



ELSEVIER

www.elsevier.com/locate/jsr

Journal of Safety Research 38 (2007) 229–235



www.nsc.org

Driver education and graduated licensing in North America: Past, present, and future

Daniel R. Mayhew *

Traffic Injury Research Foundation, 171 Nepean Street, Suite 200, Ottawa, Ontario Canada, K2P 0B4

Available online 28 March 2007

Abstract

Problem: A stated objective of driver education in North America is to produce safer drivers, typically defined as drivers less likely to crash. This paper examines the extent to which driver education has achieved this objective independently as well as the extent to which such programs can support the success of graduated licensing in reducing young driver crashes. In so doing, it discusses past experiences, recent developments, and the future direction of driver education and training in relation to graduated driver licensing. *Method:* Literature review and synthesis. *Results:* Driver education programs have yet to demonstrate consistent attainment of their safety objectives. Moreover, they have not been found to enhance the safety effectiveness of graduated licensing programs — indeed, some practices, for example, “time discounts” for driver education have actually had a detrimental effect on teen safety. *Discussion:* Despite its disappointing safety record to date, it is important not to abandon driver education. In particular, there are opportunities to improve driver education so that it achieves its safety objectives, and ensure that programs in the future complement graduated driver licensing and contribute to its overall safety benefits. Current and future efforts to improve driver education and better integrate it with graduated licensing programs, however, need to be rigorously evaluated to determine what does and does not work to reduce young driver crashes, and as importantly, to understand why this is the case. *Impact on Industry:* Improved driver education integrated with graduated driver licensing has potential safety benefits.

© 2007 National Safety Council and Elsevier Ltd. All rights reserved.

Keywords: Driver education; Driver training; Graduated driver licensing; New drivers

1. Introduction

Historically, and even today, the major initiatives used in North America to address the problem of young driver crashes have been formal driver education and driver licensing (Mayhew & Simpson, 1990, 1995).¹ The objectives of both these programs are very similar in that they attempt to ensure the novice has the skills, knowledge, and attitudes that contribute to safe driving. However, the scientific literature prior to the 1990s failed to provide any solid evidence that either driver education or conventional licensing systems had a positive safety impact.

This situation changed in the 1990’s with the introduction and rapid proliferation of graduated driver licensing (Simpson, 2003). It resulted not only in a dramatic change in the licensing process but produced significant safety benefits. On the other hand, and in marked contrast, driver education has remained relatively unchanged with the standard 30-hour in-class education and 6-hour in-vehicle instruction, a program design initially recommended at the first national conference in 1949, still the norm in many jurisdictions today (Bishop, Quinlan, Roeber, & Van Etten, 2005). And, evidence of its effectiveness remains elusive, even though a stated objective of driver education is to produce safer drivers, typically defined as drivers less likely to crash. This is certainly the expectation of policy makers, the media, and the public, and is not surprising given that driver education has strong face validity as a safety measure. Indeed, a survey in the United States found that 86% of respondents considered driver education courses “very

* Tel.: +1 613 238 5235; fax: +1 613 238 5292.

E-mail address: danm@trafficinjuryresearch.com.

¹ In this paper, the term driver education is used as an inclusive term to mean both driver education (in-classroom “theoretical” education) and driver training (in-vehicle “practical” on-road instruction).

important” in training new drivers to drive safely (Williams, 2005).

A major reason for the continued appeal of driver education is its face validity — driving in today’s demanding roadway environment is seen as requiring considerable knowledge and skill that take many years to develop. Driver education provides a structured approach to the learning process that can presumably facilitate and accelerate the acquisition of the skills needed by inexperienced beginners. Simply put, driver education is seen as a sensible alternative to “trial and error” learning, especially given that errors can have such profoundly negative consequences.

What is surprising to many is that recent reviews of the evaluation literature have confirmed what the research community has known for some time: traditional driver education programs have yet to demonstrate consistent attainment of safety objectives (Clinton & Lonerio, 2006; Mayhew & Simpson, 1996, 2002; Mayhew, Simpson, Williams, & Ferguson, 1998).

Although the track record of driver education as a safety measure is disappointing, such programs have been shown to achieve other important objectives related to mobility and independent driving by providing an efficient and effective means for teens to learn how to drive and pass the road test (Mayhew & Simpson, 1996; Williams, 2006). Moreover, it is still possible that improved driver education could potentially augment the known safety effectiveness of graduated driver licensing in the future.

Accordingly, this paper initially describes past experiences and recent developments of driver education in relation to graduated driver licensing. This is followed by a discussion of future directions for driver education that largely emerged from a midyear meeting and workshop conducted by the Transportation Research Board’s (TRB) Operator Education and Regulation Committee (ANB30), September 12–13, 2005 (Mayhew, 2006). The circular summarizing the proceedings of this workshop was entitled “Driver Education: The Path Ahead” (TRB, 2006).

2. Past Experiences

Driver education is not a new concept in North America. It can be traced to the turn of the 20th century when automobiles emerged as an increasingly popular mode of transportation. Since these early years, the history of driver education can be divided into two broad periods: one of growth and the other of decline. During both these periods, research played a major role in determining its fate.

2.1. The Rise of Driver Education

The field of driver education did not experience major growth until the 1930s and 1940s with efforts to standardize courses and establish a higher degree of professionalism within the instructional cadre. Growth accelerated even more in the 1950s and 1960s, propelled largely by evaluation

studies that provided support for the value of driver education — graduates of driver education courses were found to have a lower frequency of collisions and violations than individuals not so trained (Mayhew & Simpson, 1996). As observed by Nichols (2003), enrollment in high school driver education in the United States increased from about 200,000 students (in 3,000 public schools) in 1947, to about 1,300,000 students (in nearly 12,000 public schools) in 1964. This rapid expansion was also fueled by insurance companies offering premium discounts for successful completion of driver education (first by Allstate Insurance in 1952) and by states requiring driver education as a condition for licensing under age 18 (first by Michigan in 1957) — that is, increasing the licensing age, typically from 15 or 16 to 18, for those who did not take a course.

2.2. The Fall of Driver Education

The growth in driver education changed dramatically in the 1970s when the validity of the results from earlier studies was challenged because of methodological flaws (primarily related to the issue of self-selection). It was recognized that a definitive answer could only be achieved through a major study using random assignment.

Accordingly, the National Highway Traffic Safety Administration (NHTSA) in the United States launched a major driver education development and evaluation project in the late 1960s. This so-called “DeKalb” project remains the largest and most well designed test of the effectiveness of driver education to date (Stock, Weaver, Ray, Brink, & Sadoff, 1983). Regrettably, the results of this study did more to inflame the controversy regarding the benefits of formal driver instruction than to clarify the issue. Indeed, the DeKalb study findings are still hotly debated today — the data have been the object of intense scrutiny and sophisticated re-analyses over the years. Despite the different methods and statistical procedures that have been applied to the data, however, the findings have been extremely consistent and disappointing — taken together, the original Stock et al. study and subsequent analysis of the data show that, at best, the improved driver education program had only small, short-term, benefits, and, at worst, it was not associated with reliable or significant decreases in crash involvement (see Mayhew & Simpson, 1996, for a review of this extensive literature).

The results of the “DeKalb” study certainly did not enhance the status of driver education; on balance, the findings contributed more to the continued skepticism about the safety benefits of driver education. Perhaps the greatest “shock” to driver education came however in the 1980s, when reports suggested that driver education actually produces unexpected negative consequences. Work supported by the Insurance Institute for Highway Safety (IIHS) showed that the greater availability of driver education stimulates earlier licensure among teenagers, which in turn leads to more crashes per capita (Robertson, 1980; Robertson & Zador,

1978). Given these findings and the lack of evidence to support driver education as a safety measure, the controversy surrounding the value of driver education rose to new levels.

As an illustration of the “fallout” from the DeKalb study and subsequent research, in the early 1980s, driver education was dropped by the NHTSA as a priority and federal funding was no longer available. The change in priorities over this period dramatically altered the availability of driver education — for example, in 1976 in New Jersey, 96% of the secondary schools offered driver education programs at no charge to students; in 1986, that figure had declined to 40% (Simpson, 1989). In terms of student enrollment, the proportion of eligible students who enrolled in high school driver education decreased from 80% in 1977 to less than 50% by the early 1990’s to an estimated 40% by 2000 (Nichols, 2003).

Of related interest, the DeKalb study also had an influence on future research and evaluation. Relatively few evaluations have been conducted in North America since the DeKalb study. This is not surprising given that, for many, there was no need for further research; for others, the standard set by DeKalb would be impossible to replicate. The few evaluations of driver education that have been conducted since DeKalb were critically reviewed by the current author in 1996 and 2002 as well as by other researchers in more recent reports (Clinton & Lonero, 2006; Mayhew & Simpson, 1996, 2002). These independent reviews of the evaluation literature have continued to find little support for the hypothesis that driver education is an effective safety countermeasure. There is no clear and convincing evidence that driver education, particularly the traditional formula — for example, 30 hours in-class education and 6 hours in-vehicle instruction — impacts safe driving and reduces the elevated crash risk of young novice drivers. As observed by Clinton and Lonero (2006) in the most recent review of this literature: “although it seems reasonable to expect that driver education would make our novice drivers safer, most scientific evidence to date does not support this notion.”

As interest in driver education as an effective safety measure ebbed, however, there emerged a growing recognition of an alternative means for reducing the crash risk among new drivers — graduated driver licensing. In this regard, NHTSA had already developed a model provisional (graduated) licensing system in the late 1970s and funded development projects in California and Maryland to evaluate versions of their model program (Croke & Wilson, 1977; Hagge & Marsh, 1986, 1988; McKnight, Hyle, & Albrecht, 1983) but at that time, graduated licensing was not particularly popular nor widespread.

3. Recent Developments

In most jurisdictions in North America, there has been a long historical link between driver education and the licensing process, which continues today. In some jurisdictions, novices are required to complete a mandatory driver education program as part of the licensing process. This can take several

forms. For example, all beginners regardless of age must take driver education, or beginners aged 16 and 17 can only get licensed if they take a driver education program; those aged 18 and over need not do so. In jurisdictions where driver education is available on a voluntary basis, beginners often take the course to prepare for the road test. In these cases, courses typically focus on the skills and knowledge that are needed to pass the road test and obtain a driver’s license.

In recent years, the bond between driver education and driver licensing has been strengthened even more with the advent of graduated licensing. This has also taken several promising as well as unproductive forms and the links between driver education and graduated licensing are discussed in the following sections.

3.1. Multi-Stage Driver Education

In 1994, NHTSA recommended a two-phase driver education program as part of graduated licensing (NHTSA, 1994). This would involve an initial phase to teach basic vehicle handling skills and rules of the road and a second phase to teach safe driving procedures, including perceptual and decision-making skills. Consistent with the multi-stage structure of graduated licensing, phase one would occur during the learner stage and phase two during the intermediate stage of this licensing process.

This notion of multi-stage driver education had actually been raised several years earlier by McKnight who observed that it may be advisable to introduce more safety-oriented driver training following initial licensing and after some driving experience has been gained (McKnight, 1985). It is based on the premise that beginning drivers are not prepared to benefit fully from safety instruction in driver education. For some students, learning to drive and maintaining basic control of the vehicle are so demanding that safe driving concepts cannot be applied.

To date, Michigan is the only jurisdiction to adopt such a two-phase driver education program. Although the graduated driver licensing program in Michigan has been evaluated and proven to have safety benefits, the independent contribution of multi-stage driver education to the success of the overall program has not yet been investigated.

Although governments responsible for graduated licensing in Canada and the United States have not embraced the notion of multi-stage driver education, the commercial sector has recently developed driver education programs for licensed teen drivers, not just for learners. For example, ADEPT DRIVER, with the input from an Advisory Council of recognized experts in the field of adolescent development and young driver research, including the current author, has developed a computer-based driving tutorial — *TeenSMART* — for home use by licensed teen drivers that provides CD-ROM interactive sessions on specific driving skills, lifestyle issues and parent-teen activities, including in-car driving sessions under parental supervision. Although an evidence-based, constructive effort, with promising results from in-house

evaluations using insurance-based collision claims data, the *TeenSMART* program has not yet been independently evaluated to determine whether it actually reduces the crash involvement of teen drivers.

Not all recent commercial driver education initiatives for licensed teens, however, have been so constructive or evidence-based. For example, despite evidence that teaching advanced driving maneuvers such as skid control can produce adverse outcomes, these types of courses have become quite popular recently in the United States (Williams, 2006).

3.2. Time Discounts for Driver Education

Driver education has also been linked to graduated licensing, more typically in jurisdictions in Canada than in the United States, in a way that has proven detrimental to teen safety. Beginning in April 1994 when graduated licensing was first introduced in Ontario, and based on the earlier New Zealand graduated licensing model, beginners have been given an implicit incentive for taking driver education — its completion reduces the length of time they must hold a learner's license (from 12 months to 8 months, a 4-month so-called "time discount"). In this regard, driver education has been used as a means to accelerate the learning process.

The basic assumption of a "time discount" for driver education is that beginners who take driver education will acquire the knowledge, skills, and abilities that would have otherwise developed over a greater period of time while driving under low risk conditions. This implies that driver education is somehow equivalent to a certain amount of on-road driving experience. It also suggests that driver education graduates are safer drivers. The validity of this assumption, however, has been challenged for three reasons.

First, these time discounts are contrary to graduated licensing principles, which are based on time in the system.

Second, and as discussed previously, research has shown that driver education programs have generally not reduced crashes. Accordingly, there is no empirical basis for assuming that driver education will provide the needed safety benefits. Therefore, the practice of reducing the length of time in the graduated driver licensing program for successfully completing a driver education course is questionable at best.

Third, and more disconcerting, several evaluation studies in Ontario, Nova Scotia, and British Columbia have all reported that the time discount for driver education actually compromised the overall safety impact of graduated driver licensing programs, because drivers who received the time discount had higher crash rates than those who did not — 45% more crashes in Ontario, 27% more crashes in Nova Scotia, and 45% more crashes in British Columbia (Boase & Tasca, 1998; Mayhew, Simpson, Desmond, & Williams, 2003; Wiggins, 2004). Mayhew, Simpson, and Pak (2002) also reported that the time discount for driver education had a dramatic negative impact on the collision rates of Ontario novice drivers, a finding consistent with the interim results reported earlier by Boase and Tasca (1998). A more recent

study examining the role of driver education in the licensing process in Quebec also found that teens who use the time discount for driver education have the highest crash rates (Hirsch, Maag, & Laberge-Nadeau, 2006).

Given these consistent findings there is no justification for offering a "time discount" for taking driver education. Indeed, the evidence suggests that doing so increases rather than decreases the risk for novice drivers. This is not to suggest that jurisdictions should not encourage driver education because it can be a superior way to learn basic driving skills and it can contribute to the beginner's on-road experience — that is, practice. But novices should not be allowed to graduate sooner from the graduated driver licensing program just because they take driver education (Mayhew & Simpson, 2002; Williams & Ferguson, 2004).

In fact, recognition that a "time discount" for driver education has potentially negative effects was actually noted early on in New Zealand. The original graduated licensing system introduced in 1987, which served as a model for many jurisdictions in North America, had discounts in both the learner phase (3 months instead of 6) and the intermediate phase (8 months instead of 12). The learner phase discount but not the later one was eliminated in 1999 when changes were introduced to enhance the program (Begg & Stephenson, 2003).

This year, the discount in the learner phase (9 months instead of 12 months, a 3-month time discount) will be eliminated in British Columbia based on research showing the negative effects of this practice. However, a 6-month time reduction in the intermediate stage of the program is now received for successfully completing an approved course and staying free of violations and at-fault crashes (18 months instead of 24 months). According to the Insurance Corporation of British Columbia (ICBC), the agency responsible for graduated licensing and driver education, the reasoning for still offering new drivers an incentive for taking driver education and for the intermediate stage time discount included the following points:

- Driver training schools provide a valuable option for improving the basic driving skills of new drivers and allowing them to gain experience on the road;
- British Columbia research shows that drivers who take an approved course are more likely to pass the basic skills-focused road test on their first attempt than other new drivers;
- Drivers who pass on their first or second attempt are less likely to crash than those who take three or more attempts;
- Driver training schools also provide options for parents and help to reduce the passing-on of questionable driving habits;
- New drivers need both safe driving attitudes and skills to stay out of crashes;
- Road safety and British Columbia research show driver training to be effective in new driver skill development; and

- The six-month intermediate stage reduction is reward for completing comprehensive training and demonstrating safe driving attitudes and behaviours by staying out of crashes and following the rules of the road.

Although the above reasons for a second stage time reduction as an incentive for taking driver education are compelling, research is needed to determine the extent to which this program change has a positive effect on crashes.

3.3. Driver Education Versus Supervised Practice

As mentioned previously, many U.S. states require driver education as a condition of licensure before age 18, a practice that predates graduated driver licensing — for example, Michigan in 1957. Some U.S. states also require parents to certify that a certain number of hours have been driven under supervision, typically ranging from 30 to 50 hours, in the learner phase of graduated licensing programs. A few U.S. states waive the certification of supervised practice for completion of driver education. The Oregon graduated licensing program includes a combination of these requirements. The program requires 50 hours of certified supervised practice if the person also takes driver education, or 100 hours if they do not. In this regard, driver education is viewed as equivalent to a certain number of hours of supervised practice — that is, 50 hours.

The substitution of driver education for supervised practice, however, may undermine the safety benefits of graduated licensing. Recent research by the current author in Oregon and British Columbia (Mayhew, Simpson, Singhal, & Desmond, 2006) showed that in both study sites teens who took driver education had significantly fewer total hours of driving practice before obtaining their intermediate license. This may result from various types of selection bias: for example, some parents who lack the time, skill, or overall inclination to teach their teens to drive may have them take driver education to provide them with the necessary instruction. Taking driver education may also lead to parental overconfidence in the driving skills of their teens, so they perceive less need for additional driving practice outside of the driver education course. Indeed, parents identified some of these as reasons for their teen taking driver education.

Whatever the reason, the reduction in driving practice appears to be counterproductive to the goals of graduated driver licensing, especially since driver education has not been shown to reduce collisions. Accordingly, the typical 6 to 10 hours of driving with a professional instructor should not be used as a substitute for supervised practice over a longer period of time and under diverse driving conditions and circumstances.

3.4. Recent Initiatives to Improve Driver Education

There are several encouraging initiatives in the field of driver education that illustrate the growing interest in improving driver education. For example, the NTSB convened a 2-day public forum in 2003 and produced a report that

reviewed the current state of driver education (Bishop et al., 2005). It discussed the extent to which driver education is used, its strengths and shortcomings, and what can be done to improve it. Recommendations included: reviewing current programs and determining which instructional tools, training methods, and curricula are consistent with the best teaching methods to reduce crashes; and determining the optimum sequencing, in conjunction with GDL, for educating teenagers on safe driving skills. Several of these recommendations have resulted in ongoing NHTSA-funded projects. NHTSA has also worked with the American Driver and Traffic Safety Education Association (ADTSEA) to develop national driver education standards and curricula consistent with graduated driver licensing principles.

There has also been a renewed interest in evaluating driver education. In this regard, a project under funding from AAA Foundation for Traffic Safety and BMW involved a comprehensive review and consultation process to produce a series of reports on “Guidelines for Evaluating Driver Education Programs” (Clinton & Lonero, 2006). This is intended to provide practical information for how to conduct different types and levels of evaluations. As follow-on to this project, a scoping study, has just been completed to assess the technical, financial, and organizational feasibility of implementing a multi-site, multi-level evaluation of beginning driver education. The principal investigators of this research from the Traffic Injury Research Foundation (the current author) and Northport Associates (Larry Lonero) are currently seeking funding for this large-scale evaluation of driver education. Unlike most previous evaluation efforts that focused primarily on short-term safety impacts, this major initiative will attempt to: generate new knowledge about the safety and operational effectiveness of driver education; provide new information about how to improve the delivery and content of driver education to enhance its safety impact; and set new standards for evaluating driver education.

4. Future Directions

Despite its disappointing safety record to date, it is important not to abandon driver education. Indeed, in a recent TRB circular on the issue of driver education, Mayhew (2006) suggested that the “Path Ahead” for driver education holds promise in achieving important safety objectives, for several reasons. Much has been learned from research and program development over the past decade, including a better understanding of young driver crashes and the critical factors that give rise to their elevated crash risk. As observed by Preusser (2006) and McKnight (2006), the elevated crash risk of young drivers is highest over the first months and miles of driving, when novices are the most inexperienced and unskilled. Not surprisingly, many of the errors leading to crashes in this high-risk period relate to inexperience in driving, including for example, visual search and attention errors. This suggests that to be effective as a safety measure,

driver education should be more clearly focused on addressing the extremely high crash risk facing beginners over their first months and miles of driving.

As importantly, there is also a much better appreciation for the strengths and limitations of driver education and how to improve its safety potential based on the available research evidence. Even though driver education has generally not proven to be an effective safety measure, it has a number of important strengths that should be built upon for the future. Driver education and behind-the-wheel training are efficient means for beginners to learn how to drive and develop their driving skills in a controlled and safe environment — that is, under the supervision of an instructor. It also prepares novices to pass the road test, thereby increasing their mobility, which is highly valued in society for economic and other reasons.

However, there is an important tradeoff between mobility and safety. Driver education provides a means for teens to drive but this exposes them to crash risk. Accordingly, a number of limitations of driver education need to be addressed to minimize this crash risk. As suggested earlier, driver education should not be used as a substitute for supervised practice, which is a low risk activity. The role of driver education should include encouraging the teen to acquire more supervised driving practice and the instructor working cooperatively with parents to engage them further in the learning process and to structure how practice unfolds systematically, from simple to complex and more demanding driving situations — for example, initially during daylight hours on familiar residential streets before progressing to nighttime driving on unfamiliar roads with higher speed limits. Working together, parents and driver instructors can play an important role in shaping and influencing the teens' safety attitudes and acquisition of driving skills as well as in maximizing the quantity and quality of driving experienced gained.

There is also a need to expand the relatively short duration of driver education, which typically involves 30 hours in-class and 6 hours in-vehicle taken over a few months or weeks just before the road test. There is a need to adopt contemporary teaching methods and principles that are compatible with the individual needs of today's young drivers. There is a need to focus on the development of the skills most critical to safe driving performance in situations where young drivers are at highest risk, rather than on a broad range of knowledge and skills in a relatively superficial manner.

Potential improvements to overcome the limitations of driver education include adopting a multi-phased approach to driver education that better integrates with graduated driver licensing, a safety program with proven effectiveness. As recommended by NHTSA some time ago, this would involve at least two stages of driver education with one initially focusing on basic vehicle control skills, and the other, after some driving experience has been gained, focusing on higher-order safety knowledge and skills, such as recognizing and reacting to hazards.

Driver education should also use the best teaching methods and learning principles — for example, computer-based

instruction and driving simulation that provide a protective means for exposing teens to hazardous driving situations that contribute most to their elevated crash risk, and which provides a more efficient and possibly effective means of transferring knowledge, attitudes and skills than is currently the case with didactic lectures and dated safety videos (Brock, 2006). On-road teaching techniques, such as commentary driving, and in-car technologies to train and measure young drivers should also be considered. It is important as well to match the learning experiences to the novices' needs and skill level, which speaks to better testing and diagnostic assessments, for example, by means of improved drive tests and computer-based training and testing (Groeger & Brady, 2004; Lonero, 2006).

To be effective, driver education must also address the factors associated with crash risk, which include inexperience in driving or skill deficiencies, age-related factors associated with lifestyle, and the combination of these two major causal factors. In this regard, the content of driver education could be improved by focusing on those errors that contribute most to the initial high crash risk of novices, by motivating teens to drive safely as well as by providing insights to counteract overconfidence that might be the unanticipated byproduct of taking driver education.

Immaturity, risk taking, and peer pressure are factors in young driver crashes, especially serious ones, but the extent to which driver education can deal effectively with such "lifestyle" factors needs further consideration. Driver education may not provide the most appropriate or adequate venue for influencing negative safety attitudes, and perhaps more importantly, negative health behavior related to driving, because such programs may not have the time nor expertise needed to alter deeply ingrained attitudes and behaviors. As observed by Williams (2005) in discussing why driver education does not produce safer drivers, "...any safety messages that are conveyed can be overwhelmed by ongoing parental, peer, personal, and other social influences that shape driving styles and crash involvement. Such influences are largely beyond the reach of driver education instructors." Accordingly, innovative, comprehensive, and longer-term educational and awareness interventions also need to be considered.

In summary, driver education should complement graduated driver licensing and contribute to its overall safety benefits. Current and future efforts to improve driver education and better integrate it with graduated licensing programs need to be rigorously evaluated to determine what does and does not work to reduce young driver crashes, and as importantly, to understand why this is the case.

References

- Begg, D., & Stephenson, S. (2003). Graduated driver licensing: The New Zealand experience. *Journal of Safety Research*, 34(1), 99–106.
- Bishop, J., Quinlan, K., Roeber, D., & Van Etten, G. (2005). Driver education and training forum. *Journal of Accident Investigation*, 1(1), 36–43.

- Boase, P., & Tasca, L. (1998). *Graduated licensing system evaluation: Interim report*. Toronto, Ontario: Safety Policy Branch, Ontario Ministry of Transportation.
- Brock, J. F. (2006). Instructional methods for young drivers. *Driver education: The path ahead* Transportation research circular, Vol. E-C101. Washington, DC: Transportation Research Board.
- Clinton, K., & Loner, L. (2006). *Guidelines for evaluating driver education programs*. Washington, DC: AAA Foundation for Traffic Safety.
- Croke, A., & Wilson, W. B. (1977). *Model for provisional (Graduated) licensing of young novice drivers. Contract Number DOT HS-6-01384*. Springfield, VA: Technical Information Services.
- Groeger, J. A., & Brady, S. J. (2004). *Differential effects of formal and informal driver training* Road safety research report, Vol. 42. London: Department of Transport.
- Hagge, R. A., & Marsh, W. C. (1986). *An evaluation of the traffic safety impact of provisional licensing. Interim report*. Sacramento, CA: Department of Motor Vehicles.
- Hagge, R. A., & Marsh, W. C. (1988). *An evaluation of the traffic safety impact of provisional licensing*. Sacramento, CA: Department of Motor Vehicles.
- Hirsch, P., Maag, Y., & Laberge-Nadeau, C. (2006). The role of driver education in the licensing process in Quebec. *Traffic Injury Prevention*, 7, 130–142.
- Loner, L. (2006). Student competency measures. *Driver education: The path ahead* Transportation research circular, Vol. E-C101. Washington, DC: Transportation Research Board.
- Mayhew, D. R. (2006). The future of driver education. *Driver education: The path ahead* Transportation research circular, Vol. E-C101. Washington, DC: Transportation Research Board.
- Mayhew, D. R., & Simpson, H. M. (1990). *New to the road. Young drivers and novice drivers: similar problems and solutions?* Ottawa, Ontario: Traffic Injury Research Foundation.
- Mayhew, D. R., & Simpson, H. M. (1995). *The role of driving experience: Implications for the training and licensing of new drivers*. Toronto, Ontario: Insurance Bureau of Canada.
- Mayhew, D. R., & Simpson, H. M. (1996). *Effectiveness and role of driver education and training in a graduated licensing system*. Ottawa, Ontario: Traffic Injury Research Foundation.
- Mayhew, D. R., & Simpson, H. M. (2002). The safety value of driver education and training. *Injury Prevention*, 8(supp II), 3–8.
- Mayhew, D. R., Simpson, H. M., Desmond, K., & Williams, A. F. (2003). Specific and long-term effects of Nova Scotia's graduated licensing program. *Traffic Injury Prevention*, 4(2), 91–97.
- Mayhew, D. R., Simpson, H. M., & Pak, A. (2002). *Ontario graduated licensing system evaluation - 2002*. Toronto, Ontario: Ontario Ministry of Transportation.
- Mayhew, D. R., Simpson, H. M., Singhal, D., & Desmond, K. (2006). *Reducing the crash risk for young drivers*. Washington, DC: AAA Foundation for Traffic Safety.
- Mayhew, D. R., Simpson, H. M., Williams, A. F., & Ferguson, S. A. (1998). Effectiveness and role of driver education and training in a graduated licensing system. *Journal of Public Health Policy*, 19(1), 51–67.
- McKnight, A. J. (1985). Driver education - When? In D. R. Mayhew, H. M. Simpson, & A. C. Donelson (Eds.), *Young driver accidents: In search of solutions. Proceedings of an international symposium* (pp. 109–115). Ottawa, Ontario: Traffic Injury Research Foundation.
- McKnight, A. J. (2006). Content of driver education. *Driver education: The path ahead* Transportation research circular, Vol. E-C101. Washington, DC: Transportation Research Board.
- McKnight, A. J., Hyle, P., & Albrecht, L. (1983). Youth License Control Demonstration Project. *National highway traffic safety administration. Report no. DOT-HS-7-01765*. Springfield, VA: National Technical Information Services.
- National Highway Traffic Safety Administration [NHTSA]. (1994). *Research agenda for an improved novice driver education program. Report to Congress*. Washington, DC: U.S. Department of Transportation.
- Nichols, J. L. (2003). *A review of the history and effectiveness of driver education and training as a traffic safety program. Prepared for the National Transportation Safety Board, Washington, D.C.*
- Preusser, D. F. (2006). The novice driver problem. *Driver education: The path ahead* Transportation research circular, Vol. E-C101. Washington, DC: Transportation Research Board.
- Robertson, L. S. (1980). Crash involvement of teenaged drivers when driver education is eliminated from high school. *American Journal of Public Health*, 70(6), 599–603.
- Robertson, L. S., & Zador, P. L. (1978). Driver education and fatal crash involvement of teenaged drivers. *American Journal of Public Health*, 68 (10), 959–965.
- Simpson, H. M. (1989). *Are driver educators realistic?* Presented at 1989 Conference of the Driving School Association of Ontario, Toronto, Ontario, May 26, 1989. Traffic Injury Research Foundation, Ottawa, Ontario.
- Simpson, H. M. (2003). The evolution and effectiveness of graduated licensing. *Journal of Safety Research*, 34(1), 25–34.
- Stock, J. R., Weaver, J. K., Ray, H. W., Brink, J. R., & Sadoff, M. G. (1983). *Evaluation of safe performance secondary school driver education curriculum project: Final report. DOT-HS-806-568*. Washington, DC: U.S. Department of Transportation.
- Transportation Research Board [TRB]. (2006). *Driver Education: The Path Ahead*. Transportation research circular, Vol. E-C101. Washington, DC: Author.
- Wiggins, S. (2004). *Graduated licensing program: interim evaluation report - year 3*. Victoria, British Columbia: Insurance Corporation of British Columbia.
- Williams, A. F. (2005). Commentary: Next steps for graduated licensing. *Traffic Injury Prevention*, 6(3), 199–201.
- Williams, A. F. (2006). Young driver risk factors: Successful and unsuccessful approaches for dealing with them and an agenda for the future. *Injury Prevention*, 12(1), i4–i9.
- Williams, A. F., & Ferguson, S. A. (2004). Driver education renaissance? *Injury Prevention*, 10, 4–7.

Dan Mayhew, M.A., is Senior Vice-President with the Traffic Injury Research Foundation of Canada (TIRF). Since joining the Foundation in 1980, he has conducted research in the areas of driver licensing and improvement systems, motorcycle safety, young driver accident prevention, senior drivers, motor vehicle accident data systems, driver competency and experience, commercial vehicle driver licensing, driver education and training, enforcement, fuel-efficient driving, and alcohol, drugs and traffic safety. He has authored numerous reports and articles in these areas, including the following recent ones relevant to young driver safety:

- Reducing the Crash Risk for Young Drivers;
 - Best Practices for Graduated Driver Licensing in Canada;
 - Deaths and Injuries of Young Canadians from Road Crashes;
 - The Learner's Permit; and
 - The Safety Value of Driver Education and Training.
- He serves on several national and international road safety committees and boards, including:
- ♦ Member and past chair of the U.S. Transportation Research Board Committee on Operator Education and Regulation;
 - ♦ Member of the Committee on Contributions from the Behavioral and Social Sciences in Reducing and Preventing Teen Motor Vehicle Crashes, The National Academies;
 - ♦ Member and past secretary of the International Council on Alcohol, Drugs and Traffic Safety;
 - ♦ Member of the International Advisory Committee for the Centre for Accident Research and Road Safety – Queensland, Australia;
 - ♦ Member of the Canadian Association of Road Safety Professionals;
 - ♦ Member of the Editorial Board, Journal of Safety Research.