

A NEW APPROACH FOR TRANSPORTATION TECHNOLOGY TRANSFER AND PROFESSIONAL DEVELOPMENT

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Abstract. The Transportation Technology Transfer Center located at the Civil Engineering and Surveying Department at the University of Puerto Rico, Mayagüez Campus, has collaborated for the past twenty years with the Department of Transportation and Public Works on transportation technology transfer and professional development programs. The transportation technology activities have provided local transportation officials with the latest technology through a series of activities including a comprehensive seminar program. The professional development has emphasized on research related to public transportation using the Tren Urbano as an example of a complex infrastructure project. These educative efforts have contributed in the development of professionals in different disciplines and have promoted the exchange of ideas and research that contribute to the scientific and technological development in Puerto Rico and other places in the world. This paper will concentrate on describing the major elements of the LTAP Program as well as the success stories of this technology transfer and professional development educational approach that have contributed in the development of a new generation of engineers and professionals.

Keywords: Transportation, Technology Transfer, Professional Development.

INTRODUCTION

The Puerto Rico Transportation Technology Transfer Center, also known as the Puerto Rico LTAP (Local Technical Assistance Program), was established in April 1, 1986 in the Civil Engineering Department of the University of Puerto Rico, Mayagüez Campus to promote research and development and technology transfer in highway related activities in Puerto Rico and the US Virgin Islands. Also is part of a network of 57 LTAP centers (one in each State, one in Puerto Rico, and six that serve Native American Tribal Governments.

The Center provides this service to local transportation officials of the 78 municipalities of Puerto Rico, to the Department of Transportation and Public Works (DTPW) of Puerto Rico and the United States Virgin Islands (USVI) Department of Public Works (DPW). The activities and operational expenses of the LTAP Center are funded by the

Federal Highway Administration (FHWA), DTPW and Virgin Islands DPW.

The Center continuously collaborates with various professional organizations in the offering and development of the seminar program. Some of these are the College of Engineers and Surveyors, American Public Works Association and the Institute of Transportation Engineers. The Center has co-sponsored conferences and congresses with the National Science Foundation (NSF), The Hemispherical Center of Cooperation in Investigation and Education, and Engineering and Applied Science (Co-HEMIS), the Civil Infrastructure Research Center, and affiliations such as the Northeast and Southeast Associations of State Highway and Transportation Officials (NASHTO and SASHTO). Through nineteen years of operation, the Center has trained more than 12,000 federal, state, municipal, and local officials.

GOALS AND OBJECTIVES

The original goals and objectives of the Center are the following:

- Transferring the significant findings of investigations performed in the United States and other countries to inform it to the municipalities of Puerto Rico.
- Offering the personnel of transportation local agencies information brought up to date on the new available technology on planning, design, construction, programming, maintenance, evaluation and rehabilitation.

MAJOR ACTIVITIES

The LTAP Center has promoted a great variety of seminars to cover the needs of transportation officials of the municipalities, as well as those of the DTOP and the Virgin Islands Public Works Department. The level of training varies depending on the theme and the audience to which is addressed.

The seminar program can be classified in two categories: technical and support. The technical seminars are related to themes of transportation such as pavement design, rehabilitation and administration, pavement management, material, drainage, highway safety, traffic engineering and others. The soft skills seminars include themes that complement the normal activities of the area of transportation such as introduction to computers and applications, basic concepts of administration and guides on technical writings.

The seminars have been offered in various municipalities of the Island among them Mayagüez, San Juan, Ponce, Arecibo and Manatí. In the Virgin Islands, they have been offered in Saint Thomas and Saint Croix.

General information about the seminar program is included in the newsletter EL PUENTE. More detailed information on each seminar is included in an informative brochure that is sent by mail approximately four weeks before each seminar and in the webpage www.uprm.edu/prt2.com.

INNOVATIVE PROFESSIONAL DEVELOPMENT INITIATIVES

A. UPR/MIT/Tren Urbano Professional Development Program

The LTAP Center Directors recognizing the importance of technology transfer at all levels of education participated in 1994 in a new initiative refer to as the UPR/MIT/Tren Urbano Professional Development Program. This program used the Tren Urbano – a 17.2 km heavy rail system being planned for the Metropolitan Area of San Juan, as the focus for preparing the next generation of professionals in the area of planning, architecture, engineering, social science and business administration in a multi-campus, interdisciplinary setting.

PROGRAM ELEMENTS

The UPR/MIT/Professional Development program consists of six program elements that are focused on giving students a well-rounded academic and practical professional foundation. These elements are listed below:

1. A short course on public transportation in Boston, held each summer at MIT
2. A short course on Tren Urbano and transportation in San Juan, held each January at UPR & Tren Urbano Office
3. A one or two-year research project
4. A summer internship

5. A week-long site visit of a transit system in another country.
6. At the end of the program, most of UPR students were placed in entry-level professional jobs with Tren Urbano consultants and contractors.

The research projects in this first professional development program concentrated on the following major areas:

- Architecture / Station Design
- Airport / transit connection
- Buses/públicos
- Construction management
- Controls
- Engineering design
- Environmental
- Fare collection policy & structure
- Finance
- Geotechnical Engineering
- Information Technology
- Intermodal integration
- Joint/economic development
- Land use planning / Zoning
- Social and human behavior
- Traffic engineering
- Transportation planning
- Urban design
- Vehicles

In this process, it was validated the fact that research projects on public transportation topics under a faculty mentor is primarily a learning tool for the student, but is also an essential component for establishing a solid knowledge base on public transportation in Puerto Rico. Each student in the

program is required to undertake a research project. Research is both a learning experience for the student, and an essential enrichment to project planning, providing a constant exposure to university based “just in time” research, to assist the planning of the project in real time. For undergraduate students primarily from UPR, after a period of familiarization, literature search, and consultation with faculty and Tren Urbano staff, ~~Marketing/consultants analyze and summarize data, Operations new insights and make pertinent recommendations. For graduate students, Procurement & contracts primarily from MIT, (Northeastern and Boston University were added at later stages in the program) and UPR-Rio Piedras Campus, the Safety expectations are higher. The graduate students were expected to utilize advanced analytical techniques and apply more rigorous research methodologies. They may produce primary data, which may advance the state of knowledge in the field Typically, they will offer practical and constructive recommendations for the project and for further research.~~ Direct and frequent participation by faculty in the project helps to introduce the research results into the project on an ongoing basis. Several of the key full-time staff involved in the program at MIT have extensive prior experience in the public sector, enabling them to provide valuable input to the project team as well as effective direction for the student research. Their ability to make frequent visits to Puerto Rico is an effective mechanism for keeping a close connection between the project and the university research team. Student research is intended to complement and enrich the work of consultants.

When a student selects a research topic, he/she starts by consulting with the faculty advisor and the university program coordinator to review and discuss areas identified by the Tren Urbano Office. The student may then review related research by previous students, project reports and documents, and consult with Tren Urbano / HTA staff. Finally, under the guidance of the faculty advisor, the student shapes the topic into a manageable project, taking into consideration the specific academic degree requirements.

At each university, faculty advisors and the program director closely monitor student research. At UPR students are required to make three (3) research project presentations over the course of the year. At MIT, students meet on a weekly basis to share information, participate in special presentations and report on the progress of their research.

During the January course in San Juan, the students prepare posters summarizing their research projects. All posters are exhibited in the Tren Urbano Office and poster sessions are scheduled to provide an opportunity for receiving input and suggestions from students, faculty and project staff.

In addition to the presentations the students make as part of the program, they also present their research in such forums as the Transportation Research Board Annual Meeting in Washington, DC, Experimental Project to Stimulate Competitive Research, Congress of Engineering, Surveying and Related Disciplines, and others.

The UPR/MIT Professional Development Program lasted for 10 years (1994-2004), but its impact is evident as approximately 67% of its students have been hired to work with designers,

consultants and government entities associated with Tren Urbano in Puerto Rico and United States. Private companies have benefited from the program by the availability of a pool of young professionals with a thorough understanding of public transportation and Tren Urbano. Another significant impact of this program is *Just-in-time Research*. The student research program has constantly evolved to maintain relevance to the state of the Tren Urbano project itself. Currently it is focused most heavily on to public transportation with a special emphasis on Tren Urbano marketing, operations, contract management, intermodal integration and transportation planning, since construction is largely complete.

Some of the outstanding research projects have focused on:

- Analysis of incentives and penalties in the private operator contract and the implications for service quality
- Identification of special populations transit needs (choice-riders and students) and recommendations for marketing Tren Urbano.
- Integration of buses, públicos, and other modes through fare integration, incentives, physical design, new feeder service and customer information.
- Land use & development around station areas.
- Alternative technologies for service extensions – bus-rapid transit, HOV/HOT lanes.
- Alternative Rio Piedras station head house design. In conjunction with the community, UPR architecture students developed an alternate design for the Rio Piedras station that was adopted by the station architect.

Beyond the statistical results, at the UPR, the program has been a catalyst for increased student research experience and exposure. Students share their research results at a variety of academic forums: the Junior Technical Meeting (National Science Foundation), at Congress of Engineering, Surveying and Related Fields, at the Forum to Promote Engineering Research, and at Experimental Project to Stimulate Competitive Research.

Benefits to the Universities

The investment in the UPR-MIT Program, in addition to the many academic advantages it brings to the UPR, results in two valuable long-term benefits for Puerto Rico: (1) strengthened teaching and research programs in the College of Engineering, the School of Architecture, and the Graduate School of Planning, and (2) significantly increased public transit professional expertise.

B. UPR/PUPR/ATI PROFESSIONAL DEVELOPMENT PROGRAM

A second professional development program between UPR, Polytechnic University of Puerto Rico (PUPR) and Transportation Integrated Alternative (ATI) was initiated in 2004 which uses the integrated system namely, Público, AcuaExpreso, Metropolitan Bus Authority, Metrobus I, II and Tren Urbano as the emphasis for the research projects being conducted with emphasis on operation and system integration. Since the Tren Urbano started operations in December 19, 2004 and revenue operations in June 6, 2005, Ridership and operating data is readily available for the new students enrolled in the program.

SUCCESS STORIES

The success stories during the first twenty years of the operation of the Puerto Rico T² Center at the UPRM are many, the most significant stories are the following:

- Partnership and Joint Venture with both public and private entities with a common goal, technology transfer and professional development in an interdisciplinary setting. It includes the College of Engineers and Surveyors of Puerto Rico (CIAPR), SASHTO, NASHTO
- Partnership with the scientific community to conduct Congress, Workshops and Professional Development Programs which includes National Science Foundation (NSF), MIT, Polytechnic University of Puerto Rico, UPR at Rio Piedras.
- Providing Continuing Education Units (CEU's) to the participants of the seminar program which are accredited by IACET.
- Joint collaboration with the municipalities, highway and transportation authority and the University of Puerto Rico in co-sponsoring seminars, workshops, and conferences associated with transportation and related areas.
- Joint venture with the University of the Virgin Islands and the Department of Public Works of the Virgin Islands, in planning and offering the seminar program in USVI.
- Joint venture with the Department of Transportation and Public Works during the planning, design, construction and operation of Tren Urbano in being the development of the future generation of transportation professionals with an interdisciplinary preparation in a real world setting.
- Source of training and employment to administrative personnel which improves their clerical and administrative skills in a bilingual

setting, in a multi-task environment, which many of them ultimately were higher at the Department and Deans Office.

- Source of training and employment for students with interest in the area of transportation engineering.

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