Transportation Workforce for the 21st Century—A Challenge to Education

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Introduction

As the world enters the 21st Century, the relationship of education and training to the development of America's talent base continues to be a major factor in the success of the nation's ability to succeed and to excel. The United States has been fortunate in the payback received from its investment in learning at all levels. But past achievements and investments do not ensure future success. This paper provides an insight into the role of transportation education in transforming the nation's workforce. It then examines several additional areas that will impact on future developments.

Formal education programs and training efforts have not always been a determining factor in transportation innovations. Up until the early 20th century, transportation issues were part of the academic agenda, but did not have a specific framework of their own. In the 1950s and 1960s, education endeavors in transportation were concentrated at the collegiate level; mainly through engineering programs. The focus was on the practical matters of building and maintaining America's growing land, marine, and air-based systems. In the latter part of the 20th Century, transportation education became a discipline in its own right, not just an adjunct to other education programs. At the same time, there was growth in technical-oriented programs with a practitioner focus at the junior and community college level.

The historical progression highlights the first workforce issue: a need for a curriculum that educates individuals beyond the traditional, formal technical requirements of engineering and science. Developments in the field now come about because of continuing demands and commitments at several levels. The traditional focus of the engineering curricula is now supplemented by "soft skills" that stress management concepts (e.g., working in multi-disciplinary teams) and policy issues (e.g., moving beyond the needs of local society to cover global issues).

Transportation professionals in the 21st Century must have the ability to see how their work impacts the environment; not only in the cost to the air, land, and water, but also in energy use. They must have skills to understand how their decisions relate to community stakeholders (i.e., the politician who may make the decision and who provides or withholds support; the taxpayers who pay the expenses; the public who benefits from their efforts). At the same time, there is the ongoing upgrading of the curricula, based on the impacts of technology on infrastructure development, communications, and product design.

Some of the new specializations may be non-traditional. The topic of ethics as part of the education curricula -- a growing component of business school programs in the United States -- provides one example of this growing diversity. This is an issue that transcends disciplines and relates to the training requirements of the transportation professional. It begins in the classroom and extends into the work place where the opportunity exists to reinforce the implications of ethical dealings that individuals encounter throughout their careers. This involves not only making and upholding contractual obligations, but also maintaining a standard of integrity (especially in situations where ethical standards differ or do not exist).

The outcome derived from these curriculum changes benefits not only the formal academic, but also the practitioner at various levels who wishes to learn new skills or enhance his/her current knowledge base. At the same time, it prepares the next generation of transportation specialists and provides the leadership necessary to maintain America's preeminent position in research, technology, and infrastructure advancement.

The second workforce issue involves making education and training efforts "seamless" (i.e., offering opportunities for those entering the system, for those utilizing it throughout their formative years, and then ensuring that education becomes a life long process). In order to interest future leaders (including traditionally under represented populations) in transportation careers, elementary and secondary curricula are being developed and revised.[16] Opportunities occur because of students' interest in computers and high technology. At the other end of the learning spectrum, existing professionals are becoming part of a life long learning process that extends to those who wish to continue their learning on an ongoing basis. These are the individuals who need to maintain their existing knowledge and skills in the face of the massive technological and policy changes going on around them. Learning might also involve those who are informally interested in transportation issues. From a work force perspective, it is important to ensure that all these groups have access to up-to-date technology resources.

In order for transportation education to be relevant to society's needs, it must take into account a third workforce issue: changing demographics in the workplace. For example, the traditional scope of jobs and careers is broadening to include women and minorities in key managerial and leadership positions. Education is a key component in preparing and sustaining these individuals throughout their careers within the transportation hierarchy. The Department of Transportation's Eisenhower Fellowship Program, as one example, acts as a catalyst for training, technology transfer, and as a means of enhancing teaching for the transportation faculty.

The American transportation education network has broadened beyond the United States to become a world class model. Therefore, demographics also encompass an international component that prepares practitioners, researchers, and managers from all over the world in

[16] The U.S. Department of Transportation has recognized the importance of an ongoing commitment to transportation education through its Garrett A. Morgan Technology and Transportation Futures Program. This program supports innovation in elementary, secondary, junior and community college, collegiate, graduate and life-long learning endeavors.

solving issues within their own countries as well as interdependent transportation issues that take place within a regional or global context.

The above perspective highlights the changing and evolving focus of the "transportation professional." It is no longer sufficient to have a technical background. It is no longer sufficient to view transportation education as just as series of college courses. Work force demands make it both a multi-disciplinary and a life long endeavor.

In the 21st Century, two areas will have a crucial impact on relating education/training to the needs of a fast-changing workforce. These are the impact of globalization and the role of technology. The following sections present an insight into each while the conclusion challenges the reader with a series of "next steps" in order to maintain the momentum.

The Impact of Globalization

One of the major factors facing the United States and the world at the beginning of the 21st Century will be the impacts brought about by globalization.[17] In private sector transportation endeavors, organizations provide products, services, and research capabilities to a wide, diverse world community that is increasingly becoming more competitive. In public sector transportation endeavors, governments at various levels are responsible for the development, implementation, and maintenance of existing and evolving transportation infrastructures. Transportation education acts as the catalyst to bind these forces together by supporting innovation and change.

Globalization has and will continue to impact the changing academic environment. In a direct sense, it supports the internationalization of resources, not only in the individual classroom, but also in the research facility that then extends out to the workplace environment. The outcome shares learning innovations and the latest research and development (R&D) endeavors that go beyond the academic setting. Global transportation education efforts support industrialization, the movement of goods and people; enhanced resources; better communication, and improvements in the quality of life for all countries. Because globalization forces enhanced competition -- some call it hyper-competition in the 21st Century -- it provides a wonderful opportunity for education stakeholders to show leadership through innovative research projects as well as utilizing technology and communication to share resources and knowledge.

The Role of Technology

Just as transportation innovations acted as an "engine of growth" in the 19th century during the Industrial Revolution, they are also one of the economic and environment drivers of the technology revolution leading to the 21st Century. The technology revolution that is going on inside and beyond the classroom has a major impact on transportation education. Within the teaching environment, the use of computers as a learning tool is revolutionizing how students

[17] Globalization has been defined as "...seeing the whole world as nationless or borderless." From Koh Sera's "Corporate Globalization: a new trend".

study existing theoretical and practical problems, as well as how they plan future transportation solutions. Within the learning environment, research methodologies and outcomes are bringing about continuing change; for example, not only in tabulating and evaluating complex quantitative problems, but also in how information is shared through web site addresses and communication links.

The revolution extends beyond the formal classroom since it opens up distance learning opportunities to the academic and to the practitioner, even in remote locations. Technology is also being used as a powerful information and learning tool to interest young students as well as those who wish to know more about the field.

By combining technology and education endeavors, there is the opportunity to build new technology, improve existing infrastructure, develop world class facilities, enhance capital investments, create alternative energy sources, improve the environment, and make better communication alternatives. At the same time, it can be used to create, test, implement, and monitor potential innovations before a financial, environmental, political, or research commitment is made.

Directions for the Future

As leaders in transportation education plan for the exciting changes they face in the 21st century, they must prepare the workforce (i.e., both current and future practitioners) in several ways. In order to compete and demonstrate leadership, these individuals must have: (1) technical knowledge and skills; (2) analytical ability; (3) communication (and, in some instances, intercultural) skills; (4) technology/computerization skills, as well as (5) a variety of policy skills. At the same time, they need non-traditional skills, such as the ability to communicate between public and private interests, strategic management of human and capital resources, environmental insights, and an ability to understand how their work relates within an international context.

To accomplish this, several general and specific requirements are needed. First, educators and administrators must meet continuous, changing work force demands through the course of study they offer and the opportunities that their institutions provide. As part of this, there must be a continuing commitment to broaden the focus beyond "traditional learning" to "students" of all ages. Second, there must be a commitment by numerous stakeholders in order to supply the tangible resources needed (e.g., funding, scholarships, grants, research opportunities, internships, etc.). Third, educators must build new partnerships that bridge the gap between the academic, public, and private sectors (i.e., public private partnerships). Finally, in a world of highly competitive resources, they need to market their success to academics, and non-academics in order to build interest and support for their programs, as well as justification among voters and taxpayers.

There are numerous benefits of this multi-dimensional approach. From a practical standpoint, it develops the next generation of transportation leadership. At the same time, it builds the field of transportation education and creates the necessary innovation to meet known and unforeseen challenges. Finally, it supports the goal of developing a safe, efficient transportation systems that not only meets America's -- and the world's -- needs, but also remains the benchmark for training, education, and technology transfer in a highly competitive, world wide 21st Century work place environment.