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Case Study No. 12

Incorporating Consideration of Bicyclists And Pedestrians into Education Programs

National Bicycling And Walking Study

U.S. Department of Transportation

Federal Highway Administration

Foreword

This case study was prepared under contract for the Federal Highway Administration by Arlene M. Cleven and Richard D. Blomberg of Dunlap and Associates, Inc.

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CASE STUDY #12: INCORPORATING CONSIDERATION OF BICYCLISTS AND PEDESTRIANS INTO EDUCATION PROGRAMS

EXECUTIVE SUMMARY

This effort is one of several case studies sponsored by FHWA as part of the National Biking and Walking Study. The objective of the study was to determine how consideration of bicyclists and pedestrians can be incorporated into educational curricula and programs, including driver licensing procedures. The approach did not include a comprehensive search for available programs and literature. Rather, several bicyclist, pedestrian and driver-education organizations were contacted informally, and requests were made for information and program materials. Many state driver licensing agencies provided copies of their manuals.

The report describes current coverage of bicyclist and pedestrian topics in each program type under study--school-based pedestrian and bicyclist programs, and driver education and licensing programs. Public information and education (PI&E) materials that were identified while collecting materials for study are described. In addition, the capacity of education and licensing programs to accommodate additional coverage is described.

Recommendations of strategies for incorporating bicyclist and pedestrian topics into educational programs are provided. Samples of the major topics are identified, and a summary form is provided for each topic. Included are a brief background statement on the topic; specific points to be made to bicyclists, pedestrians and drivers; and recommendations regarding how the topic can be covered in school-based curricula, driver education and licensing materials, and driver PI&E programs.

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I. INTRODUCTION

A. Study Objectives

While motor vehicles are the major and most obvious users of the nation's highway system, pedestrians and bicyclists are also roadway users. In order for the highway system to operate safely and efficiently, each user must learn to accommodate the special needs of other users. To this end, the Federal Highway Administration (FHWA) sponsored the current effort, which addresses how consideration of bicyclist and pedestrian needs can be incorporated into educational curricula and programs, including driver licensing procedures. This effort is one of several case studies sponsored by FHWA as part of the National Biking and Walking Study.

The following tasks were specified for this case study:

- Evaluate existing bicyclist and pedestrian educational materials to determine what should be included in driver licensing and school-based educational programs.
- Review current driver licensing programs to determine what information is currently provided regarding bicyclists and pedestrians.
- Review existing school-based transportation educational programs to determine how bicycle and pedestrian travel are covered.
- Investigate means of educating individuals who are not in school-based or driver-licensing programs to the needs of bicyclists and pedestrians through public information and education (PI&E) materials.

B. Study Approach

The approach for this case study did not include a comprehensive search for available programs and literature. Rather, several bicyclist, pedestrian and driver-education organizations were contacted informally, and requests were made for information and sample program materials. Many state driver licensing agencies provided copies of their driver licensing manuals and bicycle manuals, where available. In addition, Dunlap and Associates has considerable knowledge of the bicycle and pedestrian literature from its extensive prior and current research experience on bicycle and pedestrian accidents and issues. This knowledge and experience provided a firm basis for much of the study contents and recommendations.

C. Organization of the Report

This report has been organized into three sections, as follows:

- This first section (Section I) describes the study objectives, approach and report organization.

- Section II describes current coverage of bicyclist and pedestrian topics in each program type under study--school-based pedestrian and bicyclist programs, and driver education and licensing programs. PI&E materials that were identified in the process of collecting materials for study are described. In addition, the capacity of education and licensing programs to accommodate additional coverage is described.

- Section III provides recommendations of strategies for incorporating bicyclist and pedestrian topics into educational programs. Samples of the major topics are identified, and a summary form is provided for each topic. Included are a brief background statement on the topic; specific points to be made to bicyclists, pedestrians and drivers; and recommendations regarding how the topic can be covered in school-based curricula, driver education and licensing materials, and driver PI&E programs.

References provide a listing of documents and programs obtained and reviewed as part of the study effort.

II. CURRENT PROGRAM COVERAGE

This section describes examples of current pedestrian and bicycle programs oriented toward the elementary school student, driver education curricula, and driver licensing manuals. The coverage is by no means exhaustive nor does it include all materials identified in the process of performing this brief case study. Rather, it reviews a sufficient sample of available materials to identify major coverage and issues. For a detailed list of the materials obtained for the case study, the reader is referred to the *References*.

A. School-Based Pedestrian Programs

Many pedestrian studies have been performed by various government agencies, particularly the National Highway Traffic Safety Administration (NHTSA), and materials have been developed for various school-aged groups. In general, these studies have recommended that pre-school children not be exposed to the traffic environment except in the company of an adult since the requisite knowledge and skills needed to avoid traffic accidents cannot be reliably learned by very young children. Starting at the kindergarten level, however, there are several school programs on traffic safety.

Accidents to five, six and seven year olds typically involve the sudden appearance of the child in the roadway, usually in a residential neighborhood. The child "darts out" or "dashes" into the street, usually at a non-intersection or midblock location. The child appears so suddenly that a driver frequently doesn't have time to react to avoid an accident. As children become older, they venture into commercial and other areas that are generally more complicated to walk in than are their residential neighborhoods. Accidents involving these children more often occur at intersections with traffic signals and often involve more complex vehicle maneuvers (such as turning vehicles) or obstructions to the driver's and pedestrian's vision. Thus we find that programs directed toward young elementary school children at a minimum emphasize basic stop and search procedures either midblock or at corners, while those for older students introduce more complex traffic situations.

Probably one of the most successful of these programs is NHTSA's *Willy Whistle* film which has recently been updated as a video and renamed *Stop and Look With Willy Whistle.* That program is oriented toward young children in kindergarten through third grade and teaches the critical behaviors needed to avoid the so-called "dart-out" accident. The video emphasizes basic stop and search procedures, including stopping at the curb, looking left-right-left until no cars are coming, and then crossing the street while continuing to search until safely on the other side. It also points out that, when parked cars are present, the child should make sure the cars are empty and not about to move, then go to the edge of the car and stop and search as before. A companion video called *Walking With Your Eyes* is a recent update of another successful NHTSA film called *And Keep on Looking.* That video,

oriented toward children in grades four through six, starts with a review of the critical stop and search procedures needed to avoid "dart-out" accidents. It then adds procedures to follow at intersections when there are traffic lights or pedestrian signals and when there are visual screens that block the driver's and pedestrian's view of each other. The video also covers procedures to follow in parking lots and covers cues that indicate that a parked car might start to move.

The Pennsylvania Department of Transportation has an active highway safety program that supports activities in five safety areas--pedestrians, bicyclists, seat belts, school buses and alcohol problems. As part of this program, Allegheny County is currently running what it calls its *Look Out* campaign. The campaign is targeted at pedestrians, motorists, bus riders and bicyclists in the City of Pittsburgh.

As part of this Pennsylvania campaign, a video and curriculum were developed for elementary school children that cover appropriate behaviors for stopping and searching, entering the street, crossing the street midblock, crossing in front of a school bus, using the pedestrian crosswalk and walking where there are no sidewalks. The video also incorporates safe procedures for entering a street on a bicycle, using a helmet while bicycle riding, exiting from a vehicle on the curb (rather than the driver's) side of a vehicle, and locking the car doors when entering a vehicle. The accompanying curriculum has three lessons for kindergarten through third grade students. It covers stop and search procedures, crossing at corners and crosswalks, <u>not</u> crossing midblock, how to see and be seen when there are parked cars present, design and meaning of traffic/pedestrian signals and signs, and the importance of playing in safe places. The curriculum for grades four through six covers much of the same material and adds procedures to follow in mall parking lots, as well as information on vehicle stopping distance and the importance of visibility in dark conditions.

Pennsylvania has also developed pedestrian fact sheets and activity lists for teachers of elementary and other school grade levels. Proper pedestrian procedures for children are displayed on posters. For elementary school children, these materials cover stopping and searching, watching for turning vehicles at intersections, making eye contact with the driver, obeying traffic signs and signals, being alert to vehicles backing from driveways and parking spaces, playing in safe areas, and dressing to be seen.

The Pennsylvania campaign also features a variety of PI&E activities. Although not directed at child pedestrian safety, they are included here to show what one community has done to reach adult pedestrians, bicyclists and drivers who are not necessarily in formal training programs. The campaign includes testimonials from people who were in pedestrian accidents as "victims" or "perpetrators." These testimonials have been run as public service announcements on local radio stations, on interior and exterior bus cards and in brochures that are distributed throughout the city at retail outlets, parking lots, libraries and other locations. They are oriented toward adults and currently cover the following topics: jay walking, walking while intoxicated, right turns on red, wearing bicycle helmets, senior pedestrian safety, and crossing in front of buses.

The State of Florida is currently in the process of designing an elementary school traffic education program for kindergarten through second grade students. A pilot version of the program was made available for this study. For kindergarten students, there are lessons on crossing the street midblock (including locating the edge of the road, stopping and searching before entering the road, continuing the search while crossing the road), identifying vehicles that use the road (including bicycles) and different types of traffic situations, learning concepts of near and far, identifying whether vehicles are coming or going, and proper procedures to follow when the driver and pedestrian are visually screened from each other.

Finally, NHTSA's study on *Identification and Feasibility Test of Specialized Rural Pedestrian Safety Training* is relevant. This comprehensive program combines general pedestrian safety with school bus safety. There are detailed lesson plans for kindergarten and first grade combined and separate plans for each grade from four through six. The concepts learned in earlier grades are repeated in subsequent grades using different activities. Parent brochures are also included. The first set of plans includes training in distinguishing the left from the right hand (an optional session), locating the edge of the road, performing a left-right-left search, crossing the street safely, and getting on an off a bus and crossing the street safely. The second grade sessions cover proper stop and search procedures for both intersection and midblock crossings both with and without the presence of parked cars, introduces the concepts of red and green lights, and covers safe bus boarding and exiting. The third grade program repeats the basic concepts covered in the second grade and introduces the concepts of time, distance and reaction time. The fourth grade lessons add safe walking along the roadway. Grades five and six reemphasize lessons learned and discuss variations to standard rules (for example, for a narrow road with a shoulder on only one side, it is safer to walk on the shoulder regardless of the traffic direction).

From the materials reviewed for this case study and from knowledge of the pedestrian safety field, there appear to be no differences in programs available in large vs. small states or in rural vs. urban areas. The following topics are typically covered in elementary schools that have pedestrian safety programs:

- Locating the edge of the road
- Search procedures before entering the road midblock
- Search procedures while crossing the road
- Search procedures when there are visual screens
- Search procedures at intersections
- Search procedures when there are parked cars
- Meaning of signal lights and signs

The following topics are covered less frequently:

- Wearing something light or bright to be conspicuous
- Using crosswalks
- Planning a safe route
- Walking along the road (procedures when there are no sidewalks)
- Walking in parking lots
- Judging gaps in traffic (including understanding distance and time considerations and reaction time)
- Safety considerations in bad weather
- Types of vehicles sharing the roadway--cars, trucks, school buses, bicycles

All of the preceding topics are considered to be needed in school-based pedestrian programs.

The major topic still in disagreement in the various programs regards whether or not children should be taught to cross the street midblock. Some programs note that intersections are very dangerous despite the availability of traffic lights, crosswalks, and other pedestrian aids. In addition, they involve not only traffic going straight through the intersection but also traffic making right turns, including right turns on red. Since in residential areas children are likely to make midblock crossings anyway, some feel that they should be taught to do so safely. Others still emphasize the dangers of crossing midblock and flatly state that midblock crossings should never be permitted.

It might be noted that types of vehicles using the roadway are rarely mentioned. The emphasis on vehicles is the car or truck--the most obvious users of the roadway system. Consideration of the time and distance requirements of bicycles in the roadway mix of vehicles might be helpful since many of the children will also be bicycle riders.

From this review of topics covered in school-based elementary pedestrian programs, one might infer that the following topics would be appropriate for inclusion in driver education and licensing materials in order for driver education to build properly on the pedestrian training provided in earlier school years:

- Conspicuity--Although pedestrians are advised to wear light or bright clothing, they may fail to do so at all times. The driver should therefore be particularly alert to the existence of any form or movement on the roadway.

- Inclement weather--Not only is the pedestrian likely to be less conspicuous in inclement weather but also footing for the pedestrian may be more unsure and, combined with vehicle instabilities occasioned

by bad weather, the driver should exercise extra caution whenever any pedestrians are near.

- Unpredictability--Children are unpredictable by nature and, despite good training in the proper search and crossing procedures, they might still exhibit unsafe behavior in the traffic environment. Drivers should therefore be especially cautious in areas where children are apt to be sharing the roadway.

- Obeying the law--Pedestrians do not consider pedestrian laws to be serious offenses and don't expect to be ticketed. They therefore may not feel that they need to adhere to local rules and regulations. Drivers, therefore, should anticipate the possibility that a pedestrian may not obey traffic lights and signs.

B. School-Based Bicyclist Programs

Always a means of transportation for children, the bicycle has experienced an increase in use by individuals of all ages in the past several years. This increase can be attributed in large part to the recent emphasis on cardiovascular health and the known benefits to be gained from all forms of exercise. Touring by bicycle has become a very popular activity. In some instances, the bicycle has become a means of adult transportation to and from work, while still remaining a primary vehicle for activity and mobility among children.

Many accidents involving bicyclists are similar to those involving pedestrians. For example, bicyclists who enter the roadway from alleys and driveways are similar to pedestrians who dart into the street midblock. In addition, bicyclists frequently fail to adhere to signals and signs at intersections or have blind faith that a green signal light means that it is safe for them to proceed through the intersection. They fail to appreciate that their size means that they are less visible than are motor vehicles. Also, their speed may not permit them to negotiate an intersection safely before a light changes.

Many states support a state-wide bicycle coordinator, and some have several regional (for example, county) coordinators. These individuals frequently also serve as coordinators of pedestrian and other safety activities. The coordinators work with a variety of local resources (e.g., police, schools, 4-H clubs, scouts) as well as groups concerned with children's health and safety (e.g., SafeKids, American Academy of Pediatrics) to promote bicycle safety. They provide a centralized source for training materials and support a variety of activities such as helmet loaner programs, summer bicycle camps, and bicycle rodeos. Coordinators note an increase in support from members of the medical community who are interested in promoting bicycle safety programs from an injury point of view. In addition, there are several bicycle advocacy groups that provide information on new training materials and legislative trends.

Because of the widespread use of busing, bicycles do not typically represent a primary method for most children to get to and from school. It can therefore sometimes be difficult to schedule bicycle training courses in schools, and other local resources may need to be used. Programs for elementary school children are typically designed for the third or fourth grade child. These programs are supplemented, in some instances, by summer camps designed to improve bicycle skills as well as train teenagers to teach bicycle safety at the local level. Training is also provided for members of bicycle patrols which consist of individuals who volunteer their time to improve bicycle safety by encouraging enforcement of bicycle laws.

The State of Florida has a long history of developing and testing bicycle curricula in its elementary schools. The state's current bicycle education manual contains separate sets of lessons for grades three, four and five. The grade three course contains 10 bicycle safety lessons. They cover helmet protection and proper fit, bicycle equipment and proper fit, space requirements for maneuvering and stopping, visibility, scanning techniques, signaling, recognizing and avoiding hazards, negotiating intersections by riding and by walking, leaving and entering the roadway via driveways, and crossing techniques at residential intersections. Most of the lessons are designed to provide on-bike practice of the skills taught. The fourth grade curriculum also contains 10 lessons. Many of the third-grade activities are reviewed and the following are added: evasive maneuvers ("rock dodge"), reaction time and traffic flow. Again, the fifth-grade program reviews topics presented in earlier grades and adds bicycle maintenance, dealing with high traffic intersections and dealing with emergencies (e.g., making emergency turns to avoid accidents). A supporting audiovisual program covers visibility, hazard recognition, stopping times and distances, scanning, dealing with emergencies, rules for riding safely in traffic, dealing with driveways, negotiating high-traffic intersections, and scanning for hazards.

Pennsylvania's *Look Out* program (see Section II.A) includes a bicycle safety curriculum and supporting video for various elementary school grade levels. For kindergarten through the third grade, lessons cover the importance of wearing a helmet, taking care of one's bicycle, and riding safely on the sidewalk (including who should ride on the sidewalk, proper hand signals, and detecting hazards). For grades four through six, topics include the importance of wearing a helmet, bicycle parts and their maintenance, and rules of the road (riding with traffic, signaling when turning, obeying traffic signs, riding at appropriate speeds, and yielding the right of way). A supporting manual, called *Bike Like the Best*, emphasizes the importance of selecting a bicycle of the proper size and maintaining it in a safe condition, choosing the right helmet and wearing it, being visible, obeying traffic signs, signaling properly, scanning, and recognizing and avoiding hazards

Pennsylvania also has a variety of PI&E materials oriented toward the school-aged bicyclist or the bicyclist's parents. Included is a brochure for parents that describes helmet fit procedures, equipment selection, the importance of visibility and rules of the road. Much of this information is also available in the form of a large poster. A bicycle driver's license

(which has no legal status) lists rules of the road and provides space for the bicyclist's picture and personal as well as bike identifying information. In addition, traffic safety school calendars (produced for the 1990-1991 school year) promote the themes that "safe kids are smart kids" and "safety first always." These calendars include, for each month, a photograph plus safety tips and activities on different safety issues--bicycle, pedestrian, school bus and seat belt safety, plus driving under the influence. These calendars were distributed to schools with the request that they be displayed and used in the classroom. Finally, a game called *Wheel Wise* has been designed to promote bicycle safety at various grade levels not only in school but at health fairs and community events as well. The game tests knowledge of bicycles, helmets, the law, riding skill and general safety.

NHTSA supported the development of a program called *A Fourth Grade Course in Bicycle Driver Education* in the early 1980's. The 10-lesson program covered selecting and maintaining a properly fitted and equipped bicycle, decision-making rules for safe biking (searching, predicting, deciding, and acting), communicating with other highway users, rules of the road, obeying traffic laws, anticipating hazards and scanning. All lessons were designed to be taught in the classroom. Lessons introduced various accident types that are common to bicyclists and discussed the major causes of the accidents and methods to avoid them. The program resulted in three documents: a course guide prepared to serve as a basic planning document for the course administrator, a set of detailed lesson plans for the instructor, and a workbook for the student.

A curriculum called the *Basics of Bicycling*, developed by representatives of Bicycle Federation and BikeCentennial, was evaluated in cooperation with the University of North Carolina Highway Safety Research Center. The lessons are designed for the fourth-grade level and cover selecting the appropriate bicycle equipment (including helmets), checking the fit and mechanical condition of the bicycle before riding, knowledge of traffic laws and signs, identifying and reacting to potentially hazardous situations, riding cooperatively and communicating with other highway users, and developing bike handling skills important for safety. Most of the lessons provide actual on-bike experience.

The State of Minnesota has a comprehensive bicycle program and makes a variety of materials available for improving bicycle safety. These include pamphlets promoting helmet use and rules to follow in order to share the road safely, a bicyclist driver's guide, a bike rodeo manual, bicycle activity lessons, a bike patrol training manual, a handbook on bicycle statutes from the motor vehicle laws, and a video tape on helmet use, safe riding and good decision making. Minnesota also has a bicycle registration system to aid in theft deterrence, recovery and return of stolen bicycles, and accident victim identification. Modeled after the motor vehicle registration system, the state law is not currently mandatory.

Minnesota's *Bicycle Driver's Guide* has both a student's and instructor's edition.[1] The student's edition is designed for the readability level of fourth to sixth graders. It covers the basic types of bicycles, bicycling techniques, reasons to wear a helmet, proper clothing for good and bad weather, selecting the appropriate bicycle and safety equipment, preventing bicycle theft, maintaining the vehicle, bicycle laws and safety rules (choosing the best way to turn left, scanning to the rear, signaling), the meaning of traffic signs and signals, avoiding accidents (SIPDA--scan, identify, predict, decide and act), road hazards and special conditions, dealing with dogs and pedestrians, common types of accidents and how to avoid them, and tips for touring on a bicycle. Minnesota's bicycle rodeo is designed to teach children traffic bicycling skills. It starts with bicycle safety inspection procedures, understanding principles of movement in space, bicycle security, driveway ride-out and roadway entry, safe crossing of a controlled intersection, scanning to the rear, avoiding roadway objects (dodging rocks and open car doors), proper search procedures when approaching a blind driveway, yielding right-of-way properly at an intersection, maintaining proper bicycle control and performing sudden stops.

In summary, from the materials reviewed for this case study, most bicycle programs for elementary school-aged children stress the importance of both classroom and on-bike training. Topics that are typically covered include the following:

- Selecting and maintaining the proper equipment--helmet, bicycle, and added safety features
- Obeying the law--including riding with traffic and obeying all traffic signals and signs
- Seeing and being seen--including scanning techniques and assuring that both the bicycle and bicyclist are visible in day and night conditions (wearing light or bright clothing and using bike flags during the daytime, using retroreflective materials at night)
- Communicating one's intentions at all times
- Identifying and avoiding hazards--including unsafe riding practices
- Negotiating intersections and making turns
- Entering or leaving the street via driveways or alleys

[1]These documents were customized for Minnesota by the Outdoor Empire Publishing Company which has customized similar materials for Alabama, Arkansas, Florida, Georgia, Montana, Nebraska, New Jersey, Ohio, Pennsylvania and Washington.

Many of the programs emphasize the accidents that have been identified by NHTSA as common to bicyclists (see *Bicycle Safety Education: Facts and Issues*). These include bicycle rideout (from driveways, alleys and other midblock locations), bicycle rideout at controlled intersections, motorist driveout and turn/merge at intersections, motorist overtaking and bicyclist unexpected turns/swerves. Particularly emphasized are the importance of the bicyclist riding with traffic, obeying all traffic laws, communicating intentions, being alert to potential hazards, and having skills to avoid hazards.

As with the coverage of pedestrian issues, all of the preceding bicyclist topics are considered to be needed in school-based bicyclist programs. From this list, one might infer that the following topics would be appropriate for inclusion in driver education and licensing materials:

- Bicycle as a vehicle--Under most state laws, a bicycle operator has the same legal rights and responsibilities as a motor vehicle operator. However, the vehicles do not have the same dynamics. The bicycle is much smaller, slower and more unstable than a motor vehicle. Drivers must consider the inherent differences in size, speed, stability and maneuverability when making driving decisions.

- Conspicuity--Although bicyclists are advised to wear light or bright clothing, to use head and tail lights, and to use bicycle flags in the daytime and retroreflective materials at night, many will fail to do so. Drivers should therefore be especially alert to the existence of bicycles in the traffic stream. In particular, an extra scan should be made for bicycles when a motorist makes a left turn.

- Roadway hazards--Roadway objects and debris that cause no problems to motor vehicles can be particularly hazardous to a bicyclist. The motorist should therefore be alert to the fact that a bicyclist may need to swerve to avoid roadway grates, puddles and debris. In addition, before exiting a parked car, the motorist should be sure that opening the car door will not interfere with a bicyclist's passage.

- Unpredictability--As it was indicated for pedestrians, children are unpredictable by nature and may not follow all bicycle safety rules. The motorist should therefore be especially alert to the fact that a bicyclist may enter the road suddenly from a driveway or alley or may swerve suddenly in front of a motor vehicle.

- Obeying the law--As with pedestrians, bicyclists may not consider breaking traffic laws to be serious offenses, particularly when the bicyclists are children. Before entering an intersection, therefore, the

motorist should search to the right for bicyclists who might be traveling against traffic. And, at all times, the motorist should be alert to the fact that a young bicyclist may not obey all traffic rules.

C. Driver Education Programs

Driver education courses are commonly available to high-school students of (or approaching) driving age. Some states have defined curricula, and some simply set standards (e.g., for a set number of training hours). Beyond high school, driver education can be obtained from licensed driving schools which typically concentrate on behind-the-wheel instruction and preparation for the written driver's test. Basic driver education and driver improvement programs have been prepared for drivers of all ages. In addition, a comprehensive training program is available for the professional tractor-trailer driver.

Programs that were obtained for this study are described below. They are divided into two groups--school-based programs and other adult programs. The topics covered in each program are presented, and the coverage of bicyclist and pedestrian issues in each is described. Finally, opportunities for incorporating additional bicyclist and pedestrian issues are identified.

1. School-Based Programs

School-based driver education programs reviewed for this study included those for the States of Texas, Washington and Michigan. Also included in the school-based programs was the *Sportsmanlike Driving* program prepared by the American Automobile Association (AAA). This program includes a variety of materials that serve as the basic training documents in some states and as supplementary reference sources in others.

Since the materials are in different formats, the actual classroom coverage for the various courses cannot be precisely identified nor can the contents of the different courses be precisely compared. The discussion of the current coverage of bicyclist and pedestrian issues in these programs, therefore, may be incomplete. For example, the Texas materials provide a fairly detailed outline of lesson contents as well as the purposes of the lesson, performance objectives, teaching activities and evaluation measures. The Washington materials include performance objectives, learning activities and evaluation measures plus copies of transparencies and study sheets that serve to define class contents further. The Michigan materials provide performance objectives, a suggested curriculum outline, and actual tests for classroom and in-car evaluation. The AAA materials include a text (which also has a teacher's edition), a workbook, tests and behind-the-wheel checklist.

The Texas curriculum consists of 15 classroom and in-car instruction units. The classroom units are titled as follows:

1. The driver, the passenger, and the pedestrian
2. Motor vehicle traffic laws
3. Occupant protection
4. Driving procedures
5. Driving strategies
6. The automobile and preventative maintenance
7. Highway characteristics and engineering controls
8. Physical laws
9. Accident avoidance
10. Effects of alcohol and other drugs on driving performance
11. Emergency procedures and first aid at traffic accidents
12. Two-wheeled vehicles in the traffic pattern
13. The driver as a consumer
14. The national and state traffic safety program

The list shows that the Texas program introduces other roadway users in the first unit of instruction. In fact, the following instructor cautions appear in the introduction to that unit:

> *Although the title of the unit places the driver first, the instructor should never allow students to lose sight of the fact that often they are passengers and pedestrians. When attitudes, judgment, courtesy, habits, and any of the other human factors that might cause conflict between the driver and pedestrian are discussed, remind the students that 150 pounds of flesh are no match for 4,000 pounds of metal.*

Increasing safety for both driver and pedestrian is listed as one of the goals of Texas driver education. A section on driver and pedestrian precautions presents procedures for anticipating the potentially faulty judgment of other drivers and pedestrians. Responsibilities of the driver to both pedestrians and bicyclists are included as are the responsibilities of pedestrians in the traffic environment. It is stated that drivers are responsible for the prevention of injuries to themselves and to other roadway users, including bicyclists and pedestrians. Pedestrians have legal and moral responsibilities and must exercise caution on the roadway. Scanning procedures are described as are defensive driving. In addition, a variety of situations requiring driver and/or pedestrian reactions are discussed.

The second unit of the Texas program, which covers motor vehicle laws, includes a discussion of traffic signs, signals and markings in which pedestrian and bicycle signs are included and pedestrian laws and responsibilities are covered. In addition, there is a complete section on pedestrian rights and responsibilities. This section describes the pedestrian right of way at crosswalks, when there are no crosswalks, when there are pedestrian overpasses or underpasses, when there are sidewalks, and when the pedestrian

is walking on the roadway. Drivers are cautioned to use due care to avoid hitting pedestrians and *to avoid confusing children* or incapacitated persons on the roadway.

One entire unit (Unit 12) of the Texas program is devoted to two-wheeled vehicles in the traffic pattern. Although the primary emphasis in this unit is on the motorcycle, the driver is reminded that traffic laws tell bicyclists what they must do, but laws alone cannot protect the bicyclist in traffic. The driver is cautioned: *Always remember that bicycles are often hard to see in traffic.* In addition, bicyclist rules and roadway cautions are included.

The State of Texas also provides a safety education program that can be substituted for in-car instruction in those instances when schools have difficulty implementing an in-car program. This program covers a variety of safety topics (e.g., home safety, disasters, fire safety, student transportation) and includes one section on pedestrians. Although the emphasis of the unit is on the responsibilities of the pedestrian to avoid accidents (by obeying traffic laws, being visible, not hitchhiking, not walking while intoxicated, anticipating drivers' mistakes, recognizing signs of car movement), the unit also covers driver responsibilities to exercise due care to avoid hitting pedestrians and to use their horns to warn children and incapacitated adults of their presence in the roadway.

The Washington curriculum includes 19 classroom modules plus behind-the-wheel instruction. The classroom modules are titled as follows:

1. Introduction to the highway system - Preparing and controlling - Maneuvering in limited space
2. Signs, signals and pavement markings
3. Human functions
4. Intersections
5. Traffic flow
6. Lane changes
7. Passing on a two-lane roadway
8. Freeway driving
9. Complex driving
10. Obtaining your driver's license
11. Avoiding and minimizing impact - Vehicle malfunctions
12. Vehicle characteristics - Motorcycle awareness
13. Non-motorized traffic
14. Limited visibility - Lessened traction - Special driving conditions
15. Legal responsibilities - Post-crash responsibilities
16. Trip planning
17. Internal factors - Physical factors - Alcohol and other drugs
18. Vehicle maintenance
19. System improvement - Fuel conservation

Since the course has been prepared in modular form, the modules are not necessarily presented in the classroom in the order in which they are listed.

Consideration of bicyclist and pedestrian issues is interspersed in several modules of the course. Pedestrian and bicycle signs are included in the Module 2 coverage of signs, signals and pavement markings. In Module 3, drivers are advised to make sure that other drivers, pedestrians and animals see them. In Module 4, rules for yielding to pedestrians and other drivers at intersections are covered. In Module 5, drivers are advised to "read" the ground, that is, look under parked cars in their search for child pedestrians and pets, particularly in residential areas. It should be noted that Module 13 contains a section on non-motorized traffic. This section covers rights and responsibilities of both pedestrians and bicyclists. Included are recognition of the signs that a person is blind and precautions when driving near blind persons, precautions on approaching a person on horseback, right-of-way rules for pedestrians and bicyclists at intersections, and the responsibilities of drivers to pedestrians.

For the State of Michigan, performance objectives are provided for the following units of classroom instruction:

A. Vehicle familiarization
   1. Driving compartment
   2. Starting and stopping tasks
   3. Driving fundamentals
   4. Traffic controls
B. Basic control tasks
   1. Intersections
   2. Following
   3. Being followed
   4. Lane changing
   5. Backing the vehicle
   6. Overtaking and passing
   7. Being overtaken and passed
   8. Other highway users
C. Driver fitness tasks
   1. Visual discipline
   2. Physical fitness
   3. Distractions
   4. Attitudes, emotions and risk acceptance
   5. Substance abuse
D. Intermediate control tasks
   1. Driving environments
   2. System management

E. Advanced control tasks
   1. Adverse conditions
   2. Critical situations
   3. Vehicle malfunctions
F. The vehicle
   1. Car care

Since only performance objectives and tests were included for the Michigan program, it is difficult to judge coverage of bicyclist and pedestrian issues. However, it should be noted that there is a separate unit (Unit B.8) that covers rights and responsibilities of other highway users as well as means of communicating with those users.

Finally, the AAA program called *Sportsmanlike Driving* contains sections on the following topics:

1. You and the highway system
2. Preparing to drive
3. The rules of the road
4. Basic vehicle control
5. Time-space management
6. Lateral maneuvers
7. Turns
8. Natural laws
9. IPDE (identify, predict, decide, execute) and the Smith system (aim high in steering, keep your eyes moving, get the big picture, make sure others see you, and leave yourself an out)
10. Cooperating with other highway users
11. Special driving conditions
12. Evasive action
13. Vehicle performance and maintenance
14. Physical and mental impairments
15. Alcohol and other drugs
16. Vehicle failure
17. Selecting and insuring your car
18. Planning a trip

The first section identifies the elements of the highway system as motor vehicles, roads and people. New drivers are advised that, to be safe users of the system, they must consider all users of the system and anticipate their actions. In Section 5, pedestrians and bicyclists are included with motor vehicles as elements to be considered in managing time and space. In making turns at intersections (Section 7), the driver is advised to check for bicyclists, pedestrians and other vehicles and to yield to pedestrians. In

describing the IPDE system (Section 9), drivers are advised to be especially careful to identify non-motorized highway users. The text states:

> *Pedestrians, bicyclists, and animals are the least protected of all highway users. They should be watched carefully whenever they come near the roadway.*

Finally, one complete section (Section 10) of the AAA program is devoted to cooperating with other highway users. This section covers the special problems presented by bicycles, motorcycles, mopeds, snowmobiles, small cars and trucks as well as pedestrians. Drivers are advised to exercise special cautions when sharing the road with bicyclists. It is noted that bicyclists should observe traffic laws but don't always do so. The driver is advised to search for roadway conditions that present special problems for bicyclists, such as storm drains. The importance of signaling intentions is emphasized when turning or stopping, and the driver is advised never to try to pass a bicyclist in a tight space.

For pedestrians, Section 10 of the AAA course notes that accidents at intersections are common. Pedestrians have difficulty judging gaps in traffic, and pedestrians of different ages require different times to cross the street. Special problems in suburbs are also noted where people may not appreciate the dangers of traffic and may cross midblock. People may step into the street while mowing the lawn or sweeping the sidewalk. In addition, delivery people are known to step into the path of moving vehicles. The driver is advised to do a special type of scanning, called ground search to detect children. The text also cautions that children might be hidden by shrubbery as well as parked cars and that the elderly may take longer to cross the street and may make errors in time-space judgment. The driver is advised to be alert for blind persons and to yield the right of way and provide extra consideration for pedestrians with strollers and carriages.

As indicated previously, the specific coverage of bicyclist and pedestrian issues in the various state programs reviewed may not be precisely described in this report because of variations in the formats of the various materials available for study. Where texts or detailed outlines were available, it was possible to identify the specific coverage more accurately. However, in summary, it may be noted that all of the high-school driver education programs examined included some coverage of bicyclist and pedestrian issues. Although specific details varied, the coverage included the following major topics:

- Legal rights and responsibilities of bicyclists and pedestrians
- Traffic signs pertinent to bicyclists and pedestrians
- Special roadway-surface and traffic flow problems that affect the bicyclist

- Precautions that should be observed around children and incapacitated people

- The importance of searching for bicyclists and pedestrians, exercising cautions near bicyclists and pedestrians, and communicating one's intentions to all users of the highway system

Opportunities are available for incorporating additional bicyclist and pedestrian issues in all of the driver education programs. These topics and how they might be incorporated are as follows:

- Environmental advantages of bicycling and walking--Some drivers may feel that the roadway is a complicated enough place and it should not be shared with non-motorized traffic. Since walking and bicycling not only do not use scarce resources but also do not contribute to environmental pollution, these activities benefit motorist and non-motorist alike. These advantages could be pointed out in general discussions on sharing the roadway.

- Role sharing--Most people use the roadway system in more than one role (as drivers/passengers, pedestrians or bicyclists) throughout their lives. When performing in any one of these roles, the needs of all the others must be considered in order that all can be safe highway users. Again, this point could be made when discussing sharing-the-roadway issues.

- Visibility--In discussions of poor visibility conditions, drivers could be cautioned to be especially alert for all roadway users, particularly bicyclists and pedestrians who may be especially inconspicuous when visibility is poor.

- Inclement weather--In discussions of the problems of vehicle control in inclement weather, drivers could be reminded that, if they are encountering difficulty in maintaining control of their vehicles, pedestrians and bicyclists will encounter similar or worse control problems and therefore special care around them should be exercised.

- Accidents--Discussions of accidents could include those motor vehicle accidents that are common to bicyclists and pedestrians as well as those involving vehicles only so that the driver will gain an appreciation of the need to search carefully for bicyclists

and pedestrians and exercise special precautions when sharing the roadway with them.

- Parked/parking vehicles--Instructions on procedures to follow when parking or leaving parked spaces could include consideration of pedestrians and bicyclists. Specifically, when opening car doors, drivers should not only make sure that other vehicles will not be struck by the open door but also that opening the door will not interfere with the forward movement of a bicyclist. In addition, before leaving a parking space, drivers should be especially careful to search for pedestrians who might enter the roadway behind the vehicle.

In addition, of course, teaching techniques can be used to enhance understanding of the special problems of bicyclists and pedestrians in the roadway environment. For example, situational problems that include bicyclist and pedestrian concerns could provide the basis for classroom discussions. In addition, during behind-the-wheel sessions, drivers could be required to provide a running commentary of what they are encountering as well as what they *could* encounter (from between parked cars, from behind shrubbery, from driveways, etc.) and how they are adjusting (or could adjust) their driving to accommodate the roadway events.

2. Other Adult Programs

Other adult programs reviewed for this study include the AAA's *How to Drive* program and the driver improvement programs for older adults prepared by the AAA and by the American Association of Retired Persons (AARP). In addition, the Professional Truck Driver Institute of America provided a copy of the driver education curriculum prepared for tractor-trailer drivers.

The AAA *How to Drive* program was designed to provide safety and car management information for beginning and advanced adult drivers. The program text contains the following chapters:

1. Traffic laws
2. Traffic control devices
3. Car control skills and habits
4. Basic maneuvers
5. Driving an automobile with a manual shift
6. Vision and perception
7. Management of time and space
8. Interacting with other users
9. Adverse driving conditions and emergencies
10. Keeping fit to drive

11. Consumer's guide to trouble-free and economical driving
12. Loading, towing, and driving special vehicles
13. Collisions and insurance

Chapter 2 includes descriptions of bicycle and pedestrian warning signs as well as illustrations and descriptions of the meaning of pedestrian signals. In Chapter 6, bicyclists and pedestrians are included as potential hazards to be identified in performing a proper scan of the scene. The driver is advised to classify all information revealed in the search process into major groups, including non-motorized highway users. It is noted that pedestrians, bicyclists and animals are the least protected and least predictable of all the highway groupings. Their age, sex, location (on sidewalk, curb or roadway), and activity (standing, running, walking, talking, entering or exiting a car) can provide clues to possible pedestrian actions. Age, sex, size and size relative to bicycle size, location (on roadway, sidewalk, shoulder), facing or riding with traffic, control of movement, and whether they are alone or in a group can provide clues to possible bicyclist actions. Managing time and space requirements to accommodate bicyclists is included in Chapter 7.

Chapter 8 provides a section on interacting with pedestrians. Drivers are advised that they have a legal and moral responsibility to take whatever precautions are necessary to avoid pedestrians. It is pointed out that the non-driving very young and elderly pedestrians do not appreciate the limitations of motor vehicle control and may take chances that cause serious problems for drivers. The driver is advised to watch for pedestrians in all situations and anticipate the unexpected. Special problems of child bicyclists who do not have appropriately-sized bicycles are noted as are the special needs of bicyclists to avoid various roadway surface conditions. The importance of scanning carefully for all highway hazards, including bicyclists and pedestrians, is emphasized.

AAA's *Driver Improvement Programs* can be customized according to the age and experience of the group. For example the program entitled *Managing Time, Space and Visibility* can be customized for first and second traffic offenders as well as for volunteer participants who simply wish to improve their driving skills. The program entitled *Safe Driving for Mature Operators* is addressed to the older driver. Both programs contain the following eight modules:

1. Introduction
2. Seeing
3. Communicating
4. Adjusting speed
5. Margin of safety
6. Driving emergencies
7. Your car
8. You the driver

As can be noted, these courses do not include a separate module on sharing the roadway issues. However, bicyclists and pedestrians are included in the discussions of specific improvement areas. For example, in the module on seeing (Module 2), bicyclists and pedestrians are included as hazards to be observed in the scanning process. In addition, both the importance of using ground viewing to check for pedestrians between parked cars and the importance of being especially alert in those roadside areas where a pedestrian might enter the road suddenly (that is, shopping centers, parking lots, construction areas, busy sidewalks, playgrounds and school yards) are emphasized. The driver is also advised that the law requires yielding to pedestrians in crosswalks.

In Module 3, the driver is advised to tap the horn gently when approaching a person on foot or on a bicycle. A sharp blast on the horn should be used if a child is about to run into the street. Otherwise, the horn should be tapped gently so that the pedestrian or bicyclist is not startled.

In Module 5, the discussion of time and space management includes a recommendation that the driver keep a space between the vehicle, parked cars (someone may exit from the car or step out from between parked cars), bicyclists and pedestrians. The module includes a situational example in which there is a bicyclist in the roadway just ahead of the driver and a large truck is approaching from the opposite direction. The driver is advised to allow extra space for the bicyclist in passing. The driver is also advised to allow a margin of safety for people whose view is obstructed by umbrellas or clothing. Special precautions should be observed around people who might be distracted, for example, delivery people, construction workers, small children and people who are talking to each other. The driver is advised not to attempt to pass another car in those areas where people are likely to enter the road, for example, intersections and shopping center entrances/exits. Also, the driver should look well ahead for pedestrians and bicyclists before making a decision to pass any vehicle since a pedestrian or bicyclist may make that passing space unavailable to the motorist.

The *AARP 55 Alive/Mature Driving* course is a driver improvement program prepared for the older driver. It contains the following sessions:

1. Overview
2. Physical changes
3. Interacting with traffic
4. Interacting with traffic (continued) and safety belts
5. Accident prevention measures, adverse driving conditions, other road users and recreation vehicles
6. Perception and course wrap-up

In Session 3, right-of-way rules are covered including the necessity to yield both to pedestrians who are in or near a crosswalk (regardless of whether or not the crosswalk is marked) and to all pedestrians in the turn path when turning left at an intersection. The

driver is advised to be alert for bicyclists and pedestrians when making left turns and to continue to scan for bicyclists and pedestrians while making the turn. The driver is also advised to yield to all traffic and pedestrians when making right turns on red.

In Session 5, there are separate sections on pedestrians and bicyclists. It is noted that everyone is a pedestrian at some time and must learn to be aware of the environment. Drivers are advised to look carefully for pedestrians when turning especially at busy intersections and when making right turns on red, to notice signs of pedestrian unawareness (continued walking, attention elsewhere, reading) and to be prepared to stop, and to make sure to be seen by pedestrians before proceeding in front of them. It is noted that parked cars can hide pedestrians from the driver's view as can buses and other cars that have stopped to let a pedestrian pass. The driver is advised to check all blind spots before making turns, to watch for other cars stopping for pedestrians and always to search before proceeding at traffic lights.

AARP notes that bicyclists have a legal right to the roadway but must remain near the right edge. Drivers are advised that it is unsafe to share a lane with a bicyclist. (It might be noted that, in some places, wide outside curb lanes are meant to be shared by motorists and bicyclists.) When approaching or passing a bicyclist, the driver is advised to swing wide if it is safe to do so. It is pointed out that many bicyclists are children who may not be aware of all traffic laws. Also, children may change direction suddenly so the motorist should be especially alert around young people on bicycles.

In Session 6, it is noted that the safe driver is a perceptive driver who is alert to everything on or near the roadway including bicyclists and pedestrians. The driver should be aware that children may act unpredictably and therefore should be especially cautious when children are playing in or near the road and when driving near schools and stopped school buses. The driver is advised to be alert for pedestrians and bicyclists at controlled intersections.

The *Tractor-Trailer Driver Curriculum* is a comprehensive program defined by the Professional Truck Driver Institute of America. It is based on the minimum standards issued by FHWA's Office of Motor Carriers (formerly Bureau of Motor Carrier Safety). It contains 29 instructional units grouped into the following five sections:

1. Basic operation
2. Safe operating practices
3. Advanced operating practices
4. Vehicle maintenance
5. Non-vehicle activities

Since the other sections are highly technical and deal with operating and maintaining a tractor trailer and performing the job of tractor trailer driver (including cargo handling and

documentation), only Sections 2 and 3 will be discussed here. These sections are divided into the following instructional units:

2.1 Visual search
2.2 Communication
2.3 Speed management
2.4 Space management
2.5 Night operation
2.6 Extreme driving conditions
2.7 Proficiency development

3.1 Hazard perception
3.2 Emergency maneuvers
3.3 Skid control and recovery

Consideration of bicyclists and pedestrians is included in several units of the course, including discussions on scanning and searching the traffic scene (Unit 2.1), communicating intent on the roadway (Unit 2.2), operating at night (Unit 2.5) and perceiving hazards (Unit 3.1). When overtaking another vehicle, pedestrian or bicyclist, drivers are advised to assume that they have not been seen and that the vehicle or person may suddenly move into their path. A *light* tapping on the horn is recommended to alert the vehicle or person to the truck's presence or, at night, a flashing of the dimmer switch. Drivers are also advised to use their signaling devices when overtaking pedestrians or bicyclists. Pedestrians, joggers and bicyclists are mentioned as night driving hazards because they may not be readily seen.

In the unit on hazard perception (Unit 3.1), a hazard is defined as *any road condition or other road user (driver, cyclist, pedestrian, or animal) that presents a potential danger* to safe vehicle operation. The driver is advised to make eye contact with other roadway users, but is cautioned that positive eye contact is no guarantee that a conflict will be avoided. It is noted that special care should be exercised when other drivers or pedestrians are engaged in conversation (and thus are distracted), in the presence of highway construction workers or road repair and utility crews, when vendors (ice cream trucks and other neighborhood street vendors) are present, and in the presence of disabled vehicles (a driver may be changing a tire and passengers may leave the vehicle to observe). It is pointed out that people can be careless in all of these situations, and it is the driver's responsibility to protect them from their carelessness.

The driver is advised to be cautious around buses and taxis. Passengers exiting buses may cross the street in front of or behind the bus and may not see the tractor trailer. In addition, a passenger may leave a taxi from either side, or a pedestrian may run into the street in an attempt to catch a slow moving taxi.

It is noted that pedestrians and bicyclists can be particularly hazardous in rainy weather. A hat pulled low over the eyes or an umbrella may prevent them from seeing. Pedestrians may be preoccupied and move directly into the vehicle's path. And the attention of children is easily distracted and they may dart into the street suddenly. It is noted that roadway accident scenes and hospital emergency areas can be dangerous to both drivers and pedestrians because all are distracted. And countless conflicts can develop at intersections where vehicles, bicyclists and pedestrians may enter from the left, right, opposite direction or any combination of these directions. The tractor-trailer driver is advised:

> *...driving is a social act; it involves you and everyone or every object in your surroundings. Your success will depend on how well you see and identify the potential hazards and react by adjusting your driving.*

In addition to the adult driving courses described, AAA puts out a variety of PI&E materials on various aspects of driving. Among others, these include brochures entitled *Defensive Driving, One Good Turn Deserves Another, Parking Made Easy,* and *How to Go on Ice and Snow*. The first of these brochures mentions pedestrians as a consideration in managing time and space. The second mentions both pedestrians and bicyclists as factors to be considered in making turns. The last two brochures could include consideration of both bicyclists and pedestrians in parking and traveling on ice and snow, respectively.

In summary, as with the school-based driver education programs, all of the other adult programs examined for this report included discussions of driver and pedestrian issues. Since most of these adult courses were designed for the advanced (in contrast to the beginning) driver, they emphasize pedestrians and bicyclists as roadway hazards that could develop into conflicts if the driver is not alert. The orientation is on seeing and communicating with the entire roadway environment, understanding limitations of pedestrians and bicyclists, and adjusting one's driving behavior accordingly.

Opportunities exist for incorporating additional bicyclist and pedestrian issues in all of the driver education programs examined. Most of these opportunities are identical to those listed for school-based programs. The topics and how they might be incorporated are:

- Environmental advantages of bicycling and walking--Some drivers may feel that the roadway is a complicated enough place and it should not be shared with non-motorized traffic. Since walking and bicycling not only do not use scarce resources but also do not contribute to environmental pollution, these activities benefit motorist and non-motorist alike. These advantages could be pointed out in general discussions on sharing the roadway.

- Role sharing--Most people use the roadway system in more than one role (as drivers/passengers, pedestrians or bicyclists) throughout their lives. When performing in any one of these roles, the needs of all the others must be considered in order that all can be safe highway users. Again, this point could be made when discussing sharing-the-roadway issues.

- Roadway surfaces--Bicyclists have special problems in dealing with certain roadway surface conditions (for example, grates, debris, puddles) and may need additional maneuvering room to avoid these hazards. This point could be made when discussing roadway-sharing issues or driving under adverse weather conditions.

- Inclement weather--In discussions of the problems of vehicle control in inclement weather, drivers could be reminded that, if they are encountering difficulty in maintaining control of their vehicles, pedestrians and bicyclists will encounter similar or worse control problems and therefore special care around them should be exercised.

- Accidents--Discussions of accidents could include those motor vehicle accidents that are common to bicyclists and pedestrians as well as those involving vehicles only so that the driver will gain an appreciation of the need to search carefully for bicyclists and pedestrians and exercise special precautions when sharing the roadway with them.

- Parked/parking vehicles--Instructions on procedures to follow when parking or leaving parked spaces could include consideration of pedestrians and bicyclists. Specifically, when opening car doors, drivers should not only make sure that other vehicles will not be struck by the open door but also that opening the door will not interfere with the forward movement of a bicyclist. In addition, before leaving a parking space, drivers should be especially careful to search for pedestrians who might enter the roadway behind the vehicle.

D. Driver License Manuals

Driver license manuals from 45 states and the District of Columbia were reviewed for this study. Since the purpose of the review was to determine present coverage of pedestrian and bicyclist issues, no detailed comparative analysis of the various materials was

made. Rather, the pedestrian and bicyclist topics covered in the various manuals were noted as were the methods used to incorporate the topics into the manuals and the capacity of the manuals to include additional topics.

The driver license manuals cover a variety of topics, and they are organized quite differently. They typically include the following topics as a minimum:

- Driver licensing classes and requirements
- Vehicle titling and registration
- Traffic laws, ordinances, rules and regulations
- Traffic signals, signs and markings

Many also include discussions of safe driving techniques (how to park, how to make turns, precautions for night driving, precautions in inclement weather, etc.). Some manuals include very detailed sections on specific aspects of the above-listed topics. For example, in discussions of implied consent laws, the effects of alcohol are described in some detail or, in discussions of seat belt and child restraint laws, crash dynamics are covered. In addition, there are any number of other topics, such as what to do in an accident, how to handle emergencies (tire blowout, steering failure, stuck gas pedal, etc.), effect of driver condition (fatigue, anger, etc.) on driving performance, and availability and nature of driver improvement programs, to name a few.

Some manuals include separate sections on sharing the roadway with other users. These users typically include pedestrians and bicyclists. In some instances, there are separate sections for each type of user, and some states have separate manuals for bicyclists, motorcyclists and operators requiring a commercial driver's license (CDL). When there are separate sections, they usually include rights and responsibilities of both the motorist and the other roadway user. Sometimes, they cover responsibilities only and therefore are *not* specifically directed to the motorist. Typically, when there is a separate manual for the bicyclist, it covers the bicyclist's responsibilities only although occasionally topics that could be appropriately addressed to the motorist are included. As an example, the Colorado manual for bicyclists includes the following quotation:

> *Bicycling is the most efficient form of transportation known to humanity. It is non-polluting, provides numerous health benefits and does not consume non-renewable resources. A bicycle is relatively inexpensive to purchase and maintain and can be used on most of our existing road system. Bicycling is just plain fun!*
>
> *The State of Colorado recognizes the benefits of using bicycles as an alternative form of transportation and highly recommends their use for commuting, errands and recreation. Many trips normally taken by car can be pleasantly and efficiently done by bicycle.*

The manual continues with an enumeration of gasoline and dollars that are saved and carbon monoxide, nitrous oxides, and hydrocarbons that are not produced each year if a person regularly rides a bicycle to work five miles each way. These comments could be appropriately addressed to motorists to apprise them of the environmental benefits of the bicycle as an alternative means of transportation, when practical.

All of the basic driver licensing manuals reviewed contain at least some coverage of pedestrian *or* bicycle issues. At a minimum, requirements to yield to pedestrians are covered although, in two instances, these requirements are not highlighted in the text. As stated previously, sometimes there are separate sections for pedestrian and bicycle issues. In other instances, pedestrians and bicyclists are included, as appropriate, in discussions of other manual contents. For example, a discussion on backing into a parking space might include a warning to the driver to search for bicyclists and pedestrians first or the driver might be warned to check for bicyclists before opening a car door after parking. Some manuals contain *both* separate sections on sharing the roadway *and* additional reminders in other appropriate places in the text.

In general, comments addressed to bicyclists warned them to yield the right of way to pedestrians. In addition, drivers studying for the CDL were warned to consider both pedestrians and bicyclists as road hazards; these hazards were described in the discussion on driving instruction available for operators of tractor trailers. It should also be pointed out that, in most instances, special problems common to two-wheeled vehicles (wind, road surface conditions) were typically covered more completely in manuals directed to the motorcyclist than to the bicyclist.

The specific pedestrian and bicycle topics covered in the driver license manuals are listed below, organized into broad topical areas. They are followed by a listing of additional topics that could be included in driver license manuals.

Pedestrian issues included in driver license manuals are:

- Selected pedestrian populations

  - Be especially careful around handicapped pedestrians--those with canes, on crutches, in wheelchairs and with guide dogs. They may move especially slowly.

  - Exercise special care around children since they do not appreciate the dangers of traffic and may dart into the street impulsively. Watch out for children especially near schools, bus stops, playgrounds and parks and in residential areas.

  - Before you get into your vehicle, check around it to make sure there is no child in the vehicle's path.

- Teach your children how to be responsible pedestrians at an early age.

- Exercise special care around the elderly who may not be able to see or hear well and may move slowly.

- Studies show that more than half of all pedestrians killed by automobiles are under the influence of alcohol. If you suspect a pedestrian has been drinking, be especially careful because the person's senses and judgment are likely impaired.

■ Interchangeability of roles

- Be careful around pedestrians. After all, everyone is a pedestrian at one time or another, and that includes you.

■ General pedestrian cautions

- Pedestrians are the highway users most at risk in traffic. In any conflict between a vehicle and a pedestrian, the pedestrian is going to be the loser. Regardless of the rules of the road, exercise great care to avoid striking pedestrians.

- Pedestrians can act carelessly, that is, walk on the wrong side of the road, ignore crosswalks, jaywalk, hurry across an intersection in bad weather, misjudge a light change and begin to move too soon.

- Pedestrians may not be aware of traffic safety rules.

- Never pass a vehicle that has stopped to let a pedestrian cross the street.

- Remember to keep your eyes moving when you drive. This defensive driving rule will help you spot pedestrians near or approaching the roadway.

- More often than not, a pedestrian is at fault in a motor vehicle accident, but that's little comfort to the driver who has struck someone. It is the driver's responsibility to take every precaution to avoid hitting a pedestrian.

- Slow down whenever you see a group of people gathered alongside the roadway and be prepared to stop if necessary.

- Be alert for pedestrians at all times. Tap your horn to get their attention.

- Whenever you drive on a street lined with parked cars, be prepared to stop quickly because a pedestrian could dart out between the cars at any time.

■ Warning signs

- Watch for traffic signs that indicate that pedestrians may be crossing the street, including pedestrian crossing signs, school signs, and school crossing signs. Exercise special cautions.

■ Turning

- Be especially watchful for and yield to pedestrians when making both left and right turns, and right turns on red. Pedestrians are often difficult to see in traffic.

- Right turns on red are particularly dangerous for pedestrians.

■ Driveways, alleys, private roads

- Watch for and yield to pedestrians when exiting or entering driveways and private roads.

- Before backing out of a driveway when children are near, get out of the vehicle and check behind it.

■ School buses

- Watch for children along the side of the road after stopping for a school bus. Drive slowly until you are past them.

- Most school bus-related deaths and injuries occur when children are crossing the street after leaving the school bus, not in collisions involving school buses.

■ Accidents/injuries/deaths

- About two out of five people killed in motor vehicle accidents are pedestrians. In rural areas, it is about one out of ten. Be especially watchful for motorists on the roadway.

- Most pedestrians killed are children, elderly persons or persons who have been drinking.

- Backing

  - Before backing up, look behind you over both shoulders to make sure you will not interfere with pedestrians or oncoming traffic.

- Night driving

  - Nighttime is particularly dangerous for pedestrians so be especially on the lookout for them.

  - Use your headlights during low-light periods to make it easier for drivers and pedestrians to see you.

  - Always dim your lights when pedestrians are approaching you on the road.

- Intersections

  - Remember that you must always yield the right of way to pedestrians at intersections.

  - Do not hug the curb near intersections. Many pedestrians step out into the street and become hazards in the curbside lane.

  - Always stop behind the crosswalk so that you don't block the pedestrian's way at intersections.

- Inclement weather

  - Watch out for skaters and people on sleds when it is snowy or icy.

Bicycle issues included in the driver license manuals are:

- Efficiency/advantages of transportation mode. The bike population is increasing each year and is expected to continue to increase because:

  - Replacing driving with bicycling reduces nitrous oxides, carbon monoxide and hydrocarbons in the air.

- Replacing driving with bicycling saves gasoline.
- Replacing driving with bicycling saves money.
- Bicycling is good exercise.

■ Vulnerability

- Bicyclists are often difficult to see in traffic and have little personal protection.
- Approach bicyclists with extreme caution. Allow them extra room since they have shorter stopping distances.
- In an accident, the bicyclist is usually the one to be seriously hurt.

■ Roadway hazards

- Cyclists may need to change speed or road position quickly to avoid loose gravel, debris, drainage grates, seams or grooves in the pavement, manhole covers or small animals.
- Cyclists may slow down and change direction to cross railroad tracks.
- Cyclists may have difficulty maneuvering on bridges with metal grates.
- Bicycles are not stable on the gravel of the shoulder.
- Anticipate the bicyclist's path by scanning the roadway for hazards. Slow down to permit the bicyclist to change lanes, if necessary. Drive courteously and learn to share the road.
- Many dogs have a phobia about moving bicycles. In this situation, the dog usually commands the full attention of the bicyclist who may have to swerve to avoid the dog. Be extra cautious when approaching a bicyclist who is being chased by a dog.

■ Legal rights

- The bicyclist is a legal user of the road and must be respected for these rights.

- You must yield right of way to the bicyclist just as you would to any other roadway vehicle.

- The rider

  - Many bicyclists are children who may not be aware of traffic laws and who may be careless in traffic.

  - Be courteous to the bicyclist. Like the pedestrian, the bicyclist is no match for the car or truck.

  - Since the bicycle is the primary vehicle for transportation for children under 16 years of age, make sure your child has been taught how to ride a bicycle properly and knows the necessary signs, signals and rules.

  - Don't expect proper hand signals from a bicyclist. An inexperienced rider may be hesitant to remove one hand from the handlebar to signal because balance might be jeopardized.

- Intersections

  - Yield to a bicyclist at intersections as you would to a car. If possible, make eye contact with the bicyclist.

  - Before proceeding at a stop sign, make sure you don't block the path of a bicyclist who has the right of way.

  - Take special precautions at intersections, which are frequently the site of motor vehicle/bicycle accidents. Scan all travel lanes for approaching traffic including bicycles. Check the right edge of the road for bicycles.

  - Wait until the bicyclist has cleared an intersection before making a turn to the left or the right. The most common error for the driver is to make a left turn directly into the path of an oncoming cyclist. Motorists often frequently make right turns in front of cyclists whom they have just passed, thus cutting them off.

  - Be alert for the cyclist who suddenly swerves or turns in front of you. Cyclists sometimes wait until the last second to move to the center of the roadway to make a left turn.

- Passing

  - Slow down and give bicyclists extra room when passing. Air pressure from a quickly passing vehicle can throw a bicyclist off balance. In addition, bicyclists occasionally need to weave sideways to avoid road hazards that may cause a fall.

  - When passing, a *gentle* tap on the horn well behind the bicyclist is adequate warning of your presence. Do not blast on your horn.

  - When two vehicles pass a cyclist in close sequence, the tire noise of the first hides the sound from the second. A short "beep" by the second makes good sense.

  - Allow for the bicyclist to make mistakes. Watch for swerving cycles and sudden turns.

  - If there is no room to pass because of approaching traffic, wait for the traffic to go by and then pass.

  - Be careful in judging the speed of a bicycle. A bicycle may be traveling faster than you think. Drivers sometimes cut in front of a bicyclist too fast because they have misjudged the bicyclist's speed.

  - On rainy days or when the pavement is wet, give the bicyclist extra room in passing to avoid splashing water.

  - High winds may make the bicyclist swerve.

  - Give the bicyclist extra space if your vehicle has extended outside rearview mirrors.

- Turning

  - Remember that the bicyclist you just passed may catch up with you when you slow down to make a right turn. Look over your shoulder to be sure you have cleared the bicyclist before turning right.

  - Do not underestimate the bicyclist's speed when making a left turn in front of an oncoming bicyclist. You must yield to the oncoming bicyclist.

- Be sure to signal your intention to turn to a bicyclist.

- Alleys/driveways

  - When exiting from a driveway or alley, make sure you don't block the path of a bicyclist in the roadway.

  - When approaching a cyclist who is near the roadway or attempting to enter the street from a driveway, reduce your speed and tap your horn *gently* to attract attention.

- Conspicuity

  - A growing problem for drivers is the inability to see the bicyclist. Because of their narrow profile, you will need to develop your eye-scanning patterns to include bicyclists.

  - The motorist is very often technically at fault in a bicyclist-motor vehicle collision. The most common reason given is "I just didn't see him." Sometimes, the bicyclist is in the blind spot of your car. You should constantly check the blind spot of your rearview mirror and move your eyes from side to side in anticipation of a bicyclist.

  - Be alert for bicycles when turning, changing lanes or reaching the top of a hill. Remember, the bicycle has a low profile and is more difficult to see than motor vehicle.

  - The bicyclist is particularly hard to spot in traffic when visibility conditions are poor (as in rain, at dusk, or in fog).

- Night driving

  - Night is a difficult time for both the motorist and the bicyclist. Do not assume that cyclists will always have lights and reflectors. Even with proper headlight and rear reflector, bicyclists are difficult to see at night. Use extra caution especially in poorly lighted areas.

  - Never approach a bicyclist at night with your high beams on as this will blind the cyclist. Always dim your lights for a bicyclist.

- Anticipation

  - Anticipate bicyclists at parks, playgrounds, near schools and especially in residential areas.

  - Be especially cautious during the morning and afternoon hours when bicyclists are traveling between home and work, school or play.

- Parking

  - After parking on streets and before getting out of your vehicle, both drivers and passengers should be sure that they will not strike a bicyclist when opening car door.

- Special precautions

  - Never permit a bicyclist to hang on to your vehicle in the roadway.

  - Never drive in a bicycle lane except when making a turn or entering or leaving a driveway or private road.

  - During wet weather, the breaking ability of a bicycle is greatly reduced. Be prepared to compensate for the bicyclist's decreased ability to slow or stop.

The preceding lists show that a considerable amount of information on pedestrian and bicycle issues is included in the various state driver licensing manuals. Not all of the points made are included in any one manual. Rather, the topics were compiled from all the manuals reviewed for this study. Additional bicycle and pedestrian topics that could be included are as follows:

- Health advantages of walking--to make the motorist aware of the value of sharing the roadway with the pedestrian.

- Importance of signaling intentions to pedestrians--for example, using directional as well as hand signals to let a pedestrian know the motorist's intention to turn, slow down or stop.

- Common types of motor vehicle/pedestrian and motor vehicle/bicycle accidents--to make the motorist aware of potential hazards that might be encountered.

- Instability dangers in inclement weather--to make the motorist aware that, just as there is less control over a vehicle in bad weather conditions (that is, ice, snow), the pedestrian and bicyclist have similar control problems.

- Problems when lanes end or merge--to make the motorist aware that, if the right-hand lane ends (merges with the next lane or becomes an exit lane), the bicyclist will need to travel across that lane to take a position in the new right-hand lane.

III. STRATEGIES FOR INCORPORATING BICYCLIST AND PEDESTRIAN TOPICS INTO EDUCATION PROGRAMS

The previous section of this report described the coverage of bicyclist and pedestrian topics in a sample of existing programs and suggested additional relevant topics for inclusion in future implementations. In this section, strategies are recommended for including topics such as these in the four types of programs considered within this case study:

- School-based safety and health training
- Driver education
- Driver licensing
- Driver public information and education (PI&E).

The recommendations which follow are presented in terms of each of the major *issues* identified in the previous section. It is recognized that there are numerous ways to categorize the various topical areas addressed. The classification scheme used to group the topics into issues must, of necessity, be arbitrary. The particular one chosen was selected to minimize overlap and highlight those major areas which seemed to recur across the various types and examples of materials reviewed.

For each issue, examples of major *considerations* are presented. No attempt was made to cover all of the topics addressed in Section II. Rather, a representative subset of topics was selected which illustrate the type of additional information on bicyclists and pedestrians which was deemed beneficial to include in future programs. The particular group(s), bicyclists, pedestrians and/or motorists, addressed by each consideration is highlighted with key letters.

The *incorporation recommendations* complete the coverage of each issue. First, general recommendations are presented which transcend program type. Then, recommendations specific to each of the four program types are presented.

The strategies discussed herein assume that those in charge of the curriculum for the target educational programs have already agreed to incorporate bicyclist and pedestrian topics. This is clearly not always the case. Therefore, in order to create a climate in which there is a desire to include pedestrian and bicyclist considerations, some degree of promotion will be necessary. A detailed discussion of ways to promote consideration of pedestrians and bicyclists is beyond the scope of the present case study. However, it is believed that any promotion effort should include:

- Consideration of countermeasure benefits as well as accident statistics. Intuitively, educators know that people get injured and killed as pedestrians and bicyclists. However, it is not clear that they fully appreciate just how effective current countermeasure programs, including education, can be in reducing accidents. Therefore, benefits should be stressed, perhaps even more than the "body count."

- Advocacy by groups outside the Federal Government. Safety education efforts typically need a constituency. Interest will certainly be enhanced if one or more powerful lobbying groups such as parent associations or nationally recognized teacher organizations can be enlisted to lead the movement to include pedestrians and bicyclists in education programs.

- Funding or at least technical support for curriculum revisions. Extolling the benefits of including consideration of bicyclists and pedestrians will surely not be as effective as providing resources in terms of direct funding or model curriculum modules prepared by acknowledged experts.

- Establishment of reasonable initial objectives. There is a myriad of pedestrian and bicyclist topics worthy of coverage. The reality is, however, that existing educational curricula of all types are already crowded and facing demands to include even more topics. Initial promotion efforts should therefore focus on establishing a beachhead of incorporation from which growth is possible.

Society's increasing awareness of environmental and physical fitness issues suggests that promotion efforts including these guidelines and based on the best available research information can be successful. These successes will, in turn, provide the opportunity to apply the incorporation strategies enumerated in the remainder of this section.

Issue: *Road Sharing*

Considerations: (B = Bicyclist; P = Pedestrian; D = Driver)

- Roads should be designed with pedestrian and bicycle safety in mind as well as motor vehicle safety. If the design of a road seems to promote conflicts among the users who should share it, report this to the cognizant authorities. (B,P,D)

- There are circumstances under which bicycle safety is enhanced by allowing riding on the shoulders of limited access highways if the roadway design permits and motor vehicle drivers are aware of the possible presence of bicyclists. (B,D)

- There are circumstances under which bicycle safety is enhanced by allowing riding on sidewalks if the sidewalk design permits and pedestrians are aware of the possible presence of bicyclists. (B,P)

- The roadway is used by motorists for a variety of purposes including travel for pleasure and recreation as well as business. Similarly, it is and should be available to bicyclists and pedestrians for any legitimate reason. (D,P,B)

- A bicyclist's position on the roadway is a major determinant of both safety and the attitude of motorists toward bicyclists. (B,D)

Incorporation Recommendations:

The issue of the need to *share* the road rather than just *use* it can be addressed whenever bicycling is encouraged. Also, all education programs can stress the fact that poor road sharing behavior on the part of pedestrians, bicyclists or motorists does not mean that there is an intent not to share the road. In fact, education is needed to ensure that bicyclists, pedestrians and motorists know how to share the roadway safely and efficiently.

School-based safety/health training:

School-based training tends to stress specific behaviors. Therefore, it is important for it to include specific warnings to students against the major examples of poor road sharing by bicyclists--riding two or more abreast and "hogging" the lane on a two-lane road.

Driver Education:

Students in driver education get an introduction to the entire issue of road sharing. It is therefore essential to include in the curriculum the following topics dealing with knowledge and attitudes about road sharing:

- You make a *transition* from being a pedestrian or bicyclist to being a motorist. You should therefore remember that other bicyclists and pedestrians have as much right to the roadway as you did when you were a non-motorist.

- Pedestrians, bicyclists and, in fact, motorists who do not share the roadway well are likely to do so because they do not understand how. All road users have an equal right to use roadways but not equal capabilities once on them. The first step is to acknowledge that the other road users may be present and then to plan to coexist with them. This implies the need to alter your scan patterns, speed, roadway position and mental set to take into account the limited capabilities of bicyclists and pedestrians.

- Sharing does not necessarily imply giving in. It means *acknowledging* the capabilities and limitations of other road users and *planning* your driving to accommodate them.

Driver Licensing:

The same topics that are appropriate for driver education can be covered in driver license manuals. Since space is more limited, however, less detail can be provided. It is therefore likely best to focus on attitudinal issues as an adjunct to the existing driver licensing materials which cover right-of-way issues.

Driver PI&E:

Public information can also address some of the attitudinal issues inherent in road sharing. Its limited time/space capacity, however, makes it somewhat difficult to convey this sort of information. Public service announcements (PSAs) in particular might better be devoted to specific, safety-related messages than to the more generalized sharing issues which are better addressed by specific education.

Issue: *Personal/Environmental Health*

Considerations: (B = Bicyclist; P = Pedestrian; D = Driver)

- Significant health benefits can accrue to someone who regularly rides a bicycle or walks on trips which might otherwise be made in a motor vehicle. (D)

- In addition to personal health benefits, there are significant environmental and societal benefits which arise from substituting bicycling and walking for driving. Although some of these benefits can also be obtained from the wider use of mass transit, only bicycling and walking combine the personal and societal benefits so effectively. (D)

- The choice of transportation mode for life's regular duties can have a profound impact on both the health of an individual and the quality of life for everyone else. (D)

Incorporation Recommendations:

Encouraging increased bicycling and walking can provide significant societal benefits in terms of improved health and well-being and the preservation of the environment and scarce fuel resources. A major problem is that many people likely do not think enough about bicycling and walking as alternative transportation as well as a means of obtaining exercise and recreation. Relating the numerous personal and societal benefits to the selection of walking or bicycling as a transportation mode should therefore be productive.

School-based safety/health training:

School-based programs might do well to include actual bicycling and walking experiences as well as teaching the benefits inherent in these activities. Many school systems have successfully overcome the potential liability problems that have been given as the reason for limiting the extent to which schools engage in these extracurricular activities. Examples of the benefits of walking and bicycling can be included as part of the normal ecology, earth science, physical education, economics, etc. curricula.

Driver Education:

These topics are not consistent with the intent or focus of driver education and would therefore likely fall on deaf ears if included.

Driver Licensing:

As with driver education, driver licensing materials are directed to people who have made a commitment to become motorists. However, even in this context, a reminder not to forsake the benefits of walking and bicycling just because one receives a driver's license might have some benefit.

Driver PI&E:

If appropriate sponsors could be found, PI&E addressing this issue could be successfully mounted. Developed messages could be sufficiently simplified to be prepared as PSAs. In addition to assisting on this specific issue, addressing the benefits of being a pedestrian or bicyclist could also assist in generating positive attitudes among motorists.

Issue: *Legal Rights/Responsibilities*

Considerations: (B = Bicyclist; P = Pedestrian; D = Driver)

- It is likely not clear to motorists, bicyclists and pedestrians that under our vehicle and traffic laws, the right of way is something one gives up or yields but never has. Although this may seem like a purely semantic distinction, it has been shown, in fact, to have important safety implications. (D,P,B)

- To maintain a safe and orderly traffic environment, the vehicle and traffic law imposes certain rights and duties on pedestrians, bicyclists and motorists. In general the law involves more duties than rights. This is because safety and mobility are enhanced if road users *yield* to one another rather than assuming an unconditional right of passage. (P,B,D)

- The enforcement of traffic laws on motorists is relatively well accepted as a means to control unsafe behavior. This is due, at least in part, to the fact that many common motorist offenses such as speeding are clearly viewed as related to safety. The same benefits can arise from enforcement of pedestrian and bicyclist laws *if* the laws being enforced are also perceived as safety-related. (P,B)

- *Liability*, *fault* and *responsibility* are often confused when dealing with highway crashes. Obviously, it is best to avoid accidents altogether. Surprisingly, this can be best accomplished when motorists think in terms of responsibility and causality and not in terms of fault. In particular, although pedestrians and bicyclists (particularly children) are typically at fault for their accidents, motorists often have the ability to counteract the mistakes made by other road users. Everyone benefits when an accident is avoided because one road user compensated for the error of another. (D)

Incorporation Recommendations:

There is much confusion among motorists, bicyclists and pedestrians about the vehicle and traffic law and their responsibilities as road users. Many laws exist to support adjudication and the establishment of liability after accidents occur. There is little or no evidence that increasing knowledge of these will markedly improve safety or mobility. It is likely, however, that if motorists, bicyclists and pedestrians understand their *functional* rights and duties as road users, everyone will benefit. This inherently involves focusing information programs on those issues which enhance safety and promote effective road sharing.

School-based safety/health training:

School social studies curricula could include examples derived from the traffic environment which clarified the notions of legal prescription and proscription, liability and fault and the relationship of rights and duties to accident causation. The details of the vehicle and traffic law and its implications for bicyclists, motorists and pedestrians is best left to driver education.

Driver Education:

Driver education is an appropriate setting for covering the intricacies of the vehicle and traffic law. Although this is currently done, the distinction between *yielding* and *having* the right of way is still not well understood. Therefore, in addition to covering the specifics of the law and its resulting duties for motorists, bicyclists and pedestrians, driver education might also profitably dwell on the underlying concepts from which the safety- and mobility-related aspects of the law arose.

Driver Licensing:

As with driver education, driver license manuals can more realistically address right of way issues. Overall, it is likely best to confront this issue less in terms of its punitive implications but more with respect to its essential role in ensuring safe and efficient road utilization by all classes of road users.

Driver PI&E:

Given its limited space/time availability, driver PI&E is likely best reserved for introducing new laws and responsibilities and reiterating major safety-related requirements such as occupant restraint requirements.

Issue: *Safety - Conspicuity*

Considerations: (B = Bicyclist; P = Pedestrian; D = Driver)

- Seeing and being seen when on the roadway are essential to safe travel for all road users. In order to be seen, you must be visible *and* noticed by the viewer. This is the concept of *conspicuity* which involves both the visibility properties of the "target" and the viewing capabilities and mindset of the observer. (D,P,B)

- People typically overestimate their conspicuity in a roadway environment. Although this is true for motorists a well as pedestrians and bicyclists, crash dynamics and relative speeds/weights suggest that the situation is more consequential for pedestrians and bicyclists. (P,B,D)

- Enhanced conspicuity requires that you stand out from your surroundings and call attention to yourself. You may think that you are large and easy to see as a pedestrian or bicyclist, but against a background of cars, trucks and buildings you may be camouflaged. Bright, saturated, unusual colors and motion help increase conspicuity. There are also special high visibility materials to enhance conspicuity at night under headlamp illumination (retroreflectives) and during daylight, dusk and dawn (fluorescents). (P,B)

- The human brain tends to see what it is looking for. Thus, if a motorist looks only for other cars and trucks, the tendency to miss seeing a bicyclist or pedestrian increases. It is essential to look for all types of road users when you scan. (D)

Incorporation Recommendations:

Conspicuity is not a well understood phenomenon. The entire issue of seeing and being seen on the highway is fraught with misconceptions. It is, however, relatively easy to teach and demonstrate the principles of conspicuity. In addition, conspicuity enhancement is readily achievable with high visibility materials and/or active light sources, e.g., a flashlight. Influencing the mindset of the observer, on the other hand, likely requires both the transfer of information on conspicuity and an alteration of attitudes.

Each of the four types of education programs should include information on the principles of conspicuity, the definition of retroreflective and fluorescent materials and their role in enhancing safety. Each should also address the relative overestimate of individual conspicuity which is common among pedestrians and bicyclists and the need to encompass searches for all classes of road user when scanning the environment.

School-based safety/health training:

The "hands-on" capability of school-based programs makes them ideal for physical demonstrations of low conspicuity and conspicuity enhancement. Some demonstrations, e.g., of retroreflective materials, can be conducted indoors while others, e.g., fluorescent pigments, are best done outside. Demonstrations should be made from both the viewer and the target orientations in an effort to counteract the overestimate of conspicuity and promote the benefits of high visibility materials.

Driver Education:

Demonstrations are also possible within driver education curricula. In this context, however, the presentations must be primarily from the driver's point of view. Emphasis on the need to "think bicyclist and pedestrian" when scanning the environment should be beneficial. It will also be worthwhile to include information to enhance the conspicuity of the vehicle to pedestrians and bicyclists through the greater use of headlights and "appropriate" auditory cues (brief, "friendly" horn sounds, etc.).

Driver Licensing:

The aspects of the vehicle and traffic law related to conspicuity such as mandated headlight use should be supported by a brief description of the conspicuity phenomenon. The role of the mindset of the observer (driver) in determining whether a pedestrian or bicyclist is seen can also be covered succinctly within the context of existing manual forms.

Driver PI&E:

Public service announcements describing conspicuity-enhancing techniques and the need to "think bicyclist and pedestrian" when searching can be developed. The demonstration of techniques is also possible in TV spots, print advertisements and other print forms such as pamphlets.

Issue: *Safety - Communication*

Considerations: (B = Bicyclist; P = Pedestrian; D = Driver)

- The intentions of road users are not always clear to others using the same road. Therefore, communications among motorists, bicyclists and pedestrians is essential to ensuring safety. (D,P,B)

- In addition to the "obvious" ways of communicating through hand signals, use of the horn and use of the lights, more "subtle" positional cues also can intentionally or unintentionally convey information. This may lead to incorrect assumptions which result in accidents. (D,P,B)

- It is important to remember that communication must involve some degree of feedback. Assuming that you have conveyed your intentions is not sufficient if there is no evidence that the receiver, in fact, got the message. (D,P,B)

Incorporation Recommendations:

It is assumed that most road users, except perhaps very young pedestrians and bicyclists, are aware of the basic need to communicate. They may not, however, realize that their actions and position on the roadway are constantly sending signals to other road users, and that these signals may be misinterpreted. Focusing on closing the communication feedback loop could have significant safety benefits.

School-based safety/health training:

The principles of communication among humans and the notion of feedback are topics well suited to a classroom environment. Basic discussions of psychology, logic, mathematics and physics can all form an appropriate platform for addressing the need to communicate among bicyclists, pedestrians and motorists. Classroom exercises can be developed to demonstrate the inherent difficulties in maintaining accurate communications. A variant on the parlor game "telephone" can likely be used to demonstrate that what appear to be straightforward communications can actually become twisted or garbled. This general topic must then be related to the information needs of motorists, pedestrians and bicyclists on the road to illustrate the proper safety behavior.

Driver Education:

The same issues and strategies covered in school-based training can be addressed exclusively from the viewpoint of the driver in driver education programs. The need to communicate one's intentions as early as possible to all other potentially impacted road users should be reviewed and, to the extent possible, demonstrated.

Driver Licensing:

The limited space and time available in a driver licensing manual will likely not support a detailed discussion of this issue. However, the basic need to communicate can still be highlighted along with coverage of several major times at which a motorist needs to communicate with a bicyclist or pedestrian. These might include situations such as those in which the motorist:

- Passes a bicyclist and then turns right
- Opens a parked car door
- Turns left at a wide intersection and encounters pedestrians in the crosswalk
- Is about to overtake a bicyclist in a stream of traffic after another motorist has passed the bicyclist.

Driver PI&E:

The basic need to communicate can be reinforced with PI&E. In addition, specific examples of communication are amenable to being presented in spot announcements. However, given the relatively limited number of PI&E placements for safety messages possible, it would be best to limit coverage of communications to specific, high incidence problems in the local community.

Issue: *Safety - Obeying the Law*

Considerations: (B = Bicyclist; P = Pedestrian; D = Driver)

- It is generally true that road users are more likely to obey those laws and regulations which they perceive to be directly related to their safety and welfare. Many laws are directed primarily towards adjudication, dispute resolution or even revenue generation. It is therefore essential to highlight those laws and regulations adherence to which can have the greatest impact on safety. (P,B,D)

- Even when some laws are obeyed, safety may not be enhanced and may even be diminished. For example, strict adherence to the right-turn-on-red (RTOR) law may still not avoid an accident with a pedestrian or bicyclist if the motorist fails to scan adequately to the right before commencing the turn. (P,B,D)

- In many cases, the benefits of strict adherence to traffic laws is that it promotes uniformity and predictability among road users. This enhances communications as well as safety. (P,B,D)

Incorporation Recommendations:

This issue must be carefully addressed because it could be misconstrued. Emphasizing safety-related laws could lead to the inference that the balance of the vehicle and traffic code need not be obeyed. In addition, an over-emphasis on the law in general has the potential to be very "heavy handed." Finally, the perceived risk of apprehension for most traffic offenses is relatively low. Therefore, care must be exercised to highlight the rationale for the prescriptions or proscriptions in the law vis-a-vis bicyclists and pedestrians rather than dwelling solely on the threat of a sanction.

School-based safety/health training:

History and government courses in schools provide an excellent basis for presenting examples of vehicle and traffic laws which address the safety of the populace. The concept that laws are one of the main ways that government protects the welfare of its citizens is generally taught. Coupling this with specific examples from the traffic environment, an area of particular interest to junior and senior high school students, might effectively convey the desired information.

Driver Education:

Driver education curricula tend to stress adherence to traffic laws without fully addressing the interaction that these laws have with other road users, particularly bicyclists and pedestrians. These interactions, both positive and negative, can productively be addressed in a curriculum devoted to driver training. This is likely less a matter of adding significant material than it is altering the focus of the presentations. While strict obeyance of traffic laws must be stressed, the rationale for major safety-related laws and regulations should be explicitly presented.

Driver Licensing:

Driver licensing programs have somewhat less available time/space to cover the rationale behind laws. Nevertheless, the concept that strict obeyance of laws does not necessarily guarantee pedestrian and bicyclist safety should be covered. In addition, specific laws which have been shown to have a potentially detrimental aspect for either pedestrians or bicyclists, e.g., RTOR, should be individually covered when they are discussed.

Driver PI&E:

Public information and education does not have sufficient time or space to cover the full range of this topic. However, new or revised laws are typically publicized using PI&E. When this occurs, the PI&E should be structured to address the specific impact of the change on pedestrians and bicyclists as well as motorists when relevant.

Issue: *Safety - Identifying Conflicts*

Considerations: (B = Bicyclist; P = Pedestrian; D = Driver)

- Conflicts among road users increase the difficulty of the driver, pedestrian or bicyclist task. This, in turn, can be detrimental to safety because it reduces the margins available to preserve safe operations. (P,B,D)

- Conflicts can arise due to external factors such as blind curves, parked cars, sun glare or inclement weather. (P,B,D)

- Conflicts can also arise due to factors "internal" to the bicyclist, pedestrian or motorist such as fatigue, alcohol or drug ingestion or inattention. (P,B,D)

- One of the best and often overlooked ways to avoid conflicts is through pre-trip planning. The choice of route to follow can have a profound impact on pedestrian and bicyclist safety. For example, if a motorist avoids left turns at busy intersections, conflicts with pedestrians and their resulting accidents can be avoided. (P,B,D)

- When driving, walking or riding in unfamiliar areas it is often difficult to anticipate and identify conflicts as easily as in more familiar territory. One way to compensate for this is to expand the time-space cushion, e.g., the space between you and other road users, the size of gaps accepted, the length of scans made. (P,B,D)

Incorporation Recommendations:

A focus on conflicts should emphasize that they are not necessarily, major, traumatic events or even near misses. In fact, motorists, bicyclists or pedestrians may not even realize that they have encountered a conflict because the other party involved may have resolved it independently. Both conflict *avoidance* and conflict *resolution* should be covered.

School-based safety/health training:

The very notion of a conflict may not be well understood by school-aged children. Nevertheless, they are involved in conflicts on a regular basis on an interpersonal level and in sports. Therefore, conflict avoidance and resolution in general and with specific reference to the highway environment should be covered by examples and role playing exercises. Analogies to drug and alcohol abuse avoidance and issues of personal health may also enhance the transfer of information.

Driver Education:

The basic topic of conflicts can be addressed in driver education, although not at the same level of detail as in schools. However, the practical identification and avoidance of conflicts can be well highlighted in the driver education curriculum. During on-road practice, instructors should identify conflicts, their resolution and pre-trip planning which could have avoided them. Particular emphasis can be place on pedestrian and bicyclist conflict hazards such as visual screens and high motorist workload situations.

Driver Licensing:

The available space in driver licensing programs likely will not support a detailed treatise on conflicts. However, discussions of laws and regulations as well as prudent driving practices should address conflict avoidance and resolution as benefits. In addition, mention can be made of the conflict-avoidance benefits of adequate pre-trip planning.

Driver PI&E:

The issue of conflicts is likely too complex to address in PI&E. However, specific conflict situations, e.g., car doors opening into the path of bicyclists, can and have been addressed. In these cases, emphasis should be placed on the specific behavior being pre- or proscribed and not on the general concepts of conflict avoidance and resolution.

Issue: *Safety - Personal Considerations*

Considerations: (B = Bicyclist; P = Pedestrian; D = Driver)

- Most people tend to view various classes of road users as being essentially homogeneous. This is true with respect both to inherent capabilities and relative abilities over time and as a function of physical condition. This ignores the fact that age, interpersonal differences and personal decisions can all have profound impacts on safety. (P,B,D)

- One of the major ways in which personal differences can influence safety is in the predictability of actions on the roadway. Children, for example, tend to be far less predictable as either pedestrians or bicyclists than most adults. Likewise, pedestrians or bicyclists who have been drinking are also less predictable than their sober counterparts. (P,B,D)

- It is important for motorists to consider what types of pedestrians and bicyclists may frequent the area being driven so that personal differences can be taken into account. In some instances, this may be simple to do as in a posted school zone. In others such as neighborhoods with a large population of elderly pedestrians, it may not be so obvious. (D)

- In some cases, personal limitations can be overcome or lessened through the use of protective equipment/materials or the elimination of an accessory which interferes with performance. The use of retroreflective material, bicycle helmets and anti-lock braking systems are examples of additional equipment which can help overcome personal limitations. Omitting the use of headphones or not carrying a passenger on a bicycle are examples of eliminating factors which can diminish capabilities. (P,B,D)

Incorporation Recommendations:

Some of the personal differences are intuitively obvious such as the reduced reaction times of the elderly. However, the fact that most people are aware of these factors does not necessarily mean that they will think of them when planning or executing a travel route as a motorist, pedestrian or bicyclist. Therefore, one focus can reasonably be on techniques for including an analysis of possible personal influences to be encountered and their impact on trip safety. Another clear need is for information on the benefits of personal or vehicle "add-ons" which can improve performance. Finally, the need to avoid fatigue, alcohol, drugs or emotional conditions which can impair judgement or performance, although covered quite extensively in existing materials, can always be stressed.

School-based safety/health training:

Traditional safety, health and physical education curricula touch upon many of the issues in this area. They do not, however, typically relate them to pedestrians and bicyclists. Thus, a student may get the clear impression that drinking has a negative influence on driving but little or no impact on walking. Therefore, it is important to incorporate specific reference to the pedestrian and bicyclist problems which can emerge from the full range of personal considerations. In addition, information on protective equipment/materials is somewhat lacking. Conspicuity-enhancers, in particular, should be discussed.

Driver Education:

As with school-based programs, many personal considerations are touched upon but not followed through with respect to pedestrians and bicyclists. There is also a need to discuss including personal differences as they relate to the population of pedestrians and bicyclists likely to be encountered on any given trip. The benefits of vehicle enhancements can also be added.

Driver Licensing:

This issue cannot be covered in depth in driver licensing materials. Motorists can, however, be reminded of some of the basic limitations of young and elderly pedestrians and bicyclists. The fact that some bicyclists and pedestrians are impaired by alcohol or difficult to see (conspicuity) can also be mentioned but not covered in depth.

Driver PI&E:

Individual aspects of personal considerations can be addressed with PI&E. For example, bicycle helmets can be promoted with PSAs and motorists can be told how to drive in areas with large populations of elderly pedestrians. The overall issue, however, is too complex to be covered completely by traditional PI&E forms.

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- A pedestrian safety video
- Pedestrian Facts and Teaching Tools--prepared for teachers
- Walk Smart--a poster for students
- Brochures--safety tips for bus riders, motorists, pedestrians and bicyclists

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> Alabama, Alaska, Arizona, Arkansas, California, Colorado, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Oklahoma, Oregon, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, Wyoming.

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