a prerequisite for licensure and the practice of civil engineering at a professional level."

A committee is charged with the further development of the overall plan, and the body of knowledge necessary for professional practice is being identified for the civil engineer of the future.⁷ The knowledge needed beyond the undergraduate degree may be attained via traditional on-campus graduate education courses or distance education mechanisms.

It will be important for the transportation profession to be engaged in ASCE's activities in this area to be appropriately represented in future continuing education opportunities. This is particularly true because civil engineers compose the principal employee complement of many state departments of transportation and transportation planning and engineering consulting firms.

TRANSPORTATION WORKFORCE ISSUES

In 1985, Transportation Research Board (TRB) *Special Report 207* identified the professional staffing needs for state, local and federal highway and mass transit agencies and private-sector consulting firms.⁸ The authors of the study expressed a concern that "a large number of professionals who entered highway and mass transit organizations during the past 30 years are expected to retire soon."

This concern remains today, but many agencies have shifted the work that was done formerly by their graying workforce to outside sources. Although the scope of responsibilities of transportation organizations has increased, traditional transportation engineering and planning programs still are the primary responsibility of the professional transportation workforce.

The *Special Report 207* committee's foresight for "certification procedures to ensure the necessary professional expertise is preserved while the skills of planners, environmental specialists, and other professionals are fully used," has been addressed by the numerous continuing educational post-baccalaureate programs at several universities.

In transportation, the Institute of Transportation Engineers has provided leadership in conceiving and advocating the develop-

ment of Professional Transportation Operations Engineer™ certification and other transportation-related certification efforts.

In 2003, the TRB Special Committee on Future Surface Transportation Agency Human Resources Needs: Strategies for Recruitment, Training and Retaining Personnel, was formed to examine the changing roles and responsibilities of public transportation agencies over the next two decades.⁹ The intent of the study, published as TRB *Special Report 275*, was not to determine specific numbers of particular individuals in agencies, but to identify expertise areas that will be needed and to describe the capabilities of that workforce.

The study committee focused on how transportation agencies can adjust to future workforce challenges. Establishing training as a strategic priority was cited among several key factors affecting the quality of the nation's future transportation workforce. The final report recommended that the transportation workforce should seek partnerships in providing the necessary investments for effective and focused training.

Although no single organization model could possibly accommodate the variability across the breadth of transportation-related services and providers, the committee clearly noted the need for strategic-level planning regarding human resource functions within transportation organizations.

TRANSPORTATION WORKFORCE DEVELOPMENT

For transportation entities (public and private) to adequately address the need for continued workforce development, quantitative assessments of related workforce issues are necessary. Information about fundamental transportation human resources is lacking. This makes it difficult to clearly identify future content knowledge needs, mix of workforce staff levels and experiences and succession planning. Key data and pertinent assessment studies appear limited, and mostly anecdotal evidence exists on the capacity within public agencies.

Although published, detailed knowledge gaps and workforce skill-set information are lacking. A recent National Cooperative Highway Research Program Synthesis Report (#323) found that state agencies overwhelmingly cite opportuni-

ties for professional development, training programs and continuing education assistance to be the most useful benefits for individuals joining their agencies.¹⁰

The need for continuous professional development in one's chosen field is intuitive. Transportation professionals' motivation for life-long learning should begin during the undergraduate experience. Entry-level engineers are routinely found to have the necessary base technical skills upon graduation.

Employers, however, regularly note that entry-level graduates need additional improvement in communication skills, an understanding of how to market services and products, an appreciation of the financial aspects of business operations and general project management skills. These observations indicate that in addition to maintaining the technical competency of practitioners, a demand exists to address a broader range of professional capabilities within the transportation workforce.

While professional development stages are principally a progression of cumulative work experience, the transportation profession also is characterized as having many entry points to its system. Individuals gain employment in various fields/areas of transportation. Their technical skills and personal experiences are as varied as their educational preparation. Fortunately, entry to the transportation field is not limited to a specific "pipeline."

The National Workforce Summit recognized the importance of addressing workforce development through the support that comes from one's own professional organization. This base of professional support, along with the efforts provided by other partners, helps promote the creation of a well-trained transportation workforce. The group also noted that professional development includes more than knowledge training, but also mentoring and other related professional interactions.¹¹

TRANSPORTATION CONTINUING AND DISTANCE EDUCATION

Reflecting the increased demand for all forms of training, institutions of higher learning recently have shown growth in the number of students enrolling in professional development programs via distance education alternatives. Although

distance education will not completely replace face-to-face education and training programs, the U.S. General Accounting Office has reported continued growth in distance education involvement by undergraduate and graduate students.¹²

Distance education includes live off-campus instruction, interactive television/audio, pre-recorded video, CD-ROM, or other computer-based systems. Many institutions are using the Internet more than any other mode of delivery. Most distance education subjects are related to business, humanities, or education. Transportation distance education programs are slowly entering the mainstream of distance education, but currently vary greatly in breadth and depth of subject matter coverage.

Post-baccalaureate continuing educational programs (such as conferences, seminars, short courses, Web-based courses, real-time two-way audio/video and CD-based) historically have been among the alternatives for acquiring professional development knowledge. The "courses" are offered either for full academic credit or as continuing education units.

Graduate "certificate" programs are becoming a very common recognition for post-baccalaureate credit. Such certificates can be made compatible with "certification" programs of various professional societies, or can act as placeholders for the accumulation of graduate credit, which then could be transferred to a master's degree program.

Online continuing education offers new and additional opportunities for transportation professionals. For example, ITE, ASCE and several state agencies have begun offering various educational programs with transportation-related content. Some state agencies have collaborated with universities to develop and deliver individualized programs.

During the past year, a concept for a National Surface Transportation Graduate Studies Certificate Program via distance education has been under consideration. Discussion of this concept has been facilitated by the National Highway Institute Office of Professional and Corporate Development.

CLOSING COMMENTS

ITE is in a unique position to distin-

guish itself as a preferred provider to transportation professionals seeking continued education and training on various transportation topics. Although distance education will gain in popularity and familiarity for those seeking to develop professionally, demand will remain for the preparation of written content that can be disseminated via Web site postings, handbooks, journals, traditional short courses, seminars and conferences. ITE has demonstrated that it can provide these opportunities. ITE also has the opportunity to facilitate the further development of critical partnerships to deliver the desired professional development programs through traditional means and via distance education initiatives.

I encourage the academic community to continue to be actively engaged in the necessary outreach efforts within our transportation profession. U.S. Department of Transportation sponsored University Transportation Centers; various transportation education, research and training programs; and associated institutes and consortia can provide the necessary integration for public- and private-sector transportation workforce education and training opportunities across interrelated disciplines.

Academic institutions are making incremental progress in more fully engaging a variety of outreach activities. Current efforts cover activities ranging from K-12 interactions to collaborating in exchanging graduate-level courses across disciplines and between institutions.

Post-secondary institutions including community colleges, technical institutes, private-sector training entities and four-year engineering programs are logical and relevant partners in meeting the professional development needs of the future transportation workforce.

A FINAL PERSONAL NOTE

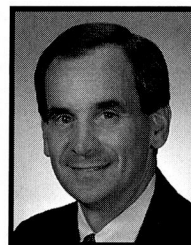
The ITE community, in cooperation with its transportation association/agency colleagues and its constituencies in the public and private sectors, can meet some of the continuing education and training demands by partnering with academia. Such a partnership can effectively develop, conduct and deliver the knowledge desired by transportation professionals. Through

well-conceived, strategically focused collaborations, ITE and its partners will meet and sustain the needs of the transportation workforce on a continuing basis.

I again wish to thank ITE and the member transportation associations for this recognition. I look forward to continuing to participate in the educational development activities of our profession. ■

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His career consists of teaching, research, private practice and administrative responsibilities spanning 35 years. He joined ITE in 1970 as a student member and officer of the Pennsylvania State University Harrisburg student chapter.

His leadership and participation in ITE committee roles include: Education, Administration and Professional Standards Committee; E-Learning Advisory Group; Traffic Academy steering member; inaugural member of the Traffic Engineering Certification Board of Directors; the Educator's Council; and the Urban Traffic Engineering Project. John's commitment to geometric design is demonstrated by his willingness to promote the development of ITE's new Geometric Design Handbook series. He served as co-chair on the Geometric Design Task Force and is senior editor of the three handbooks, which address safety and operational considerations in the geometric design of freeways and interchanges, urban roadways and rural highways.

He has chaired the Education and Training Committee for ITS America and was on the original steering committee for the ITS Professional Capacity Building Program. He was chair for the ARTBA Research and Education Division, member of ASCE education committees and past president of the Council of University Transportation Centers. He serves on the FHWA National Highway Institute Advisory Group, exploring distance learning programs for transportation professionals.

His noteworthy participation in publications includes TRB Special Report 275, The Workforce Challenge and NCHRP Report 347, Parts I and II, Civil Engineering Careers: Awareness, Retention and Curriculum Programs.

John holds a B.S. in transportation from Pennsylvania State University, an M.S. in transportation engineering from Villanova University and a Ph.D. in civil engineering from Texas A&M University. He was a member of the committee that developed the Professional Traffic Operations Engineer™ certification and was a proponent of initiating a professional development program to complement the certification. He is a fellow of ITE.