Developing an Interdisciplinary Transportation Certificate Program for Today’s Transportation Workforce

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ABSTRACT

The demand for skilled transportation professionals that possess a breadth of interdisciplinary backgrounds including planning, public policy, and finance is higher now than ever before in the U.S. However, there are few educational programs that address the field of transportation in a comprehensive and interdisciplinary manner. Transportation certificate programs that offer professional training in transportation planning can play a crucial role by providing a substantive base of knowledge through required and elective coursework delivered on campus or online. This paper shares insights and observations from Texas A&M University’s interdisciplinary transportation certificate program, offered both through an existing degree program and online for non-degree seeking students. In addition to discussing curriculum development, certificate implementation, and marketing and recruiting efforts, this paper shares insights on implementing a distance learning transportation certificate. This study also evaluates the transportation certificate program by analyzing data on student characteristics, graduation and retention rates, and job placement. Specific recommendations and guidelines for implementing a transportation certificate program are offered that may be of value to other universities and institutions seeking to develop a similar program.
INTRODUCTION

Transportation planning in the U.S. has become increasingly complex and multi-faceted. Traditionally, transportation planning had been dominated by civil engineers and followed a rational planning model of defining goals, identifying problems, generating and evaluating alternatives and developing plans (7). The construction of the 42,000 mile Interstate Highway System, perhaps the greatest achievement in U.S. transportation history, was heavily reliant on federal largesse. In the post-Interstate era, this paradigm has shifted towards multidisciplinary and interdisciplinary approaches, with the former drawing knowledge from multiple disciplines while keeping their respective boundaries and the latter synthesizing the links between disciplines, with an emphasis on environmental impacts, public participation in the planning process, and innovative financing (2, 3). Thus, there is a high demand for transportation planners that can complement their traditional areas of expertise with a broader, interdisciplinary perspective of how economics, public policy, finance, and urban design influence the effectiveness of the transportation system.

Given the changing climate of the transportation planning profession, it is imperative to develop an educational program or curriculum that would prepare students with the tools and expertise needed to be broadly successful in the transportation planning profession. However, there are few educational programs presently that address the field of transportation in a truly comprehensive and interdisciplinary manner. Certificate programs that offer professional training in transportation planning can play a crucial role by providing a substantive base of knowledge through coursework delivered in the classroom or online. These programs can help satisfy industry demand for well-trained and versatile transportation planners possessing a broad array of competencies required for contemporary planning practice.

While there has been some limited research on what should be covered in a transportation planning or engineering curriculum, there are virtually no identifiable studies to date that examine the role of transportation certificate programs in attracting students to the transportation planning profession. There is also no published literature that discusses how transportation planning education can be delivered through the internet. This paper aims to fill these important gaps by providing a comparative survey of transportation planning certificate programs in the U.S., and sharing insights and experiences from Texas A&M University’s (TAMU) Graduate Certificate in Transportation Planning (CTP) Program, an interdisciplinary certificate program offered both through an existing degree program and online for non-degree seeking students.

The paper begins by addressing the challenges and needs of today’s transportation workforce, followed by a review of existing national certificate programs focusing on transportation planning, an overview of TAMU’s transportation certificate program structure, and the implementation of the traditional and online versions of the program. We also present findings on CTP students’ profiles and job placements, and share insights on our efforts to explore the market of the online CTP program. Finally, we offer recommendations and guidelines based on lessons from TAMU’s CTP program.
THE URGENT NEED FOR DIVERSE TRANSPORTATION PROFESSIONALS

Despite the urgent transportation needs and challenges in the U.S., the transportation industry faces a critical shortage of qualified skilled workers, especially in the public sector. An aging workforce is a significant factor with nearly half of the transportation workforce reaching retirement age within a decade and fierce competition from other fields for skilled workers (4, 5). Public agencies have also endured challenges with retention of their employees, particularly with engineers (6). National Cooperative Highway Research Program (NCHRP) Report 693 identified four critical issues affecting workforce recruitment in transportation including demographic changes (e.g., baby boomer retirements and younger workers entering leadership positions), career awareness and training in the K-12 school system and colleges/universities, new technologies (such as Intelligent Transportation Systems), and demand on transportation agencies for workers with a wider range of technical and non-technical skills and experience (7). Current workforce challenges in the transportation industry have been addressed at the National Transportation Workforce Summit in 2012 and similar summits at various Regional University Transportation Centers (8, 9, 10). State Departments of Transportation (SDOTs) and transit agencies are particularly impacted by these changes in the workforce, and are in most dire need of attracting young professionals into the workforce.

SDOTs and transit agencies have traditionally played a major role in attracting graduates into the transportation field, particularly those with civil engineering degrees (4). However, the demand for non-civil engineering transportation specialists, particularly those with planning and environmental backgrounds, has increased in recent years due to the changing nature of transportation planning process. Hence, SDOTs and transit agencies are aiming to hire transportation professionals who possess a breadth of interdisciplinary knowledge that spans beyond engineering, and have established ties with state universities to recruit these students. While many of these agencies offer training and certificate programs, they are mainly for technical personnel such as project engineers and construction inspectors, and do not offer a comprehensive educational experience.

Therefore, there is a compelling need for interdisciplinary academic programs to attract a diverse group of future transportation professionals and provide the training needed for a dynamic transportation workforce. Today’s transportation planners are not only expected to have the technical competencies required for implementing transportation projects, but understand the economic, social, environmental, and political implications of transportation decisions (11). The ability to communicate and work with the community through citizen participation is a crucial skill required in all transportation projects. An interdisciplinary curriculum offered by a transportation certificate program can effectively address this need, which is the motivation of our case study.
OVERVIEW OF U.S. CERTIFICATE PROGRAMS IN TRANSPORTATION PLANNING

Certificate programs in the transportation field vary in breadth and scope. Traditionally, they have emphasized technical knowledge and expertise in operations and maintenance that fall within the purview of civil engineering. While many existing certificate programs still comprise this structure, there is a growing demand for workers to address issues that span multiple disciplines such as economics, public policy, planning and urban design. The academic community has become aware of the changing needs of transportation agencies, and some universities have started to develop interdisciplinary transportation curricula to provide knowledge and skills needed for the current transportation workforce in the public and private sector (11, 12).

The number of certificate programs in transportation planning is relatively small, but increasing. To provide an up-to-date and comprehensive overview of certificate programs in transportation planning in the U.S., the authors conducted a Google web search and scoured the websites of accredited master’s programs in urban planning listed on the Planetizen website (13). This search yielded twenty programs that include transportation planning as one of their areas of focus. It should be noted that this is not a comprehensive list of transportation planning certificate programs, as it was compiled from an internet search and may have omitted some programs that either did not turn up in the search, or do not have a website. This list does not include certificate programs that are run by industry or government agencies, and excludes programs that focus only on engineering or other disciplines that do not include planning. Additionally, the list does not include specialized programs that focus on one specific area of transportation such as public transit.

Key attributes of university certificate programs in transportation planning are summarized in Table 1. Information about the structure and format of the certificate program, core and elective courses, and admission requirements were obtained on the university website and also by phone inquiries. All regions of the country are represented on the list of certificate programs, including the Northeast (6 programs), South (4 programs), Midwest (4 programs), Southwest (4 programs), and Northwest (2 programs). Most of the certificate programs are affiliated with accredited graduate urban planning programs.

In terms of admission requirements, the majority of programs are open to both students that are pursuing graduate degrees at the university, as well as non-degree seeking professionals. Some programs are only available to students enrolled in a degree program at the university (mostly urban and regional planning), while others are strictly stand-alone certificate programs aimed at working professionals. All programs require students to possess a bachelor’s degree, and nearly all have a minimum GPA requirement (typically a 3.0 or better although a bit lower in some programs). All programs also require applicants to submit a formal application which may include a letter of interest or statement of purpose, a resume or curriculum vitae, official transcript of previously taken courses, and letters of reference.
### TABLE 1 UNIVERSITY CERTIFICATE PROGRAMS IN TRANSPORTATION PLANNING

<table>
<thead>
<tr>
<th>Title of Certificate Program</th>
<th>Host University</th>
<th>Focus Areas</th>
<th>Delivery Format</th>
<th>Open to Non-Degree</th>
<th>Credit Hours Needed (Core/Elective)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate Certif. in Transportation Policy and Planning</td>
<td>Calif. State Univ., Long Beach</td>
<td>No</td>
<td>Traditional</td>
<td>No</td>
<td>18 (6/12)</td>
</tr>
<tr>
<td>Graduate Certif. in Transp. Planning and Modeling</td>
<td>Eastern Michigan University*</td>
<td>No</td>
<td>Traditional</td>
<td>No</td>
<td>16-17 (14/2-3)</td>
</tr>
<tr>
<td>Transportation and Logistics Policy Graduate Certif.</td>
<td>George Mason University</td>
<td>No</td>
<td>Traditional</td>
<td>No</td>
<td>15 (3/12)</td>
</tr>
<tr>
<td>Certificate in Transportation Studies</td>
<td>New Jersey Inst. of Tech.*</td>
<td>No</td>
<td>Both*</td>
<td>Yes</td>
<td>12 (9/3)</td>
</tr>
<tr>
<td>Transportation and Urban Systems Graduate Certif.</td>
<td>North Dakota State University</td>
<td>No</td>
<td>Online</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Transportation Planning Graduate Certificate</td>
<td>New York University*</td>
<td>No</td>
<td>Traditional</td>
<td>No</td>
<td>12 (9/3)</td>
</tr>
<tr>
<td>Graduate Certificate in Transportation</td>
<td>Portland State University*</td>
<td>No</td>
<td>Traditional</td>
<td>Yes</td>
<td>21 (9/12)</td>
</tr>
<tr>
<td>Graduate Certificate in Transportation Studies</td>
<td>Rutgers University*</td>
<td>Yes</td>
<td>Traditional</td>
<td>No</td>
<td>15*</td>
</tr>
<tr>
<td>Certificate in Transportation and Land Use Planning</td>
<td>San Jose State University*</td>
<td>No</td>
<td>Traditional</td>
<td>Yes</td>
<td>12 (8/4)</td>
</tr>
<tr>
<td>Transportation Planning Certificate</td>
<td>Temple University*</td>
<td>No</td>
<td>Traditional</td>
<td>Yes</td>
<td>12 (3/9)</td>
</tr>
<tr>
<td>Graduate Certificate in Transportation Planning</td>
<td>Texas A&amp;M University*</td>
<td>Yes</td>
<td>Both*</td>
<td>Yes</td>
<td>15 (6/9)</td>
</tr>
<tr>
<td>Certificate in Sustainable Transportation and Logistics</td>
<td>SUNY at Buffalo*</td>
<td>No</td>
<td>Traditional</td>
<td>Yes</td>
<td>15*</td>
</tr>
<tr>
<td>Certificate in Transportation Studies</td>
<td>University of Iowa*</td>
<td>No</td>
<td>Traditional</td>
<td>No</td>
<td>18*</td>
</tr>
<tr>
<td>Certificate in Transportation Systems Analysis</td>
<td>University of South Florida*</td>
<td>No</td>
<td>Both</td>
<td>Yes</td>
<td>12 (3/9)</td>
</tr>
<tr>
<td>Certificate in Transportation Systems</td>
<td>Univ. of Southern California*</td>
<td>No</td>
<td>Traditional</td>
<td>Yes</td>
<td>15*</td>
</tr>
<tr>
<td>Certif. in Sustainable Transp. Systems and Planning</td>
<td>University of Vermont</td>
<td>No</td>
<td>Traditional</td>
<td>Yes</td>
<td>15 (9/6)</td>
</tr>
<tr>
<td>Certificate in Sustainable Transportation</td>
<td>University of Washington*</td>
<td>No</td>
<td>Online</td>
<td>Yes</td>
<td>12*</td>
</tr>
<tr>
<td>Graduate Certif. in Transp. Management and Policy</td>
<td>Univ. of Wisconsin-Madison*</td>
<td>No</td>
<td>Traditional</td>
<td>No</td>
<td>17*</td>
</tr>
<tr>
<td>Certif. in Transportation Planning and Analytics</td>
<td>Virginia Commonwealth Univ.*</td>
<td>No</td>
<td>Traditional</td>
<td>Yes</td>
<td>12 (6/6)</td>
</tr>
</tbody>
</table>

Notes: ◊: Requires students to choose a focus/concentration area; ♠: University has an accredited master’s degree program in planning; ♣: Requires completion of capstone course or project; ♥: Not all required courses are available online; ♦: No core course(s), but requires students to select courses from different focus areas; ▲: Elective courses only (can choose from list of courses); ▼: Core courses only (cannot choose courses).
The course requirements of the certificate vary considerably across programs. Most programs have required core courses that need to be taken to earn the certificate, as well as elective courses where students can choose from a list of transportation courses that may include multiple disciplines such as policy, economics, logistics, and engineering. Some programs (e.g., North Dakota State University) do not have required core courses but elective courses that can be selected from an approved list, while others (e.g., University of Southern California) only have core courses with no option to choose an elective. Two programs (TAMU and Rutgers University) have clearly defined focus areas or concentrations where course requirements vary depending on the concentration or focus area chosen. Two programs (TAMU and Arizona State University) also require the completion of a capstone course or project where students are exposed to real-world transportation projects. The course credits needed to earn the certificate also vary by program, ranging from 9 credit hours (3 courses) to 21 credit hours (7 courses), with a median of 15 credit hours. Finally, in terms of course delivery, three-fourth of the programs offer only traditional (classroom) courses, while three programs offer both traditional and online courses. Two programs that are offered online only target a professional (non-academic) audience.

An overview of certificate programs in transportation planning show that the structure and format of certificate programs differ widely. Some certificate programs have more restrictive course requirements without the option of selecting from a list of courses, while others offer a wide range of course options to tailor the certificate to a desired emphasis or focus area. Course curricula also vary from program to program, with some programs being more multidisciplinary (e.g., requiring courses from multiple disciplines) than others. Course delivery is also an important distinction, with online courses allowing place-bound students and working professionals to take courses without having to physically attend classes on campus. Programs that offer more flexible options, especially distance learning, would make it easier for working professionals to earn a transportation certificate. In the following sections, we will describe TAMU’s certificate in transportation planning program, including methodology for certificate development, curriculum structure, and implementation of the traditional and online programs.

DEVELOPING AN INTERDISCIPLINARY CERTIFICATE PROGRAM IN TRANSPORTATION

The idea for an interdisciplinary transportation planning certificate was conceived at Texas A&M University to address the issues and challenges that confront transportation professionals that increasingly require multidisciplinary and interdisciplinary approaches. Previously, students with an interest in transportation either pursued a degree in urban planning or civil engineering. However, given the current demand for transportation practitioners who can complement traditional areas of expertise with a broader, interdisciplinary perspective to include economics, public policy, finance, and urban design, TAMU recognized the need to develop a comprehensive program that addresses transportation in an interdisciplinary manner. The Graduate Certificate in Transportation Planning (CTP) was established in 2008 to fill this critical need by providing students with a
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multi-faceted, interdisciplinary education in the field of transportation.

Methodology for Certificate Development

The initial step for developing the CTP program was drafting and submitting a formal proposal to the university. The proposal was developed by a committee of faculty and researchers from multiple departments and colleges within the university to ensure its interdisciplinary focus, including the Department of Landscape Architecture and Urban Planning (LAUP) in the College of Architecture, Texas A&M Transportation Institute (TTI), Zachry Department of Civil Engineering, and the George Bush School of Government and Public Service. In essence, all departments and institutions involving transportation at TAMU played a role in the development of the transportation certificate. The following key components will be described in more detail: 1) curriculum development; 2) certificate implementation; and 3) marketing and recruitment efforts.

Curriculum Development

The committee aimed to develop an interdisciplinary curriculum that would provide students with a substantive background on the practice of transportation planning as well as more specialized instruction in an interdisciplinary area of focus. Each of the focus areas is designed to meet critical needs within the transportation profession and aim towards securing student placement in appropriate transportation-related agencies and organizations. The content of existing courses offered within the planning, civil engineering, and public policy were reviewed to ensure that they covered the knowledge and skills relevant to the focus area. New courses were also created specifically for the certificate program.

To ensure breadth of coverage from multiple disciplines, the CTP requires students to complete a minimum of 15 credit hours of course work (equivalent to five courses) in transportation planning, which includes the following (see Figure 1):

1. One foundational course (Transportation in City Planning).
2. Three focus area courses, including a three-credit-hour Focus Foundation course and two (6 credit hour) elective courses in the focus area.
3. Capstone course (Applied Transportation Studio).
The foundational course is designed to provide an introductory overview of general transportation planning topics, focusing on the role of transportation in society. The course is intended to provide a general background of transportation planning, and is typically taken before other transportation certificate courses. Concepts covered in the foundational course include a primer on transportation legislation and public policy decision-making processes, common aspects of transportation planning such as travel demand analysis, transportation finance, transportation and land use, and specific current issues facing transportation planners and policy makers including congestion, air quality, energy, and social equity.

In the second step of the program, students complete nine credit hours in a selected focus area. These focus areas were designed to meet critical needs in the transportation field, and allow students to customize their degree plan to emphasize a particular area of transportation. In the initial proposal, three focus areas were created: 1) Multimodal Systems Planning; 2)
Transportation and Urban Design; 3) Transportation and Public Policy. A fourth focus area, Transit Management, was created in 2012. These focus areas are briefly described below, and courses for each focus area are listed in the student handbook for the CTP (12).

A. Multimodal Systems Planning. This focus area addresses regional-level mobility issues with multimodal solutions. The curriculum is designed to teach students the tools and methods for designing regional-level transportation system investments, including traffic engineering, systems management, and infrastructure planning. This focus area is designed to help prepare students to gain employment with metropolitan planning organizations, regional councils of governments, and private consulting firms that support the activities of these agencies.

B. Transportation and Urban Design. This focus area balances mobility concerns with the needs of the built and natural environments. The emphasis is on a context-sensitive approach to transportation planning and design, and aims to teach students about the role of sustainability in contemporary planning practice. Topics covered in the curriculum include design for sustainable transportation, street and highway design, and environmental impacts of transportation. This focus area is aimed to prepare students for employment in the growing number of private firms providing specialized design services to local and SDOTs, as well as public sector agencies.

C. Transportation and Public Policy. This focus area highlights the issue of public expenditure on transportation infrastructure, and prepares future policy innovators who can tailor public policy and finance to address emerging transportation needs. The curriculum emphasizes transportation investment decisions as well as public policy administration, organization and management. Students choosing this focus area are prepared to assume policy and managerial positions in the public sector agencies responsible for transportation planning and investment, including federal agencies such as FHWA and FTA, SDOTs, and local transportation agencies.

D. Transit Management. This newest focus area addresses the growing demand for well-trained professionals in the public transit industry. The curriculum provides students with skills and knowledge in transit operations, management techniques, and organizations, and includes courses from the Mays Business School. Students focusing on Transit Management will have the necessary skills to pursue careers in the public transit industry, and find employment in federal (FTA), regional and metropolitan transit agencies, small town and rural transit agencies, and specialized transit agencies providing demand response and paratransit services.

The culmination of the CTP program is a studio capstone course that synthesizes the knowledge obtained during the course of the certificate program. The capstone course was specifically created for this program, and is aimed at fostering cross disciplinary collaboration among students from different focus areas to work collaboratively to develop comprehensive real-world solutions to transportation problems on local and regional scales.
In the capstone courses taught by the lead author, students worked with rural communities in Texas to develop and revise the transportation element of their comprehensive plans.

In sum, the curriculum development process identified and considered current needs in the transportation workforce, and created interdisciplinary focus areas to address those needs. The committee canvassed the existing course curriculum from multiple colleges and departments within TAMU to determine appropriate elective courses for each focus area. The committee also reviewed syllabi for existing courses and checked with each department to ensure that courses would be offered at least on an annual basis. Gaps in the existing curriculum were identified and addressed by the creation of new courses such as the transportation studio capstone, which provides students with valuable real-world experience in transportation planning. The three-step process and structure allows students to take courses in sequential order that establishes a general framework of transportation planning issues, followed by more specialized course instruction in the chosen focus area, and culminating in a collaborative and interdisciplinary capstone project.

Certificate Implementation

The CTP was implemented in multiple phases, from initial submission of the proposal to the College of Architecture (where the CTP is based) in October 2007 to university-wide approval by the TAMU Faculty Senate on July 2008, and final approval by the president of TAMU on August 2008. This initial proposal outlined the structure of the certificate program, the CTP curriculum, and the process for obtaining the certificate. The distance learning certificate (“e-Certificate in Transportation Planning”) was proposed in Summer 2011 and implemented in Fall 2013, described in more detail later in the paper.

To ensure a harmonious working partnership among the participating units of the transportation certificate, a CTP Council was created, comprising of faculty members from LAUP, Civil Engineering, Bush School of Government and Public Service, and TTI. The CTP Council is responsible for advising all matters relating to the program, and for ensuring that the students admitted to the certificate program satisfy the requirements. They also periodically review course content and update the pre-approved list of courses that meet the requirement for the certificate. They can also make proposals for new focus areas which would require approval from the department heads of the participating units. The CTP Council is also responsible for reviewing student requests for transfer credit from courses taken outside of TAMU. Additionally, a certificate program coordinator was appointed who would be responsible for recruiting and accepting new applicants into the program.

Marketing and Recruitment Efforts

Marketing and recruitment efforts are an important element of the certificate implementation plan. A multipronged effort that includes the dissemination of printed and digital media, face to face recruitment via classroom talks and symposia, and financial support through scholarships were pursued. Recruiting brochures, flyers and pamphlets were developed and
distributed to TAMU students and posted in the participating academic departments. Program descriptions were also distributed via the internet using university and departmental Listservs. The LAUP website also outlines the CTP program description and degree requirements, in addition to a student handbook which provides detailed descriptions of the curriculum structure and process for applying and completing the certificate program (J2). Recruitment efforts were also conducted in person by the CTP Coordinator by giving classroom talks in the planning, civil engineering, public policy, and management schools at TAMU. An annual university-wide transportation symposium is also held to highlight the transportation certificate program. Additionally, departmental scholarships and scholarships from a University Transportation Center for Mobility grant from US DOT were awarded to highly qualified applicants to the program.

Implementing a Distance Learning Transportation Certificate

A milestone of TAMU’s transportation certificate program is the development and implementation of the distance learning certificate (“e-Certificate”). While the CTP targeted currently enrolled students at TAMU’s flagship campus in College Station, the e-Certificate was designed to extend the delivery of the existing certificate via distance to a wider audience of professionals interested in transportation planning in major metropolitan areas in Texas and beyond. The program objective of the e-Certificate is to increase access to place-bound students and working professionals by offering TAMU’s transportation curriculum online. Hence, it is possible for one to earn a transportation certificate without having to enroll in a degree program at TAMU, thereby offering a “stand-alone” version of the CTP. This increases the access of the transportation certificate curriculum to a much broader base, addressing the needs to expand educational opportunities to attract workers into the transportation field.

The curriculum structure of the e-Certificate generally follows the same format as the CTP, with the exception of the capstone course requirement. Since the “hands-on” group-oriented studio does not adapt well to an online format, the capstone course was replaced with a comprehensive examination that covers material similar to the American Institute of Certified Planners (AICP) Certified Transportation Planner exam. Also, the transit management focus area is not yet available online. As of August 1, 2014, four elective courses have been developed for online delivery (transportation and the environment, sustainable transportation, transportation systems analysis, and transportation investment decisions) and additional courses are currently under development or proposed.

The e-Certificate utilizes a fully interactive online format including asynchronous and synchronous delivery. These include threaded discussions, video and audio presentations, lecture slides, and other course documentation posted on the website. Synchronous activities include live chat and web conferences including video and audio interactions. In preparation for the delivery of online courses, faculty members in transportation planning attended several instructional technology workshops taught by specialists and invited guest experts in online teaching that focused on designing and implementing effective online courses as well as choosing the appropriate tools and software needed. These workshops were effective in
equipping instructors with technological expertise needed to teach courses online.

The e-Certificate was developed and implemented using a similar methodology as the CTP. First, a project team was established and course instructors were identified. Second, a formal proposal for the e-Certificate was drafted and moved through university approval processes. Third, faculty and teaching assistants underwent extensive training to develop and deliver online courses. Fourth, foundation and elective CTP courses were converted into an online format and finally, an action plan for delivery of online course and administration of the eCertificate program was drafted.

Marketing and recruitment for the newly minted e-Certificate program is an ongoing effort. Since it was officially launched in Fall 2013, information about the program has been distributed through printed and digital brochures, pamphlets, and the CTP website. CTP faculty members have disseminated information at national planning conferences, and through planning and transportation Listservs. In the summer of 2014, CTP courses were added to the Transportation Leadership Graduate Certificate Program (TLGC), a national post-baccalaureate certificate program sponsored by the Regional University Transportation Centers.

The authors have also explored the possibility of expanding the e-Certificate program outside of the U.S. by visiting two East Asian universities (for anonymity, named University A and University B) in the summer of 2013. Interviews were conducted with faculty and students regarding their interest in the program. The interviews were unstructured and intended to assess the potential market of the CTP program to students abroad in addition to establishing a collaborative partnership with TAMU to offer the certificate program to professionals outside of the university. University A expressed greater interest in collaborating as it viewed the CTP as an opportunity to strengthen the transportation concentration of its urban planning program and to better prepare students interested in working with multi-national consulting firms in planning, civil engineering and design, while University B was less receptive to the CTP since they had a well-established transportation program. While a formal agreement with either university is still pending, these insights illustrate the potential for the online certificate program to extend beyond U.S. borders.

EVALUATION OF THE TRANSPORATION CERTIFICATE PROGRAM

There are very few resources available that establish clear criteria for evaluating a certificate program. Given that certificate programs are intended to help students achieve employment after graduation, a critical measure of its success is the placement record of certificate holders. We propose the following metrics for evaluating TAMU’s transportation certificate program. First, is the certificate program reaching a diverse audience of students? Second, is there a steady stream of graduates from the program, ensuring its viability? And perhaps most importantly, what is the record of placement for CTP graduates, and in what types of transportation positions? To evaluate the transportation certificate program at TAMU, data on student characteristics (race/ethnicity, gender, and graduate level), graduation and retention
rates, and job placement were collected. It should be noted that only TAMU degree candidates are included in this analysis; data on non-degree seeking e-Certificate candidates are not currently available due to its recent implementation.

**Student Characteristics**

Since the launch of the CTP in Spring 2008, a total of 53 students have graduated from TAMU’s transportation certificate program. Among CTP graduates, nearly all (51 students) were master’s students and two were doctoral students. In terms of discipline, the majority (47 students) were urban planning students, followed by civil engineering (4 students), public policy (1 student) and architecture (1 student). With respect to ethnic background and gender, CTP recipients represent a diverse group. While transportation tends to be a male-dominated field, it is notable that the proportion of female transportation certificate recipients at TAMU is nearly equal to males (45.3% female; 54.7% male). Minority groups are well-represented among CTP recipients, with about one-half being non-Hispanic white (49.1%), about one-quarter East Asian (24.5%), about one-fifth South Asian (18.9%) and the rest are Hispanic (7.5%). Notably, African Americans are absent from the pool of CTP graduates.

The diversity of TAMU’s CTP graduates is greater than the diversity of transportation professionals in the workforce, with nearly half of CTP recipients being either women or an ethnic minority. Nearly all CTP graduates of Asian and South Asian descent are international students, and the university has made an effort to attract an ethnically diverse pool of candidates into their graduate programs. However, there is still some work needed to be done in terms of diversifying the pool of certificate recipients, as Hispanics are underrepresented compared to the general population and African Americans are not represented at all. These findings highlight the need to enhance outreach efforts to Hispanic and African American communities to attract these students to study transportation planning at TAMU.

**Graduation Rate**

There has been a steady stream of graduates from TAMU’s transportation certificate program since its inception. The first CTP student graduated in the spring semester of 2008. Since then, there have been at least 8 CTP recipients each academic year since 2008-2009, with a peak of 11 CTP recipients during the 2011-2012 academic year (see Figure 2). The 2013-2014 academic year yielded 6 CTP graduates, but this figure does not include those graduating in Summer 2014. Further, the retention rate of CTP students who enroll in their first year of graduate studies and continue to their second year is 100 percent. While the number of CTP graduates has remained consistent since the launch of the program, it has not significantly increased despite efforts by the CTP Council to actively promote the program on campus. This may reflect a growth limitation of the CTP program as it is dependent on annual enrollment of TAMU graduate students that are interested in transportation. The CTP program is also competing with certificate programs in other disciplines within the College of Architecture and outside departments. On the other hand, online delivery may help expand the program by reaching place-bound students and working professionals outside of campus.
Placement of CTP Graduates

Graduate placement is a critical metric of success in the transportation certificate program, as the transportation certificate is designed to help students achieve employment in the transportation sector. Placement information was obtained from CTP graduates and was determined by the graduate’s first full-time position after earning the certificate. While many CTP students worked as interns in transportation planning, design or engineering firms during their progress towards the master’s or doctoral degree, these positions (mostly part-time) were not considered as placements.

Figure 3 shows the number of CTP graduates by their first full-time position as of August 1, 2014. Job placement information is unavailable for three graduates and one student who graduated in May 2014 is still seeking employment. The remaining 49 graduates have either landed a full-time position (45 graduates) or entered a doctoral degree program at TAMU or another university (four graduates). Seven students obtained a position overseas (four in Asia, two in Europe, and one in South America) as a transportation planner or a civil engineer.
Among the 38 graduates who landed full-time positions in the U.S., all except one accepted positions within Texas, and nine graduates worked as transportation planners. Twelve graduates were employed by a governmental agency, including six in a municipal government, four in a metropolitan planning organization, and two in a regional planning commission. Twelve graduates achieved employment in the education sector; two as faculty members at a university (one out-of-state and one international) and ten as an assistant researcher or scientist at a university-affiliated transportation research institute. The remaining fourteen graduates worked in the private sector transportation industry for urban planning, engineering, and design firms.

Overall, the placement record of CTP graduates at TAMU shows that nearly all CTP recipients are successful at achieving a full-time position in the transportation field. While some CTP graduates obtained positions overseas, the majority find employment in the states, contributing to the U.S. transportation workforce. While this study does not directly compare placement rates with non-certificate students seeking transportation jobs, the placement rate of transportation certificate recipients at TAMU is high and most are successful at achieving a position that matches their area of interest.

CONCLUSIONS AND RECOMMENDATIONS

The case study of TAMU’s transportation certificate program highlights the importance of developing an interdisciplinary curriculum to better prepare future transportation professionals. Given the current shortage of qualified transportation workers in the U.S., it is imperative for universities to address these needs through certificate programs that could attract students to the field of transportation planning. While a number of transportation certificate programs currently exist, they differ significantly in terms of course structure, delivery format, and the availability of concentrations. The experience of TAMU’s transportation certificate program has shown that a versatile program that allows students to customize their degree plan with focus area electives, as well as requiring critical foundation and capstone courses, provides students with a strong set of analytical and practical skills that would be desirable in a transportation job candidate.
This paper concludes by providing the following recommendations and guidelines for designing and implementing a transportation certificate program.

1. **The curriculum should be based on a carefully considered plan that reflects the current diverse needs of the transportation workforce.**

The transportation certificate program at TAMU was deliberately designed to deliver a comprehensive and interdisciplinary education in transportation that encompassed multiple disciplines relevant to transportation. The partnership between the planning, civil engineering, and public policy schools allows CTP students to receive certificate course credit for selected courses taken in those programs, allowing an integrated interdisciplinary degree program. Existing courses offered in the curriculum should be carefully reviewed to ensure that the content is up to date and covers a broad set of transportation expertise needed in the transportation profession. Furthermore, gaps in the curriculum should be addressed with the creation of additional courses such as the capstone course, which provides students with invaluable practical training in a real-world setting. Finally, it is important for certificate courses to be offered regularly on a rotating basis, allowing for students to complete their degree program on time. We argue that a carefully guided certificate program that provides students with multifaceted training would be superior to a certificate program that consists of a string of courses that do not fall within an interdisciplinary framework.

2. **Promoting a certificate program through marketing and recruitment effort is crucial for its success.**

The sustainability of a certificate program depends on a steady stream of student enrollment. To ensure this, developing a marketing and recruitment plan is necessary. While traditional printed media such as flyers are effective, the distribution of program materials in digital format and the web allows for faster dissemination. Based on our experience, a multifaceted approach that includes face-to-face recruitment in transportation-relevant departments on campus in addition to symposia and conferences, is important. Further, attracting a diverse body of students to the transportation field is also imperative, given the shortage of qualified minority and women applicants for transportation positions. To address this, outreach efforts to local high schools and community colleges in minority neighborhoods may be necessary, in addition to recruiting via social media outlets such as Facebook. However, one challenge that TAMU currently faces is the lack of dedicated marketing personnel and limited resources to promote the CTP beyond campus, which may be a challenge for other universities with similar programs.

3. **Offering an online certificate program would greatly expand access of transportation education to place-bound students and working professionals.**

Based on our survey of national transportation certificate programs, few transportation certificate programs are currently offered online, limiting place-bound students and working
professionals from pursuing a certificate. Offering a stand-alone certificate program that allows non-degree candidates to take courses online would greatly increase the access of the program to students and professionals beyond the host university. Given that an increasing number of graduate students are working full-time, online certificate programs will play an increasingly pivotal role in attracting candidates into the transportation workforce. However, implementing an online certificate program requires careful planning and oversight to ensure that the content of the online course is equivalent to the classroom course. Critical factors for the successful delivery of online programs include conveying a coherent learning environment, being cognizant of the limitations of asynchronous and synchronous methods, ensuring student access to learning resources, providing administrative and technical support, and having faculty that are accessible and trained to teach online courses (14). For certain types of courses, an online course may not be suitable for a traditional class, such as a capstone studio course, so it may be necessary to make some adaptations to the curriculum structure to accommodate the distance learning format.

In sum, this study provides insights into the development and implementation of a transportation certificate program, and how these programs can draw students to careers in transportation planning. Given the increased demand for versatile transportation planners with a diverse array of skills, providing an interdisciplinary education that is comprehensive and flexible is paramount to satisfy the growing demands of the U.S. transportation industry. While this paper provides a glimpse into the development and implementation of a transportation certificate program, some facets of the program may not be applicable to other universities and institutions. We also acknowledge that the paper shares these experiences from the faculty perspective, and not from the students. Future studies in this area should include feedback on student experiences from the certificate program, as well as surveys from transportation employers about their interactions with transportation certificate graduates.
REFERENCES


