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An Interdisciplinary Approach to Transportation Education

Abstract

Our current transportation system is a manifestation of the decisions made by transportation professionals in our somewhat recent past. Those decisions were influenced by the education that transportation professionals received and by their approaches to problem solving set forth by a culture imbedded in them throughout their professional lives.

We are now acutely aware of the impacts our current transportation system has, not only on our mobility and safety, but also upon the environment, disadvantaged populations and numerous other aspects of our built and human environment.

This being said, it is important to explore new approaches to transportation education. Bringing together transportation students from various disciplines, such as engineering, planning, and public policy seems to enhance the learning experience and may potentially result in a more well rounded transportation professional capable of influencing better transportation decision-making.

At the University of Wisconsin-Madison, and sponsored through the Gaylord Nelson Institute for Environmental Studies, is an interdisciplinary, graduate-level certificate program entitled, “Transportation Management and Policy” (TMP). Through this 17-credit program, transportation students of various backgrounds take courses together and interact with students of varying perspectives on the topic of transportation.

This paper serves as an exploration of this format of transportation education. Students from different educational backgrounds are afforded the opportunity to interact, through settings that promote considerable discussion and even team efforts focused on transportation projects. Perhaps through this style of transportation education, the vocabulary and approaches to problem solving associated with the “cultures” of the various transportation disciplines might be meshed, thus resulting in a well rounded transportation professional.

This paper will consider the observations and opinions of current employers of some of the graduates of UW-Madison’s Transportation Management and Policy certificate program. A survey will be administered to willing employers and will attempt to quantify, though admittedly through a very small sample size, the employer’s thoughts regarding the relevant success of the TMP graduates in their current work environment and perhaps compare their success to graduates of traditional engineering or planning programs.

Background

Our nation’s transportation system is a complex one. It consists of many modes, owned by many parties, travels through many jurisdictions and impacts many people, communities, businesses and even ecosystems. Because our transportation system is such a complex one, the planning, design, construction and operation of such a system requires a vast number of skilled professionals working together towards a common goal of an efficient transportation system that moves people and goods safely and effectively.

These professionals come from a number of different backgrounds. Planners determine need through collection of data, detailed analysis, and communication with the public and politicians to begin the project development process. Engineers design and oversee the construction and operation of the infrastructure. Environmentalists provide input during the NEPA process. Real estate specialists get involved during property appraisal and acquisition. Financial analysts prepare budgets and track expenditures throughout the process. Public affairs professionals coordinate political efforts and administer the funds. This is only a partial description and barely scratches the surface of the disciplines involved but makes the point that the players often come from very different professional and educational backgrounds.

Table 1 provides a description of how various disciplines contribute to each phase of the transportation project development process.³

Table 1. Role of disciplines in each phase of the project development process

Phase	Description and Disciplines Involved
Early Planning (Long Range)	Mostly transportation planners and some engineers, traffic and environmental study personnel participate in preliminary assessment of transportation needs and the potential impacts of solutions that address those needs.
Project Programming and Budgeting (setting priorities)	Mostly engineers, planners and some financial staff with expertise in budgeting are involved in this process. Decisions are influenced by top ranking public officials, politicians, and special interest groups.
Preliminary Design and Engineering	Mostly engineers and surveyors are involved in consultation with the environmental study personnel, as well as architects, geologists, hydrologists and others when applicable.
Environmental Studies	Involves mostly personnel from the disciplines of engineering, planning, biology, archeology, and historic preservation, but may also involve personnel with expertise in real property acquisition (i.e. property appraisers) and relocation of families, businesses and institutions. Other disciplines potentially involved include architecture, landscape architecture, geologists, and lawyers.
Final Design	Mostly engineers who may consult as necessary with those involved in environmental studies (i.e. to address the compliance with environmental commitments or assess mitigation alternatives not previously considered) and real property acquisition.
Property Acquisition and Relocation Assistance	Mostly involves acquisition and relocation assistance personnel such as property appraisers and relocation assistants, but may involve personnel with expertise in civil rights and other areas.
Construction	Mostly involves engineers and engineering assistants, but also involves personnel with expertise in construction safety, accounting, and other disciplines mentioned above (i.e. those with expertise in disciplines associated with environmental studies particularly in cases where environmental commitments are in

	effect).
Operations and Maintenance	Mostly involves personnel with expertise in transportation facility maintenance, traffic counting, auditing, and other disciplines. For cases in which environmental or other commitments are in effect, personnel with expertise in those fields will be employed, as applicable.

This description of disciplines and their responsibilities is an extensive one, though not entirely exhaustive (especially if you consider modes other than highway). Some of the other disciplines not mentioned but that are still integral to the overall successful operation of a multimodal transportation system include researchers, law enforcement officers, vehicle and system operators, and managers of port authorities, among others.

While it is absolutely critical for these parties to be involved to provide a transportation system of high quality, getting these parties to work together can be a very real challenge. A challenge not because they do not get along but because they often do not truly understand one another. This difficulty in communication is rooted in the fact that each discipline has their own vocabulary and approaches to problem solving that are part of their discipline’s culture, or as Hugh Petrie calls it, a discipline’s “cognitive map,” i.e. the cognitive and perceptual approach connected to a discipline. The longer a practitioner operates within a discipline, the more engrained this cognitive map becomes. It can get to the point where, “...quite literally, two opposing disciplinarians can look at the same thing and not see the same thing.”⁸

For example, when looking at the problem of a congested segment of urban highway, an engineer may suggest expanding the highway to include another lane. The urban planner may attempt to employ demand management strategies such as car pooling, parking restrictions and telecommuting to alleviate the peak hour volumes. The transit operator will likely suggest encouraging commuters to switch their trips to bus or commuter rail. The traffic control engineer may recommend the use of ramp metering and incident management control measures. Meanwhile the environmentalist is in favor of whatever strategy is least likely to adversely impact air and water quality, and nearby sensitive ecosystems.

Having different view points should not be considered a bad thing. It is true that it can be a struggle to find a solution when you have so many competing interests but it is these competing interests that help to ensure all angles are examined, or at least considered, when attempting to find a solution to such a problem.

Often time there is no one right answer. It might be that the solution is a combination of the suggestions above. But if we did not have these groups working together at various points in the project development process, solutions considered “best for all involved” may have been missed. In order to find these solutions, the multitude of disciplines involved in the process must be able to communicate. In order to communicate effectively, we must have foundational understanding of where each other is coming from and why we each think and talk like we do.

So the question being begged here is, “How do we begin to understand one another?” “How do we learn to communicate more effectively?” Perhaps we need to begin this learning process

before we become so immersed in our own sub-cultures. A natural place to start seems to be in college. It is during this time that transportation professionals begin to take on the vocabulary and approaches to problem solving that makes an engineer and engineer, a planner a planner, an environmentalist and environmentalist, and so on.

The idea for this paper came from a discussion with a former student in the Transportation Management and Policy (TMP) program at the University of Wisconsin-Madison. She was completing her Masters in Civil Engineering and working part time with an engineering consultant. Her supervisor put a blueprint in front of her with engineering specifications regarding the construction of a new roadway. Before becoming involved with the TMP program, she said she would have simply reviewed the engineering specifications for correctness and moved on. However, now that she had been exposed to the other disciplines in the transportation field and had attended class with transportation students from other disciplines such as planning and public policy, she now found herself taking a more holistic view of the project. She found herself asking questions such as, “How would this impact the community it’s running through?” “Does a facility of this kind and capacity fit the needs of the users?” “Who benefits from this project and who is adversely impacted by its construction?” These are the questions transportation professionals, project managers, and decision-makers should be asking themselves.

Benefits of Interdisciplinary Education

It is a difficult proposition to find quantifiable benefits of an interdisciplinary education. Not only would a method for assessing, or measuring, the benefits of an interdisciplinary education need to be developed but there would need to be a way to track the student into the work force, and again, measure the benefits to the professional and the transportation system with which he or she interacts. An employer survey of TMP graduates has been employed to quantify the benefits, and success, of the TMP program, albeit a rather rudimentary attempt considering the limited number of TMP graduates, and hence, the limited number of respondents.

Qualitative benefits can be claimed. In a project report stemming from the Interdisciplinary Studies Project at Harvard Graduate School for Education, the author notes, “More than building a factual knowledge base, the emphasis of an interdisciplinary program seems to be on developing ‘bend of mind,’ or meta-thinking skills, that allow students to remain learners and seekers of information.” “...graduates of the program are prepared to become expert sifters, searchers, and synthesizers of information.”⁷ Students of interdisciplinary educational programs not only have the skills to remain focused on the technical details of their respective disciplines but gain the ability to see the big picture.

Connors and Seifer² examine models of interdisciplinary service learning and reiterate this phenomenon, “...university students report the development of key skills and attributes resulting from their participation in interdisciplinary service-learning, including gaining the ability to think beyond traditional academic disciplines and being more adept at integrating and applying what they are learning. ...introduced in the early years of study can help to foster the contribution of positive attitudes about working in communities and teams.”

David Plazak, Associate Director for Policy at the Center for Transportation Research and Education (CTRE) at Iowa State University, notes the benefits of an interdisciplinary education, “The real world is interdisciplinary and [is] becoming more so all the time. For students to function well in the real world they need to understand what other professionals and technicians do and the type of value they add to projects. Students with interdisciplinary experience are more versatile and more flexible and this is of benefit to their employer. I hear this all the time from firms and agencies that have employed our MS TRANS graduates.”⁹

Steven Polzin and Beverly Ward used a focus group consisting of twelve [transportation] professionals [at the level of vice president or director] from area firms and public agencies to assess industry support for an interdisciplinary transportation program. All were in agreement that an interdisciplinary transportation degree, though a non-engineering degree, would be valued by their organizations. There also seemed to be a consensus that the interdisciplinary approach would help satisfy a need for a workforce with a broader perspective needed in management-level positions. It should be noted that this group was almost entirely engineers.¹⁰

Approaches to Interdisciplinary Education

This paper is not an inventory of transportation degrees and certificates currently being offered. Nor is it an assessment or an evaluation. This section of the paper simply takes note of a few of the programs that currently exist around the country. These programs were located by starting with the USDOT’s listing of University Transportation Centers at <http://utc.dot.gov/>.

One could argue that a student gains significant benefit simply by sitting in the same classroom as students from other transportation-related disciplines. Students appear to gain insight into the perspectives of other disciplines through discussion with these peers and hearing the questions asked by these peers. In a transportation planning course at the University of Tennessee, a civil engineering student asked the question, “Why do we even need to involve the public in the transportation decision-making process?” This was a valid question and probably not one most engineers in the class had given too much thought to before. The professor turned to the planning students in the room and asked for them to provide an answer to the question, which they did, since public involvement is an essential part of the planning process that every planning student, even in his or her first semester of graduate school, is keenly aware of.

A similar situation occurred during a discussion in a course at the University of Wisconsin-Madison. The instructor posed the scenario of funding a bypass around an urban center. The planning and public policy students were quick to attack the idea for its potential environmental and socially disruptive side effects. An engineering student pointed out advantages, such as safety and mobility that this kind of facility might provide. All valid points. Still, these points may not have been heard in a classroom with students of the same discipline.

Massachusetts Institute of Technology’s (MIT) Department of Civil and Environmental Engineering offers a Master of Science in Transportation (MST).⁶ The interdisciplinary degree, which typically takes students two years to complete, consists of two core courses – one focused on an introduction to transportation systems using a “softer” approach, while the other is a more technical analysis of the modal systems and tools used to operate and analyze these systems. Other course requirements include building a depth of understanding in a select area of interest,

such as one of the transportation modes like air transport or ocean systems – that depth could also be attained through coursework in planning, policy, logistics, or management. Or, rather than focusing on depth, the student may choose to take coursework in numerous areas and build a broader understanding of transportation. Since research is at the heart of the program, a research-based thesis is also required.

Though this program is located within the School of Engineering, it brings in students with backgrounds in the physical and social sciences, urban planning, management, as well as engineering. All that is specifically required for admission are two courses in calculus and one each in economics and probability. The requirement for two courses in calculus appears to be unique to MIT and likely reflects MIT's reputation as a leader in technical education. Dual degrees are also an option with pairings available in MST/Master of Science in the Technology and Policy Program, MST/Master of Science in Operations Research, and MST/Master of City Planning.

Based on a preliminary review of the MIT program, it appears that the second option, where a student is able to build a broader understanding of transportation and the disciplines involved, is more likely to develop the skills and perspective that are desirable of a well rounded transportation professional. This is the type of professional an interdisciplinary transportation education program seeks to develop.

The University of South Florida (USF) houses the Graduate Interdisciplinary Transportation Program, or GITP, for graduate students of Civil Engineering, Economics, and Public Administration.¹² Here, graduate students enrolled in one of the three departments, take a common set of core courses that emphasize urban transportation issues (as this is the theme of the National Center for Transit Research, or NCTR, which has a close tie to the GITP), while pursuing either a Master of Science in Civil Engineering, Master in Civil Engineering (directed towards professional engineering practice), Master of Arts in Economics, or a Master of Public Administration. Regardless in which of the three departments the student resides, he or she must complete a core of interdisciplinary courses in transportation engineering, transportation planning, urban economics, microeconomics, policy analysis, and urban planning.

While transportation courses must be taken as a part of the core courses, students pursuing a Master of Arts in Economics offered within the College of Business Administration, and the Master of Public Administration offered within the College of Arts and Sciences, do not seem to be required to take any additional transportation-focused courses. However, students pursuing the Master of Science in Civil Engineering or the Master of Civil Engineering are required to take additional transportation-focused courses outside of the core courses. Again, this appears to be the case based on a preliminary review of the program. The Master of Science in Civil Engineering is a research degree and requires a 6 credit transportation thesis and 7 credits in transportation engineering electives. The Master of Civil Engineering requires a 3 credit transportation project and 7 credits in transportation engineering electives.

The GITP is now being offered as a six-course certificate program. The certificate was developed for early and mid-career transportation professionals in response to a need expressed

by the profession for increased training in interdisciplinary approaches to transportation issues. The certificate may also eventually be offered statewide through USF's distance learning system.

Iowa State University too has a Master of Science degree in transportation.⁵ This 36-credit degree, with a required thesis or creative component related to transportation, is an interdisciplinary degree offered under a cooperative arrangement with three departments including Civil and Construction Engineering, Community and Regional Planning (in the College of Design), and Logistics, Operations and Management Information Systems (in the College of Business).

In addition to requiring the student to take courses in each of the three departments, he or she must also take core courses in statistics, Urban Transportation Planning, Economic Analysis of Transportation Investments, and a Seminar in Transportation Planning. This seminar is similar to the one offered as a part of the Transportation Management and Policy certificate program at the University of Wisconsin-Madison.

Admission requirements include an undergraduate degree in a transportation related field such as business, planning, engineering, psychology, sociology, government, etc. It is not certain what the specific requirements are as some of these fields can only be considered transportation related only if a focused set of coursework is taken.

As one can see, the programs do vary, though each affords students from various disciplines the opportunity to interact with one another in a classroom setting. These are only three such examples and one can be certain that many similar interdisciplinary transportation programs exist with varying levels of connection between the disciplines both programmatically and in the classroom.

University of Wisconsin-Madison Approach: The Transportation Management and Policy Program

History of TMP

Teresa Adams, Program Chair and champion of the TMP program, explains, "We looked at educational needs in this area and discovered that they go beyond just civil engineering. Technical issues are part of it, but the context in which we deliver transportation systems has changed dramatically, so now we're concerned with the environment, social justice, political issues and the not-in-my-backyard syndrome."¹

Teresa Adams along with other faculty at the University of Wisconsin-Madison and within the Midwest Regional University Transportation Center (MRUTC) realized the need for a program such as the TMP to train these well rounded transportation professionals. Research into the existence of programs like the TMP note that graduate schools routinely offer transportation related courses through departments of engineering, business, urban planning, public policy, and geography. Some graduate schools offer special tracks in transportation within one or more of these traditional disciplines, however, few of these programs provide a curriculum reflecting the essential interdisciplinary nature of transportation management and policy.

In order to address this need, an multidisciplinary Academic Advisory Board made up of faculty from the School of Business, La Follette School of Public Affairs, Department of Civil and Environmental Engineering, Department of Agriculture and Applied Economics, the Law School, the School of Human Ecology, Department of Urban and Regional Planning, and the Gaylord Nelson Institute for Environmental Studies oversaw the development of the TMP program with encouragement from the state and federal transportation agencies and the Wisconsin transportation industry. The MRUTC, at the University of Wisconsin-Madison, led the initiative. A series of meetings with the Academic Advisory Board of the MRUTC and the Land Resources Program Committee were held between May 2001 and May 2002 to develop and approve the TMP certificate program.

TMP Curriculum

In 2002, the Transportation Management and Policy Certificate program was born. It is a 17-credit graduate-level certificate program that welcomes applications from any student enrolled in a graduate program at the University of Wisconsin-Madison with an interest in transportation. However, the program is especially well suited for students with academic backgrounds in business, economics, engineering, environmental studies, land management, public affairs, and urban planning.

Every TMP student must take a set of core courses, which consist of the Practicum in Transportation Management and Policy and the Colloquium in Transportation Management and Policy. The Practicum is a three-credit course that must be taken once during the program, while the Colloquium is worth one credit and must be taken at least twice. Both of these courses will be discussed in further detail later in this paper.

Beyond the core courses, each TMP student must take one course in each of the focus areas. These areas include Technology/Engineering, Economics, Policy/Management, and Environmental. Each focus area lists two to three recommended courses but the student can, with approval from the TMP Chair, take courses outside of the recommended ones. However, the substituted course must adequately satisfy the intent of the of the focus area in which it's being substituted. These recommended courses are offered by multiple departments and schools at the University of Wisconsin-Madison, including Civil Engineering, Urban and Regional Planning, Economics, La Follette School of Public Affairs, Operations and Technology Management within the School of Business, and the Nelson Institute for Environmental Studies.

In addition to the course requirements, each TMP student must also complete a transportation related internship equivalent to at least 120 hours. Many TMP students complete the requirements of the internship by working at the Midwest Regional University Transportation Center (MRUTC). While working in the Center, students are often involved in activities such as marketing for the Center where he or she might assist in putting together the annual report, newsletters, research summaries, or brochures. Students working for the MRUTC also have opportunities to assist principal investigators associated with the MRUTC with research, which may lead to thesis topics.

Practicum in Transportation Management and Policy

One of the two core courses required of TMP students is the Practicum in Transportation Management and Policy, which is offered in the spring of each academic year. This course puts students into interdisciplinary teams of three to six and tasks them with providing solutions to transportation issues solicited from various industry partners. Practitioners from these agencies serve as liaisons and are a consistent information resource for the student teams. At the end of the course, students prepare a white paper and present a PowerPoint to the senior managers within the participating agency(s).

This Practicum course accomplishes several objectives. It provides students with real world experience in the analysis of transportation issues. It gives them experience communicating the results of their work to industry managers. And, critical to this discussion, it provides the students with experience working with teams of people from other disciplines, who have different talents, vocabularies, and approaches to problem solving.

The spring of 2007 marked the fifth spring in which this course was offered. The transportation topic areas that students have been assigned to work on thus far have included, developing an alternative to the fuel tax. (students focused on the Vehicle Miles Traveled (VMT) tax); a project examining what factors should be considered in programming capital maintenance; a project analyzing a range of options for keeping the aging population safer on the roadway (students looked at traffic signing and information to improved transit service to keep them mobile); and an evaluation of how Wisconsin's Comprehensive Planning law was achieving its goals.

Other projects have tasked Practicum students to analyze the Wisconsin Information System for Local Roads (WISLR), including how the system was used and how it had impacted decision-making at the local government level; an economic analysis of the impact ferry systems have on their respective communities in Wisconsin; an analysis of the statewide travel demand planning model; and a documentation of best practices for freight planning at the Metropolitan Planning Organization (MPO) level.

Through these many team oriented transportation projects, students have been able to interact within and experience the interdisciplinary nature that is characteristic of transportation.

Colloquium in Transportation Management and Policy

The other required course is the Colloquium in Transportation Management and Policy. This is a weekly seminar course, where invited speakers from transportation agencies come in and present their perspectives and case studies on transportation management and policy. The colloquium course is held in the fall and spring of every academic year and each TMP student is required to take this course at least twice in order to receive the certificate.

Each semester's Colloquium has a theme. This theme is reinforced through the careful selection of practitioners who are invited to present. The history of thematic areas for the Colloquium, going back to the Fall of 2002, include Transportation Management, Finance and Economics; Environmental Impacts of Transportation; Transportation and Land Use; Transportation Safety; Politics of Transportation; Public Transportation; Non-Motorized Transportation Options with a

Focus on Pedestrian and Bicycle Facilities; Freight Transportation; Ethics and Social Responsibility in Transportation; and Transportation History and Law.

Future thematic areas for the Colloquium include Local and Regional Transportation Management to be offered in the fall of 2007, and a likelihood of revisiting the topic of environmental issues in transportation in the spring of 2008. The idea here is to take advantage of a connection with the Nelson Institute of Environmental Studies and their Community Environmental Forum. Through this cooperation, the TMP will be able to bring in some new, exciting speakers and many industry representatives to further engage the Colloquium students.

As with the Practicum, students of various educational (and sometimes professional) backgrounds, but with a similar interest in transportation, are brought together in the same classroom. Though these students are not asked to work together on a transportation related project as they are in the Practicum, they seem to benefit greatly simply by being exposed to, and interacting with, students from the other disciplines as is evidenced by the student who inspired this paper.

The Colloquium is an informal setting where the practitioner presents his or her information, or data, and students are encouraged to engage the presenter, and other students, in dialogue. These informal discussions go a long way towards familiarizing the students with their peers and their differing perspectives, vocabularies and approaches to problem solving. Hearing some of the questions their peers are asking of the presenter seems to stimulate interest in dialogue that students often times wouldn't experience with like-minded students from the same disciplines.

Employer Survey

An element of this paper includes a survey of current employers of some of the graduates of the TMP program. Please refer to Appendix A to review the survey itself and the responses to the survey in tabular format. To date the TMP has graduated thirteen students. A survey was sent to the current employers of nine of those graduates (the remaining four graduates were unable to be contacted). Seven of those employers responded to the survey. Even though the survey results are less meaningful due to the number of respondents, I will still try to summarize the results in this section.

The objective of the survey is to gain feedback from industry with regard to the success of the TMP in creating well rounded transportation professionals prepared for the multi-disciplinary transportation industry. As was mentioned earlier in this paper, the employer survey is a first attempt at quantifying the benefits of an interdisciplinary education. This feedback will be used not only for this and other papers but also to enhance the curriculum of the TMP program.

The survey asks employers to rate their employee's understanding of transportation policy, the transportation decision-making process, transportation economics and funding, organizational structure, environmental issues, and ability to communicate with others outside their degree area, compared to others hired in the past in the same or similar position. Each of these questions included responses of *excellent*, *above average*, *average*, *below average*, and *poor*. Additional questions ask if the employers were aware that their hire had completed an interdisciplinary graduate-level certificate in transportation management and policy, and if so, if this played a

factor in their decision to hire. Employers were also asked if they would consider hiring another TMP graduate and to provide comments that they feel are relative to the topic.

It is encouraging to note that even though about half of the employers were aware the TMP graduates they interviewed had graduated from such a program, all said it was a factor in extending offers of employment.¹³ Also of note is no survey respondent rated their hire “below average” or “poor” in response to any of the survey questions.

The areas where TMP students rated highest (all respondents rated their graduates no lower than *above average* on these questions) included their understanding of transportation policy issues, understanding of environmental issues as they relate to the transportation industry, and their ability to communicate with co-workers and others in the transportation industry outside of their degree area. Students also rated highly in their understanding of the transportation decision-making process with only one *average* rating.¹³

It is likely the high ratings in the transportation policy and transportation decision-making areas are due not only to the policy and management courses TMP students are required to take but also due to the focus of both the Colloquium and Practicum courses and their emphasis on connecting students to professionals in the industry, which exposes them to industry-related challenges that often revolve around policy and decision-making. The high rating in environmental issues related to transportation is an obvious connection due to the TMP’s sponsorship by the Gaylord Nelson Institute for Environmental Studies.

Easily the best responses received were in the area of communication with others in the transportation industry outside of their degree area.¹³ This is very encouraging as this is the true focus of the TMP. The fact that our graduates are able to communicate well with others in the industry, means the TMP has achieved its goal of exposing engineers, planners, public policy, and environmental students to one another’s vocabulary and approaches to problem solving associated with their respective “cultures.” This is a crucial first step in becoming a well rounded transportation professional.

According to survey responses, areas for improvement include doing a better job of familiarizing students with transportation economics/funding, and to organizational structure in the transportation industry.¹³ The latter may have not been rated quite as high due to the wording of the question. Not only were the respondents asked to rate the student’s understanding of organizational structure in the transportation industry, but also their understanding of how the public sector and private sector can potentially interact. This may have served to complicate the question, resulting in two *average* ratings.

Another outcome of the survey worth mentioning includes two of the respondents being impressed with the contacts their recent hires have established while at UW.¹³ This is very likely a result of these TMP students working in the Wisconsin Transportation Center at UW-Madison and the large number of partners the Center has in the industry. The Center tends to hire only students of the TMP.

Certainly the best way to improve upon this survey, and this paper, is to increase the number of respondents. As the TMP continues to graduate students, it is hoped that whoever serves as the education coordinator for the TMP will continue to survey employers of past students. It's not always an easy task to keep track of students after they have graduated from college, but if this can be done with some degree of success, then the results of this survey, or perhaps an improved version of it, should prove to be more relevant and useful.

Final Thoughts

As transportation professionals, we often assume a certain level of knowledge of transportation history possessed by all of us. As noted above, the theme for the spring 2007 Colloquium in Transportation Management and Policy was Transportation History and Law: Setting a Context for Today's Transportation Challenges. The students' were assigned to write a memo demonstrating their understanding of how the lessons learned from transportation history impact today's transportation system. One student working on his PhD in civil engineering states, "I always believed that somewhere in the past, planners took a decision to build the interstate system the way it is now and had it built. It turned out I was wrong. Planners were never involved in the decision making process. If I had not been sitting in a class like this with engineers and planners discussing [transportation] history, I would never have known the real story. Hence the importance of multidisciplinary education in the field of transportation cannot be stressed more."

In that same memo, students were asked to pay specific attention to the interaction among the various disciplines in transportation and to provide personal observations on the perceived effectiveness of an interdisciplinary transportation education program. Though a few students failed to address this aspect of the memo, no students regarded the interdisciplinary aspect of the classroom setting with negative sentiment. All students suggested that success of the transportation system depends on the effective collaboration among disciplines and that beginning this collaboration during the educational process is a step in the right direction.

Another student, working on a dual degree on civil engineering and law, writes, "...the sooner that engineers, planners and others work together [such as] in a classroom setting, the greater the understanding of each other's disciplines will be. Engineers can better anticipate planners concerns, and vice versa. Future projects will rarely, if ever, be successful without the interaction of many different groups and this interaction will only be successful when its leaders can speak each others' 'languages'."

An urban and regional planning student writes, "It is important for decisions, which have such resounding effects upon the urban form to be made with due regard to all likely positive and negative results. An educational program that integrates planners, engineers, and social science students in a classroom setting allows for discussion and debate of real-world transportation topics is important so that all can realize the limitations of their own scope and the biases affecting their chosen field."

At the time the Transportation Management and Policy program was established at the University of Wisconsin-Madison, there was a lack of similar interdisciplinary transportation programs in the U.S. (Adams 2003) In fact, it wasn't until the 1950s and 1960s that

transportation engineering programs began to surface at the collegiate level. (Transportation Education and Training Committee 2000) This no longer seems to be the case. Interdisciplinary transportation programs of varying approaches are emerging all over the U.S. This can be discovered by performing a simple Google search.

Though no quantitative research results have been published to support the benefits of an interdisciplinary transportation education, the qualitative and anecdotal findings, along with the rudimentary results from our employer survey, seem to suggest there is a great deal of benefit to be gained from the meshing of disciplines in a classroom or team-oriented project setting. Outside of the transportation sector, it appears that a majority of the research performed on the benefits of and obstacles to the success of an interdisciplinary environment occur within the medical field, specifically in oncology. Here to, the research suggests there are many positives outcomes from such an interdisciplinary environment but only if each of the disciplinarians are technically solid within their discipline and open to the idea of working in a team environment.⁴

As the noted American poet and critic, Mark Van Dorn, once stated, “The student who can begin early in life to think of things as interconnected, even if he revises his view every succeeding year, has begun the life of learning.” So is the “process” of interdisciplinary education. It is no longer sufficient to view transportation education as just a series of college courses. It is, and will continue to be, multi-disciplinary and a life long endeavor.¹¹

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13. Results from Employer Survey. Administered by Author, January 2008.

Appendix A: Employer Survey (including results in tabular format)

The Transportation Management and Policy Program (TMP) at UW-Madison is a 17-credit, interdisciplinary, graduate-level certificate. Any graduate student (with an interest in transportation) attending UW-Madison is eligible to enroll in the program but the vast majority are students of engineering, planning, and public policy.

The TMP was created in 2002 to satisfy the demand for transportation professionals who understand multiple dimensions of mobility management and planning, enabling them to make choices leading to more environmentally and socially sustainable transportation systems now and into the future.

Students are required to take courses in engineering/technology, economics, policy/management, and environment. Additionally, all students must take two semesters of a colloquium (speaker series) and a practicum where students from the above mentioned backgrounds work together as a team on a transportation-related problem posed by industry.

This survey is being administered to gain valuable information as feedback regarding the relative success of our program. These results will be used in a paper planned to be presented at a conference focused on engineering education, as well as to enhance the current curriculum of the Transportation Management and Policy Program.

The following survey is anonymous, so you will not be asked to give personal information about yourself or your employee who is a TMP graduate. However, as this is a very short survey, we greatly encourage you to provide us with any additional information you see fit in Q. # 10.

1. Were you aware of this person obtaining an interdisciplinary, graduate-level certificate in Transportation Management and Policy, in addition to their degree, prior to offering this person a position? (if yes, please answer Q2, otherwise please skip to Q3)
Yes, No
2. If you answered “yes” to the previous question, was this a factor in extending this person an offer of employment?
Yes, No
3. How would you rate this person’s understanding of transportation policy issues compared to others you have hired in the past at the same/similar position?
Excellent, Above Average, Average, Below Average, Poor
4. How would you rate this person’s understanding of the transportation decision-making process compared to others you have hired in the past at the same/similar position?
Excellent, Above Average, Average, Below Average, Poor
5. How would you rate this person’s understanding of transportation economics/funding compared to others you have hired in the past at the same/similar position?
Excellent, Above Average, Average, Below Average, Poor

6. How would you rate this person's understanding of organizational structure in the transportation industry, and how the public sector and private sector can potentially interact compared to others you have hired in the past at the same/similar position?
Excellent, Above Average, Average, Below Average, Poor

7. How would you rate this person's understanding of environmental issues as they relate to the transportation industry compared to others you have hired in the past at the same/similar position?
Excellent, Above Average, Average, Below Average, Poor

8. How would you rate this person's ability to communicate with co-workers and others in the transportation industry outside of their degree area compared to others you have hired in the past at the same/similar position?
Excellent, Above Average, Average, Below Average, Poor

9. Would you consider hiring another graduate of the Transportation Management and Policy program?
Yes, No

10. Please provide any information/comments that that you feel are relative to the topic of this survey.

Thank You!

Question #	Excellent	Above Average	Average	Below Average	Poor	Unsure	Yes	No
1							3 (43%)	4 (57%)
2							3	0
3	2 (29%)	5 (71%)	0	0	0	0		
4	1 (14%)	5 (71%)	1 (14%)	0	0	0		
5	1 (14%)	3 (43%)	2 (29%)	0	0	1 (14%)		
6	2 (29%)	3 (43%)	2 (29%)	0	0	0		
7	1 (14%)	5 (71%)	0	0	0	1 (14%)		
8	3 (43%)	4 (57%)	0	0	0	0		
9							7 (100%)	0