

# Transportation Planning Education in Urban and Regional Planning Graduate Programs

KATHERINE F. TURNBULL

Recent federal legislation has resulted in significant changes in the transportation planning and decision-making process. The Clean Air Act Amendments, the Intermodal Surface Transportation Efficiency Act, the Americans with Disabilities Act, and other regulations establish new federal priorities for the surface transportation system and contain guidelines for planning, financing, and administering the different modes. Transportation planners with a wide variety of skills will be needed by public agencies and private businesses to adequately respond to these new responsibilities. Educational programs, especially those at the graduate level, must be attuned to these changes to help ensure that the current and future demands for transportation professionals are met. In this research the skills and areas of expertise needed in the transportation planning marketplace were examined and the responsiveness of current urban and regional graduate planning programs to meeting those demands was analyzed. This was accomplished through an analysis of recent federal legislation, national research problem statements, interviews with 46 transportation professionals, and a survey of 78 graduate planning programs in the United States. The research results indicate that while the current transportation planning curriculum addresses many of the existing and anticipated demands of the transportation marketplace, improvements are needed to adequately prepare graduate students for future jobs. The research identified 12 knowledge and 9 skill areas as important for future transportation professionals. The evaluation of the current curriculum indicates that many, but not all, of these areas are being addressed. Based on this analysis, knowledge and skill areas are identified for more extensive coverage in graduate courses.

Maintaining a viable surface transportation system that provides for the efficient and effective movement of goods and people is critical in ensuring the economic and social health and vitality of cities, states, and nations. Increasing traffic congestion, declining mobility, air quality and environmental concerns, deterioration of the transportation infrastructure, and limited resources are all major issues facing transportation professionals and decision-makers today. Further, additional demands are being placed on these groups in response to recent legislation at the federal, state, and local levels; rapid changes in technologies; and increasing complexities in the workplace.

Historically, transportation planners, along with transportation engineers and others, have played important roles in addressing these issues. To respond to these new challenges, however, transportation planners today must possess a wide range of technical skills, multiple areas of expertise, an understanding of the institutional settings within which transportation decisions are made, and the policy implications of alternative recommendations. Urban and

regional planning education, especially at the graduate level, represents a major source for developing this knowledge. To ensure that graduate students in transportation planning are adequately prepared to meet the challenges and opportunities facing this country, the programs offered by urban and regional planning graduate schools must focus on providing an understanding of a wide range of subject areas, knowledge of the policy and political processes, and training in basic technical skills.

The research documented in this paper was undertaken to provide an enhanced understanding of the current and projected needs of the transportation planning marketplace and to analyze the extent to which graduate programs in urban and regional planning are presently addressing these needs. This was accomplished through an analysis of recent federal legislation, national research problem statements, interviews with 46 transportation professionals from throughout the country, and a survey of 78 urban and regional planning graduate programs.

This paper is a summary of the process used in this research and presents the results of this analysis. To accomplish this, the paper is divided into five major sections. Following this introduction, the second section briefly describes the methodology used in the research. This is followed by an examination of the knowledge and skill areas identified as important for transportation planners based on a review of previous studies, recent federal legislation, national research problem statements, and interviews with transportation professionals from a variety of backgrounds. These sources provide a perspective on the current and future needs of the transportation planning marketplace. The third section summarizes the results from the survey of urban and regional planning graduate programs. The number and nature of transportation-related courses are examined, along with special degree programs. The paper concludes with a comparison of the needs of the transportation planning marketplace and existing urban and regional planning courses and programs. Knowledge and skill areas not currently being addressed are identified and potential changes and additions in graduate transportation planning curriculum are suggested.

The research results presented in this paper should be of interest to transportation professionals; educators; national planning and transportation organizations; transportation agencies at the federal, state, and local levels; and ultimately, the general public. Ensuring that transportation planners emerging from urban and regional planning graduate schools possess the necessary training and skills is of great importance to public-sector agencies and private firms responsible for all aspects of transportation planning, operation, and management; to educators and university administrators; and to national planning and transportation organizations.

## RESEARCH METHODOLOGY

The research conducted in this study focused on two major activities. First, the current and projected skills and areas of expertise for transportation planners were identified through a review of previous research, an examination of recent federal legislation and policy requirements, research problem statements issued by federal agencies and national organizations, and interviews with key transportation professionals. The approach used in the research was consistent with techniques used in previous studies examining other subjects offered by urban and regional planning programs (1-7).

The review of recent literature included an examination of the recommendations from recent conferences sponsored by the Transportation Research Board (TRB) (8-10) and other articles on transportation education (5,11-17). These articles and conference proceedings identify the historical areas of expertise for transportation planners. Recent legislation and regulations were reviewed to better understand the current and future knowledge and skill areas. These included the Americans with Disabilities Act (ADA) of 1990, Clean Air Act Amendments of 1991, and Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. Recent problem statements issued by the TRB, the FHWA, and the FTA were also examined.

Interviews were conducted with selected transportation professionals from throughout the country for additional insight into current and future demands on the transportation planning profession. A total of 46 interviews were conducted with transportation professionals from federal agencies, national organizations, state depart-

ments of transportation, transit agencies, metropolitan planning organizations, local municipalities, consulting firms, transportation research institutes, and universities. A semistructured questionnaire was used with the interviews. Thirty of the 46 interviews were conducted in person, and 16 were completed over the telephone. A list of the individuals interviewed is provided in Table 1.

Second, a survey was conducted to obtain information from the 78 urban and regional planning graduate programs accredited by the American Planning Association (18,19). A questionnaire was sent to the director at each university requesting information on the number and nature of transportation courses, the existence and requirements of a specialization in transportation planning or a joint degree program, and specific topics addressed in the transportation courses. Information was obtained from all 78 schools, accounting for a 100-percent response rate. Realizing that other disciplines—primarily civil engineering, business, and economics—also play a significant role in training future transportation planners, information on courses offered in other departments was also obtained. This included information from schools participating in the Council of University Transportation Centers (20).

## TRANSPORTATION PLANNING KNOWLEDGE AND SKILL AREAS

The information obtained through the reviews and interviews identified the key knowledge and skill areas for transportation planners. The results of this analysis are summarized in this section. The

TABLE 1 Transportation Professionals Interviewed

<b>Federal Agencies</b>	<b>Transit Agencies</b>
Ronald Fisher, FTA	Robert Babbit, MTA—Nashville
Dennis Judycki, FHWA	John Bartosiewicz, "T"—Fort Worth
Thomas Larson, FHWA	Michael Bolton, AATA—Ann Arbor
Lawrence Schulman, FTA	Larry Heil, McDonald Transit—Fort Worth
<b>National Organizations</b>	Judith Hollander, RTB—St. Paul
Thomas Brahm, ITE	Robert MacLennan, METRO—Houston
James Costantino, ITS America	Patricia McLaughlin, LACMTA—Los Angeles
Grace Cruncan, STPP	
George Marcou, APA	<b>Consulting Firms</b>
Richard Weaver, APTA	Donald Capelle, PBQD
<b>State Department of Transportation</b>	Peter Fausch, SRF, Inc.
Leslie Jacobson, WSDOT	Richard Pratt, RHPC
William Jeffrey, VDOT	Tad Widby, PBQD
John Kilian, CDOT	Richard Worrall, JHK
Alvin Luedecke, TxDOT	
Eugene Ofstead, MnDOT	<b>University Research Institutes</b>
<b>Metropolitan Planning Organizations</b>	Richard Braun, Minnesota
Patti Bass, Waco MPO/TTI	Thomas Humphrey, MIT
Alan Clark, HGAC—Houston	James Miller, Penn State
Natalio Diaz, Metropolitan Council	Robert Paasuell, City University of New York
Janet Kennison, San Antonio MPO	C. V. Wootan, TTI
Ronald Kirby, WASHCOG	
Joel Markowitz, MTC—San Francisco	<b>Educational Institutions</b>
<b>Cities</b>	C. T. Fielding, California, Irvine
Oliver Byrum, Minneapolis	Michael Meyer, Georgia Tech
Rebecca Kohlstrand, San Francisco	G. Scott Rutherford, Washington
Ann Perry, Minnetonka	Robert Stokes, Kansas State
William Stockton, Austin	Martin Wachs, UCLA

reviews indicated that the ADA, the Clean Air Act Amendments, the Intermodal Surface Transportation Efficiency Act, and other factors are combining to place additional responsibilities and requirements on federal, state, metropolitan, and local transportation agencies.

Although the direction and nature of many of these requirements are not new, the scope, magnitude, and implication of the Acts are. In many cases, the legislation provides a statutory basis for what were previously only guidelines. Further, the three Acts combine to establish a new vision and direction for the future transportation system in this country. This new vision is based on an intermodal approach focusing on better managing all elements of the existing transportation system, addressing air quality and environmental concerns, and providing equal access to transportation services by all segments of society. These changes place additional demands on transportation professionals. To respond to the changing transportation planning marketplace, transportation professionals in the future will need a wide range of skills and areas of expertise. While many of these build on the historic strengths of transportation planning and transportation engineering, many represent new and emerging skill areas.

A typology is presented in Table 2 summarizing the current and anticipated future demands of the transportation marketplace by knowledge areas and technical skill areas. This typology was used to differentiate the general subject areas that transportation professionals should have an understanding and awareness of, and the more specific areas of technical expertise. It is recognized that there is overlap between the two general categories, and that it is not possible for students or professionals to possess expertise in all of the skill areas noted. The classification system is useful, however, for

identifying the topics that should be covered in graduate transportation planning courses and classes in other fields to better meet the anticipated future demands of the transportation planning marketplace. Each of the major knowledge and skill areas is briefly summarized in this section, along with the key areas of expertise identified through the interviews.

Although the 46 individuals interviewed represented a variety of backgrounds, technical areas of expertise, and current job responsibilities, a number of similar ideas were voiced on the current status of the transportation profession and the future demands of the transportation planning marketplace. In addition, a number of unique perspectives were also presented by individuals from the different agencies and organizations.

All of the individuals interviewed were in agreement that significant changes were occurring in the surface transportation system and the transportation profession. Although a number of people indicated that many of these trends were not new, all stressed that the 1990 Clean Air Act Amendments and the 1991 Intermodal Surface Transportation Efficiency Act formally established a new direction for the nation's transportation system. Most of the representatives noted that these two Acts have significantly changed the planning, development, implementation, and operation of the surface transportation system. Rather than continuing to build new capacity and expand facilities, the Acts refocus future efforts on better management of the existing transportation system and addressing current air quality concerns. Further, many individuals noted that numerous factors are combining to make all aspects of the transportation system and the responsibilities of transportation professionals much more complex today.

To respond to these new demands, most of the individuals suggested that the roles and skills of transportation professionals will also change somewhat in the future. Although stressing that many of the traditional areas of expertise will still be in demand, most indicated that professionals with a variety of backgrounds and skills will be needed in the future. A number of individuals, especially those with federal agencies, national organizations, and universities, stressed that the transportation profession should embrace people from diverse disciplines and backgrounds. In addition to the traditional fields of civil engineering and planning, other disciplines noted were law, political science, public administration, computer science, business, finance, management, geography, sociology, and human factors. Thus, the need for a multidisciplinary approach to transportation planning and operation was promoted by many of the individuals interviewed. Multidisciplinary programs were noted as particularly important in the areas of intelligent transportation systems (ITS), travel demand management (TDM), intermodalism, and air quality and environmental analyses.

Further, in addition to specialized expertise in some of these areas, many individuals stressed that transportation professionals should have an understanding and familiarity with all of these subjects. Although they may not be experts in all areas, many of the representatives indicated that transportation planners should have a working knowledge of the different technical tools and techniques. This understanding was identified as important to support the role transportation planners play in linking the technical and policy levels.

The direction provided by the ISTEA clearly reflects a future vision of an integrated multimodal and intermodal transportation system. This system would maximize the advantages of each mode and would provide a variety of choices for operators and users. It appears appropriate that transportation planning education begin to

**TABLE 2 Summary of Knowledge and Skill Areas for Future Transportation Planners**

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**Knowledge Areas**

- **Intermodal/Multimodal Focus**
- **Individual Mode Characteristics**
  - Highways
  - Transit (bus, rail, paratransit, rideshare)
  - Bicycles
  - Pedestrians
  - Goods Movement
- **Transportation/Land Use Interrelationships**
- **Traffic Engineering**
- **Air Quality and Environmental Impacts of Modes**
- **TSM, TDM, and TCM**
- **Travel Demand Forecasting Process**
- **ITS and Advanced Technologies**
- **Federal and State Requirements**
- **Transportation Planning and Decision-Making Process**
- **Public Participation Process**
- **Management**

**Skill Areas**

- **Travel Demand Modeling**
  - **Air Quality and Environmental Analysis Techniques**
  - **Financial Analysis Techniques**
  - **GIS**
  - **Database Management**
  - **Mode Specific**
  - **Evaluation Techniques**
  - **Problem Solving Techniques**
  - **Communication Skills**
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reflect this vision by adopting a multimodal and intermodal approach. Such a focus would provide students with an understanding of the multimodal and intermodal concepts and the methods, techniques, and facilities needed to encourage greater integration of all modes.

Although there is a need to reflect an intermodal focus, there is also a need to provide students with an understanding of the characteristics of the individual modes. Given the broad scope of the ISTEA and the factors that need to be considered in the different plans, students should be exposed to not only highways and transit modes, but also bicycles, pedestrians, and goods movement. Further, the transit component should cover bus, rail, paratransit, and ridesharing systems. Topics to be addressed should include the capital and operating costs associated with each mode, the basic planning techniques used to estimate the demand for different modes, and issues unique to each mode.

To address many of the factors included in the state and metropolitan long-range plans and to take a more proactive role in addressing the issues facing urban areas, future transportation professions will need to understand the relationships among the different elements of the transportation system, land use, economic development, and social factors. This need was stressed by the representatives from MPOs, state DOTs, transit systems, federal agencies, and local communities. Graduate transportation programs should provide students with a perspective on the interaction of all these elements and the influence transportation decisions may have on other components. Further, planning students should understand the tools and techniques available to influence and control development and land use patterns. These may include such topics as zoning and other land use controls, economic development strategies, joint development techniques, and other approaches. In addition, transportation planners should be trained in the basic planning process, including the articulation of goals and objects, the development and evaluation of alternative plans, the selection of the recommended concepts, and the ongoing monitoring and updating of plans.

Transportation planners should also have an understanding of the basic concepts of traffic engineering. This should include such elements as the functional classification system, level of service characteristics, volume and capacity features, traffic flow concepts, basic design elements, and traffic management techniques. This is not to suggest that planners will perform traffic or transportation engineering. Rather, it recognizes the importance of many of the basic engineering concepts for facility design, operations and management, and travel demand modeling. Transportation planners who do not have an engineering background should have an understanding of these basic concepts to enhance their ability to conduct different studies, better coordinate activities and communicate with engineers, and provide a link between the technical and policy levels.

The requirements of the ISTEA and the Clean Air Act Amendments provide a clear indication that air quality and environmental concerns will be significant factors in future decisions regarding the overall transportation system and specific projects. Many of the individuals interviewed indicated that students with expertise in environmental areas were currently in demand. As a result, transportation professionals will need to have a much better understanding of the environmental impacts and consequences of different transportation improvements and the ability to conduct environmental analyses. Further, the Clean Air Act Amendments and the ISTEA require the examination and implementation of techniques

to encourage greater use of high-occupancy commute modes and to increase vehicle occupancy levels. Various Transportation System Management (TSM), Travel Demand Management (TDM), and Transportation Control Measures (TCM) strategies will be necessary to meet the requirements of these Acts and other state legislation. Graduate transportation planning curriculum should cover not only the general concepts associated with the different strategies, but also the techniques to estimate demand, and implement, monitor, and evaluate selected programs.

Many of the individuals interviewed stressed that the travel demand forecasting process represents a basic component of the transportation planning process. Although not all transportation planners will be experts in use of travel demand models and forecasting techniques, an understanding of the basic concepts is important. This should include a comprehension of the factors considered in travel models, the strengths and limitations of different types of models, and typical applications. The importance of skills in these areas can be noted by the inclusion of additional training in the use of travel demand models as a technical area of expertise.

There continues to be a great deal of interest in the development, testing, and deployment of ITS and other advanced technologies to improve the overall efficiency of the transportation system. Numerous activities at the federal, state, and local levels are focusing on the application of a wide range of evolving technologies. Many of the individuals interviewed noted that professionals from many disciplines will be needed to successfully develop, implement, and operate ITS. Graduate planning students should be provided with at least a general introduction to ITS to help prepare them for future work in this area.

It is important that transportation professionals and graduate students have an understanding of the requirements of the ISTEA, the Clean Air Act Amendments, and the ADA. Planners with a knowledge of not only the regulations, but also the methods, techniques, and plans necessary to address the requirements will be in demand in the future. Graduate transportation planning curriculum should cover the important elements of all three Acts and the basic components of the different plans. For example, graduate students should know the factors that must be addressed in the metropolitan and statewide long-range plans and how to conduct the necessary analyses. In addition to the requirements of recent federal legislation, relevant state and local laws should also be included.

Many of the representatives interviewed, especially those associated with state and local agencies, stressed that transportation planners should have an understanding of the transportation planning process, the local decision-making process, and the political process. To respond to this identified need, these topics should be covered in graduate transportation planning curriculum. Topics to be addressed include the roles and responsibilities of the different agencies, the nontransportation factors that may influence the decision-making process, and possible methods to coordinate transportation and land use decisions.

Related to the transportation planning process is the need for transportation professions to have an understanding of the public participation requirements associated with the development of the different plans, programs, and project selection activities. The mandates contained in the ISTEA, the Clean Air Act Amendments, and the ADA for early and ongoing public involvements are requiring major improvements in the citizen involvement programs of many agencies. Thus, it appears that planners with an understanding of the requirements and the skills to conduct public participation strategies will be in demand. Graduate planning programs should help prepare

students to meet these needs by providing not only an overview of the requirements and the different approaches that can be used, but also experience in the use of different strategies.

The last knowledge area suggested as important for transportation planners, and thus graduate students, is management. A number of the representatives interviewed indicated planners need both project and people management skills. Capabilities in these areas were noted as especially important as people move up within organizations. Most of the individuals interviewed noted that not all students might have an interest in management courses. Providing the opportunity to take management classes was suggested as important for those students that do, however.

In addition to understanding the basic concepts in these areas, transportation professionals will also need a variety of technical skills to be competitive in the future transportation planning marketplace. The individuals interviewed provided suggestions on these technical areas of expertise. As identified in Table 2, these include a variety of computer, analytical, and communication skills. Given the widespread use of computers today, it is critical that future planners have an understanding of the different programs and are comfortable working in a computer-assisted environment. Further, to perform the analyses required in many of the knowledge areas, transportation planners will be needed with technical skills in the areas of travel demand modeling, air quality and environmental analyses, financial analyses and cost-benefit techniques, geographic information systems (GIS), and database management. Providing students with exposure to these areas and allowing them to develop practical skills in the use of different computer programs and techniques will enhance their marketability.

A number of other basic skills were highlighted by the transportation professionals interviewed. For example, all of the individuals interviewed agreed that transportation planners need good communication skills. The ability to write and speak clearly, make presentations, and work with diverse groups of people and individuals was stressed as critical attributes for transportation professionals. There was strong sentiment among all the representatives that communications skills are critical; without the ability to communicate clearly a planner cannot be effective.

In addition, a number of people suggested that successful planners will need more than just the basic communication skills. To respond to these demands, graduate programs should also be teaching advanced communication techniques. For example, one individual noted that their Planning Commission and City Council meetings are broadcast on local cable television. As a result, it was suggested that students should be exposed to the use of television and other innovative communication techniques. The need for good interpersonal skills was further stressed to allow planners to successfully interact in the diverse workplace environment, with a variety of groups and individuals, and with elected representatives. To help promote the development of interpersonal skills, a number of people encouraged the use of group projects, especially those involving students from different disciplines.

Representatives from all nine categories supported the use of internships as a way of providing graduate students with valuable practical experience. Internships and other training allows students to test and practice the skills and techniques they have learned. Further, students have the opportunity to develop skills in areas of specialization that may not be available through their normal course work. Almost all of the individuals interviewed indicated that the agencies or businesses they work for use interns or student workers. In addition to providing practical experience for students, a number

of benefits to the agencies were identified. For example, many people noted that internships not only provide students with contacts that will assist them in their careers, but also that agencies use internships as one method for identifying future employees.

Finally, it is interesting to note that the university professors and the representatives from the transportation research institutes identified many of the same needs and priorities as representatives from private and public-sector agencies and organizations. Thus, the results from the interviews seem to indicate that many university faculty and staff are aware of the changing demands of the transportation marketplace. Further, most identified the need for university programs and courses to change to meet these new demands. The faculty and staff members provided a realistic assessment of the ability of universities to respond to these new demands, however. Funding limitations for new equipment and the long and cumbersome process to add or change courses were two of the limiting factors identified by the university representatives. Even with these limitations, however, the professors and staff members were unanimous in their enthusiasm toward the future opportunities in the transportation profession.

## CURRENT TRANSPORTATION PLANNING EDUCATION

A total of 134 transportation-related courses were identified in the survey as being offered at the 78 urban and regional graduate planning programs. The number of transportation courses reported by each program is shown in Table 3. A total of 22 programs, or 28 percent of all the schools surveyed, do not offer any transportation courses. Correspondingly, a total of 56, or 72 percent of the urban and regional planning programs, offer one or more transportation courses. A total of 24 schools reported offering only one course, 11 offer two courses, and 19 programs list between three and five transportation classes. Finally, two schools reported eight transportation-related courses.

The nature of the 134 transportation courses offered at the different programs reflects a wide variety of subject areas. Table 4 presents a summary of the courses using a topology covering 13 general areas. As illustrated, introductory classes in transportation planning and urban transportation planning are the most commonly offered courses, accounting for 27 percent and 23 percent of the total, respectively. Courses in transportation policy, transportation and land use, public transportation, and infrastructure/comparative urban systems form a second grouping. Between 7 and 14 courses focus on each of these topics. Finally, only a few programs offer specialized courses in advanced transportation planning, trans-

TABLE 3 Urban and Regional Planning Programs—Number of Transportation Courses Offered

Number of Courses	Number	Percentage
None	22	28%
1	24	31%
2	11	14%
3	9	12%
4	5	6%
5	5	6%
5+	2	3%
Total	78	100%

**TABLE 4 Urban and Regional Planning Programs—Transportation Courses by General Type**

General Topic	Number	Percentage
Introduction to Transportation Planning	36	27%
Urban Transportation Planning	30	23%
Transportation Policy	14	10%
Transportation/Land Use	12	9%
Public Transportation	8	6%
Infrastructure/Comparative Urban Systems	7	5%
Advanced Transportation Planning	6	4%
Transportation Systems	6	4%
Transportation Economics	5	4%
Transportation Modeling and Techniques	5	4%
Environmental	3	2%
Transportation Regulation	1	1%
Transportation Engineering	1	1%
Total	134	100%

portation systems, transportation economics, travel demand modeling, environmental issues, transportation regulation, and transportation engineering.

The survey also contained a matrix listing 13 topic areas. Respondents were asked to check the topics covered in the different courses and in other classes within the program. The most frequently noted topics were land use and transportation, public transit, transportation modeling, introduction to transportation, TDM/TSM, and air quality and environmental issues. Thus, it appears that the 68 courses listed under the general titles of introduction to transportation and urban transportation planning cover a variety of trans-

portation modes and subjects. Topics that are currently receiving less emphasis include goods movement, GIS, ITS, and statistics. Respondents from 16 programs indicated that consideration was being given to adding new transportation courses. The most frequently mentioned subject areas being considered were public transportation, transportation modeling, transportation policy, land use and transportation, and multimodal planning.

According to the survey responses, a total of 31 urban and regional planning programs offer a transportation emphasis area. These schools are listed in Table 5. Thus, the survey results indicate that 40 percent of the graduate urban and regional planning pro-

**TABLE 5 Graduate Programs in Urban and Regional Planning with Transportation Emphasis Areas**

Alabama A&M University—Community Planning and Urban Studies
University of California, Berkeley—City and Regional Planning
University of California, Irvine—Urban and Regional Planning
University of California, Los Angeles—Urban Planning
Columbia University—Urban Planning
Eastern Washington University—Urban and Regional Planning
Florida State University—Urban and Regional Planning
Georgia Institute of Technology—City Planning
Harvard University—City and Regional Planning
Hunter College of the City University of New York—Urban Planning
University of Illinois at Chicago—Urban Planning and Policy
University of Illinois at Urbana-Champaign—Urban and Regional Planning
Iowa State University—Community and Regional Planning
University of Iowa—Urban and Regional Planning
University of Kansas—Urban Planning
Massachusetts Institute of Technology—Urban Studies and Planning
Memphis State University—City and Regional Planning
Michigan State University—Urban Planning
University of Michigan—Urban and Regional Planning
New York University—Urban Planning
University of North Carolina at Chapel Hill—Regional Planning
University of Oklahoma—Regional and City Planning
University of Pennsylvania—City and Regional Planning
Portland State University—Urban Studies and Planning
Rutgers University—Urban Planning and Policy Development
San Jose State University—Urban and Regional Planning
State University of New York at Albany—Geography and Planning
Texas A&M University—Landscape Architecture and Urban Planning
University of Texas at Arlington—City and Regional Planning
University of Washington—Urban Design and Planning
University of Wisconsin, Milwaukee—Urban Planning

grams offer emphasis areas in transportation planning. A total of 12 programs, accounting for 15 percent of the total planning programs, offer a joint degree or concurrent degree option. As shown in Table 6, 10 of these joint degree programs are offered with engineering departments, one interdepartmental program is provided in transportation planning, and one certificate in ITS is offered in cooperation with a civil engineering department. In addition to these programs, one university reported a separate department in transportation studies.

Survey respondents were asked to identify transportation-related courses in other departments that were available to graduate students in the urban and regional planning program. A total of 115 courses were listed in the surveys. The most frequently noted courses were in traffic and transportation engineering and urban transportation planning. All but five of these were offered by civil engineering departments. Geography, economics, and business comprised the other departments with courses listed. A number of respondents indicated that students interested in transportation planning are encouraged to take courses in civil engineering and other departments.

## CONCLUSION

It appears that the current transportation course offerings in urban and regional planning programs address some, but not all of the knowledge and skill areas identified previously in Table 2. Approximately half of the transportation classes currently offered in planning programs are introductory in nature. From the course topics identified in the survey and copies of the course outlines provided by some respondents, it appears that many of these classes provide a good overview of the basic elements involved in transportation planning. For example, most seem to address the different modes, TDM and TSM, land use and transportation, and the travel demand modeling process. Fewer courses appear to cover multimodal and intermodal planning, goods movement, air quality and environmental issues, ITS, GIS, and other emerging knowledge areas, however.

Although the current courses seem to offer an adequate general overview of many of the key knowledge areas, little depth is available in many programs after the first introductory course. For example, 31 percent of the urban and regional planning graduate programs offer only one transportation course. The remaining 41 percent provide two or more courses. Thus, few specialty courses are available within many programs. Of the transportation knowledge areas, only 14 programs offer a course in transportation pol-

icy, only eight offer a course in public transportation, only five offer a modeling course, and only three offer a course in transportation and the environment.

Educational opportunities in the more specialized skill areas identified previously are also lacking in many programs. Although a number of topics are covered in the general introductory courses, few programs offer specialized classes in travel demand modeling, environmental analysis techniques, public transportation, and GIS. Although courses in these topics are offered in civil engineering departments at some universities, it appears that additional courses within both disciplines would be beneficial.

Thus, if urban and regional graduate planning programs wish to assist in meeting the current and future demands of the transportation marketplace, additional courses and enhanced curriculum will be needed. These enhancements should focus on both the knowledge and technical skill areas identified previously. Graduate programs should focus on providing students with a comprehensive understanding of a number of subject areas and more specific technical skills.

Based on the assessment of the needs of the transportation planning marketplace, the examination of current course offerings, and the examples noted above, a number of suggestions can be made for future enhancements to the transportation curriculum offered in urban and regional planning programs. First, it is suggested that introductory courses provide students with a multimodal and intermodal perspective to transportation planning, implementation, and operation. This approach is in keeping with the vision of the ISTEA and other recent legislation. Further, although the focus of future transportation education should be on a more integrated approach, students should still learn the basic characteristics of the different modes. This should include a discussion of highways, transit, goods movement, bicycles, pedestrians, and techniques to integrate these different modes. In addition, an introductory course should also provide students with a basic understanding of the requirements of recent legislation, the transportation planning process, and the use of emerging technologies and techniques.

Other courses should be provided focusing on more specific knowledge areas and technical skills. Examples of courses appropriate to meet the demands in the identified knowledge areas include transportation and land use; the transportation planning process, policies, and legislation; the environmental impacts of alternative modes and analysis techniques; the travel demand forecasting process; transit and TDM; and ITS and advanced technologies. Further, students interested in transportation should be provided with the opportunity to take courses in management and business administration.

**TABLE 6 Joint or Concurrent Degree Programs in Transportation**

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<b>University of Arizona—Interdisciplinary Planning and Civil Engineering</b>
<b>Auburn University—Planning and Civil Engineering</b>
<b>California Polytechnic, San Luis Obispo—Planning and Engineering</b>
<b>University of California Berkeley—Planning and Engineering</b>
<b>Georgia Institute of Technology—Planning and Engineering</b>
<b>Iowa State University—Interdepartmental program in Transportation Planning</b>
<b>University of Iowa—Urban and Regional Planning and Engineering</b>
<b>Massachusetts Institute of Technology—Planning and Civil Engineering</b>
<b>University of Michigan—Certificate in Transportation Studies: IVHS</b>
<b>Ohio State University—City and Regional Planning and Civil Engineering</b>
<b>Virginia Polytechnic Institute &amp; State University—Planning and Engineering</b>
<b>University of Wisconsin, Milwaukee—Urban Planning and Engineering</b>

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The technical areas of expertise that should be covered in transportation or other planning courses include a variety of computer, analytical, and communication skills. In general, all planners should be comfortable working with computers and should have an understanding of the different programs that can enhance their jobs. Transportation planners should be provided with further opportunities to learn technical skills in the areas of travel demand modeling, financial analysis techniques, air quality and environmental analyses, statistics, GIS, and database management. In addition, a course should be provided addressing the communication skills planners will need to be effective problem solvers. This should include writing and presentation skills and the use of video and other technologies.

Developing enhanced transportation emphasis areas based on these suggestions will position urban and regional graduate planning programs to better respond to the anticipated future demands of the transportation planning marketplace. Further, it will provide graduate students with an understanding of the knowledge areas and the technical skills necessary to compete in the job market and to respond to the complex issues facing all areas of the country. Thus, enhancing transportation emphasis areas in urban and regional graduate planning programs will benefit students, the institutions, and society, in general.

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