Current Research in Driver Education

WILLIAM E. TARRANTS, National Highway Safety Bureau,
U.S. Department of Transportation, Denver

•DRIVER-EDUCATION PROGRAMS continue to expand throughout the nation. In 1967-1968 over 13,000 high schools provided driver-education courses for about 2 million students, or about 65 percent of all those eligible. In addition, over 2,000 commercial driving schools teach over 2 million young people and adults how to drive each year. The total annual operating cost of the current high school driver-education program is approximately $142 million, and the annual operating cost of commercial and special-purpose programs is estimated to be about $225 million.

Clearly, the nation is engaged in a major driver-education effort and has devoted substantial resources to programs in this field. An activity of such a magnitude is bound to draw the critical attention of the public that is called upon to support it. The question is not whether driver-education programs are successful in teaching people to drive. Young people and adults are learning driving skills and acquiring the knowledge and ability necessary to handle a car in modern traffic. Instead, the question is whether we are getting sufficient returns from this investment, in terms of both the intrinsic value of current programs and the comparative payoff of driver education in relationship to other urgent claims on our limited resources.

In February 1968, Daniel P. Moynihan (6) responded to this question in a report to the Secretary's Advisory Committee on Traffic Safety: "Unfortunately, the present state of knowledge as to the effectiveness of driver education provides no certainty, and much doubt, that the return on this enormous prospective effort will be commensurate with the investment. A broad and systematic inquiry is needed into the general question of how driving behavior is acquired, and how drivers can be taught not only to operate automobiles, but also to understand the major problems of highway safety."

Our inability to draw valid scientific inferences regarding the impact of driver education on subsequent driving performance is further emphasized in a statement by Leon Brody (1) of the New York University Center for Safety: "(a) No clear proof has as yet been produced showing that driver education, as presently constituted, has a significant favorable effect on driver performance. (b) No clear proof has as yet been produced showing that driver education, as presently constituted, does not have a significant favorable effect on driver performance."

These comments are but manifestations of the more general situation recognized in the Moynihan report, which refers to traffic safety as "an almost wholly uncharted area" and urges the establishment of "carefully elaborated and comprehensive national goals." Such a statement of goals could then serve as a basis for setting priorities and for determining the allocation of resources to different safety programs. However, the achievement of such goals, according to this report, requires that 3 cautions be observed. First, "traffic safety research must henceforth be conducted at the very highest level of methodological rigor and of scientific and intellectual relevance." Second, both research and its application "will involve many concepts and activities that are considerably at variance with views held by the public at large." Third, because of the newness of the field, "there do not exist even the most rudimentary standards of performance by which to measure achievement."

It is clearly evident that we cannot hope to evaluate the effectiveness of any experimental procedure without first defining the goals of the procedure. What are the most

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relevant criteria of driver-education effectiveness? Or, stated another way, what are we attempting to accomplish? Is our objective to provide effective entrance-level driving skills; to inform future driving citizens regarding national or local transportation and safety problems; to reduce the mounting toll of accidents and traffic law violations over near, intermediate, or longer time intervals; or some combination of these or other aims? The historical fact is that the primary criteria for effectiveness that have been employed to date involve reductions in the incidence of accidents and violations, and, in particular, incidence of driver-responsible accidents over varying time periods. You might wish to argue about whether or not these are the most realistic or appropriate criteria for evaluating driver-education effectiveness, but they have been unquestionably the most widely employed in this field. Historically, the overriding justification for driver education offered by driver educators themselves has been the need to reduce injury and death on highways, and the presumed effectiveness of driver education in contributing to this goal (7, 8).

It is not germane at this point to continue to list the claims and counterclaims regarding the effectiveness of driver education and training as an accident countermeasure. One observation is inescapable: Prior evaluation studies have not provided clear, consistent, objective evidence that allows an impartial person to conclude with confidence, one way or another, that one type of driver-education and training program, as currently taught, is more effective as an accident countermeasure than any other type of program.

Clearly, then, there is an urgent and critical need to evaluate the accident countermeasure efficacy of driver-education and training programs and to develop improved programs that contribute more substantially to accident control objectives. An initial step toward achieving these objectives was taken by the National Highway Safety Bureau (NHSB) when it awarded 4 contracts for driver-education research to be performed in fiscal year 1968. The contractors were the Center for Safety, New York University; the Institute for Educational Development; Dunlap and Associates, Inc.; and the Development Education and Training Research Institute, American University.

These researchers were requested to work independently on the same project, which was to develop methods and plans for evaluating the effectiveness of current or proposed driver-education and training programs at state and local levels and thereby to identify areas of needed improvements, including new driver-education and training techniques and procedures. The contractors were specifically required to (a) document in detail the recommended evaluation method or methods; (b) identify all necessary data and data sources utilized in the evaluation process; (c) document the application of the recommended valuation method or methods with regard to short-term and long-term program evaluations; (d) document the method to be employed to determine weaknesses in the total driver-education program and develop a method of assessing the effect or impact of the weaknesses on the program; (e) prepare a clear and concise plan for cataloging and describing existing driver-education systems; (f) prepare preliminary cost estimates for the data collection method of program evaluation; (g) with particular emphasis on public secondary schools, research and document the relationship of the recommended evaluation method or methods to other accepted evaluation techniques employed in educational institutions in the United States; and (h) describe the alternate evaluation methods explored and the reason or justification for selecting the method or methods recommended.

The 4 feasibility studies provided a comprehensive review of the status of driver education and its relationship to traffic safety (1, 4, 5, 9). From these reviews it is evident that at the present time it is impossible to draw valid scientific inferences regarding the impact of driver education or subsequent driving performance. All 4 reports emphasized that the objectives of driver education must be the ultimate development of driver proficiency in the real world, as reflected in efficient traffic flow and accident reduction. Despite the fact that driver-education programs are well established, there was agreement that analysis of the driving task in the real world is crucial for developing and validating programs designed to change driving behavior. Parallel to the need for task analysis was the recognized need for developing more objective measures of driving capabilities and attitudes.

The 4 contractors differed considerably in their recommended plans for carrying out the evaluation effort and in their proposals for research. These ranged from a brief reference to the need for establishing a driver information base to an elaborate, highly specific experimental design. The 4 reports all suggested some kind of survey of driver-education courses as an immediate or short-term measure. In general, these proposals resembled a form of accreditation. The 4 contractors each developed cost figures based on educated guesses and some detailed buildup depending on the number of programs and the number of drivers to be sampled in their proposed research. American University recommended $10 million for hardware alone (a whole-task simulator); Dunlap and Associates suggested $100,000 for the pilot phase only; the Institute for Educational Development proposed an expenditure of $3 million over a 9-year period; and New York University suggested an expenditure of less than $1.5 million on the development and implementation of an evaluation plan. Other major recommendations of the 4 contractors were as follows:

1. New York University suggested an analysis of variance design to determine the significance of the multiple variables influencing driver performance, as well as whether or not interactions are present. An alternative research design was offered that considers evaluative techniques that are concerned more or less with immediate learning as a result of driver-education courses (1).
2. The Institute for Educational Development concluded that the National Highway Safety Bureau must guide its support of component studies by cost-effectiveness decisions based on systems analysis of the interaction among components affecting the achievement of system goals. This contractor suggested that concurrent, complimentary programs in the areas of driver proficiency be improved. The three evaluation plans it proposed are (a) evaluation of program characteristics by measuring the quality of the learning experience provided with a focus on the program's "openness" and capacity to adapt; (b) evaluation of driver proficiency by means of a test derived from required real-world behavior as assessed by expert opinion; and (c) validation of program effectiveness by utilizing a driver-proficiency test to examine a broad range of influences and interventions on the acquisition and maintenance of driver proficiency over the long term (4).
3. Dunlap and Associates suggested using as an immediate criterion the evaluative criteria developed by the National Study of Secondary School Evaluation. This contractor stated that a long-term evaluation plan should be evolved later as the quality of accident data is improved (9).
4. The American University suggested a short-term evaluation effort based on the cataloging of existing driver-education programs. It was suggested that long-term evaluation should be based on the development and validation of a whole-task, high fidelity simulator. An analysis of driving performance was seen as the starting point in the development of standardized, objective, intermediate performance proficiency measures. American University also developed a structure for conducting a driving-task analysis (5).

The results of these 4 projects were translated into a unified short- and long-term plan by a fifth contractor, the Highway Research Board of the National Academy of Sciences. HRB was assisted by evaluative research personnel at the Educational Testing Service, Princeton, New Jersey, and by an advisory committee, formed by the National Academy of Sciences, that included experts from fields relevant to the evaluation of driver education. This study was conducted for the purpose of providing either a selection or a synthesis or both of instruments used to evaluate various types of driver-education and training programs and to develop validation plans for these instruments (2).

The HRB project concentrated on planning for immediate, short-term, and long-term evaluation methods. A broad outline of the parts of the total plan is shown in Figure 1. Only the highlights of the short-term and long-term plans are indicated. The immediate plan consists of steps that could be taken now, employing only the means at hand to evaluate driver education. The NHSB has essentially established its own "immediate" plan by issuing Highway Safety Program Standard 4.4.4 along with a program

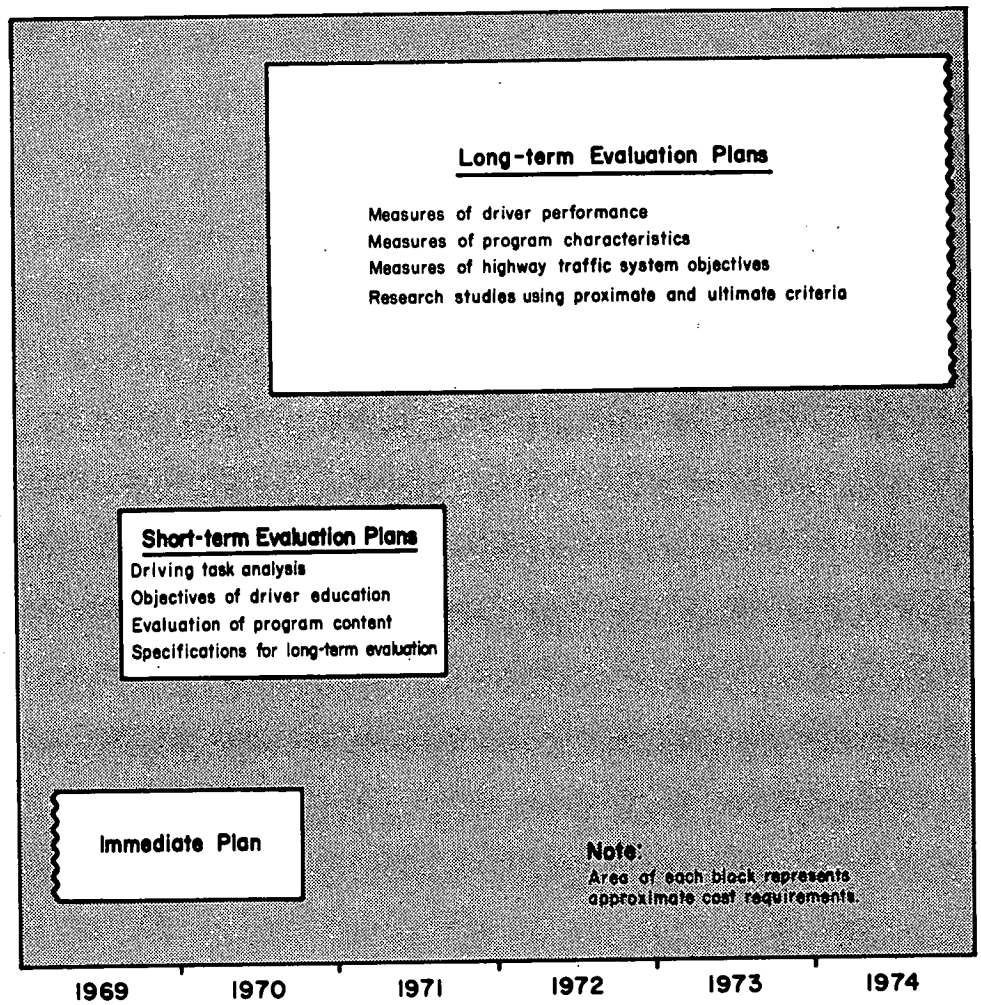
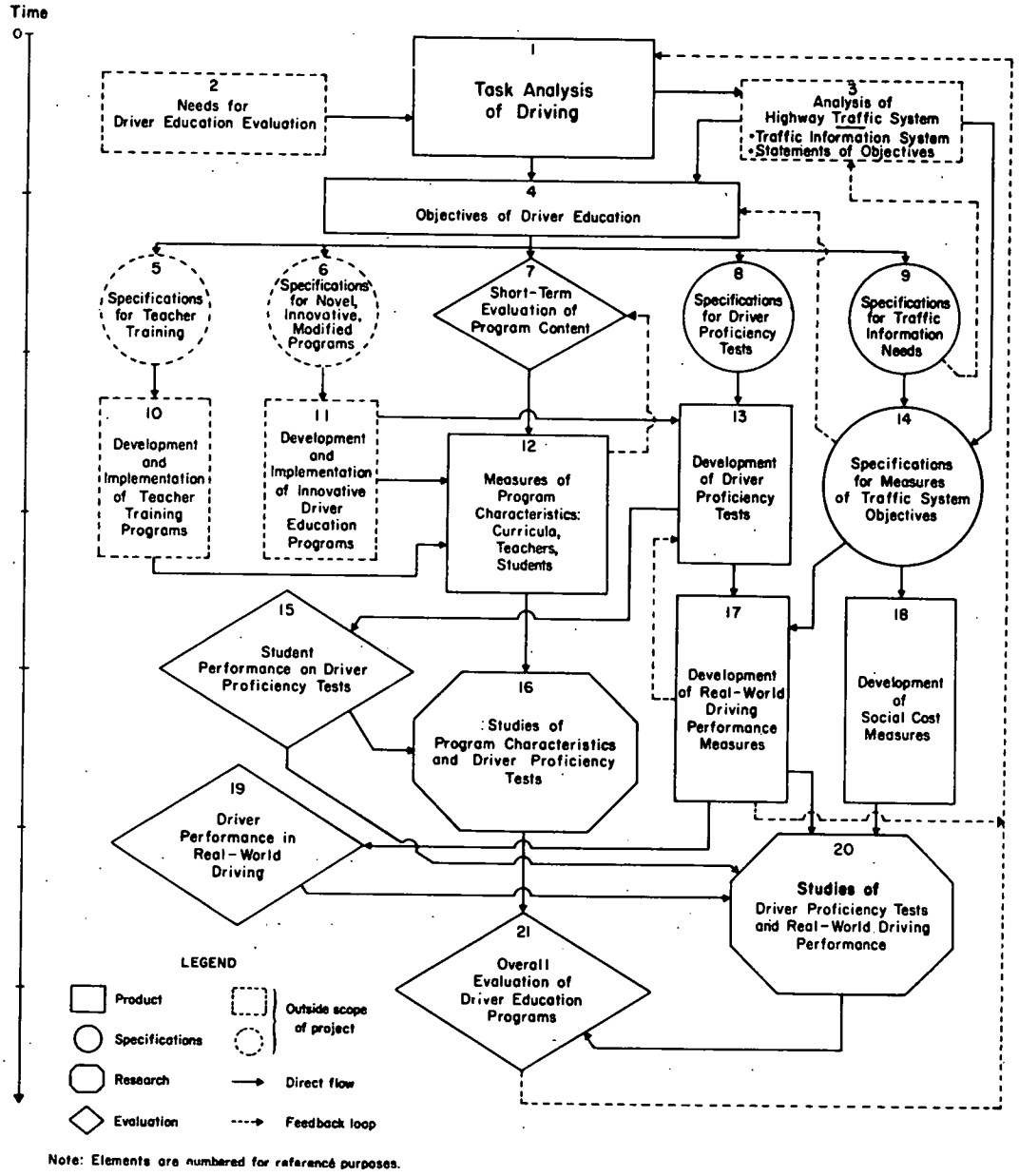


Figure 1. Schedule and relative costs of immediate, short-term, and long-term evaluation plans.

manual containing guidelines for its implementation. The short-term plans include a detailed analysis of the driving task followed by the development of driver-education objectives, of an instrument for evaluating program content, and of specifications for long-term evaluation. In the long-term evaluation plans the major activities include development of various measures of driver performance, measures of program characteristics, measures of highway traffic system objectives, and research studies using proximate and ultimate criteria designed to bring these several factors to bear on the question of scientific evaluation of driver-education and training programs.

Figure 1 also shows that a period of about 6 years is required for accomplishing the plans. The immediate plan can be started and finished within a year as the short-term evaluation results become available; the short-term effort could be started shortly and carried out within the next 2 years; and the long-term evaluation could begin in about a year and continue for 5 years or longer. The general magnitude of costs required to carry out the proposed plans is shown by the size of the blocks in Figure 1. In the opinion of the contractor, an adequate evaluation of driver education can be accomplished with expenditures of approximately $1 million for the short-term effort and $4 to $5 million for the first 5 years of the long-term evaluation effort. Furthermore, if the work is to be accomplished in the indicated time intervals, and at the postulated expenditures, then the manpower requirements would appear to be approximately 25 man-



Note: Elements are numbered for reference purposes.

Figure 2. Elements of the short-term and long-term evaluation plans.

years for the short-term effort, with the peak reached about a year after the start of work, and an average of 20 to 25 man-years per year for the long-term effort. The relative magnitudes in this estimate are probably more meaningful than the absolute values.

Figure 2 shows a complete outline of the recommended short-term and long-term evaluation plans. The elements of the plans are numbered for reference purposes and are positioned vertically according to the time scale that proceeds from top to bottom.

Elements that are an integral part of this project are enclosed in solid lines; those that are outside its scope are enclosed in broken lines. Many activities outside the realm of this project may influence driver education and training. The most important

impact comes from other parts of the highway traffic system, including the highway safety program, and is indicated simply by element 3. For example, the nature of the traffic information system, outside statements of objectives, and the driver-licensing program might influence the driver-education program. Other examples of outside activities are curriculum development for driver education, elements 6 and 11, and teacher training programs, elements 5 and 10.

Elements 1 and 4 through 9 represent the short-term evaluation plans, and elements 10 through 21 represent the long-term activities. Relationships among the elements are shown by solid lines that indicate sequential flow and show dependencies or precedence relationships; broken lines are the feedback loops necessary to ensure improvement at all stages based on experience.

The elements and their relationships serve as a road map for current research activities in driver education. Four separate contracts are involved in this initial effort. The first project has as its purpose the development of a set of objective descriptions of the tasks and subtasks that comprise the driving performance of the passenger vehicle operator. This project is considered a necessary first step in any short- or long-range plan to evaluate driver-education programs. On the basis of this task analysis the contractor, Human Resources Research Organization (HumRRO) of Washington, D.C., will develop a set of objectives for driver-education courses and a preliminary set of tests to evaluate the student's progress toward these objectives. The contractor is asked to identify the specific behavioral elements of driving performance and describe them operationally as behaviors that can be measured. This task analysis will provide the identification of elements related both to accident avoidance per se and to normal driving tasks involved in ensuring good traffic flow. The evaluated task analysis will be the basis for developing a statement of driver-education objectives. These objectives are intended to provide criteria for the development of driver-education curricula and for their evaluation. Based on the task descriptions and the objectives, a preliminary driver-skill evaluation instrument will be developed for the purpose of determining the extent to which each of the objectives has been achieved by the student. The contractor has been cautioned to pay particular attention to the entire driving task, not merely to the motor skill elements. The analysis of the driving task is intended to produce behavior descriptions that can be used as bases for identifying course content for formal training programs and driver-improvement courses, and that can be translated into standardized, objective, quantifiable proficiency measures for use in evaluating the effectiveness of training programs and driver-licensing examinations.

A second project is now under way that relates to the specification, development, and implementation of innovative driver education programs, elements 6 and 11. A contract has been awarded to the American Institutes for Research to develop standards for driver-training simulators and driving ranges and to develop guidelines for their use. The first portion of the program will be devoted to determining which of the driving tasks identified in the task analysis project can be simulated at a reasonable level of cost effectiveness and the extent to which skills developed on either simulators or driving ranges or both transfer to the real-world, on-the-road driving situation. The contractor will study the effectiveness of various configurations of driving simulators and driving ranges in training beginning drivers in these tasks. Based on the results of this research, a set of proposed standards for classroom simulators and driving ranges will be developed.

Elements 5, 9, 10, 14, and 18 represent projects that will be initiated during the current fiscal year. One of these projects will develop curricula for the training of teachers of driver-education in secondary school programs, college-level programs, commercial school programs, and special programs such as violator schools and defensive driving courses. This project will be keyed to the task analysis study and will produce a set of recommended curriculum guidelines that will appear in future editions of the NHSB driver-education manual. A project to develop social cost measures is also planned.

We are proposing that an interim instrument be developed to collect information about the content of current driver-education programs. This instrument will probably

be a questionnaire type to provide information primarily for the analysis of driving behavior and the statements of driver-education program objectives. It will request information concerning the amount and nature of instruction relative to each identified driving task or to associated skills, knowledges, and attitudes. A system will be developed for scoring or rating the responses concerning the nature and extent of instruction related to each performance objective. The system will assign a weight or criticality to each specified task, and the tasks identified as highly critical will receive relatively high scores.

Simultaneously with the development of an instrument for short-term evaluation of program content, specifications for driver-proficiency tests will be defined and the tests developed, and specifications for traffic information needs and for measures of traffic system objectives will be developed.

The long-term plans for driver education evaluation shown in Figure 2 consist essentially of the following 5 major activities: (a) measures of driver performance, including student performance on driver-proficiency tests and driver performance in real-world driving, elements 15 and 16; (b) development of real-world driving performance measures, element 17; (c) studies of driver-proficiency tests and real-world driving performance, element 20; (d) development of social cost measures, element 18; and (e) research studies of program characteristics and driver-proficiency tests and the ultimate overall evaluation of driver-education programs, elements 16 and 21.

Analysis of the driving task is the keystone holding together the structural building blocks of the entire driver-education evaluation system. Much of the future work in driver-education research will evolve from this single project. In addition to its key function in driver education and licensing, the task analysis will provide important inputs to numerous other research programs within the National Highway Safety Bureau. Some of these are in the areas of (a) disability and old age—identification of requirements for compensatory devices and rehabilitative programs; (b) alcohol and drugs—development of more sensitive indexes of impairment; (c) attitudes and motivations—identification of target areas for attitude change; (d) vehicle handling—range and type of nominal and emergency maneuvers; (e) instrumentation—checklist for vehicle status display requirements; (f) driver visibility and rear vision—better basis for evaluating and ranking importance of areas to be seen; and (g) lighting and signaling—augmented basis for evaluating the nature and placement of signals.

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