

Developing a Maritime Transportation and Port Operations Education and Research Program in the US – Experiences and Challenges

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Abstract: - The paper presents an integrated effort in developing a Maritime Transportation and Port Operations education and research program in the US. The interdisciplinary character of the maritime transportation related education is emphasized. The program is being developed in cooperation with the industry and in response to the industry needs. Moreover, developing education and research collaborative efforts between academic institutions located in different areas of the globe can better capture the international character of maritime transportation and provide better education to the current and prospective employees of the maritime industry

Key-Words: -Education, Research, Maritime Transportation, Port Operations, Maritime Infrastructure, Maritime Transportation Degree, International Educational Collaboration

1 Introduction

Maritime transportation and port operations are a crucial niche area within freight transportation and a critical force in regional economies. In today's global marketplace maritime transportation plays a major role in providing better and cheaper transportation over the whole distance from origin to destination. The current transport system, which provides fast and cheap access to almost every corner of the globe, consists of roads, railways, inland waterways, shipping lines and air freight services. The maritime component of this transportation system has been a remarkably successful and efficient facilitator of regional economic growth, providing competitive, low-cost, efficient service for the international trade. Shipping is four times as important as rail, and four hundred times as important as air, in terms of volume in freight transportation. For most inter-regional cargoes, deep

sea shipping is the only economic transport solution between the continental landmasses.

Maritime transportation is a complex industry and the conditions that govern its operations in one sector do not necessarily apply to another. For example ports, a critical component of the maritime transportation system, vary widely in size and type; they provide a whole range of services for a variety of goods; and provide the interfaces with all the other modes. Liner shipping represents totally different operation characteristics as compared to tramp shipping.

The exploding increase in volume of maritime container transportation has led to extensive pressure on port facilities world wide creating a severe congestion problem with diverse negative implications. Meanwhile, the inevitable need to address security problems at the marine terminal level makes this situation even more complicated and challenging. Anticipated trade growth and increasing

demand for further, more efficient and less expensive services have increased complexities in global supply chains and the logistics sectors serving them. Supply chain, logistics and transportation systems engineers, planners, managers and decision makers need to have a broad understanding of the issues involved in today's global goods movement systems and as a result, a formal, interdisciplinary educational approach would be required to cover these needs. It is inevitable that the global, multi-sided, complex and dynamic nature of the maritime transportation system requires an international, interdisciplinary, integrated, systemic and synergistic approach to fully understand and analyze it and develop methods and strategies to improve its productivity, efficiency and service quality.

The educational program presented in this paper has been developed with the scope of advancing maritime transportation, a major sector in the global, national and regional economies, as well as broadening the knowledge basis of the maritime transportation education. The next section gives background information on the University program housing the educational initiative presented herein followed by a discussion of the findings of an industry survey aiming to identify current and future needs of the new transportation professionals who will work in the freight and maritime industry. This is followed by a description of the components of the educational program, highlighting those components that have already been developed and offered to students from various academic units within the university. The future direction of the program is presented next, followed by concluding remarks.

2 Background

The maritime transportation and port operations educational curriculum has been developed to support the educational objectives of the Maritime Infrastructure Engineering and Management Program (MIEMP) which is one of the self sustained programs within the Center for Advanced Infrastructure and Transportation (CAIT) at Rutgers, the State University of New Jersey. MIEMP is a dedicated academic initiative incorporating research, education, and training activities in the fields of intermodal and maritime transportation; maritime infrastructure engineering and management; port planning, management and operations; security of port facilities, access, and vessels. MIEMP's mission is, working in

consultation with the maritime and freight industry, to establish itself as a unique resource center that is able to address and solve problems of the complex and dynamic shipping industry in a pragmatic and effective way. MIEMP is housed in the state-of-the-art CAIT building and has dedicated facilities equipped with an SGI supercomputer and other supporting hardware, software and databases, which provides unique research and instruction capabilities.

MIEMP participates in the Rutgers University Transportation Coordinating Council (TCC) and is leading various research efforts such as a University sponsored project to study the feasibility of establishing a Freight Transportation Center of Excellence (FTCE) at Rutgers University and a National Science Foundation – Partnerships for Innovation project. MIEMP has an Advisory Board comprising of leading experts in the regional maritime and port industry, and has built partnerships with leading institutions at an international level that have focused programs in maritime transportation and port operations.

CAIT is a United States Department of Transportation Tier I University Transportation Center (UTC) Program. Through its partnerships with agencies, industry, and other universities, the Center disseminates knowledge and experience throughout the region, state, and nation. CAIT comprises of various programs, including the Pavement Resource Program (PRP), Local Technical Assistance Program (LTAP), Rutgers Intelligent Transportation Systems (RITS), Transportation Safety Resource Center (TSRC), Bridge Engineering and Advanced Materials (BEAM), Pipeline Safety and Security Program (PSSP), Renewable Energy Program (REP), and MIEMP.

The educational initiative presented herein supports the Institution's goals and its initiatives through international collaborations and deepening research and education activities in the field of Maritime Transportation and Port Management and Operations, which are niche areas for our regions' economy and prosperity.

Support for the development of the educational component has been provided through the National Science Foundation – Partnerships for Innovation program. One of the objectives of the project, titled Partnership to Maximize Port Industry Performance, is to establish educational and training capabilities for students and practitioners in this field.

MIEMP has established an Advisory Board of key industry participants who give direction and advise for continuous review, update and refinement of the program. The Advisory Board comprises high-level representatives from the Port Authority of New York and New Jersey, New York Shipping Association, NJ Department of Transportation, Maher Terminals Logistic Systems, and other key experts from shipping industry, financial institutions and consultancy pertinent to maritime engineering and shipping.

MIEMP has built collaborations with institutions at an international level with leading programs in various disciplines, focusing on maritime and port related issues. These collaborations are leveraged in the development of the second phase of the program, which is discussed later in this paper.

3 Educational Needs

Establishing a successful educational program in maritime transportation requires an efficient relationship with industry to be established to ensure the development of a pragmatic multidisciplinary educational program, continuous support in updating the program and possibilities for industry internship opportunities to ensure a robust mixture of theory and practice. A survey among the members of the MIEMP Advisory Board as well as several regional, federal and international institutions, as well as consulting firms and private port and shipping related businesses was conducted. The objective of this survey was to study and evaluate educational needs in the fields of freight and maritime transportation and port operations regionally and at national and international levels.

Results indicated that there is a need for:

- broader and deeper understanding of the key issues related to the maritime and ports industry, including legal, economic, environmental and social issues, and involving technology, engineering, policy, planning and management aspects
- understanding of the global and interdisciplinary nature of this industry
- industry perspective and understanding to be brought to the university students through lectures, seminars, field trips and student internships
- hands-on experience through student involvement in sponsored research projects, partnering industry
- early exposure of students, during their undergraduate course of study, so that they become familiar with the field and increase the possibility of

their selecting it as a focus area in their post-graduate education

The survey indicated that there is a need for transportation experts, educated in freight and maritime issues, who understand the global nature of this industry, the needs and issues of key industry players, the objectives and interactions among stakeholders, the statutory, regulatory and institutional barriers, as well as issues related to operations, safety and security, and productivity-enhancing technology applications.

Overall, the industry feels that there is clearly a need for and lack of young experts educated in issues related to the freight and maritime industry, while the demand for such expertise is very high. The educational program discussed herein aims to assist in this direction, offering a curriculum addressing these needs.

4 Components of the educational program

The educational program advances a major sector of the global, national and regional economy, and broadens the knowledge bases pertaining to maritime transportation and port operations education at a graduate level. The program is built around thematic clusters and bridges theory and practice. Participants from both the industry and the university play dual roles as trainers and trainees, educators and students, as they communicate and learn from one another, becoming key participants in their learning process. Bringing research findings into the classroom and engaging students in current sponsored research projects, the program provides an innovative and exciting mechanism for building sustainable research and education communities at the graduate level. Each of the thematic clusters is taught by instructors with the relevant expertise and includes at least one lecture from key industry experts.

The program is housed within the Department of Civil and Environmental Engineering but is open to students in Industrial Engineering, Operations Research, Business School, Economics, Logistics, Supply Chain Management, Policy and Planning and Environmental Science. There are currently six core courses, which the students may supplement with relevant courses from their Departments. Since the program does not grant an interdisciplinary degree at this point, students may take all or a few of the courses offered, and supplement them with additional courses from their

respective units, which makes the overall curriculum more relevant to their degree program. The instructors collaborate in building their individual course curricula, so that they are consistent and relevant to the scope of the program.

The key core courses in the Civil and Environmental Engineering curriculum include:

180:529 Security and Safety in Maritime Transportation and Port Operations

180:530 Maritime Transportation

180:536 Transportation Systems Analysis

180:538 Freight Transportation Systems

180:540 Port Planning, Management and Operations

180:579 Environmental Management of Maritime Infrastructure

Additional courses may be taken from the Rutgers School of Planning and Public Policy, the Center for Supply Chain Management in the Rutgers Business School, or the department of Industrial and Systems Engineering in the School of Engineering.

Although this is not currently a degree granting educational program, it gives students the flexibility to built their curriculum around their specific department's and/or their individual interests, while providing adequate breadth and depth in the understanding of maritime transportation and port operations related issues.

Special seminars and lectures covered by industry experts are open to upper level undergraduate students, introducing them to current issues in freight and maritime transportation and port operations. One of the issues that came up during the previously presented discussions with industry experts is the poor public image of the freight transportation in general. Undergraduate student participation to these seminars may help improve this image as students understand the importance and economic benefit brought by freight transportation; and may make the curriculum more relevant and interesting, thus helping attract more students to the field. The program may increase social and environmental awareness as it relates to freight transportation and draw students' interest toward the search for sustainability. This may enhance the prestige of the profession and make it easier to attract better students, particularly women, since in our culture they are socialized to be more context sensitive than men (Vanderburg and Khan, 1994). Making the curriculum more relevant and interesting can help attract more students, reduce the drop-out rate and ultimately provide an adequate supply of graduates to cover the increasing need for freight and maritime

transportation professionals (Kepes, 1965; Gonseth, 1995; Boile et al, 1997).

The educational program has been designed to increase students' knowledge and make them active participants in their learning. The learning styles of all students have been considered: those who perceive and process information based on concrete experience (feeling), abstract conceptualization (thinking), active experimentation (doing) or reflective observation (watching) (Kolb, 1984). The effectiveness of the program is being determined based on the level of student knowledge and understanding of the presented material, which is tested before and after they are exposed to the programs. This is done through individual interviews with the students, which help assess student skills such as ability to assess information, conceptual learning, thinking, problem solving, communication, social and self-management skills, as well as to determine their analytical background and knowledge of the material and its relevance, prior to taking the course. Evaluation of course assignments and the final course evaluation as well as exit interviews are used to assess students knowledge and understanding upon completion of a course. Evaluation of the first few course offerings through the program indicated that the majority of the students did not have a strong prior interest in following the course curriculum. Some of them took a course merely to satisfy their degree requirements. The majority of the students took more than one course through their course of study; they have indicated that they found the curriculum very relevant and interesting, and gave them an interesting perspective within their course of study. Students that did not have a strong analytical background indicated some difficulty to follow some sections of specific courses and the related assignments. Overall the experience with this educational program has been very positive and promising and gives more incentive to further develop and implement the additional components that are presented next.

5 Future Developments

The establishment of a Maritime Transportation Degree Program (MTDP) is under consideration. An indicative picture of the anticipated ultimate program structure granting a multidisciplinary graduate degree is given in Figure 1. The structure consists of a module of three core courses, a module of three general elective courses, a module of supporting elective

tools for today's freight transportation experts. Upon completion of the program a comprehensive evaluation will be performed through exit interviews. The program participants will be asked to comment on the academic and technical quality of the program, the integration of research into the educational components, and the overall scientific challenge presented to the students; the international experience; as well as on the assistance in preparing with the trip and living arrangements, overall accommodation provided and experience living abroad. The results of the exit interviews will be carefully analyzed and will be considered in revising the program.

This international education collaboration effort is based on a successful example from business executive education and it can produce a unique amalgamation of diverse disciplines and regional experiences to cope with the global multidisciplinary skills required from a shipping industry professional.

6 Conclusions

The paper presented an educational program focusing in the fields of maritime transportation and port operations. Various parts of this program have been presented, including the currently fully developed, as well as the under development components. Results from a recent freight and maritime industry survey are presented and discussed. The program presented in this paper responds to the identified needs through an integrated industry and research multidisciplinary educational approach, which covers both global and regional aspects of maritime transportation systems. In developing this program, issues such as what works in terms of student learning, what works in terms of institutionalizing change, and how successful practice varies internationally have been considered. In its first phase, the program has been offered in a multidisciplinary environment, open to students from the Schools of Engineering, Planning and Public Policy, and Business. A degree awarding program open to students from various University units as well as to people from the industry is under development. Collaborations with other institutions internationally have been developed and in its second phase, the program will combine its strengths with universities that have leading programs in freight and maritime studies, to develop an international graduate program in maritime transportation. This program, modeled

closely after an existing successful business degree model, will be modular, so that each module, with thematic clusters, could be offered at a different institution. Within the collaborating units, there exists a reservoir of expertise gleaned from past and ongoing research projects and other activities. This includes in-depth expertise of key issues that are of direct and vital interest to the global maritime community. Pooling resources, joining capabilities and developing synergistic strategies will serve to remedy the current fragmented situation in the maritime domain and create a robust venue for international, interdisciplinary work on related research and education.

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