Training of Traffic Incident Responders

DETAILS

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The Second
STRATEGIC HIGHWAY RESEARCH PROGRAM

SHRP 2 REPORT S2-L12-RW-1

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The Second Strategic Highway Research Program

America's highway system is critical to meeting the mobility and economic needs of local communities, regions, and the nation. Developments in research and technology—such as advanced materials, communications technology, new data collection technologies, and human factors science—offer a new opportunity to improve the safety and reliability of this important national resource. Breakthrough resolution of significant transportation problems, however, requires concentrated resources over a short time frame. Reflecting this need, the second Strategic Highway Research Program (SHRP 2) has an intense, large-scale focus, integrates multiple fields of research and technology, and is fundamentally different from the broad, mission-oriented, discipline-based research programs that have been the mainstay of the highway research industry for half a century.

The need for SHRP 2 was identified in *TRB Special Report 260: Strategic Highway Research: Saving Lives, Reducing Congestion, Improving Quality of Life,* published in 2001 and based on a study sponsored by Congress through the Transportation Equity Act for the 21st Century (TEA-21). SHRP 2, modeled after the first Strategic Highway Research Program, is a focused, time-constrained, management-driven program designed to complement existing highway research programs. SHRP 2 focuses on applied research in four areas: Safety, to prevent or reduce the severity of highway crashes by understanding driver behavior; Renewal, to address the aging infrastructure through rapid design and construction methods that cause minimal disruptions and produce lasting facilities; Reliability, to reduce congestion through incident reduction, management, response, and mitigation; and Capacity, to integrate mobility, economic, environmental, and community needs in the planning and designing of new transportation capacity.

SHRP 2 was authorized in August 2005 as part of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The program is managed by the Transportation Research Board (TRB) on behalf of the National Research Council (NRC). SHRP 2 is conducted under a memorandum of understanding among the American Association of State Highway and Transportation Officials (AASHTO), the Federal Highway Administration (FHWA), and the National Academy of Sciences, parent organization of TRB and NRC. The program provides for competitive, merit-based selection of research contractors; independent research project oversight; and dissemination of research results.

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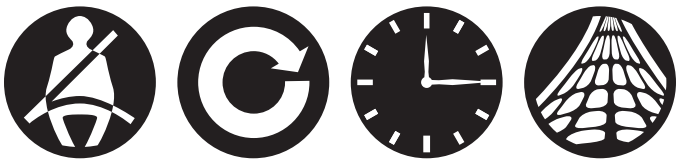

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FOREWORD

Gummada Murthy, *SHRP 2 Senior Program Officer, Reliability*

The primary goal of SHRP 2 Reliability research is to improve the reliability of highway travel times by reducing the frequency and effects of events that cause travel times to fluctuate unpredictably. Seven potential sources of unreliable travel times—that is, events that cause variable travel times—have been identified: traffic incidents, work zones, demand fluctuations, special events, traffic control devices, weather, and inadequate base capacity. Traffic incidents alone are a major cause of delay. This report presents the results of a project that developed a training program for traffic incident responders and managers.

For every minute that an Interstate lane is blocked because of a traffic incident, a 4- to 5-minute travel delay can be expected to result (*3*). A strong interdisciplinary traffic incident management program can significantly decrease incident duration and, when combined with traveler information, can increase peak-period freeway speeds, reduce crash rates, and improve trip time reliability. To realize this type of traffic incident management program, it is imperative to have a sound and effective training program for incident responders and managers.

The training program described in this report contains two components: training of trainers and incident responder training. The course material provides extensive training on the core competencies for interdisciplinary traffic incident response. It is designed to help responders understand and implement the national unified goal for traffic incident management: responder safety; safe, quick clearance; and prompt, reliable, and interoperable communications.

The training methods include a variety of adult-learning techniques, including interactive seminar, case study analysis, tabletop role-play and scenario, and field practicum. The training was developed for delivery through a 2-day intensive format or a modular (single lesson per session) format. The train-the-trainer curriculum is designed to facilitate cost-effective cultivation of qualified trainers across the country. Core multidisciplinary competencies were identified with input from a group of experts in traffic incident management. These competencies provided a framework from which the curriculum was built and design documents created. After development of the course materials, formative evaluation was conducted by holding two pilot training sessions, and the input from participants was incorporated into the final materials.

This report, as well as other SHRP 2 Reliability products related to institutional structures and business process reengineering, is intended to help transportation agencies move forward in addressing nonrecurring traffic congestion and delivering more reliable travel times on their highway networks.

CONTENTS

Executive Summary

The second Strategic Highway Research Program's Reliability Project L12, Improving Traffic Incident Scene Management, was designed to establish the foundation for and promote certification of responders to achieve the three objectives of the traffic incident management (TIM) national unified goal (NUG). The intent is to motivate responders from different stakeholder groups—law enforcement, fire and rescue, emergency medical services (EMS), the U.S. Department of Transportation (U.S. DOT), towing and recovery, and notification and dispatch—to acquire a common set of core competencies to promote a shared understanding of the requirements for achieving the safety of responders and motorists, quick response, and effective communications at traffic incident scenes.

A multiagency and multidisciplinary course was developed as a result of this research that uses a variety of adult-learning techniques, including interactive seminar, case study analysis, tabletop role-play and scenario, and field practicum. The training was developed for delivery through a 2-day intensive format or a modular (single lesson per session) format. A train-the-trainer curriculum also was developed to facilitate cost-effective cultivation of qualified trainers across the country.

The research approach used to develop the core competencies and the training curriculum and materials employed more than 100 subject-matter experts (SMEs) across six TIM discipline areas. Core multidisciplinary competencies were identified with input from a group of cross-disciplinary TIM SMEs. These competencies provided a framework from which the curriculum could be built and design documents created. These design documents were reviewed by two groups: the SMEs who were originally responsible for contributing to the list of responder actions and an independent evaluation group (IEG) nominated by the Federal Highway Administration (FHWA). IEG input was incorporated into the design documents. After the course materials were developed, formative evaluation was conducted by holding two IEG-observed pilot training sessions. Feedback was garnered from the 80 student participants, and postpilot workshops were held with the IEG to obtain their input. Based on the research team's observations during each pilot and input from the students and IEG, revisions were incorporated into the draft final materials.

The research team drew several conclusions from the research:

1. Participants received the training program well and viewed it as beneficial. The positive evaluation results discussed in the section in Chapter 3 on the assessment of training effectiveness demonstrate this response.
2. As a result of the training, participants demonstrated an understanding of the core competencies used to develop course materials (see section in Chapter 3 on the assessment of training effectiveness). This response demonstrates that the course materials and delivery

approaches successfully enabled course participants to achieve terminal and enabling learning objectives.

3. A critical component of implementing the training is ensuring that it is transferable to other instructors. The research team believes that the course would benefit from additional deliveries (see suggested research in Chapter 4) to evaluate and refine methods for training potential instructors. An evaluation of learning transfer and results, which is discussed in Chapter 4, could occur at the same time.
4. Because some agencies may experience difficulty in sending responders to 2 full days of training, the research team recommends that portions of the content should be converted to an online format and be designated as a prerequisite to classroom training so that the classroom component could be reduced to 1 day (see Chapter 4 for a discussion of online training).
5. Central oversight and administration for the training program should be considered for the first 3 to 5 years to facilitate institutionalization of the curriculum as a certified and accredited national curriculum, supplemented with collaborative SME-based curriculum updates annually and more frequently as needed. The central administration model likely can then be supplanted by a distributed model in which certified and accredited delivery channels are in place but central oversight of the curriculum baseline is preserved, as discussed in the section in Chapter 4 on leadership and oversight for the training.
6. The research team recommends facilitated feedback sessions with national and regional stakeholder organizations, such as the International Association of Chiefs of Police, the National Fire Protection Association, the Towing and Recovery Association of America (TRAA), and the National Emergency Management Association, to explore the attractiveness, feasibility, and ideal environments for modular delivery of the training. Similarly, the feasibility of integrating TIM strategies into existing discipline-specific offerings could be investigated, as discussed in Chapter 4. To help defray the high costs associated with conference attendance, virtual webinars could be conducted using online collaborative tools, such as Group Systems' Think Tank. The online tools would enable multiple participants to view materials, provide comments, and interact with each other on a virtual basis. This model was used to develop the list of responder actions and the core competencies.

CHAPTER 1

Background

SHRP 2 Reliability Project L12, Improving Traffic Incident Scene Management, was designed to establish the foundation for and promote certification of responders to achieve the three objectives of the traffic incident management (TIM) national unified goal (NUG). The intent is to motivate responders from different stakeholder groups—law enforcement, EMS, fire and rescue, U.S. DOT, towing and recovery, and notification and dispatch—to acquire a common set of core competencies to promote a shared understanding of the requirements for achieving the safety of responders and motorists, quick response, and effective communications at traffic incident scenes. The impact of traffic incidents on highway operations, reliability, and safety is well documented:

- According to the Texas Transportation Institute, congestion costs continue to rise.
  - Measured in constant 2009 dollars, the cost of congestion has risen from $24 billion in 1982 to $115 billion in 2009.
  - The total amount of wasted fuel in 2009 topped 3.9 billion gallons—equal to 130 days of flow in the Alaska Pipeline.
  - Cost to the average commuter was $808 in 2009, compared to an inflation-adjusted $351 in 1982.
  - Yearly peak delay for the average commuter was 34 hours in 2009, up from 14 hours in 1982 (*1*).
- According to a report published by FHWA, it is estimated that one-quarter of the traffic congestion in the United States is caused by nonrecurring traffic incidents (*2*). For every minute that an Interstate lane is blocked during nonpeak congestion, 4 to 5 minutes of travel delay result (*3*).
- From 2003 through 2007, 59 law enforcement, 12 fire and rescue, and 54 highway maintenance personnel died after being struck by vehicles along the highway (*4*). Data on towing and recovery industry occupational fatalities are not well tracked. However, TRAA anecdotally reports a loss upward of 100 towing operators in the line of service annually (*5*).

A significant body of research has shown that improving incident response activities offers substantial benefits for reducing the adverse impact of traffic incidents (*6*). The National Traffic Incident Management Coalition (NTIMC) developed the NUG for TIM to help encourage state and local government agencies to adopt the unified, multidisciplinary programs and policies that in turn have enabled state and local governments to realize the benefits of improved TIM.

CHAPTER 2

Research Approach

Research Approach

The research approach designed for the development and testing of the SHRP 2 L12 traffic incident responder training was predicated on one primary objective: the involvement of field practitioners representing all traffic incident response stakeholder groups. The rationale for stakeholder group involvement was to ensure that

- Course materials and content are relevant and beneficial to field practitioners;
- The viewpoints and needs of multiple stakeholder groups are identified and incorporated into course materials; and
- Stakeholders are involved in the development, testing, and verification of course materials on an iterative basis.

An overview of the research approach, which demonstrates how this objective was achieved, is shown in Figure 2.1.

The research approach used to develop the core competencies and the training curriculum and materials employed more than 100 subject-matter experts (SMEs) across six TIM discipline areas:

- Law enforcement;
- Fire and rescue;
- EMS;
- Towing and recovery;
- Transportation and service patrol; and
- Notification and dispatch:
  - Public safety answering point;
  - Traffic management center; and
  - Traffic operations center.

Nearly 40 TIM SMEs across each of the six disciplines (six to eight SMEs from each discipline) collaboratively identified a list of responder actions in each of the major TIM phases (e.g., notification and arrival). These SMEs, who were nominated by FHWA and NTIMC, then identified which of these actions other on-scene responders from other TIM disciplines should either know how to perform or be aware of to facilitate safe, quick clearance.

A smaller multidisciplinary group of these TIM SMEs examined the responder actions nominated by each discipline-specific group of SMEs and identified which of these should be core competencies—competencies that all responders should know how to perform on-scene (primary) or with which they should at least be familiar (secondary) to facilitate safe, quick clearance on-scene. The draft training design document, list of core competencies, curriculum, and training materials incorporated the identified primary and secondary competencies. These materials were distributed for the full group of TIM SMEs to review. An additional group of TIM SMEs nominated by FHWA to serve as independent evaluators (not affiliated with the 40 SMEs who developed the responder actions and core competencies) further reviewed the materials. The independent evaluation panel included TIM experts from FHWA, law enforcement (Indiana and New York), and transportation agencies (Maryland, Georgia, and North Carolina).

More than 80 TIM SMEs then reviewed the competencies, curriculum, and training materials through the delivery of two pilot training sessions; they provided comments, further strengthened the materials, and further refined the proposed national core competencies. The independent evaluation panel also observed the two pilot training sessions and participated in two post-training workshops to provide comments, review training materials, and suggest revisions to the training materials and course structure in a synthesis review session. These changes were incorporated into the draft final materials.

Responder Actions and Core Competencies

As the starting point for identifying responder actions, a preliminary list of responder actions for representative incident scenarios was developed through a comprehensive

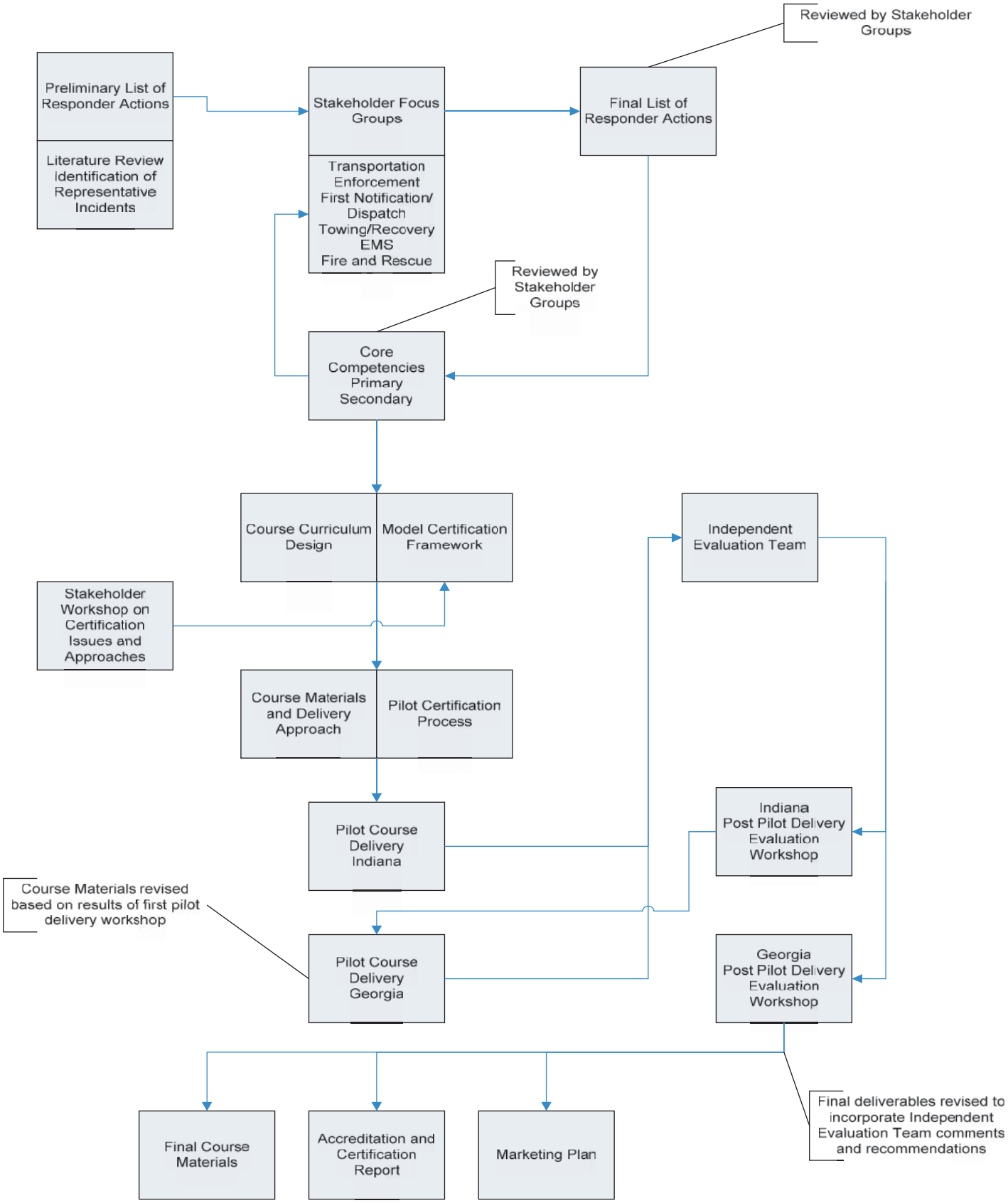

Figure 2.1. Overview of research approach for project.

literature review and input from nearly 40 SMEs across six TIM discipline areas as described in the research approach. To facilitate this process, representative incident scenarios were identified into which responder actions could be sequentially bundled. Initially, nine scenarios were developed, but based on stakeholder input from the first focus group, the representative incident scenarios were consolidated into four incident types. This consolidation enabled the identification of core TIM competencies that could support more consistent implementation of TIM and the NUG by multidisciplinary responders across the country:

- Incident Type 1: Noncrash (debris or disabled or abandoned vehicle). Roadway debris with lane obstructed or all lanes clear (debris on shoulder), or disabled or abandoned vehicle with lane obstructed or all lanes clear (vehicle on shoulder).
- Incident Type 2: Noninjury crash, fuel or liquid spill. Noninjury crash with lanes obstructed or all lanes clear (vehicles on shoulder), or noncargo liquid discharge from vehicle.
- Incident Type 3: Injury crash (injuries, extrication, or fatality). Traffic incident involving injury with no fatalities, extrication or rescue of injured parties, or one or more fatalities.
- Incident Type 4: Commercial vehicles, cargo spill (nonhazmat or hazmat). Traffic incident involving commercial vehicles with spilled cargo (nonhazardous) or spilled cargo (hazardous).

After the four incident types were identified, facilitated focus groups were conducted with each of the six discipline-specific groups of SMEs using Group Systems' Think Tank, an online collaborative tool. The lists of responder activities were then consolidated and reviewed, and SMEs validated them through individual review.

The lists of responder actions were analyzed to identify core competencies—that is, multidisciplinary, crosscutting actions shared by responders at the scene of an incident regardless of a responder's specific discipline. As defined in the curriculum, core competencies are those actions responders should be able to practice (primary) or, at a minimum, understand and be aware of the value or role of (secondary), at an incident scene. This analysis yielded several observations:

- A significant number of on-scene actions are common to, and may be taken by, more than one responder group under certain circumstances.
- Although many similar actions occur for all incident types, the scope and complexity of these actions vary substantially. For example, how establishing or adjusting traffic control devices is accomplished and what this action entails for a disabled vehicle may be dramatically different from how this action may be implemented for an incident involving fatalities.
- A number of on-scene responder actions are unique to a specific incident type. For example, providing medical care will be required at an injury crash but may not be required at a disabled vehicle incident scene.

Primary core competencies were defined as those shared or similar actions typically taken at each incident type by at least three on-scene responder groups. Every incident responder active in that incident management phase—regardless of responder type—should know how to implement these core competencies. For example, using emergency responder vehicles to create a safe work area at the incident scene and wearing appropriate high-visibility protective apparel are primary core competencies for all incident responders.

Secondary core competencies for each incident type were defined as those actions that a specific responder group performs that all other responder groups should understand and be aware of. Every incident responder active in that phase of response should be aware of these competencies because they are interdependent. However, individual responders may not need to know how to actually implement them. Examples of primary and secondary core competencies are listed in Table 2.1. In addition to primary and secondary competencies, certain core discipline-specific competencies were included. Discipline-specific competencies are those that only one responder group performs but are of such a critical nature that it is necessary for all disciplines to be aware of their existence and performance, such as hazardous materials (hazmat) cleanup.

The proposed core competencies were vetted with the same process used to vet the responder actions with SMEs. Each discipline-specific SME group was provided with the list of proposed core competencies and the proposed criteria for identification of primary and secondary core competencies and asked to provide input and feedback. They were invited to identify additional core competencies that should be included and identify any that they felt did not qualify as a core TIM competency. Their feedback was incorporated into the final list of proposed core TIM competencies that would form the foundation for the forthcoming national multidisciplinary TIM training. Robust SME input in every aspect of the development of a robust list of proposed national TIM core competencies was critical to the eventual acceptance of these competencies and training as credible by TIM practitioners and as a foundation for any forthcoming national certification and accreditation initiative. Follow-up focus groups were tentatively scheduled to discuss the proposed core competencies, but SME consensus on the proposed core competencies resulted in these discussions not being held.

Table 2.1. Examples of Primary and Secondary Core Competencies

TIM Phase	Incident Type	Competency	Responder Type	Competency Type
Detection	All	Identify type and level of incident.	All	Primary
Response	Injury crash	Ensure injured and ambulatory patients are contained.	All	Primary
Clearance	Injury crash, commercial vehicles, cargo spill	Participate as on-scene flagger, if necessary.	All	Primary
Response	Injury crash, commercial vehicles, cargo spill	Close road, if necessary.	Law enforcement, fire and rescue	Secondary
Response	Noninjury crash, injury crash, commercial vehicles, cargo spill	Change variable message signs for lane closures, traffic diversions, expected delays, etc.	Notification and dispatch, DOT	Secondary

Curriculum Design

Adult learning principles state that adults learn more effectively when they can understand the intrinsic value of the materials being covered and are motivated to learn to the extent that they perceive that learning will help them perform tasks or is relevant in dealing with real-life situations (*7*). Adult students gain new knowledge, understanding, skills, values, and attitudes most effectively when offered real-life or experience-oriented learning. These basic principles guided the curriculum development.

When the competencies had been thoroughly reviewed and mapped by incident stage, the content was divided into lesson areas, and terminal and enabling learning objectives were developed to support each lesson. Terminal learning objectives (TLOs) represent what each student is expected to learn from a particular lesson. Enabling learning objectives (ELOs) represent concise statements of the specific steps a course participant should take to achieve the TLO. Once the learning objectives were established, learning activities and class resources were identified, and test questions were developed.

To ensure that learner attention was adequately engaged from the outset and learners were motivated and ready to learn, introductory and terminology and statistics lessons were developed covering topics such as the impact of congestion, line-of-duty deaths, and struck-by incidents. These lessons included real-life scenarios, national efforts at addressing the issues surrounding TIM, and the importance of common terminology. The final list of core competencies provided the foundational material for the development of the other 10 lessons in the traffic incident response course, including two that focused on providing experiential learning opportunities. Identifying the competencies associated with incident response enabled the curriculum design team to identify areas in which increased coordination and awareness among incident responders could reduce incident response durations. The goal was that a shared awareness of primary and secondary core competencies would enable incident responders to reduce secondary incidents and improve the safety and effectiveness of incident response by reducing both the time required to clear an incident and overall congestion. Content incorporated in lessons prompts students to consider questions such as the following:

- How frequently do secondary incidents occur?
- If lanes must be closed, can they be progressively reopened?
- Does the shoulder count as a lane?
- Can some tasks, such as extrication and investigation, be conducted simultaneously?
- When can crash vehicles be moved off the roadway immediately and the incident worked in a secondary location?
- What are the quick clearance laws in specific jurisdictions?
- Does fluid used to power a vehicle require a hazmat response?
- Does a placard always mean a hazmat response?
- Why does the towing company need accurate information regarding the types of vehicles to be towed?
- When should the towing company be called in?

Table 2.2 lists core competencies and associated TLOs and ELOs for the incident responder component of the course. TLOs and ELOs were also developed for the train-the-trainer component. Although not directly linked to core competencies, these objectives were designed to ensure that potential trainers receive the necessary instruction to deliver the course to participants. These objectives are shown in Table 2.3.

When the design documents were finalized, the course materials were developed (for a discussion of this development, see the section below on course materials) and the formative evaluation process, namely the course pilots, began. During the pilot implementation, materials were further refined based on input garnered from observation and feedback from instructors, students, and the independent evaluation team. The TIM course consists of a 15.5-hour incident

(text continues on page 11)

Table 2.2. Incident Responder Terminal and Enabling Learning Objectives by Lesson

Lesson Title	Terminal Learning Objective	Enabling Learning Objectives
Course introduction	Restate the consequences of congestion and list some of the organizations and strategies that aim to alleviate congestion and improve reliability.	List the safety, social, and economic impacts of congestion.
		Recognize the goal of the NTIMC.
		Restate the main NUG objectives.
Statistics, terminology, and standards	Enumerate the statistical impacts that line-of-duty deaths and near misses have on incident responders and recognize the common strategies and terminology that can aid in quick clearance.	Know and understand incident statistics.
		Restate national incident management system–compliant core industry terminology used during incident response.
		Recall the terminology used to describe roadways.
		Identify the principles discussed in the *Manual of Uniform Traffic Control Devices* (MUTCD).
		Arrange the phases of incident response or duties in chronological order as taught in the course.
Notification and response	Describe the necessary notification and response actions required during incident response.	List the sequence of events that occur up to the point when responders first arrive at the incident scene.
		Recognize the importance of the role that dispatchers or traffic control center operators play in the notification process.
		Recall when it is appropriate to use emergency lighting.
Arrival	Recall the appropriate arrival safety procedures and communication protocols.	Restate the correct approach methods when arriving at a scene, including the use of emergency lighting and safely parking the responder vehicle.
		Summarize communications that may occur during the arrival phase of incident response.
		Differentiate between move-it and work-it incidents.
		Restate how to achieve vehicle positioning that complies with MUTCD standards.
		Identify the characteristics of the three classes of American National Standards Institute (ANSI) Standard 107 highway safety vests.
Initial size-up	Outline the key points of a thorough and safe initial size-up.	Enumerate the ways in which responders can retain situational awareness when exiting their vehicles and approaching the incident.
		Describe the core factors to review when performing an initial size-up of the scene.
		Recall the importance of determining if hazmat responder involvement is required.
Command responsibilities	Summarize how to use the incident command system to establish an organized incident scene with effective scene communications.	Recall the importance of establishing and participating in the incident command system.
		Summarize the importance of prioritizing incident objectives.
		Discuss how to plan for physical organization of the scene and describe the need for diversion routes or staging areas.
		Describe how to develop a plan for safe, quick clearance.
		Describe how to designate the staging area location for additional resources or responders, or both.
		Discuss the communications that should occur with command, public information officer, and dispatch regarding the staging area; additional services; contact with trucking companies; incident updates and revised duration; traffic control devices; and lane closings and openings.
		Recount when to proceed to the staging area.

(continued on next page)

Table 2.2. Incident Responder Terminal and Enabling Learning Objectives by Lesson (continued)

Lesson Title	Terminal Learning Objective	Enabling Learning Objectives
Safety, patient care, and investigation	Recount the key safety-related tasks for law enforcement, fire and rescue, EMS, DOT, and towing and recovery as they pertain to general safety, fire prevention or suppression, patient care, and crash scene investigation.	List the types of high-visibility markings on responder vehicles.
		Recount best practices for working with hazmat and nonhazmat spills at an incident scene.
		Identify the concerns of responding to an incident that involves vehicular fire.
		List the concerns of responding to incidents involving hybrid vehicles.
		Restate responsibilities of responders not involved in extrication while extrication tasks are being performed.
		Summarize how to ensure appropriate patient care, including the correct procedures for handling medical supplies.
		Describe how to approach an incident that has the potential of an injured motorist.
		Recall the differences between ensuring appropriate care for ambulatory versus nonambulatory patients.
		Restate the protocols that should be followed before and during a medical helicopter on-scene arrival.
		Identify the primary investigation goal at an accident scene.
Traffic management	Recount the equipment, procedures, and communications for safe, effective TIM.	Describe the proper use and monitoring of traffic control devices at an incident scene.
		Recognize the components of traffic control zones during an incident.
		Recognize circumstances at an incident scene that would require the advanced warning area to be extended.
		List best practices of light management on scene arrival and during the course of the incident.
		Recall the traffic management elements that need to be communicated and monitored during an incident.
Clearance	Identify the best clearance practices during incident response.	List the principles of the laws that relate to quick clearance.
		Identify the procedures for removing cargo and cleaning up spilled liquid or debris from the accident scene.
		Describe the best practices for ensuring that the appropriate towing vehicle for the damaged vehicle is dispatched.
		Recount the necessary communications for a successful scene clearance egress and wrap-up.
Termination	State the termination procedures that ensure the scene returns to preincident conditions in the time frame appropriate for the incident type.	Name the cleanup procedures necessary for proper scene termination.
		Explain the procedure for reopening traffic lanes.
		Summarize the procedure for communicating traffic restoration.
		Restate the procedures involved in safe and timely incident egress.

(continued on next page)

Table 2.2. Incident Responder Terminal and Enabling Learning Objectives by Lesson (continued)

Lesson Title	Terminal Learning Objective	Enabling Learning Objectives
Hands-on activity	Demonstrate an ability to appropriately clear all given incident types in the provided set of scenarios.	Demonstrate comprehension of appropriate responder actions for a noncrash incident with debris or a disabled vehicle, specifically, tasks related to traffic management and having the vehicle(s) towed for a freeway, ramp, service road, high-occupancy vehicle (HOV) lane, city intersection, and rural road scenario.
		Demonstrate comprehension of appropriate responder actions for an incident involving a noninjury crash with a fuel or liquid spill, specifically, tasks related to having the vehicle(s) towed and cleaning up the debris or liquid for a freeway, ramp, service road, HOV lane, city intersection, and rural road scenario.
		Demonstrate comprehension of appropriate responder actions for an incident involving an injury crash, specifically, positioning responder vehicles to provide a protected area for patient care, ambulance egress, and anticipating the need for a medical helicopter for a freeway, ramp, service road, HOV lane, city intersection, and rural road scenario.
		Demonstrate the use of responder vehicles and the roadway in the appropriate setup for a commercial vehicle cargo spill, including making provisions for hazmat response participation and removing debris for a freeway, ramp, service road, HOV lane, city intersection, and rural road scenario.
Situational awareness	Visualize reinforcement of selected competencies involved in incident response, arrival, initial size-up, and traffic management to increase responder situational awareness.	Paraphrase the correct method for placing a responder vehicle in a blocking position.
		Summarize the correct step-by-step procedures for emergency vehicle drivers and passengers when exiting a responder vehicle at an incident scene.
		Describe the correct procedure for correct placement of traffic control devices such as cones, flares, and deployable signs.

Table 2.3. Train-the-Trainer Terminal and Enabling Learning Objectives by Lesson

Lesson Title	Terminal Learning Objective	Enabling Learning Objectives
Legal guidelines and considerations	Identify and locate the legal guidelines and considerations that pertain to TIM.	Identify major national and international organizations that directly affect the laws, standards, and policies first responders must adhere to in the line of duty.
		Recall the importance of being up to date on responder statistics and case studies.
		Recount how real-life incidents affect laws and how responders view their actions at an incident scene.
Best practices and real-world scenarios	Recall how to locate and identify TIM resources and best practices and utilize real-world scenarios.	Locate and explain documented incident best practices.
		Locate relevant resources to aid in keeping the course up to date.
		Summarize the teaching points in the real-world scenarios presented.
Hands-on activity setup	Demonstrate the ability to set up and administer the hands-on tabletop activities.	Assemble each of the tabletop setups for the identified incidents.
		Arrange incident instructions for the appropriate incident types.
		Formulate answers to common student questions.
		Evaluate the exercise solutions developed by the student teams.
Situational awareness activity setup	Recount how to conduct the situational awareness activity.	Restate the best practices for exiting a vehicle at an incident scene.
		Restate the best practices for traffic cone placement at an incident scene.
Course logistics and orientation	Restate the logistical details that need to be addressed when conducting the course.	Restate tasks that need to be performed before the training to secure and set up the training classroom.
		Describe the supporting materials required to conduct the training.
		Locate the list of props and resources necessary to conduct the training.

(continued from page 7)
responder training segment with 12 lessons; the train-the-trainer segment covers five lessons in 3 hours.

Instructional Methods

The TIM course was designed to facilitate learning by getting students involved and helping them assume responsibility for their own learning. Competencies are divided into manageable, modular lessons and learning objectives, and expected outcomes are clearly laid out for students. To underscore the multidisciplinary nature of this course, it was decided that instructors from two different responder disciplines should deliver it. This approach delivered the subliminal message that regardless of discipline, responders must work together as a team. More importantly, it adds credibility to the content being taught because it shows that the principles and best practices addressed in the training relate to all responders, not just one particular discipline.

The course begins with an icebreaker during which students introduce themselves and identify from a precreated list their biggest complaint about what they see at incident scenes. This exercise not only acts as an icebreaker to make students feel more comfortable, but it also piques their attention because it is immediately apparent that the course contains content that is relevant to their real-life roles and the tasks they perform on a daily basis. Throughout the course, different techniques and presentation methods are used to convey the content being taught. The course is designed to encourage a high level of participation among students. Strategies used include real-life scenarios, case studies, small- and large-group activities, questioning techniques, solicitation of ideas, brainstorming, and hands-on activities. Using such varied instructional techniques serves multiple purposes. First, it places students on the scene and encourages them to be active participants in their own learning. Second, these activities enable the instructor to impart cognitive (knowledge), psychomotor (skills), and affective (attitude) concepts. For example, analysis of a best-practice case study demonstrates to students, step by step, how traffic cones should be placed at an incident scene (cognitive); the outside demonstration segment enables students to practice placing the cones using these methods (psychomotor); and attitude changes are influenced not only by the validity of the case study but also by the instructor's explanation of why this is the best practice and the advantages it confers (affective). Peer acceptance of the concept from the student group also influences affective changes.

The third advantage of using a variety of instructional methods takes into account that people learn in different ways. Studies in neurolinguistic programming have found that learning centers around three areas: visual, auditory, and kinesthetic. Individuals vary in their orientation toward each category, meaning that some individuals use only one method, and some use a combination of two or three. Visual learners need to see something to know it, so their preference is for diagrams, pictures, and other visuals. Auditory learners need to hear something to know it, so they prefer to have verbal instruction and may struggle if information is only provided visually. Kinesthetic learners must do something to know it, so they prefer hands-on types of activities and learn best when involved in an activity. A well-designed course caters to all of these needs by providing a variety of instructional strategies so that all types of learning preferences are engaged. The TIM course combines a rich multimedia presentation, including photographs from actual incident scenes, diagrams that depict incidents, video footage, and textual definitions that an instructor uses to underscore learning points when reviewing each lesson. An example of such a presentation is shown in Figure 2.2.

The incident responder portion of the training culminates in two practical, hands-on exercises: the situational awareness lesson and the tabletop hands-on incident scene activity. The situational awareness lesson enables students to see what maintaining situational awareness looks like when practiced on the job. Model responder vehicles from different disciplines are used, and students participate in strategies that can be used when parking and exiting vehicles and setting up traffic control devices. Figure 2.3 shows an example of part of the situational awareness lesson in which an instructor, with the assistance of a volunteer, walks students step-by-step through best practices when exiting a response vehicle at an incident scene. The topic is covered in the lecture portion of the course, but the demonstration provides students with an opportunity to see what this looks like when practiced on the job and to understand what they need to do to achieve this result.

During the hands-on tabletop activity, students role play and apply what they have learned to practice and demonstrate competency in the content. Using a variety of incident scenes—city surface street, rural road, limited-access highway, HOV lane, and an overpass ramp—the participants simulate incidents using model vehicles. Students then work together in multidisciplinary groups to clear the incident using the principles learned in the course. Figure 2.4 shows students from one of the pilot courses working through a tabletop activity. In the first several exercises, students assume roles different from their real-life profession. This exercise is usually very uncomfortable for students at first. Only after playing a range of other incident responder roles are the students finally permitted to role play their real-life roles.

The research team observed that students see their own roles differently after the experience of playing other roles. They are much more sensitive to the interdependencies

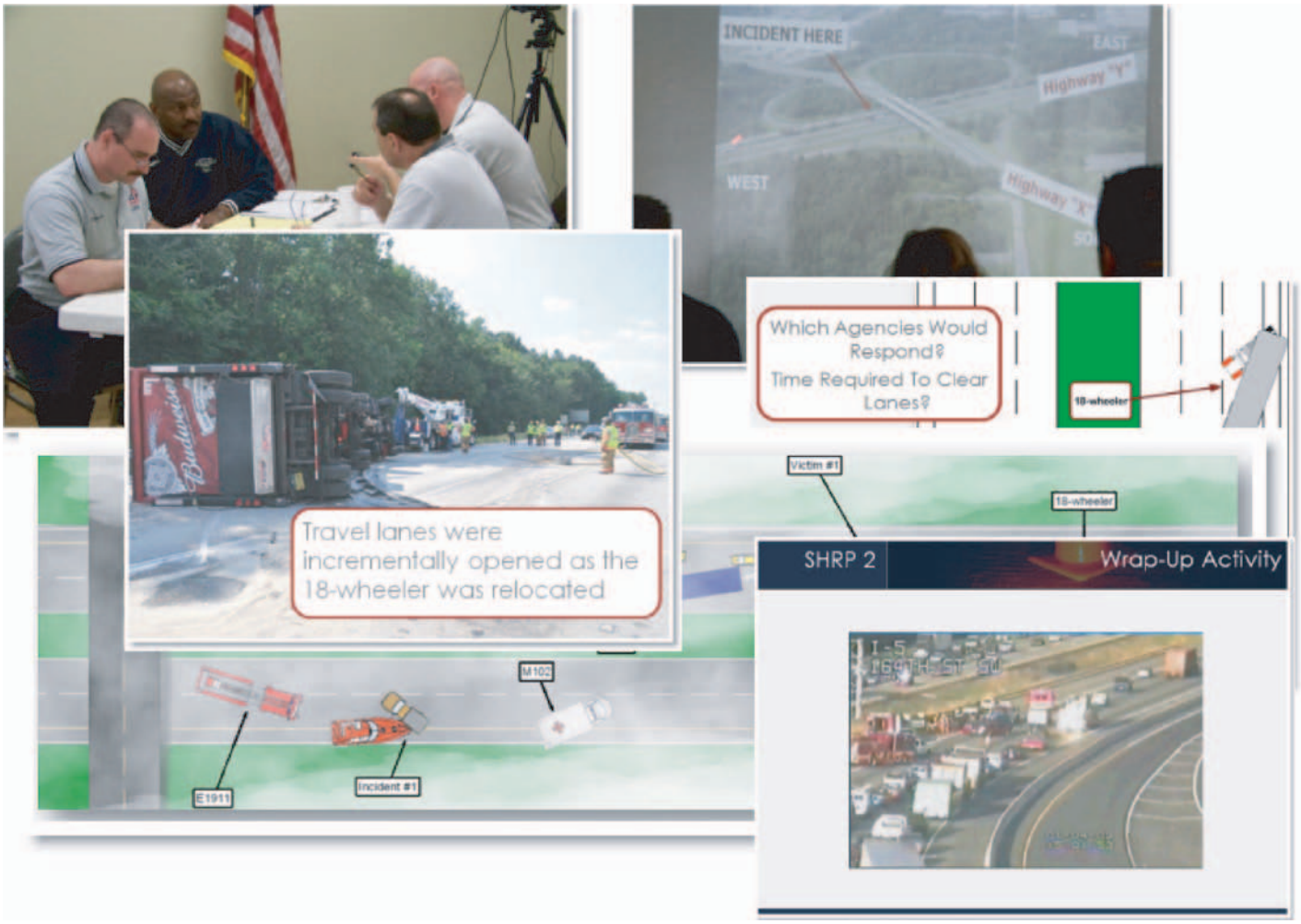

Figure 2.2. Samples of instructional materials and activities contained in the incident responder course.

between their roles and those of others in the context of the shared goals embodied in the NUG—responder safety; safe, quick clearance; and prompt, reliable, interoperable communications. Through interaction in the exercises, students gain a dramatically different and improved understanding of each other's roles, priorities, and concerns in incident response. They gain visibility into what others are thinking and doing during incident response, thus leading to affective changes in behavior. The activity also effectively ties together the knowledge garnered from the course and allows direct application of these skills in a safe environment that mirrors an incident scene.

Figures 2.2 through 2.4 show the pilot delivery of the course in Georgia and Indiana.

Course Materials

As part of the course development process, a full suite of classroom instructional materials was created for both instructors and students. Having such a suite available was deemed critical to ensure consistent delivery of core training content. When a course is intended to be delivered by multiple instructors in multiple locations, this approach ensures that all instructors can follow a cohesive course outline and that students receive a consistent course delivery and set of training materials, regardless of where they receive the training. Table 2.4 shows course materials by instructor, student, and classroom.

Instructor Materials

- Classroom roster. This tool enables the instructor to track classroom attendance easily.
- Instructor guide. This guide is designed to assist the instructor in setting up the classroom and provide practical tips to make the learning process more engaging. It includes the course lessons and exercises with step-by-step instructions that enable the instructor to deliver the material appropriately. It also includes answer keys for all classroom activities to ensure consistency of delivery across all training sites. A place for instructor notes is included. The guide is designed

Figure 2.3. Field demonstration of exiting a response vehicle at an incident scene.

to be produced in an 8.5 × 11-in. spiral-bound booklet or on a CD.

- Student PowerPoint presentation. This presentation is designed to aid, enhance, and guide the instructor's presentation to the classroom. It focuses the students on the key objectives of the training by using a combination of text, video, and graphic elements, such as images, charts, and diagrams. The presentation is designed in Microsoft PowerPoint 2007 with associated video files and could be distributed on a CD.
- Train-the-trainer instructor guide. This guide is designed to assist the instructor in setting up the classroom and provides practical tips to make the learning process more engaging. It includes the course lessons, with step-by-step instructions, to enable the instructor to deliver the material appropriately. It also includes answer keys for all classroom activities to ensure consistency of delivery across all training sites. A place for instructor notes is included. The guide is designed to be produced in an 8.5 × 11-in. spiral-bound booklet or on a CD.
- Train-the-trainer PowerPoint presentation. This presentation is designed to aid, enhance, and guide the instructor's presentation to the classroom. It focuses the students on the key objectives of the training by using a combination of text, video, and graphic elements, such as images, charts, and diagrams. The presentation is designed in Microsoft PowerPoint 2007 with associated video files and could be distributed on a CD.

Figure 2.4. Hands-on tabletop activity.

Table 2.4. Course Materials

Instructor	Student	Classroom
Classroom roster	Student workbook	Tabletop roadways
Instructor guide	Train-the-trainer student workbook	Staging pads
Student PowerPoint	Assessment	Best-practice sheets
Train-the-trainer instructor guide	Evaluation	Model vehicles
Train-the-trainer PowerPoint		Classroom poster
Assessment answer key		

- Assessment answer key. This aid includes the answers to the student assessment questions and is used to grade student performance.

Student Materials

- Student workbook. This workbook contains all the student-related lesson content, including exercises, case studies, and scenarios. It also contains a full bibliography of reference materials used in the creation of the content, as well as copies of peripheral third-party items, such as brochures and reference cards. The guide is designed to be produced in an 8.5 × 11-in. spiral-bound booklet or on a CD. A place for student notes is included.
- Train-the-trainer student workbook. This workbook contains all the student-related lesson content, including exercises, case studies, and scenarios. It also contains a full bibliography of reference materials used in the creation of the content, as well as copies of peripheral third-party items, such as brochures and reference cards. The guide is designed to be produced in an 8.5 × 11-in. spiral-bound booklet or on a CD. A place for student notes is included.
- Assessment. This aid is a Kirkpatrick Level 2 (learning) assessment consisting of a bank of questions that tie directly into the course objectives and measure learner knowledge at the end of instruction (*8*).
- Evaluation. This aid is a Kirkpatrick Level 1 (reaction) evaluation that students complete at the end of the course. It measures how the learner feels about or reacts to the training (*8*).

Classroom Materials

- Tabletop roadway scenes. These aids consist of five roadway scenes—city surface street, rural road, limited-access highway, HOV lanes, and an overpass ramp—used to create the incident scenes during the hands-on tabletop activity.
- Staging pads. These aids are used as a holding area for responder model vehicles during the hands-on tabletop activity.
- Model vehicles. These aids, often Matchbox cars, represent civilian and responder vehicles and are used to simulate accidents and response steps during the hands-on tabletop activity.
- Best-practice sheets. These sheets contain best-practice tips to assist students when clearing incidents during the hands-on tabletop activity.
- Classroom poster. This is a visual aid used in the classroom that helps provide a reference point for students regarding where they are in the course and how that stage relates to the response phases.

Pilot Course Deliveries

A key component of the project was to conduct pilot deliveries of course materials to traffic incident responders in two locations. In identifying candidate locations, a determination was made that the pilot deliveries address three key objectives:

- The effectiveness of course materials should be tested on a relatively new audience from a location that has an emerging multidisciplinary TIM program. The focus of this pilot delivery was to assess the extent to which the training enhanced traffic incident responder capabilities and enabled the responder to complete the end-of-course test successfully, thus meeting the criteria for certification.
- The course materials should be vetted among responders in a location with a well-established multidisciplinary TIM program. The focus of this pilot delivery was to assess the technical accuracy and completeness of the course materials and to identify particular aspects of TIM operations that were not adequately addressed in the course.
- Both pilot deliveries should test the effectiveness of the train-the-trainer component of the course.

Locations in Indianapolis, Indiana, and Atlanta, Georgia, were identified as ideal candidates for hosting the course pilots. In 2007, with support from FHWA, Indiana established the Quick Clearance Working Group with representatives from

Table 2.5. Number of Pilot Course Attendees by Discipline

Discipline Represented	Indiana Pilot Course	Georgia Pilot Course	Total
Law enforcement	7	8	15
Fire and EMS	15	4	19
Towing and recovery	2	5	7
Hazmat and environment	4	1	5
Notification and dispatch	1	3	4
DOT	11	8	19
Coroner's office	1	0	1
Other	0	7	7
Total participants	41	36	77

the Indiana DOT and the Indiana State Police. The working group was reconfigured as the Indiana Traffic Incident Management Effort (In TIME) in January 2009 and established as a statewide TIM organization. The state's strong commitment to improving TIM and the fact that In TIME is a relatively new organization made Indiana an excellent candidate for the delivery of the emerging multidisciplinary TIM program pilot course.

The inclusion of Atlanta was based on its extensive experience with multidisciplinary TIM programs. It currently has a TIM Enhancement Task Force, a public–private, multiagency organization. The task force is designed to improve regionwide incident management and interagency coordination and includes representatives from state, county, and municipal governments; FHWA; and the private sector (Georgia Motor Trucking Association, Towing and Recovery Association of Georgia, and traffic engineering and transportation consulting firms). In addition, the Georgia DOT operates Highway Emergency Response Operators in the Atlanta region. This program, which is a nationally recognized safety service patrol, responds to between 55,000 and 60,000 incidents and calls annually. It is primarily responsible for reducing traffic congestion and delays, as well as providing support to law enforcement, first responders, and other emergency agencies during incident response activities. Both locations agreed to participate in the pilot deliveries of the training course. The first pilot training was delivered in Indianapolis from March 30 to April 1, 2010, and the second pilot training was delivered in Atlanta from May 11 to 13, 2010. Table 2.5 summarizes the number of attendees from each discipline at each location.

CHAPTER 3

Findings and Applications

Assessment of Training Effectiveness

An assessment of training effectiveness was performed using the Kirkpatrick four-level model of training evaluation, the training industry standard for evaluating training program effectiveness (*8*). An overview of the model and the four levels of assessment are presented in Table 3.1. For the purposes of the SHRP 2 L12 project, Levels 1 and 2 were the only levels that could be assessed effectively.

At the end of each pilot course, participants were asked to complete a course evaluation form. The data compiled from these evaluation forms were used to analyze the Level 1 (reaction) data, which assesses how the participants felt about the training experience. Analysis consisted of identifying any trend data that indicated areas in which most participants (80% or more) had issues with critical items.

Table 3.2 provides the combined Level 1 responses (reaction) from both pilots. The data are based on 33 respondents from the first pilot and 17 respondents from the second pilot who completed the Level 1 evaluation forms. The overall Level 1 evaluation indicates that the students reacted positively to the instructional program. Results from the evaluation analysis were addressed between the pilots, as the data demonstrate, as well as after the pilots.

At the end of each pilot course, participants were asked to complete a test to determine their level of understanding of course materials. The data were analyzed in several ways: the overall score obtained by each student, student performance on individual questions (to determine the clarity, reliability, and validity of questions), and how scores compared across disciplines. Initially, the results of the test were used to assess participants' Kirkpatrick Level 2 (learning) understanding of course materials and increases in knowledge and capabilities based on completion of the course. The research team then analyzed the total participant results on each test item. This analysis assessed their increase in knowledge and ability related to multidisciplinary TIM programs. Test item analysis was performed to determine the root cause for any statistically significant failure of the group against specific test items. This test item analysis provided a qualitative assessment of test item and instructional issues.

When test items or instructional changes were made between pilots, those test items driving the change were eliminated from pilot-to-pilot comparisons. The third set of data analyzed was the assessment results (Level 2). Assessment results are organized by incident responder types. The mean, median, and mode score for each group was determined along with the range of results. A standard deviation was derived for each grouping (cluster) to determine if there was a statistical significance in deviation from the scores. Cross-comparisons would have been provided to identify any deficiencies in instruction for specific participant groups if such a result were identified, which it was not.

Table 3.3 provides the analysis of the total group and the individual groups of participants for the Georgia pilot course delivery.

Five participants' results are included in the total group but are not evaluated as a specific role-based group because they attended the pilot as evaluators. One other candidate was discounted because the name on the assessment did not match any name on the class roster; therefore, the candidate's discipline could not be identified. The results, in aggregate, were within an expected or normal (bell) distribution—that is, the students' test results were within planned parameters. No group deviated significantly from the total group in terms of results, indicating that the instruction worked satisfactorily regardless of an individual's job role as measured by the Kirkpatrick Level 2 testing. Participants were expected to achieve a score of at least 80 out of 100 to receive a certificate establishing successful completion of the course. The data indicate that no changes to the instruction or testing are required to accomplish the learning objectives adequately.

Table 3.1. Kirkpatrick Four-Level Model of Training Evaluation

Level	Evaluation Type (What Is Measured)	Evaluation Description and Characteristics	Examples of Evaluation Tools and Methods
1	Reaction	Reaction evaluation is how the learner felt about the training; it is a form of customer satisfaction.	Smile sheets, feedback forms, verbal reaction, post-training surveys, or questionnaires.
2	Learning	Learning evaluation is the measurement of the increase in the learner's knowledge and skill and the change in attitude from the beginning to the end of instruction.	Assessments or tests.
3	Behavior	Behavior evaluation is the extent of applied learning and level of implementation when the learner is back on the job.	Observation and interviews over time are required to assess change, relevance of change, and sustainability of change.
4	Results	Results measure the effect of the learning that the learner acquires on business measures.	Measures are already in place via normal management systems and reporting—the challenge is to relate them to the trainee.

Table 3.2. Combined Level 1 Reactions

Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Scheduling					
Date and timing of training fit my schedule.	28%	62%	8%	0%	0%
Trainer					
The instructors clearly explained the goals and objectives of the training.	46%	54%	0%	0%	0%
The instructors clearly conveyed the material to the audience.	54%	44%	0%	2%	0%
The instructors' knowledge of the subject material was satisfactory.	85.71%	14.29%	0%	0%	0%
The instructors' pace of presenting the material was appropriate.	42%	46%	10%	2%	0%
The instructors satisfactorily answered participants' questions.	64%	34%	2%	0%	0%
The instructors satisfactorily used training aids to help facilitate a clearer understanding of the topic.	64%	34%	0%	0%	2%
The written material provided helped me understand the content of the training.	34%	28%	30%	8%	0%
Overall Training					
The content of this training course was valuable to me in developing my understanding of this subject matter.	62%	38%	0%	0%	0%
The content of this training appropriately built on my existing knowledge of this subject matter.	60%	38%	2%	0%	0%
I am satisfied that the learning objectives for this training were met.	48%	52%	0%	0%	0%
The duration of the training was sufficient for learning the subject matter.	40.43%	42.55%	17.02%	0%	0%
Based on the training I received, I am able to explain the subject matter to others that may need future assistance on this topic.	36%	56%	6%	2%	0%
I am likely to request or attend additional training on this topic in the future.	50%	30%	14%	6%	0%
I would recommend this training to others.	70%	30%	0%	0%	0%
The training environment was comfortable/appropriate for the class.	72%	22%	4%	2%	0%
Time-Saving Measures					
	>10 hours	**6–10 hours**	**3–5 hours**	**1–2 hours**	**0 hours**
Estimate the time this training may save you on researching information.	31.91%	25.53%	31.91%	10.64%	0%

Table 3.3. Analysis of Certification Test Results: Georgia Pilot Course Delivery

	Total Group	Law Enforcement	Fire and Rescue	Towing	Hazmat	Notification and Dispatch	DOT
No. of students	31	6	4	5	1	3	6
Mean	86%	89%	88%	87%	94%	85%	83%
Median	87%	89%	89%	87%	94%	85%	83%
Mode	90%	88%	90%	90%	94%	NA	NA
Range	19	6	6	14	0	3	13
Standard deviation	0.050403	0.020619	0.028570	0.055967	0.000000	0.015430	0.053226

Course Length

The training course was originally proposed as a 1-day course with 8 hours of class time and an additional 4 hours for the train-the-trainer component. However, when the research team gathered the core competencies and began the curriculum design process, it became apparent that this time was insufficient to cover all content adequately. During the pilot course deliveries, the time to deliver each lesson was recorded and analyzed to determine the amount of time required for the successful completion of each lesson. The results of these analyses are shown in Table 3.4.

According to standard classroom practice, students should be allowed a 10-minute break for every 50 minutes of instruction, meaning that 15.5 hours should be allocated to ensure adequate time to deliver the incident responder portion of the training with an additional 3 hours allocated to the train-the-trainer portion.

Table 3.4. Analysis of Lesson Durations

	No. of Minutes			
Lesson	Pilot 1	Pilot 2	Recommended	Comments
Incident responder				
Lesson 0: Course introduction	140	70	60	After the first pilot, a decision was made to move the terminology and statistics component to another lesson to improve the clarity of the message. Additional evaluator introductions and comments were included in the timing of this lesson during the second pilot, which would not routinely occur.
Lesson 1: Statistics, terminology, and standards	NA	80	80	This lesson now exists as a stand-alone lesson.
Lesson 2: Notification and response	20	40	40	The team decided to use additional examples in this lesson to underscore teaching points and focus more on the role of dispatch (traffic operations center and traffic management center), which increased the time requirement for this lesson.
Lesson 3: Arrival	70	75	75	The timing of this lesson remained consistent during both pilots.
Lesson 4: Initial size-up	30	30	30	The timing of this lesson remained consistent during both pilots.
Lesson 5: Command responsibilities	20	45	60	Recommendations from the first pilot and the working group suggested expanding this section to include more detail and examples. However, during the second pilot, time constraints meant that not all the material could be covered.

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Table 3.4. Analysis of Lesson Durations (continued)

Lesson	No. of Minutes			Comments
	Pilot 1	Pilot 2	Recommended	
Incident responder				
Lesson 6: Safety, patient care, and investigation	90	80	90	During the second pilot, time constraints meant that not all the material could be covered.
Lesson 7: Traffic management	110	80	120	During the second pilot, time constraints meant that approximately one-third of the material and activities in this lesson could not be covered.
Lesson 8: Clearance	30	60	60	Recommendations from the first pilot and the working group suggested expanding this section to include more examples as well as more detail on quick clearance laws.
Lesson 9: Termination	3	2	30	Time constraints meant that the team was unable to test this lesson during either pilot.
Lesson 10: Tabletop	60	75	90	Recommendations from the first pilot and the working group suggested including a two-dimensional walkthrough before moving to the tables for the hands-on portion. During the second pilot, time constraints meant that student groups were only able to rotate through two scenarios.
Lesson 11: Situational awareness	20	30	45	A detailed demonstration of cone placement was added to this lesson after the first pilot. This change increased the lesson duration but allowed it to engage participants and be adequately staged.
Train the trainer				
Assessment	60	90	60	Additional assessment questions were tested during the second pilot, which added to the duration of this component. Because future participants will complete only a randomized selection of test questions, 60 minutes will be adequate for assessment.
Adult learning theory	60	NA	NA	A decision was made to drop this lesson after the first pilot because it was determined that potential instructors should have acquired this knowledge through training and experience as instructors at their respective agencies.
Legal guidelines and considerations	60	60	60	The timing of this lesson remained consistent during both pilots.
Resources, best practices, and real-world scenarios	35	35	60	Additional content and resources were added as a result of the second pilot.
Hands-on activity setup	NA	15	15	The need for this lesson was identified during the first pilot.
Situational awareness setup	NA	NA	15	The need for this lesson was identified during the second pilot.
Course logistics and orientation	NA	NA	30	The need for this lesson was identified during the second pilot.

NA = Not applicable.

Modular Design

To make the training more readily accessible to participants, the lessons were designed as self-contained modules. This modular construction enables the training to be administered over several consecutive days, weeks, or months, depending on the needs of the intended recipients or trainers, and making the content accessible to, for example, volunteer firefighters, who may not be able to attend a full 2-day session. Examples of modular delivery options could include the following:

- Brief (e.g., 15-minute) segments in daily roll call training delivered to patrol officers during briefing sessions at shift change;
- Fire department weekly safety meetings; and
- Integration with existing training programs (see section in Chapter 4 on online training).

The course includes curriculum materials that could be exported to other delivery platforms, such as the Transportation Operations Academy offered by the Center for Advanced Transportation Technology at the University of Maryland, the I-95 Corridor Coalition's 3-D interactive training program, or the initial in-service training offered by law enforcement or fire academies.

The research team recommends facilitated feedback sessions with national and regional stakeholder organizations (e.g., the International Association of Chiefs of Police, the National Fire Protection Association, the Towing and Recovery Association of America, the National Emergency Management Association, and the American Association of State Highway and Transportation Officials) be convened at upcoming conferences to explore the attractiveness, feasibility, and ideal environments for modular delivery of the training.

Multidisciplinary Training

Each of the pilot training courses was delivered by a multidisciplinary training team that combined practical TIM experience with extensive training experience. This model proved highly effective:

- The training team's practical experience established credibility with the course participants. Participants viewed the trainers as having real-world experience, which in turn helped establish the credibility of the course materials.
- The training team represented fire and rescue and law enforcement. This dual representation helped establish credibility with the course participants and also encouraged more student participation. The trainers discussed their respective disciplines' views on TIM, which encouraged the representatives of stakeholder groups to share their own experiences.
- The instructors' previous training experience ensured that the training team understood how to deliver training using the multiple instructional methods included in the course.

During the pilots, a deliberate effort was made to ensure that the class consisted of a balanced mix of participants from the primary incident response roles at a typical incident scene. In many cases, this was the first time any of the students had sat down with members of other disciplines. Throughout the training, participation in instructional activities allowed students to gain unique perspectives and understanding of the roles that responders from other disciplines play. Because this training was conducted on a regional level, responders also had an opportunity to build relationships; this opportunity is valuable because some of the attending responders are likely to respond to the same incidents.

CHAPTER 4

Conclusions and Suggested Research

Conclusions

The outcome of this research project has been the creation of a comprehensive multidisciplinary curriculum developed with the input of responders from the targeted audiences. Additionally, a diverse group of evaluators considered to be TIM leaders extensively reviewed the curriculum. Participants received the training program well and viewed it as beneficial. Their positive response is demonstrated by the Kirkpatrick Level 1 and 2 evaluation results discussed in the section on assessment of training effectiveness in Chapter 3. The curriculum represents what the team considers to be the gold standard encompassing all the topics and strategies that, if successfully transferred into everyday work practices, would help achieve reliability goals while also increasing the safety of both the general public and on-scene responders.

One of the critical factors in ensuring the successful nationwide implementation of this course is ensuring that potential instructors are adequately prepared to teach the course. To help facilitate this preparation, detailed speaker notes have been added to the course's instructor guide and a train-the-trainer component has been developed. However, although the train-the-trainer component was delivered during the pilots, actual instructor delivery of the course by trainers who were not involved in the development of the materials has not yet been tested. Therefore, to validate the transferability of the course, the research team recommends that the train-the-trainer curriculum also be validated through targeted pilot testing. Candidate instructors would be required to demonstrate subject matter and curriculum competency as well as classroom management and facilitation skills to a specific standard. Competency criteria for both a master instructor and a qualified instructor could be developed. To develop these criteria, the research team recommends, as outlined in the section on additional pilot course deliveries, that a series of 10 pilots be conducted. These pilots would be divided into three phases:

- During Phase I, content not previously tested in a classroom (i.e., changes made in response to the final pilot of the SHRP 2 L12 effort) could be field tested and validated. During this phase, a sample of potential instructors would be selected and trained in the content to act as instructors of the program for Phase II.
- Phase II of the pilot series would consist of having the potential instructors conduct the training sessions with different methods used to facilitate their transition to proficiency in teaching this course (as outlined in Table 4.1) and using a standardized evaluation tool against which proficiency would be measured.
- During Phase III, any changes that resulted from lessons learned in Phase II would be incorporated, and a final pilot would be held to validate any changes.

Although the level of detail covered in the curriculum is necessarily robust and thorough, it may be difficult for some agencies to send their responders for a full 2-day course. Therefore, the research team recommends exploring other options for delivery, such as those discussed below in the sections on online and discipline-specific training.

Although the research team agrees that for this subject matter face-to-face training is preferable to achieve optimal learning outcomes, offering online options could open up the content to a wider audience. Of the online options suggested below, the team believes that creating prerequisite modules that could be completed by students before they attend the classroom portion would be the most beneficial. A combination of online and classroom learning would shorten classroom time while retaining the unique benefits of face-to-face, multidisciplinary training. Additionally, it would retain the integrity of the curriculum, allowing all

Table 4.1. Field Test Actions and Objectives

Field Test	Actions and Objectives
Phase I	
Field Test 1	• Content should be refined because many modifications were made after the final research field test and evaluator debriefing. • Lesson times should be validated because several lessons had to be abbreviated during the initial field tests. • Tasks specific to train the trainer, such as teach-backs, setup and implementation of hands-on tabletop, and situational awareness lessons, should be refined and expanded with selected students from the group.
Field Test 2	• Remediation of all content and timing issues should be verified. • Remediation of any train-the-trainer issues identified in the first field test should be validated.
Field Test 3	• This would be the first field test for which all content is considered golden. • Candidates who have been identified as potential instructors should be trained. This group would consist of four to six people from a variety of disciplines who have prior instructor experience in their discipline.
Phase II	
Field Test 4	• The value of mentoring could be tested by pairing the master instructor with one of the novice instructors and having them teach the class together. • The session should conclude with a debriefing and lessons-learned session for the novice instructor. • The novice instructor should be evaluated against a structured and controlled model.
Field Test 5	• Two novice instructors are primarily responsible for delivering the class, with observation and assistance, as necessary, of a master instructor. • Because they have fewer primary teaching responsibilities, the master instructors would be able to better observe classroom interactions and help coach and mentor novice instructors, as necessary. • The session should conclude with a debriefing and lessons-learned session for the novice instructors. • Novice instructors should be evaluated against a structured and controlled model.
Field Test 6	• Novice instructors would lead this class alone without the presence of the master instructor. This field test would test the transferability of the course without the mentoring option. • The session should conclude with a debriefing and lessons-learned session for the novice instructors. • Novice instructors should be evaluated against a structured and controlled model.
Field Test 7	• The value of mentoring could be tested by pairing the master instructor with one of the novice instructors and having them teach the class together. • The session should conclude with a debriefing and lessons-learned session for the novice instructor. • The novice instructor should be evaluated against a structured and controlled model.
Field Test 8	• Novice instructors would lead this class alone. This field test would test the transferability of the course with instructors who had the benefit of previously working with a master instructor for their first class. • The session should conclude with a debriefing and lessons-learned session for the novice instructors. • Novice instructors should be evaluated against a structured and controlled model.
Field Test 9	• Novice instructors would lead this class alone without the presence of the master instructor. In the week before delivery, these instructors would have a virtual meeting with a master instructor to review instructional materials and obtain clarification on any pertinent issues. This field test would test the transferability of the course with limited mentoring. • The session should conclude with a debriefing and lessons-learned session for the novice instructors. • Novice instructors should be evaluated against a structured and controlled model.
Phase III	
Field Test 10	• In this final field test, lessons learned and content refinements should be implemented before the field test and validated during the delivery.

content to be retained rather than cutting material to fit an allotted time period. Typical compression ratios when converting classroom training into online training are approximately 50%, meaning that for every hour of classroom training, an equivalent amount of training could be taken online in 30 minutes. A full content analysis would be necessary to determine which portions of the content would be most suitable for conversion to an online format, but the research team believes that such an option would allow the classroom portion to be reduced to a 1-day class with 3 to 4 hours completed online before arrival in the classroom.

Similarly, the research team recommends that discipline-specific training should be considered for further research. Although discipline-specific training may not promote the appreciation and understanding of other responders' TIM roles that is fostered by multidisciplinary training, it may be advantageous for many disciplines to insert excerpts from the course into their existing training or incorporate them into

already established routines. The course has been designed in separate lessons to facilitate delivery in a modular fashion, although refinement of message and delivery format would likely have to be made for successful delivery of a lesson to a single discipline (or in a format that matched the requirements of many disciplines). The research team does not consider this option to be optimal as a replacement for a multidisciplinary course, but it could serve to augment the reach and reinforce the message of the course by having the subject addressed at the discipline level.

As described in Chapter 3 in the section on assessing training effectiveness, the formative evaluations show that students have a positive reaction to the course and that they are able to demonstrate proficiency in the content. What is not yet known is whether students are transferring the knowledge gained back to their jobs and, if so, to what extent. The impact that this training may have on improving reliability is also not yet known. Methods of determining these parameters are discussed below in the section on measuring learning transfer and results. The research team considers such measurements vital because positive outcomes provide validation that the training intervention is effectively targeting the correct areas; positive results would also encourage buy-in for the course from stakeholders. Less positive results would suggest that further interventions should be considered. The section on additional pilot courses suggests the inclusion of such evaluations.

Finally, as discussed in the section on leadership and oversight for the training, the research team recommends beginning with central oversight and administration to allow the training and curriculum to become accepted as a national standard within its market. This same central entity would lead marketing for the training, including development and maintenance of the central website to establish a brand for the training, ensure that core messages are clear, and show that a reliable one-stop shop containing all information about this training is readily available for audiences.

Suggested Research: Additional Pilot Course Deliveries

As described in the previous section, the research team recommends that a three-phase approach be conducted to test the transferability of the curriculum to other instructors:

- Phase I would involve the first three deliveries of the field test. The intent would be as follows:
  - Further test course materials, delivery methods, and time requirements. These deliveries would follow the model used for the pilot course deliveries, with course materials being modified after each delivery to incorporate recommended changes.
  - Identify and train additional candidate trainers who, after meeting specified criteria relating to experience as both a responder and an instructor in their disciplines, would act as instructors for some of the subsequent deliveries. For ease of explanation, these instructors will be referred to as novice instructors, indicating that they are new to teaching this particular course.
- Phase II would involve delivering six field tests. The intent would be as follows:
  - Deliver the course using new instructors and expanded target audiences, and use a standardized model to validate instructor proficiency. Although all potential instructors would receive the same base training, different methods would be used to facilitate their transition from novice to proficient (or qualified) TIM instructor. Methods would include the following:
    - Having each novice paired with a master instructor for the first class;
    - Having the master instructor observe and offer coaching and feedback to a pair of novices at designated points throughout the class;
    - Having the master instructor coach the novice instructors in the week before class delivery; and
    - Offering no mentoring or coaching to evaluate the sufficiency of the instructor guide and other training materials as stand-alone materials in preparing trainers to satisfactorily deliver this training.

    An independent evaluation team would monitor the courses to determine the various degrees of difficulty in delivery of all elements of the course content. The exact course lessons and specific course content that may challenge future instructors would be identified. If a course lesson, a recommended delivery methodology, or a course element is consistently difficult to present, found to be confusing to instructors, or presented incorrectly during these field tests, these elements can be reevaluated, and changes made to the instructional strategies used. Feedback also would be gathered from the novice instructors at the end of each class. At the conclusion of Phase II, a facilitated workshop should be conducted with the novice instructors to gain insights into their experiences and garner any feedback that could be used to improve the model used to train instructors.

    On completion, the evaluation data from each session, as well as novice instructor feedback, should be analyzed and compared to gauge which strategy would be most beneficial for implementation of the course on a large scale.
  - No changes should be made to any course materials during this phase to enable testing a common set of materials to multiple audiences.
- Phase III would involve collecting all comments and recommendations received during the Phase II delivery of field

test courses four through nine and making one final set of revisions and modifications to the course. A final course delivery then would be conducted to validate all changes and to establish the official baseline training course and supporting materials.

The research team recommends that the preimplementation course, or field tests, be delivered around the country, both in areas with emerging TIM initiatives and in areas that already have well-established programs. To test the course applicability and robustness, it is envisioned that the course should be offered in a mix of urban and rural areas and in multistate corridors. Stakeholder associations, such as the International Association of Chiefs of Police, the U.S. Fire Administration, the American Association of State Highway Transportation Officials, and the Towing and Recovery Association of America, should be approached to examine opportunities for sponsorship of the field tests and to discuss the possibilities of integration of the program into their training initiatives. State public safety academies may include fire, EMS, and law enforcement training or establish a level of interdisciplinary cooperation. Fire training agencies are comfortable with the National Fire Protection Association standard system, which may be helpful in introducing the concept of national TIM training. Organizations already teaching TIM concepts include the Cumberland Valley Volunteer Firemen's Association, the Emergency Responder Safety Institute, the American Traffic Safety Services Association, the I-95 Corridor Coalition's incident management virtual training program, and the First 30 initiative. Opportunities to integrate this training into the programs these institutions offer also should be explored.

Because a critical component of the success of this initiative is to ensure the transferability of the content and teaching methods, the model by which potential instructors are trained and validated as meeting the criteria deemed necessary to successfully teach this course should be further refined. Throughout the field tests, feedback should be gathered, formally and informally, from attendees and agencies and incorporated into the course. The geographic diversity and makeup of the classes will ensure that the course caters to the needs of the responder community nationwide.

Mechanisms should be developed to measure the best way to transition the novice instructors to the classroom environment: options include coteaching with a master instructor, observing and being observed by a master instructor for one or more training sessions, offering some limited virtual coaching before the first class, and allowing the instructor to directly begin to teach, using student feedback forms and knowledge test results to identify any potential areas needing improvement in teaching delivery. Ideally, feedback on novice instructors should be sought over the period of the first three course deliveries to promote consistent quality in instructors' delivery of the curriculum across the country. Candidate instructors would emerge as approved, proficient instructors.

The report from these field tests would yield a measurement and evaluation tool for the individuals designated as qualified by an agency. Such a tool would be invaluable. For the training to have the largest reach possible, regional master instructors would need to be responsible for conducting train-the-trainer classes to turn out qualified instructors who would teach the responder course at a more local level. Competency criteria for both a master instructor and a qualified instructor would be developed.

Options to be considered include mentoring and coaching; these are more fully described in Table 4.1. This model provides the novice instructor with an opportunity to receive mentoring from the master instructor and also provides an opportunity for further evaluation and adherence to required criteria.

It is envisioned that the field tests would be conducted in a format similar to that described in Table 4.1.

Suggested Research: Online Training

Students in both pilot sessions and independent evaluators suggested that an online version of the training would allow more responders to access the curriculum. Although feedback was unanimous that in-person training is by far the preferred delivery mechanism because it fosters valuable relationship building among the multidisciplinary, multiagency course participants, it is not feasible for all agencies, especially those working with volunteers. Stakeholders also pointed out that online training can be a valuable supplemental resource to reinforce learning, even among audiences receiving in-person training.

Several online format options could be considered. Audio and video presentation of material could be supplemented with video and photographic clips from the in-person training. This format could include interactive questions from multidisciplinary perspectives (the answers would reflect each discipline's perspective to help mimic the insights gained in the in-person training format) or discussions within a multidisciplinary group. Each lesson would include an online test. Interactive games, quizzes, and real-life scenarios as complements to specific modules to focus on kinesthetic skills and references to related source materials would provide a more in-depth experience. Yet another option, live and recorded online seminar-style delivery with optional live interactive chat with the instructors, would be similar to formats offered by online universities.

More specific web-based options to consider include an online TIM university, in which a media-rich online version

of the course would combine live facilitated webcasts with an assigned instructor with precreated web-based lessons. The online facilitated modular sessions could be interspersed with the precreated content to give them more of a live feel. Students could be assigned to multidisciplinary groups that could go through the training together as in a traditional classroom over a predefined time period, such as 6 weeks. In this case, students would complete segments, activities, or assignments in a given time frame. The group would meet in an online chat room or community with the instructor, which would give the training more of a classroom feel. Students could be assigned to a group based on their responder discipline to retain the desired multidisciplinary flavor. If online TIM university classes were conducted regionally, they could be combined with a traditional classroom session for some activities.

Another option would involve creating web-based training lessons that would be a prerequisite to attending the classroom training. Segments of content could be converted to web-based training that students would complete individually to shorten the duration of the in-person classroom training. Having students complete some of the introductory lessons in advance would allow instructors to focus more intensively on the multidisciplinary collaborative lessons during the available classroom time. This type of training, called blended learning, may be an attractive option for regions whose agencies' employees or volunteers are unable to commit to 2 full days away from the job.

In contrast to the blended learning model, the entire curriculum could be converted to web-based training that would serve as a stand-alone equivalent option to classroom training. A similar model is the Federal Emergency Management Agency's independent study program. The target audience would be those responders who do not have the flexibility to attend even a 1-day course or who prefer an online format. As an alternative option, selected core elements of the course could be converted. Students completing this version of the online training would benefit from the information but would not receive the same completion certificate as those taking the complete course.

As a more specific example of the value of web-based instruction, a video of the situational awareness field practicum would permit a cost-effective presentation of the outdoor field practicum content in environments in which it would not otherwise be feasible, such as for online-only audiences, in-person training venues experiencing inclement weather, or when responder vehicles are not available. An online video would permit some flexibility for agencies unable to participate in 2 full days of training because it would allow students to obtain the knowledge conveyed in this field segment. This video also could be used in the train-the-trainer section as a supplement to the still photographs in the PowerPoint presentation to illustrate to potential instructors how to perform this lesson.

Suggested Research: Discipline-Specific Training

The TIM course was developed as a multidisciplinary course intended for a multidisciplinary audience, but the day-to-day reality is that, for many disciplines, it may be advantageous to insert excerpts from the course into existing training or incorporate them into already established routines. For example, course information could be distributed during weekly fire department safety meetings or to patrol officers during briefing sessions at shift change. It is worth investigating whether the content contained in the multidisciplinary TIM course could be converted into smaller segments delivered through discipline-specific channels (e.g., fire academies) while preserving the multiagency, multidisciplinary values and emphasis of the course.

Additional research should be conducted to examine whether content contained in this multidisciplinary training could be extracted and act as stand-alone material aimed at a single discipline for use as part of different initiatives. Although the core objectives and message of the training would remain the same, it is likely that the focus would shift depending on the audience. For example, it is anticipated that the course would focus on different areas if it were delivered to a group of 9-1-1 center operators and dispatchers as opposed to transportation or law enforcement personnel.

Additional research should be conducted to determine the most appropriate training medium or format for each discipline. When completed, field tests aimed at discipline-specific delivery models should be conducted. These field tests would allow for analysis of the feasibility of converting the course into single-discipline training and the degree to which students develop the appreciation for the multidisciplinary, multiagency emphasis of the core competencies that occurs in the multidisciplinary in-person delivery environment. Such tests also would reveal which aspects of the entire course content are most relevant to specific disciplines and the format that would be most useful for each discipline.

It is recommended that six discipline-specific field tests be run (one for each major TIM discipline; see Table 4.2) using an instructor and students from that discipline only. Observation and analysis of Kirkpatrick Level 1 (reaction) and Level 2 (learning) evaluation data gathered during these field tests from student evaluation forms and knowledge tests at the completion of the training should be used to modify each discipline-specific version of the course if discipline-specific training is determined feasible.

Table 4.2. Discipline-Specific Training Field Tests

Field Test	Audience
Field Test 11	Law enforcement
Field Test 12	Fire and rescue
Field Test 13	Emergency medical services
Field Test 14	Transportation and service patrol
Field Test 15	Towing and recovery
Field Test 16	Notification and dispatch

Measuring Learning Transfer and Results

Although learning is the obvious expected outcome of any training, the most critical aspect of any learning intervention is students' ability to transfer knowledge back to the job and have their behavioral changes positively affect the situation that initially prompted the learning intervention. The Kirkpatrick Level 1 (reaction) data show that students' reactions to the training were positive, and the Level 2 (learning) results show that they were able to demonstrate proficiency in the content, as discussed in Chapter 3 in the section on assessment of training effectiveness. It is not yet known whether those skills are being transferred into everyday work practices or if they are having the intended effects on improving reliability.

Conducting further evaluation on the effects of the course would require Level 3 and 4 evaluations. A Level 3 evaluation explicitly measures a student's ability to transfer learning to the job and the degree to which students have applied the training or knowledge to their jobs. It is generally conducted a few weeks to 3 months after training with a student's supervisor and ideally involves measuring on-the-job observable behaviors, as well as conducting interviews. A Level 4 evaluation measures the impact of the training on the organization or on reliability. This evaluation is achieved by measuring quantifiable changes in key performance indicators by means of interviews, questionnaires, or focus groups 3 months to 1 year after training.

Leadership and Oversight for the Training

The research team recommends central oversight and administration of this training for approximately 3 to 5 years to allow the training and curriculum to become accepted as a national standard within the designated market of multiagency federal, state, and local TIM responders across the country. Central oversight and administration will help to control early rollouts of the training to ensure that the core values and key principles for long-term success of the training are honored: quality, qualified trainers; multidisciplinary perspective and emphasis; and structured collection of feedback from students both immediately after and 1 year after training.

The research team also recommends that this central entity initially lead marketing for the training, including development and maintenance of the central website (the nucleus of the marketing). This approach will help to establish a brand for the training, ensure that core messages are clear, and show that a reliable one-stop shop containing all information about this training is available. This website would be the home of online training for alumni forums and communities of practice and a platform for soliciting feedback from students.

Distributed marketing should be strongly encouraged to raise awareness about and generate interest in the training and to attract audiences to the website to learn more. National TIM proponents would learn about leveraging key stakeholder channels, including word-of-mouth endorsements and marketing messages from associations and academies, such as the National Fire Protection Association, the National Association of State EMS Officials, and the International Association of Chiefs of Police. Marketing messages could include links from these organizations' websites to the central TIM website, mentions in their newsletters and at events of this training, and encouragement to their audiences to obtain this training.

In addition to developing and maintaining the central website and marketing messages, the central entity would be responsible for the cost-effective development of other collateral such as brochures. These materials would be made available for use by national associations and regional and local agencies to raise awareness in their markets about the training. The central website would provide all stakeholder organizations with immediately available marketing resources that they may not have the resources to develop on their own.

As organizations acquire qualified trainers, they would be encouraged to conduct their own marketing to attract students to the training and would be welcome to cobrand or supplement these materials with others as desired.

The research team recommends a variety of additional actions to help further refine, mature, and institutionalize this training curriculum in its intended market:

- Feedback should be solicited on the curriculum and training methods from new participants immediately after they receive the training and from alumni within 1 year of the training, after they have had the opportunity to put their new knowledge into practice. This feedback could be collected on the website and structured by lesson; competency

or practice; and the name, title, role, and experience level of the submitter.

- The training curriculum should be positioned as a living, collaborative curriculum that is updated at least annually by the community of expert TIM practitioners across the country to reflect the latest state of TIM practice. A formal annual TIM summit with selected, nominated SMEs, assisted by a facilitator, should systematically review the feedback collected over the course of the previous year. SMEs will formally adjudicate feedback and identify specific changes to the curriculum baseline. The central administering authority will manage the curriculum with stringent configuration management controls to ensure traceability for any changes to the curriculum. The basis for every change will be explicitly documented to provide a knowledge base on the evolution of the training curriculum.
- The training should also be positioned as national TIM training developed by and for TIM practitioners to stimulate a sense of ownership and trust among the broad TIM community for this curriculum as their curriculum, specifically designed to help them be as effective as possible in achieving safe, quick clearance.

As updated training materials are developed and formally released, they should be available through the central website; all state and local agencies can subscribe to RSS feeds to be automatically notified when a new and updated curriculum is available. If key stakeholder organizations have standard training periods in their annual calendars, the new curriculum releases could be timed to align with and support these time frames. Alternatively, an annual release of updated training would help stimulate anticipation, similar to commercial launches that use known timelines for the release of much-anticipated products.

Market receptivity to and interest in the advantages of formally certifying trainers and students who complete the training should continue to be monitored, as well as interest in accrediting the training. Accreditation would facilitate distributed (franchised) training opportunities and professional education credits for attendees. Within 3 years, as market acceptance of the idea of national TIM training grows and the curriculum has matured and evolved by extensive practitioner feedback, it is expected that the market will support certification and accreditation of this training. Such support is possible if the training is perceived as the representative standard of TIM practice and if practitioners who have taken the training report safer, quicker incident clearance.

Certifying and accrediting authorities (or a single authority) should be identified, and a model for implementing certification and accreditation should be established that preserves the core value of an evolving curriculum continually shaped by field practitioners as the state of the practice evolves. When a certification and accreditation model is in place, certified and accredited training delivery organizations will be free to conduct their own marketing to attract students to the training. The need for a centralized website likely will become obsolete at this point.

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