PROFESSIONAL DEVELOPMENT AND TRANSLINK®

Final Report

by

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ABSTRACT

The current and future success of the transportation infrastructure and its diverse array of components depend on developing a larger cadre of transportation professionals capable of designing, planning, managing, operating, and maintaining it. Professional development (PD) throughout the transportation profession is critical to the success of ITS and the transportation profession nationwide. Three primary efforts of this PD program include: (1) training and retraining of existing professionals for planning, designing, operating, and maintaining ITS systems; (2) training future leaders in the ITS industry through formal academic programs; and (3) educational outreach to elected officials, policy makers, and the general public. The intent of this project was to develop resources and foster awareness of transportation and ITS, thereby working to increase the pool of qualified transportation professionals entering the workforce in the 21st century. Three tasks were completed under this project: (1) the development of an ITS Professional Development Publications database; (2) the development of a traffic signal educational exercise for high school students; and (3) the preparation of a white paper on distance learning. The publications database contains information on the ITS Professional Development publications and materials the Center has in its library, ranging from journal articles and presentations to white papers and meeting notes. It is the intent of TransLink® and the Center that this database will be available on the Center's Internet site in the next few months and continually updated as new materials become part of the Center's library. The traffic signal exercise was designed to introduce students to the complex task of timing traffic signals. It discusses the importance of traffic signal control, the types of traffic signals used around the world, includes a brief overview of traffic signal equipment and settings, theory and terminology, and provides students with an opportunity to develop a physical lane design and timing plan for a model intersection. The white paper on distance learning defines the concept of distance learning, and the various advantages and disadvantages of its numerous components. TTI plans to use the paper to build a consensus both within its organization and among its partners on what distance learning avenues should be pursued and the facilities required to successfully implement the professional development efforts planned for the future.

ACKNOWLEDGEMENTS

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DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information presented herein. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

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1. INTRODUCTION

The past decade has seen revolutionary changes in the face of transportation in the United States. With the deployment of Intelligent Transportation Systems (ITS) and the monumental leaps made in technology applications in all aspects of life, the transportation profession is faced with a new dilemma. In short, the current and future success of the transportation infrastructure and its diverse array of components depend on developing a larger cadre of transportation professionals capable of designing, planning, managing, operating, and maintaining it. Thus, it is critical that universities take a proactive role in educating and training transportation professionals to work effectively and efficiently in the 21st century.

1.1 BACKGROUND

Professional development (PD) throughout the transportation profession is critical to the success of ITS and the transportation profession nationwide. Three primary efforts of this PD program include: (1) training and retraining of existing professionals for planning, designing, operating, and maintaining ITS systems; (2) training future leaders in the ITS industry through formal academic programs; and (3) educational outreach to elected officials, policy makers, and the general public. Texas A&M University, Texas Transportation Institute (TTI), and TransLink® are well suited to play a role in this program as they have vast knowledge resources that can readily contribute to these PD efforts. Based on results from previous research examining ITS training facilities, this project will work to develop and effectively disseminate ITS knowledge and material to these audiences. The objective is to enhance their knowledge, skills, and abilities (KSAs) such that they can efficiently and effectively work with the transportation infrastructure of the 21st century.

1.2 PURPOSE

This project works to develop resources for use by transportation professionals, students, educators, and the general public for the enhancement of knowledge, skills, and abilities. The intent is to foster awareness of transportation and ITS, thereby working to increase the pool of qualified transportation professionals entering the workforce in the 21st century.

2. PROFESSIONAL DEVELOPMENT EFFORTS

Three tasks were completed under this project: (1) the development of an ITS Professional Development Publications database; (2) the development of a traffic signal educational exercise for high school students; and (3) the preparation of a white paper on distance learning. The following sections provide a detailed description of each task and their resulting modules and products.

2.1 ITS PROFESSIONAL DEVELOPMENT PUBLICATIONS DATABASE

As technology and its application to transportation problems have advanced, so have the education and training needs of the transportation professionals who must solve those problems. Such individuals can only succeed in their complex tasks if they have the proper knowledge, skills, and abilities (KSAs) to use that technology efficiently and effectively. A considerable number of articles, presentations, and papers have been written over the last several years that address this very topic. Each discusses various aspects of the continuing need for professional development and profession promotion within the transportation industry. Thus, TransLink® and the Center for Professional Development determined that a comprehensive database of these various resources would be beneficial to the profession.

The developed database contains information on the ITS Professional Development publications and materials the Center has in its library. Information cataloged in the database includes the title, date, author(s), and abstract of various materials relating to ITS Professional Development. These materials range from journal articles and presentations to white papers and meeting notes. Table 1 provides a summary of the publications currently in the database.

A complete printout of the information on each publication is included in Appendix A. It is the intent of TransLink® and the Center that this database will be available on the Center's Internet site in the next few months and that it will be continually updated as new materials become part of the Center's library.

Table 1. ITS Professional Development Publications.

Publication Year	Title	Authors
1996	*An Ideal ITS Engineer- Where in the World Is This Person?*	Sarakki & Land
	ITS Education and Training: A Strategic Plan	Bronzini, Mason, & Maze
	ITS Education and Training: Why Progress is Slow	Saka
	ITS Education in American Universities	Benson
1997	*A Vision for the Future Role of the ITS Research Centers of Excellence and ITS Institute*	White
	Distance Learning in a Changing Environment	Townsend
	Integrating ITS Research Project Results into Engineering Curricula	Collura & Kaufman
	Summarization of the Meeting for PCB at the University / College Level	White
	The Integrated Curriculum	Panitz
	The ITS Operations Concept: A Missing Link in System Definition	Pearce & Lynch
	The ITS Professional Capacity Building Program	Humphrey
	The PCB Vision	Virginia Tech
	Traffic Engineering Education Plan Using Alternative Media	Poe, Mason, & Pietrucha
1998	*Assessment of a Regional Transportation Education Alliance to Improve Mobility*	Kuhn
	Building Professional Capacity for Metropolitan ITS Deployment and Operations	Humphrey
	Distance Learning Becomes Reality: The Sky Is the Limit	Smith
	IT'S the New School: Progress on ITS Education and Training in the USA	Collura
	Securing the Future Through Training	Humphrey
1999	*What Are Universities Doing to Address Changing Needs?*	Humphrey
	What Do Today's Professionals Need to Know?	Humphrey

2.2 TRAFFIC SIGNAL EXERCISE - "BEHIND THE SCENES: TRAFFIC SIGNAL CONTROL"

TTI, in partnership with Texas A&M University, Texas Southern University in Houston, and Paul Quinn College in Dallas sponsored a 1999 Summer Transportation Institute (STI) to promote transportation as a viable career option to the youth of Texas. The Texas STI was attended by 35 high-school students in Dallas and Houston where they received exposure to air, land, and water transportation and met with professionals and officials to learn about career opportunities in this diverse profession.

As part of this summer program, the students also participated in technical exercises to emphasize the vast array of KSAs they will need to pursue a career in transportation. One exercise in which the students participated was developed as part of the professional development project of the TransLink® program. This exercise was entitled "Behind the Scenes: Traffic Signal Control."

The intent of “Behind the Scenes: Traffic Signal Control” was to introduce students to the complex task of timing traffic signals. Initially, the exercise discusses the importance of traffic signal control and types of traffic signals used around the world. The module includes a brief overview of traffic signal equipment and the settings necessary to properly operate a signal. Basic terminology and signal theory is also presented, including the concepts of phases, cycle length, and lane layout. Finally, the exercise provides students with an opportunity to develop a physical lane design and timing plan for a model intersection. Students were divided into teams and were given basic intersection geometry information and traffic volumes to use in their design.

As the students participated in the signal design activity, staff was available for questions and provided feedback to the students. At the completion of the activity, staff entered the designs into a traffic simulation model to determine the operational characteristics of the design. The students were then able to see a simulation of their intersection design. They also discovered which team had the best design based on various measures of effectiveness, including level of service, delay, and vehicle emissions. A copy of the signal activity presentation is included in Appendix B. It is anticipated that lecture notes will be added to the slides in the presentation and that it will be posted on the Center for Professional Development’s Internet site for widespread access.

2.3 DISTANCE LEARNING DEFINED

In today’s world of rapidly changing technology and escalating competition, employers are finding it increasingly more difficult to keep their workforces technologically current and well trained. Furthermore, the imposition of time, distance, travel costs, and other constraints on workers have made traditional approaches to training increasingly difficult. TTI is considering implementing distance learning in its professional development activities. Thus, it was determined that a white paper that defines the concept distance learning and the various advantages and disadvantages of its numerous components would be beneficial. TTI could use the paper to build a consensus both within its organization and among its partners on what distance learning avenues should be pursued and the facilities required to successfully implement the professional development efforts planned for the future. A copy of the white paper in included in Appendix C.

3. FINAL REMARKS

The results presented in this report begin to develop a program for reaching both the transportation professional and students of all ages. The intent is to broaden KSAs of existing professionals and encourage students to pursue careers in the transportation profession. The materials developed as a result of the project can be used across the nation through on-line presentation and dissemination. Furthermore, mechanisms will soon be in place to provide feedback regarding the content of the materials and to facilitate easy delivery via traditional and non-traditional mechanisms. Finally, it is important to recognize that this project works to meet the goals and objectives of TransLink® and the national Professional Capacity Building program, especially as it relates to educating the future professionals who will design, build, operate, manage, and maintain the transportation infrastructure of the 21st century.

APPENDICES

APPENDIX A: ITS PROFESSIONAL DEVELOPMENT PUBLICATIONS

ITS Professional Development Publications

Publication Year: 1996

Title: An Ideal ITS Engineer- Where in the World Is This Person?

Author 1: Sarakki **Author 2:** Land

Author 3: **Author 4:**

Author 5:

Journal: ITS Quarterly

Publisher: ITS America

City: Washington **State:** DC **Country:** USA

Page No: 27-34

Notes: File: Professional Development – 1996

Abstract: This article reviews the developing nature of ITS programs, identifies useful course work for traffic engineers, and estimates the future demand for ideal ITS professionals. The authors believe there is a need for a new brand of ITS engineers to bridge the gap between the public agencies who administer the ITS projects and the private industry sector participants who design and deploy them. Professionals in the public and private sectors have trouble communicating using their own technical jargon. The new ITS engineers must be able to recognize the potential mis-communication that might be occurring. They need to be able to bridge the gaps between the computer, communication, traffic and transportation, electrical engineering, and other disciplines. The article gives a brief history of ITS because the size and number of corporations from various business sectors show the multi-disciplinary nature of ITS and the promise it holds. The ITS concept is drawn from the multiple disciplines and multiple industrial sectors. There are three major parts of the ITS industry: the public, private, and academic sectors; a table identifies roles and operating philosophies of these sectors. There is a need for public sector, private sector, and universities to work together in order to establish undergraduate and graduate programs. The programs need to reflect the needs of the ITS industry, so that students are ready after graduation. The U.S. DOT estimates that in 20 years, ITS will be able to meet two-thirds of the nation's highway capacity needs at one-fifth the cost of building additional capacity. When making decisions regarding the implementation of ITS programs, you need to have a basic understanding of the other support industries to ensure that systems utilize the most current technology. Practicing engineers and professionals who are seeking employment in the ITS industry can select the type of course work depending on their undergraduate major and the type of ITS work that interests them. The successful ITS professionals will be those who can bridge the various technologies, providing the vision for integrated systems to serve transportation as well as other information dependent services.

ITS Professional Development Publications

Title: ITS Education and Training: A Strategic Plan

Author 1: Bronzini **Author 2:** Mason, Jr.

Author 3: Maze **Author 4:**

Author 5:

Journal: ITS Quarterly

Publisher: ITS America

City: Washington **State:** DC **Country:** USA

Page No: 43-49

Notes: File: Professional Development – 1996

Abstract: This article reviews the workshop conducted in 1995 by the ITS America's subcommittee on Education and Training. There are four groups that need training, ITS providers, decision-makers, educators, and users. There is a table that summarizes the areas of education and training that are needed. The main training needs of these groups were categorized as ITS awareness, technology, economics, and institutional factors. The most surprising need from this categorization is the need for ITS economics and awareness education and training. Almost all groups need in-depth information on the benefits and costs of ITS and comparisons of this technology with other means of addressing critical mobility needs. It is recommended for the educational system that K-12 receives transportation awareness; use community colleges for quick response and to build partnerships; let universities have chapters and at an informal level have partnerships. It is recommended for public agencies to increase awareness and knowledge, train traffic management center trainers, consider ITS deployment benefits and costs, develop ITS partnerships, undertake innovative procurement, and be skilled in systems engineering. For the private sector, it is recommended that ITS public sector awareness guide to procurement is developed, and the transportation industry partner with associations. Recommendations for ITS America include: education and training (E&T) partnerships, student chapters, ITS Materials Clearinghouse, ITS awareness, Intermodal ITS, procurement issues, and ITS E&T Institute. It is now ITS America's job to monitor these implementation efforts, participate as appropriate, and support board acceptance of the plan and its outcomes.

ITS Professional Development Publications

Title: ITS Education and Training: Why Progress Is Slow

Author 1: Saka **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal: ITS Quarterly

Publisher: ITS America

City: Washington **State:** DC **Country:** USA

Page No: 37-42

Notes: File: Professional Development – 1996

Abstract: This article discusses a lack of consensus among academicians on required ITS skills and how academic discipline is responsible for what the author describes as slow progress in providing ITS education and training at institutions of higher learning in the U.S. The issues targeted in this article include: consensus on ITS education and training strategy; skill requirements and responsibilities of ITS technical personnel; resources to support ITS related education and training activities; and development of a national ITS system architecture. There are two views of ITS schools. The first views ITS as a new interdisciplinary program of study, while the second views ITS as an upsurge of the classical transportation discipline. There are other questions as to the required skills and responsibilities needed for ITS technical personnel. The primary goal of ITS initiatives in the U.S., therefore, concerns systems performance optimization, using electronic and communication technologies. Saka believes that the desired ITS education and training program is one that supplements the traditional transportation engineering and management curricula with the relevant information and communications technologies. The ITS system architecture permits continuity in the flow of information on ITS. Development of ITS education and training programs does not require large amounts of resources. Saka discusses the experience that Morgan State University had when successfully developing its ITS course. The main objective was to expose the students to the general concept of ITS and other important topical areas that were not covered in the traditional transportation engineering and management courses. What is required is a little bit of motivation and resourcefulness, that is, the ability to effectively tap from the vast amount of readily available resources in both the public and private sectors.

ITS Professional Development Publications

Title: ITS Education in American Universities

Author 1: Benson **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal: ITS Quarterly

Publisher: ITS America

City: Washington **State:** DC **Country:** USA

Page No: 17-25

Notes: File: Professional Development – 1996

Abstract: This paper looks at the instruction in ITS provided by U.S. universities and discusses three key educational issues confronting ITS: 1) the distinction between training and education; 2) approaches to interdisciplinary ITS education; and 3) trade-offs between breadth and depth in ITS education. ITS training and education seem to mean the same thing; however, it is important to distinguish between the two. University programs usually concentrate on education. Much of the work in ITS does not require a special educational program but may require special ITS programs or training. Interdisciplinary studies are widely recommended for ITS professionals in the future, but some of the discipline-based universities will have trouble adapting to such a goal. There seem to be problems to produce large numbers of intellectually well-rounded engineering graduates. When trying to balance the depth and breadth of education in ITS, it is important to consider the student's time horizon. If students are planning to immediately assume responsibilities in ITS, they should focus on depth in knowledge, while those with a longer time horizon should lean toward the breadth of knowledge.

ITS Professional Development Publications

Publication Year: 1997

Title: A Vision for the Future Role of the Intelligent Transport Systems (ITS) Research Centers of Excellence (RCE) and ITS Institute

Author 1: White **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal:

Publisher: University of Michigan

City: Ann Arbor **State:** MI **Country:** USA

Page No:

Notes: File: Professional Development – 1997
White Paper

Abstract: The purpose of this paper is to indicate how the RCEs and the ITS Institute have responded to public and private investments by describing contributions in research, education, and service that have resulted from the program in its first three years. Another purpose is to present a vision for the RCE/ITS Institute Program that will build on the Program's current momentum, thus further enhancing the value of the program to the nation. The vision and accomplishments of the program are summarized. The groups that are potential customers for a program in transportation research and professional capacity building are current and future. These groups include transportation professionals in the public sector, transportation professionals in the private sector, transportation educators and researchers, and public and elected officials. The levels of expertise that are required by these groups vary but include general awareness and overview knowledge of transportation program elements, costs, and benefits; basic knowledge of specific transportation program elements; intermediate in-depth knowledge of specific transportation elements; and advanced in-depth knowledge of specific transportation elements and emerging state of the art technology. The future roles of the universities in the program are research, education, and service. The program has three developmental phases; phase one involves important developmental issues; phase two shifts to a more integrated and synergistic focus, and phase three is envisioned as having the centers leverage their resources by providing the national consortium. The next step for the four universities is to determine the most effective form of collaborative relationship between the universities in the Program in order to insure successful phases one and two. The purpose of this workshop is to discuss how the American research university can best contribute to the Nation's need for professional capacity building. Other actions that could result from this joint activity are research, education, and service.

ITS Professional Development Publications

Title: Distance Learning in a Changing Environment

Author 1: Townsend **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal:

Publisher: Lucent Technologies

City: **State:** **Country:**

Page No:

Notes: File: Professional Development – 1997
PowerPoint Presentation

Abstract: This paper is part of a PowerPoint presentation. The first page is about technology-based learning, and how they want to make learning widely accessible, just in time, and 'better than being there.' This would involve a switch from classroom, learning centers, full-day events, U.S. focus, learn by listening, and credit for attendance to Internet, multimedia, work sites, 90-minute meetings, global access, learn by doing, and credit for performance. Townsend talks about an 80/20 model, where 80% of the material is learned asynchronously, and 20% is learned in 'short classes' as a group. The purpose of this is to provide a minimal amount of structure to assess learning and to motivate the students to keep pace. The benefits to synchronous learning include, scheduled event, motivates attention, quick to develop, economical to revise, answers questions, assesses learning, and supported by culture. The benefits to asynchronous learning are: empowers learners, 25-50% faster, delivered close to need, inexpensive to deliver, learning by doing, can simulate job, and consistent delivery. Distance learning is the way of the future in education, both at universities and in industry, and an opportunity for learners at a distance to take advantage of education not otherwise available to them. Distance education also represents a challenge to educate more people in less time and cost, and make learning accessible anytime, anywhere, and better than being there. There are two ways of currently delivering distance learning technology: live and interactive, 1-way video, and 2-way audio, and live and interactive-2-way video and audio. The current distance learning technology is not live and interactive, and interaction is possible via telephone, e-mail, and fax. There are advantages such as: real-time classes available to students at a distance; students and instructors can interact during class time, and videotaping is possible for later viewing if students miss a class. The disadvantages are occasional equipment/signal problems, and students may not all be at the same place in the course. There are also new creations because of distance learning, such as interaction occurs outside of class and homework and exams delivered via FedX, US mail, fax, and e-mail. Future distance learning technology can include Internet, PictureTel/ Vtel/ videoconferencing, satellite, CD-ROM or web-based and independent vendors. The presentation techniques needed are: visuals need to be in landscape, instructors act as 'entertainers,' student needs to see instructor and visuals, and instructors need to make the students feel included.

ITS Professional Development Publications

Title: Integrating ITS Research Project Results Into Engineering Curricula

Author 1: Collura **Author 2:** Kaufman

Author 3: **Author 4:**

Author 5:

Journal:

Publisher: Virginia Tech University

City: Blacksburg **State:** VA **Country:** USA

Page No:

Notes: File: Professional Development – 1997
White Paper

Abstract: This paper is about a project, the primary objective of which is "to integrate past and on-going research results in the area of Intelligent Transportation Systems (ITS) into upper level undergraduate and graduate level engineering curricula at the University of Massachusetts Amherst." Some components of this project are the development of an ITS laboratory, the advancement of national interests in ITS education, and practice through dissemination of an ITS manual. Hopefully, engineering students will be given the opportunity to acquire basic knowledge and an understanding of advanced technology innovations in transportation. Increasing travel demands, increasing traffic congestion, energy consumption, noise, and air quality have produced a need for new capabilities in the transportation profession. "Meanwhile, new technologies in real-time communication and computing have made it possible to gather and analyze unprecedented quantities of information to understand and deal with these factors." Past and current ITS research topics and projects of key personnel include: large-scale implementation and testing of AITS; travel behavior analysis; evaluation of ATIS through GPS/ Cellphone technology; use of automatic vehicle location (AVL) technology for paratransit dispatching; advanced incident management strategies; video and optical technologies in traffic data acquisition; electronic payment systems; in-vehicle evaluation of driver response; dynamic traffic assignment; dynamic link travel time prediction; and travel time observation via video acquisition of license plate data. The curriculum plan is to prepare students receiving undergraduate degrees to help plan, design, operate, and evaluate ITS systems to be installed or maintained. The paper talks about which courses they are changing and the new courses that are being developed. The traffic management laboratory is where students can gain hands-on experience in performing tasks of ITS design, management, operations, and evaluation. The laboratory will support four main functions: Advanced Public Transportation Systems (APTS), Automated Vehicle Control Systems (AVCS), Advanced Traveler Information Systems (ATIS), and Advanced Traffic Management Systems (ATMS). Some of the exercises performed in the ITS lab are going to be: on-time bus performance analysis, evaluating automated fare collection systems, effects of collision warning systems, dynamic travel time measurement and analysis, calibration of dynamic link impedance models, and traveler compliance with dynamic route guidance. The program will maintain reviews of program quality, with attention to making a national impact on ITS education and practice. They will use standard course evaluations, post-graduation surveys, professional review committee, and publication. They will also ensure that NSF support of ITS activities at UMass enhances national capabilities to meet the vital need for improved transportation capacity and quality using exercise manuals, conferences, journal publication, and distance learning.

ITS Professional Development Publications

Title: Summarization of the Meeting for Professional Capacity Building at the University/College Level

Author 1: White **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal:

Publisher:

City: **State:** **Country:**

Page No:

Notes: File: Professional Development – 1997
Meeting Notes

Abstract: This report presents the outcome of a meeting of university representatives on PCB at the university level. The purposes of the meeting were as follows: 1. How can the federal government leverage currently existing programs in order to support the PCB program? 2. How can we better utilize American research to effectively contribute to PCB, and where should this contribution be focused? 3. What would be the long-term objectives of the university PCB involvement? Universities should and can play a big role in deploying the ITS professional capacity building program. Regarding how to harness the universities, their courses, and their technologies to assist ITS deployment and PCB, there were many suggestions. They included: acting as a sounding board/peer review group for the business plan and course materials, providing actual training as professional educators, providing insight, and focusing on the needs of the undergraduate audience as attracting them to the field of transportation is critical to enhancing the future of the field. Other suggestions were to bring in outside professionals to enrich courses, to educate other faculty in the importance of establishing cross-disciplinary studies, and to tie in the research in transportation to course work. The PCB program is being developed by, managed from, and deployed by the federal level of government. Tom Humphrey says that all the work cannot be done at the federal level. They made some dos and don’ts for the federal responsibilities.

ITS Professional Development Publications

Title: The Integrated Curriculum

Author 1: Panitz **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal: ASEE Prism

Publisher: American Society for Engineering Education

City: Washington **State:** DC **Country:** USA

Page No: 24-29

Notes: File: Professional Development – 1997

Abstract: This article is about integrating the curriculum for engineering students. By connecting engineering, math, science, and other subjects, students will gain a richer, more holistic view of their course work and what it means to be an engineer. Integrated curriculums help students build links among the different disciplines and may help retain more engineering students by involving them in actual engineering activities early. "In an integrated curriculum, faculty members representing different disciplines work together so that their subject matters support and supplement each other. The repetition through the courses enhances the learning. The results so far have been good. The students gain a sense of community and have improved retention rates and grade-point averages. Faculty members rated students in the integrated curriculum superior to others in the regular engineering courses. Some of the areas were: developing ideas to appropriate conclusions, relating new experiences and concepts to prior knowledge and experiences, communicating ideas effectively and easily, demonstrating an attitude that is appropriate for learning, and integrating the use of the computer for problem solving. These results might not be totally due to the fact that the students took integrated classes, because most of the pilot schools also introduced active learning, use of instructional technology, and a focus on teamwork at the same time. Some of the problems that curriculum reformers have faced are departmental differences, time requirements, administrative opposition, lack of faculty buy-in, overenthusiasm, lack of flexibility, and having too much of a good thing (causing students to miss individual concepts). Most schools have smoothed over the problems they have had and have found success.

ITS Professional Development Publications

Title: The ITS Operations Concept: A Missing Link in System Definition

Author 1: Pearce **Author 2:** Lynch

Author 3: **Author 4:**

Author 5:

Journal: ITS Quarterly

Publisher: ITS America

City: Washington **State:** DC **Country:** USA

Page No: 33-38

Notes: File: Professional Development – 1997

Abstract: In this article, the authors talk about how the implementing agency will benefit from a clearly defined and well-communicated description of the way in which ITS is to be used to provide the user services for which it is intended. The authors believe that both process and organization create the need for the operations concept. They think that the usual method, planning, designing, implementing, and operating ITS systems can be improved based upon the 'lessons learned,' which involve the technical issues and the institutional lessons. It is important to develop and document an operations concept for any major ITS system to be deployed. The first step in preparation of an ITS early development study, in which user service needs are determined and prioritized, a technical assessment is performed, a high-level architecture may be prepared, and a projected plan for deployment is created. The second step is the development of detailed plans and specifications, later used in the procurement of the system. In many technology-dependent fields, the operations concept has been utilized to assure that the eventual users have appropriate influence over and expectations for the system. The operations concept describes what we do and how we do it, and it begins by documenting the background, purpose, and concept for the resultant system. The next part of the operations concept is describing the management, the objectives, and staffing of the operations organization. Another part of the operations concept has several key steps in any system operation such as: coordination, conflict resolution, schedules, contingency operations, status reports, configuration checking, activity evaluation, fault detection and correction, performance trending, and other special operations. The next section of the operations concept describes the system itself, which includes operations simulation, systems integration testing, operations readiness testing, systems training, installation, logistics, and maintenance. The purpose for these elements is for the designer, implementers, and user to understand how the system will be prepared and supported once in operation. The intended purpose for the automated system is to dramatically advance and support the delivery of functions and services that would be impractical or inordinately expensive with manual methods. The hardest challenge in developing an operations concept falls upon the true innovator, thus they will need to consider not how the job is done but how it can be done in a new fashion. The objective of an operations concept is to 'bridge the gap' between disciplines and process steps to assure that the vision of one component is consistent with the 'realities' of another.

ITS Professional Development Publications

Title: The ITS Professional Capacity Building Program

Author 1: Humphrey **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal: Public Roads

Publisher: U.S. DOT - FHWA

City: Washington **State:** DC **Country:** USA

Page No: 36-38

Notes: File: Professional Development – 1997

Abstract: This article once again shows the need to elevate the knowledge, skills, and abilities of surface transportation professionals to advance new technologies and programs. DOT is developing programs to advance the deployment of intelligent transportation systems (ITS) infrastructure across the nation. DOT and ITS launched a five-year Professional Capacity Building (PCB) program to support the goal to deploy ITS infrastructure by 2005. There are four primary objectives: 1) ensure that sufficient numbers of trained professionals are available; 2) cultivate the next generation of transportation professionals by instilling interdisciplinary knowledge and skills; 3) increase awareness of ITS benefits and deployment options; and 4) raise public awareness about ITS benefits and services to create informed transportation users. The need to develop new professionals comes from the fact that ITS deployment will: require skills unfamiliar to today's transportation professionals; there are not enough trained ITS professionals to effectively support widespread ITS infrastructure deployment; a deeper and more technical understanding of the requisite knowledge is needed; and we must determine and understand the best methods to deliver ITS programs. There are five critical reasons transportation staff do not receive adequate training: heavy workload, unavailable funding, long duration of courses, inconvenient place of training, and inconvenient scheduling of courses. The PCB program is divided into three tracks: Tracks 1, 2, and 3. Track 1 targets existing transportation professionals; Track 2 advances the development of future transportation leaders; and Track 3 builds awareness of elected or appointed officials who have influence over transportation issues. "As it has done in the past, DOT will ensure that transportation professionals, decision makers, and travelers can support and effectively use the technologies and systems, in this case, the new ITS infrastructure that will advance the safety, efficiency, and quality of the nation's surface transportation systems."

ITS Professional Development Publications

Title: The PCB Vision

Author 1: **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal:

Publisher: Virginia Tech University

City: Blacksburg **State:** VA **Country:** USA

Page No:

Notes: File: Professional Development – 1997
PowerPoint Presentation

Abstract: This paper is the goal the PCB program has for the year 2000. By the year 2000, the PCB program hopes that: elected officials and the public will be aware of the ITS program; there will be sufficient numbers of trained transportation professionals working and sufficient numbers entering the work force; training will be multidisciplinary, multilevel, and reflect state-of-the-art and state-of-the-practice ITS technology; and ITS specialist topics will be integrated in all areas of PCB. There are many functional areas that need to be addressed, such as planning, funding/policy, design, construction/inspection, operations, maintenance, MIS, enforcement, and public relations. There are also many ITS components, including freeway management systems, traffic signal systems, incident management systems, traveler information systems, transit management systems, electronic toll collection, electronic fare payment, railroad grade crossings, and emergency response providers. The specific sectors that are involved are educational institutions, private corporations, local agencies, state agencies, and federal agencies. This makes up to 405 potential training or education targets. The elements for university-based development are: comprehensive training needs analysis; assess existing short/long courses and seminars; develop ITS deployment assistance seminars; update existing courses; develop new courses; develop and deploy an ITS Institute; and develop an ITS core curriculum. To do this, you have to start with the first phase they have planned: Needs Analysis and Function Specifications; this will tell you who is involved in ITS deployment. At this point, a body of knowledge will have been produced concerning the appropriate professional capacity building needs in the U.S. This knowledge can be used to educate/train professionals in the ITS field.

ITS Professional Development Publications

Title: Traffic Engineering Education Plan Using Alternative Media

Author 1: Poe **Author 2:** Mason, Jr.

Author 3: Pietrucha **Author 4:**

Author 5:

Journal:

Publisher: Pennsylvania Transportation Institute

City: University Park **State:** PA **Country:** USA

Page No:

Notes: File: Professional Development – 1997
White Paper

Abstract: This paper presents the substantive features of the traffic engineering education plan. The plan follows after learning that the transportation field was rapidly changing and that about one-third of all professional engineers in local and state transportation agencies will retire between 1985-1995. States must develop training and continuing education programs to keep their staff not only aware of advances, but experts. PennDOT indicates that they need to continually upgrade the level of technical knowledge within the traffic engineering function. Pennsylvania Transportation Institute (PTI) conducted a needs assessment study with PennDOT and found that they need to identify the primary tasks in the traffic engineering function; identify new challenges and opportunities; identify knowledge requirements; and identify skill requirements. The strategy of the education plan was to separate the traffic engineering function into major organizational divisions and determine the knowledge content needed within each division. They decided the four areas within traffic engineering were essential elements, operation, management systems, and application of advanced technology. There are then 23 knowledge modules within each of the four traffic engineering functional areas. The main type of media that has been used to deliver this information is the use of short courses. There are other methods suitable for the training programs for PennDOT, such as, informational packets, research circulars, study courses, manual, newsletters, videos, computer programs, and distance learning education. There is a time schedule for the Traffic Engineering Education Plan, including short-term, mid-term, and long-term. This traffic engineering education plan represents a comprehensive approach for developing a traffic engineering training program. Separation of the traffic engineering function into its functional areas and subdividing those areas into 23 knowledge modules provides a framework for addressing a variety of technical areas, both emerging and continually changing.

ITS Professional Development Publications

Publication Year: 1998

Title: Assessment of a Regional Transportation Education Alliance to Improve Mobility

Author 1: Kuhn **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal:

Publisher: Southwest University Transportation Center

City: College Station **State:** TX **Country:** USA

Page No:

Notes: File: Professional Development – 1998
White Paper
Report No. SWUTC/98/167103-1

Abstract: This paper explains the need for universities to take a proactive role in educating and preparing future transportation professionals to work effectively and efficiently in the 21st century. There needs to be an increased emphasis to improve undergraduate education, and on transportation system operation and management that requires a skill set that is not available in a traditional setting. This paper discusses results to surveys sent out to employers in the traffic industry and universities. Transportation employers responding said that traffic engineering, traffic operations, highway capacity, and transportation planning were critical to hiring new graduates. Pavements, public transportation, highway safety, ITS awareness, and multi-modal issues had a moderate priority when hiring new graduates. Geometric design and human factors are at a low priority level. Employers believe that project management, budgeting, finance, technical writing, and communications are other important skills that a graduate needs. The results of the university survey, compared with the employer survey, provide information on areas where an alliance can work to close the gap between education resources and needs of employers.

ITS Professional Development Publications

Title: Building Professional Capacity for Metropolitan Intelligent Transportation Systems Deployment and Operations

Author 1: Humphrey **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal:

Publisher: U.S. DOT - PCB Program

City: Washington **State:** DC **Country:** USA

Page No:

Notes: File: Professional Development – 1998
Draft Report
Recommendations on the Fundamental Competencies, Staffing, and Curricula for Transportation Professionals, Transportation Agencies, and Typical ITS Projects

Abstract: This report is almost the same as the ITS_2.doc. It has the same author, and he talks about the same things. “This report summarizes work carried out in the summer of 1998 in an effort to obtain a better understanding of the fundamental knowledge, skills, and competencies required to plan, deploy, operate, and maintain intelligent transportation systems (ITS) projects. After interviewing 200 professionals throughout the country, they were able to get the “grassroots” input needed to better understand future education and training initiatives required and to be carried out in the public sector, the private sector, and by the academic community to achieve mutually beneficial goals and objectives. The Professional Capacity Building (PCB) challenge is to develop the full range of knowledge and skills required by transportation professionals in ITS development, operations, and management activities. Another part of the challenge is to classify the wide group of transportation professionals into audiences that capture the diversity of needs in such a way as to provide professional capacity building materials and programs that are: tailored in their content, targeted to meet audience needs, and accessible when, where, and as needed, and to utilize the most effective forms of delivery available, be it training, education, technical assistance, or information dissemination. The final part of the challenge is to continue to be a comprehensive, multi-modal program that includes all levels of government, academic, public and private sector transportation professionals. The interviews revealed some key findings, such as PCB needs of current professionals, ideal staffing for agencies and ITS projects, technical assistance and information dissemination programs, institutional constraints to successful deployment, future transportation professionals, and private sector participation. The report again recommends some immediate actions, some near-term future actions, and some longer-term future actions.

ITS Professional Development Publications

Title: Distance Learning Becomes Reality: The Sky Is the Limit

Author 1: Smith **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal: Dallas/Fort Worth Current Technology

Publisher: Texas Technology, Inc.

City: Dallas **State:** TX **Country:** USA

Page No: 38-44

Notes: File: Distance Education – 1998

Abstract: This article is about how distance education can help all ages of people further their education or get one. "Distance learning is going to be a big part in furthering your education, career opportunities and level of experience from here on out." Distance education is becoming popular because of the convenience-driven society we live in. Distance learning means that you are learning away from the same location as the instructor, which usually is more flexible for most learners. In general, the people who are successful on-line students are self-directed learners. If thinking about taking a distance education course, Smith gives some suggested questions that you should ask such as: Is the university accredited? What costs are involved? What is the previous record for distance education with this university? There are two ways of delivering distance education materials, asynchronous and synchronous. Synchronous instruction requires the simultaneous participation of all students and instructors, requiring a set time. Asynchronous instruction does not require all students to be on-line together, does not involve 'real time,' and is more flexible than synchronous learning. Smith gives examples of companies over the Internet that can give help, schools that use distance learning, and companies that use distance learning. She tells what has been happening with distance learning in Texas. There are a few negatives she mentions, including you must be motivated and stay motivated, accreditation can be a problem, and finally you do not get the 'real' college experience with distance learning. Technology is the easy part of distance learning; money is what is holding things up for most institutions.

ITS Professional Development Publications

Title: IT'S the New School: Progress on ITS Education and Training in the USA

Author 1: Collura **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal: Traffic Technology International

Publisher: UK & International Press

City: Surrey **State:** **Country:** United Kingdom

Page No: 44-48

Notes: File: Professional Development – 1998

Abstract: This article is about the United States' struggle to move fast enough when educating and training a new breed of professionals. It relates to ITS education using technology and telecommunications. There have been changes in industry and government, leaving the need to examine and evaluate current educational and training programs designed to produce the necessary labor pool. Academic courses are probably not evolving quickly enough to meet ITS education and training needs. The University of Massachusetts at Amherst is integrating their past and ongoing research and incorporating them into three existing courses; this also includes an advanced transportation laboratory. The lab gives students practical experience that helps them grasp a solid understanding of ITS concepts and applications. Generally, the faculty understand the education and training needs to be successful in a transportation career. A new transportation professional needs to understand the depth and breadth of transportation, be educated in areas of technology, systems, and institutions, and also needs leadership, strategic planning, and people management capabilities. With regards to the aspect of funding, it is not a problem. In two years, US educators, government officials, and practitioners have set in motion several ITS educational activities to stimulate the thought and actions required to ensure that the transportation community has the pool of professionals needed to address transportation problems and formulate advanced solutions for the next century. This will require a collaborative effort among various institutions and disciplines.

ITS Professional Development Publications

Title: Securing the Future Through Training

Author 1: Humphrey **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal: ITS America Newsletter

Publisher: ITS America

City: Washington **State:** DC **Country:** USA

Page No:

Notes: File: Professional Development – 1998

Abstract: This article tells about the progress the PCB has made in the nine months prior to December 1997. More than 3000 people received training under the $3 million program, according to Thomas Humphrey. In the action that represented the first step, the PCB program presented over 100 seminars, workshops, and short courses to about 3000 existing transportation professionals across the country. The second part will be to attracting people to the profession, developing new curricula among universities, getting programs into community colleges and high schools, etc. Training is free to the transportation professionals, with the U.S. DOT providing the instruction. "Humphrey says that the PCB program must become an integral part of the operations of the U.S. DOT, universities, and professional associations."

ITS Professional Development Publications

Publication Year: 1999

Title: What Are Universities Doing to Address Changing Needs?

Author 1: Humphrey **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal:

Publisher: Virginia Tech - Center for Transportation Research

City: Blacksburg **State:** VA **Country:** USA

Page No:

Notes: File: Professional Development – 1999
PowerPoint Presentation
Presented at the Forum on Transportation Education and Training
TRB Annual Meeting
January 10, 1999
Washington, DC

Abstract: This is a copy of a PowerPoint presentation by the same author who wrote article number one. The major actions of universities are conducting research on educational issues, sponsoring conferences/workshops/forums, and developing new and modified curricula/courses. It has several front pages of other reports and meetings. ITS University Catalog Organization consists of new full-semester academic courses, modified full-semester academic courses, and short courses and workshops. The entry format will be university name, course title, contact/instructor, skill level, target audience, and availability. The skill levels will be defined as follows: 1. Basic and fundamental knowledge of ITS, 2. Basic knowledge of specific ITS program elements, 3. Intermediate, in-depth knowledge of ITS elements, and 4. Intensive, hands-on technical KSAs. The report also shows where some of the schools are that have full-semester ITS courses. Short courses, workshops, and other ITS offerings are the procurement of advanced technologies, intelligent transportation systems, ITS architecture, and principles of ITS telecommunications systems. A summary of actions is given. These are to conduct research and prepare publications, sponsor conferences, develop new curricula, revamp old curricula, add new full semester courses, modify existing full-semester courses, establish/expand laboratories, and develop short courses and seminars.

ITS Professional Development Publications

Title: What Do Today's Professionals Need to Know?

Author 1: Humphrey **Author 2:**

Author 3: **Author 4:**

Author 5:

Journal:

Publisher: U.S. Department of Transportation - PCB Program

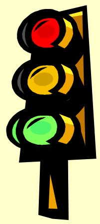
City: Washington **State:** DC **Country:** USA

Page No:

Notes: File: Professional Development – 1999
Draft Report
Presented at the Forum on Transportation Education and Training
TRB Annual Meeting
January 10, 1999
Washington D.C.

Abstract: The purpose of this paper is to summarize the results of a project directed at obtaining a better understanding of the fundamental knowledge, skills, and competencies required to more efficiently operate and manage multimodal surface transportation systems. The top ten ITS competency areas for which more training is needed are systems integration, organizational/institutional changes, technology options, systems analysis and design, managing contractors, financing, communications, ITS planning, coalition building with new stakeholders, data analysis, and management. There are tables for the ideal staffing for agencies and typical transportation projects or activities. Charts were created for each agency and for each typical project that provides ideal team roles, functions of each team member, and ideal competencies required to carry out each function. There are fundamental knowledge areas that would better prepare graduates to enter the ITS workforce, including electrical engineering principles, computer sciences, telecommunications, transportation systems engineering, business practices, interpersonal communications, and creativity. When conducting field interviews, participants indicated that systems integration, managing contractors, contracting options, software/hardware specifications, project management, data management, and data evaluation were most important for ITS deployments. Humphrey cites some findings from previous studies on education needs that are consistent with the USDOT's 1998 field interviews described earlier. He gives some recommendations for academic progress that are divided into seven categories: pre-college programs, community and junior college programs, undergraduate programs, graduate programs, continuing education programs, educating the educators, and innovative delivery media. Some of the initiatives ITS hopes to launch with the academic community are putting all old courses on the Internet, pilot program for distance education, create a virtual learning environment, develop new courses that address some of the immediate education needs identified earlier, develop a targeted curricula for the public sector, private sector, and the academic community. A reoccurring theme seems to be working in a partnership with other groups to get things done.

APPENDIX B: "BEHIND THE SCENES: TRAFFIC SIGNAL CONTROL" MODULE



Behind the Scenes: Traffic Signal Control

by

Roelof Engelbrecht

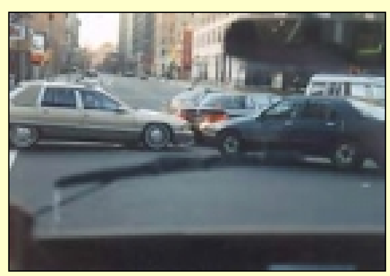
TransLink® Research Center

Texas Transportation Institute

SLIDE 1: TITLE

Traffic Signal Control

- Why put in a traffic signal?
  - ➤To improve safety
  - ➤To improve traffic flow
- Warrants
  - ➤Traffic counts
  - ➤Engineering study



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SLIDE 2: TRAFFIC SIGNAL CONTROL

Types of Traffic Signals

Fixed Time

- Uses historical data
- Less efficient

Traffic Actuated

- Responds to traffic
- More efficient

Non-coordinated

- Far away from other signals
- Operates independently

Coordinated

- Close to other signals
- Operates with other signals

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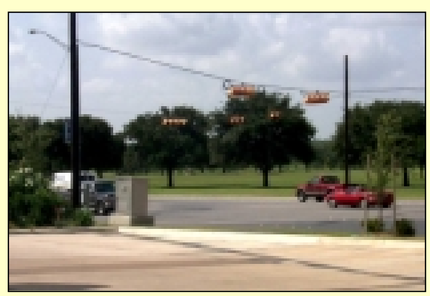
SLIDE 3: TYPES OF TRAFFIC SIGNALS

Traffic Signal Equipment

- Traffic signals
- Vehicle and pedestrian detectors
- Controller cabinet
- Controller



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SLIDE 4: TRAFFIC SIGNAL EQUIPMENT

Traffic Signals

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SLIDE 5: TRAFFIC SIGNALS

Vehicle Detectors

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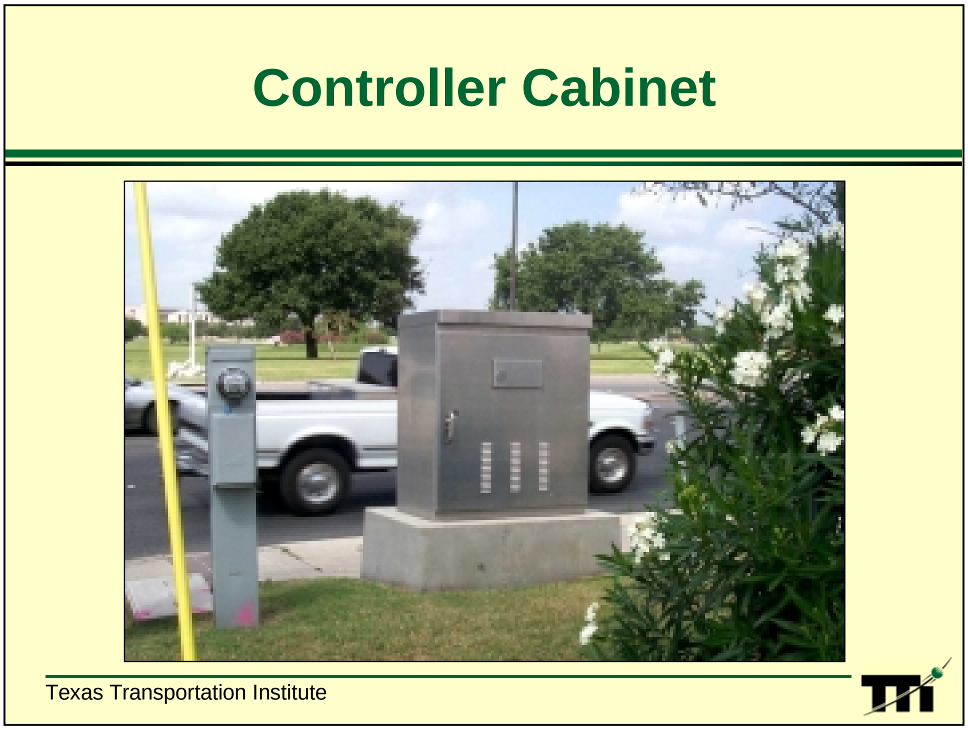
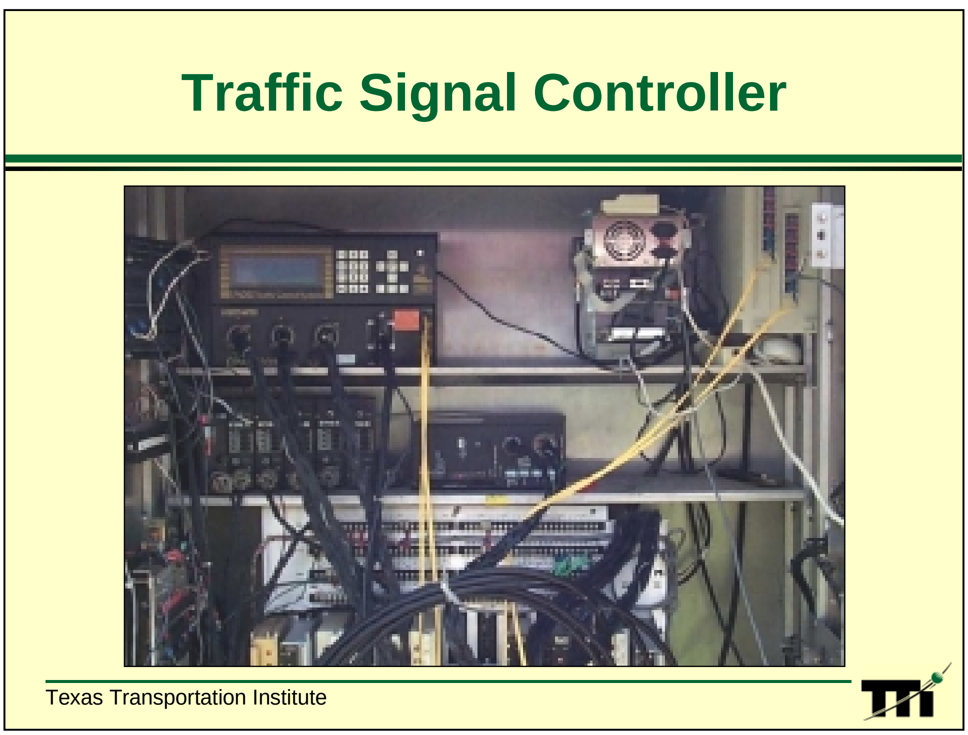
SLIDE 6: VEHICLE DETECTORS



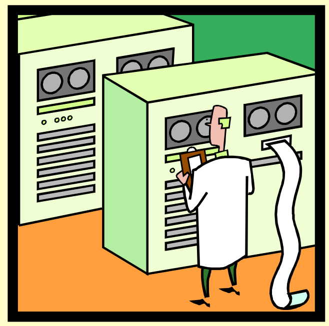
SLIDE 7: CONTROLLER CABINENT



SLIDE 8: TRAFFIC SIGNAL CONTROLLER

Traffic Signal Settings

- Objective
  - ➤Minimize vehicle stops
  - ➤Minimize delay
- "Speak the language"
  - ➤Phases
  - ➤Cycle length
  - ➤Bandwidth
  - ➤etc...



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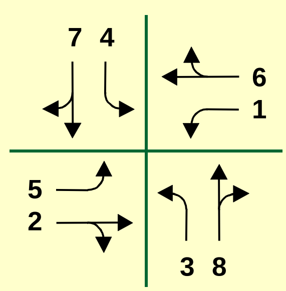
SLIDE 9: TRAFFIC SIGNAL SETTINGS

Phases

- Definition
  - ➤A traffic signal indication that controls the movement of one or more traffic movements
- Phase numbers



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SLIDE 10: PHASES

Phase Times

- The phase time is the duration that the phase is "on."
- While a phase is on, it goes through 3 intervals:
  - **Green** (cannot be less than 5 seconds)
  - **Yellow** (about 4 seconds)
  - **Red** (about 1 second)
- While a phase is not on, it stays in **Red**.

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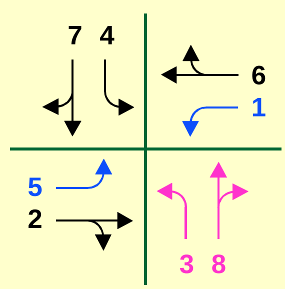
SLIDE 11: PHASE TIMES

Non-Conflicting Phases

- Phases that can run simultaneously
  - E.g. phases 1 & 5 or phases 3 & 8



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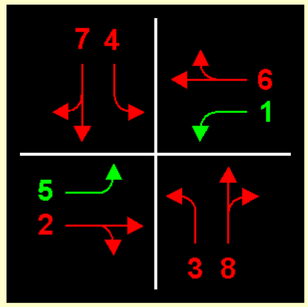
SLIDE 12: NON-CONFLICTING PHASES

Phase Sequence

- Fixed sequence in which phases follow each other.
  - E.g. 1&5→1&6→2&6→3&8→4&7→1&5…



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SLIDE 13: PHASE SEQUENCE

Cycle Length

- Time it takes to cycle through the phase sequence.

$\underbrace{\boxed{1\&5 \rightarrow 1\&6 \rightarrow 2\&6 \rightarrow 3\&8 \rightarrow 4\&7}}_{\text{1 cycle}} \rightarrow 1\&5 \rightarrow 1\&6\ldots$

- There exists an optimal cycle length that will minimize delay.

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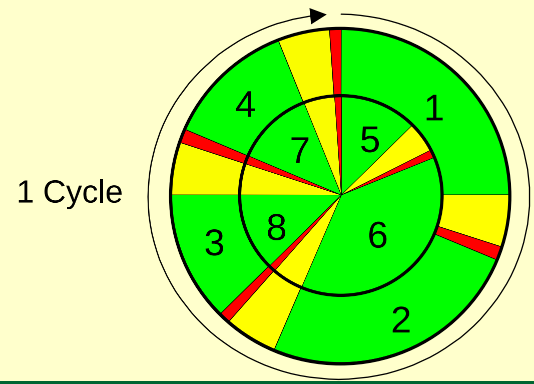
SLIDE 14: CYCLE LENGTH

"Time Budget"

- Have to budget cycle time to phases.
  - E.g. 1&5→1&6→2&6→3&8→4&7



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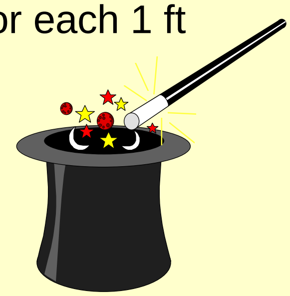
SLIDE 15: "TIME BUDGET"

"Magic" Numbers

- **Headway**: In a normal lane, vehicles cross the stop line every 2 seconds when discharging from a queue.
- Headway increases by 2% for each 1 ft decrease in lane width.
- **Lost time**: About 5 seconds of the phase time is needed to start and stop the traffic stream.



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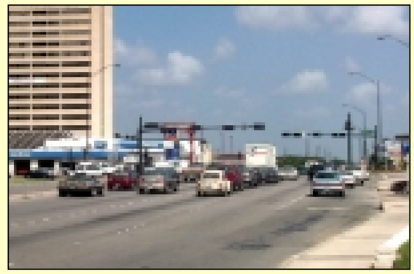
SLIDE 16: "MAGIC" NUMBERS

Lane Layout

- Normal lanes are 12 ft wide.
- Left-turn movements usually have their own lane(s).
- Lanes typically not narrower than 10 ft.
- Kerb lanes may be wider for bicycles, trucks, and drainage.



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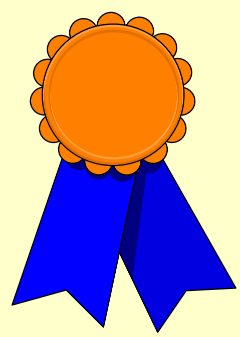
SLIDE 17: LANE LAYOUT

The Exercise

- Given:
  - ➤Intersection geometry
  - ➤Traffic volumes
- Determine:
  - ➤Lane layout
  - ➤Phase sequence
  - ➤Phase times (and cycle length)
  - ➤Estimate traffic performance (extra credit)



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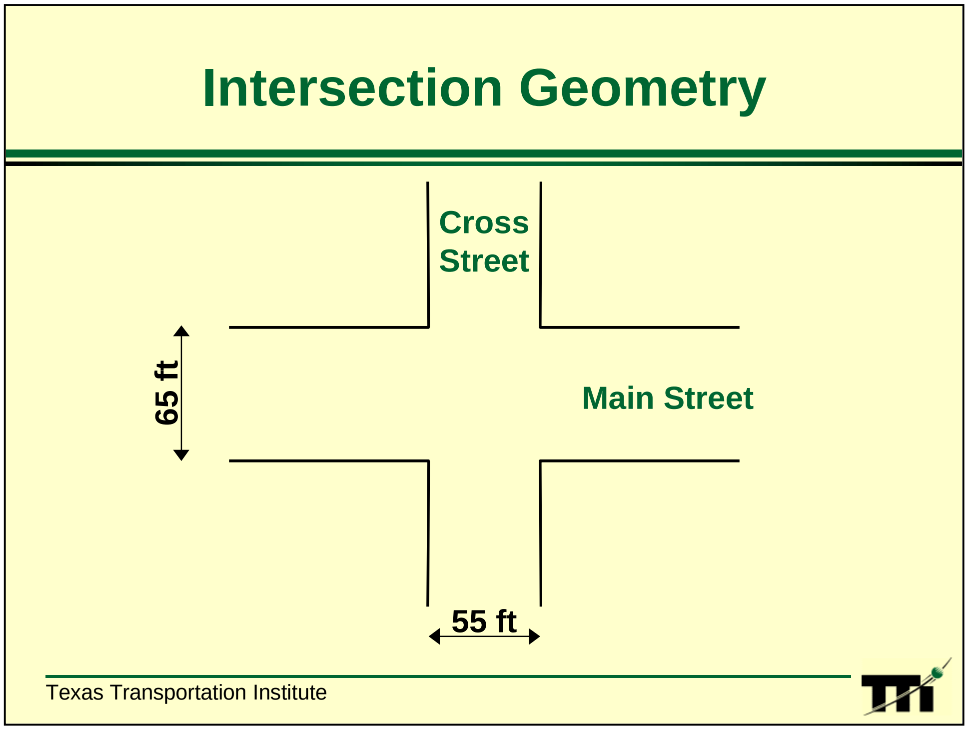
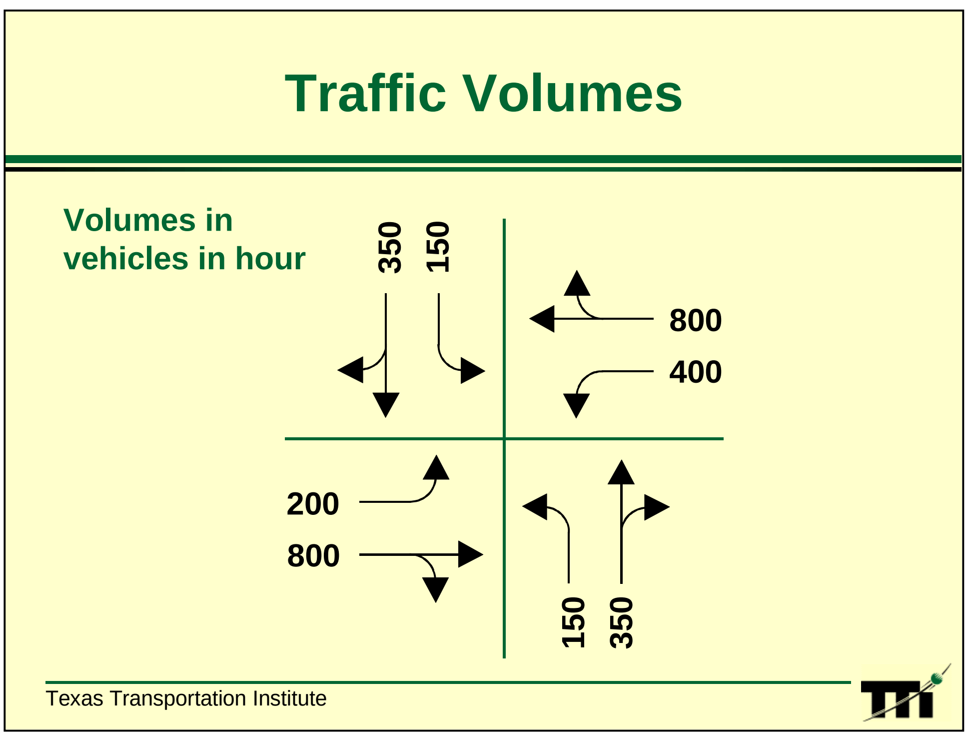
SLIDE 18: THE EXERCISE



SLIDE 19: INTERSECTION GEOMETRY



SLIDE 20: TRAFFIC VOLUMES

APPENDIX C: DISTANCE LEARNING DEFINED

DISTANCE LEARNING DEFINED

In today's world of rapidly changing technology and escalating competition, employers are finding it increasingly more difficult to keep their workforces technologically current and well trained. Furthermore, impositions of time, distance, travel costs, and other constraints on workers have made traditional approaches to training increasingly difficult. By using technology such as computers and telecommunications, innovative approaches can be taken regarding education. These new approaches include "just in time" delivery of critical information where and when it is needed, in just the amount it is needed, and in a format preferred by the user. Avoiding excessive and extraneous information ensures that the education workload for the user is manageable and meaningful. One of the new approaches frequently considered is distance learning.

THE DEFINITION OF DISTANCE LEARNING

Quite simply, distance learning is any type of education that occurs while location, time, or both separate the participants. In distance learning, the teacher, through the use of technology, delivers instruction to a student at a separate location. The teacher then receives feedback, either immediate or delayed, from the student. Contrary to popular opinion, distance learning does not have to be "high tech." A classic correspondence course in which printed materials are mailed to the student and returned to the teacher is distance learning. In fact this method, which utilized the postal system, was the original form of distance learning. Distance learning may utilize any/or a combination of the following four technologies:

$ printed materials;
$ audio/voice technologies;
$ computer technologies; and
$ video technologies.

TYPES OF DISTANCE LEARNING

Distance learning may be roughly divided into two delivery types—synchronous and asynchronous. Synchronous learning implies that the student and trainer interact with each other in real time, while asynchronous learning relies on delayed feedback. Distance learning that utilizes printed materials exclusively is always asynchronous, although utilization of faxes minimizes the delay between interaction. Audio, computer, and video technologies may be used for either synchronous or asynchronous distance learning. Table C-1 outlines synchronous and asynchronous delivery methods of distance learning utilizing various technologies.

DISTANCE LEARNING APPLICATIONS

Distance learning can be used for a variety of educational applications. Educational applications may include knowledge management, collaboration, support of performance,

Table C-1. Examples of Synchronous and Asynchronous Delivery in Distance Learning

Technology	Synchronous	Asynchronous
Printed Material	None	Self Paced Textbooks Correspondence Course
Audio/Voice	Audio conferencing Telephone	Audiotape Radio
Computer	Chatroom Desktop video conference	E-mail CD-ROM Bulletin Board
Video	Video conferencing	Videotape Television Broadcast

mentoring, tutoring, and classical training and education. Knowledge management is an environment where the knowledge, skills, and experiences of members of a group are captured, stored, organized, and made available to others in the organization. The goal of knowledge management is education of the organizations. Examples of knowledge management are:

$ information concerning policies, procedures, workplace handbooks, missions, and goals;
$ information on individual or group work products such as reports, presentations, and briefs;
$ information documenting experiences such as lessons learned, anecdotes, case studies, and case histories; and
$ information on boilerplate or templates for previous successful endeavors, such as examples of successful proposals, guidelines for report writing, or templates for transmittals.

Internal web pages, shared databases, and group ware are all examples of distance learning techniques that may be used for knowledge management. Both synchronous, asynchronous, or a combination of these delivery types may be used to accomplish knowledge management.

Collaboration is defined as working jointly with others in an intellectual endeavor. By working jointly in a project or problem, learning occurs. Collaboration promotes learning through interaction and may be a byproduct of the main goal of completion of the project or solving the problem. Examples of collaboration are:

$ exchange of work files or e-mails to accomplish a task;
$ working with a shared file;
$ discussion groups or newslist;
$ online chat group or on-line meeting; and
$ video conference or audio conference.

Video conferences, audio conferences, conference telephone calls, chat rooms, bulletin boards, discussion groups, facilitated e-mail newslists, and shared drives are all distance learning tools that may be used for collaborative efforts. Although both asynchronous and synchronous delivery types are effective for collaborative efforts; synchronous methods are most commonly thought of when discussing collaboration.

Performance support is the provision of assistance and tools to someone who aids them in accomplishing a specific goal or task. In addition to that aid, coincidental learning may take place and is a byproduct that occurs as the student or employee accomplishes the task. Examples of performance support distance learning include:

$ access to remote resources to groups in isolated environments;
$ on-line or shared databases that assist in making informed decisions; and
$ logic or troubleshooting trees to assist in problem solving.

Performance support is classified as a goal-oriented form of distance learning. Shared databases, troubleshooting lists, logic trees, operator guides, websites, frequently asked questions (FAQs) lists, and technical support sites are all examples of performance support distance learning tools. The asynchronous form of distance learning is the most common delivery type for performance support education.

Mentoring and tutoring are similar forms of distance learning. Mentoring is defined as education from a trusted counselor or guide, while tutoring is individual teaching or instruction on a specific subject. Both tutoring and mentoring are viewed as one-on-one forms of distance learning. Examples of mentoring and tutoring may include:

$ access to software tutorials for specific tasks, software, or hardware;
$ providing an “ask the expert forum;” and
$ electronic dialogues which include input from an advisor or expert.

Tutoring is goal oriented and focuses on a specific topic, while mentoring may be either goal specific or general education. Videoconferences, audio conferences, workshops, on-line dialogue, self-paced courses, and product use courses are all forms of either tutoring or mentoring. Tutoring and mentoring may be delivered by either synchronous or asynchronous methods.

Classical training and education are structured courses that are specifically intended to provide skills and knowledge. These forms of distance learning have designated instructors and students, and the learning is intentional. Each course has specified objectives that are often defined by tasks, conditions, and standards. Examples of classical training and education utilizing distance learning are:

$ on-line workshops;
$ remote classrooms; and
$ correspondence courses.

Classical training and education events are group oriented, although members of the group may be located at remote sites. The general format consists of a lecture or presentation by the instructor, followed by discussion, and student feedback in the form of an assignment or test. Videoconferences, videotape, audiotape, online chats, printed materials, and CD-ROM are all forms of delivery for classical training and education. This form of distance learning may either be synchronous or asynchronous.

TECHNOLOGIES NEEDED FOR DISTANCE LEARNING

A wide range of technologies may be used for distance learning, and as previously stated, they are divided into four general categories: printed materials, audio/voice, computer, and video. These categories may be further subdivided by means of delivery. For example, audio/voice may have subcategories of telephone, voicemail, audio conferences, audiotape, and radio. Additionally, the technologies may overlap categories. Audio conferences may be held using the telephone, on-line chat rooms, and two-way radio communications.

Technologies used for distance learning also span a wide range of costs and complexity. It is important to consider the advantages and disadvantages of each type of technology, the cost, and the availability of the technology to both instructor and learner, when designing a distance learning module. It is also important to remember that the bottom line for all distance learning is to deliver instruction to learners in an effective and efficient manner.

Table C-2 lists the four general categories of distance learning, as well as examples of subcategories for each. Also provided are the basic advantages, disadvantages, and hardware requirements.

SUMMARY

New and innovative technologies have created many opportunities in the arena of distance learning. Distance learning can be an effective and efficient method for delivering instruction and education to a variety of students in numerous locations. For distance learning to be effective, the presenter must know the target audience and select an appropriate technology for the presentation. Considerations in selection include target audience, available equipment, goals and objectives of the presentation, cost, and accessibility. Alternatives and backup plans should also be explored and designed in the event of technology failure.

During the design and development of a distance learning module, ongoing evaluation can provide valuable insight. Once a distance learning event is completed, evaluation and feedback from the students and instructors is also crucial. These lessons learned can be applied to future distance learning endeavors to make them more effective and efficient. By carefully planning and utilizing technology, distance learning can be an effective and timely means for providing educational and learning experiences in both the classroom and boardroom.

Table C-2. Overview of Distance Learning Technologies.

Technology	Subcategory Examples	Advantages	Disadvantages	Hardware Requirements
Printed Material	Textbooks Study guides Workbooks Fax	Extremely portable Comfort level high Low cost Readily available Easy to use	No student/teacher interaction Static presentation Requires reading skills Time delay	Fax machine may be required
Voice/Audio	Telephone Voicemail Audio conferences Audiotape Radio	Moderate to low cost Readily accessible Easy to use Comfort level moderate to high	Requires scheduling No visual information Impersonal	Telephone (speaker phone preferable for groups) Tape player (specify cassette/cd) Radio (specify standard or 2-way)
Computer	E-mail Web-based sites Video conferences CD-ROM Collaboration sites	Incorporates text, audio, video, graphics Interactive Provides written record of discussions Moderate expense	Requires hardware and software Generally relies on written communications Computer viruses, hacking No guaranteed performance (network reliability)	Computer Internet connection Video card Sound card CD-ROM burning capability (instructor end) Network capability
Video	Videotape Satellite delivery Microwave Broadcast video Desktop video Video conferences	Incorporates audio and video Interactive Personal communications	Moderate to expensive cost Planning and preparation Requires scheduling Requires technical support	Video player Video recorder Audio system Satellite link

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