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State of Virginia Survey on Adolescent Driver Education

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State of Virginia Survey on Adolescent Driver Education

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State of Virginia Survey on Adolescent

Driver Education

Report of Findings

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STATE OF VIRGINIA SURVEY ON ADOLESECENT DRIVER EDUCTION

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State of Virginia Survey on Adolescent Driver Education
Summary of Findings

Question 1: Based on Virginia crash data, is there a difference in motor vehicle crash rates for graduates of commercial driver training programs versus graduates of public school driver education programs?

Crash rates represent the percent of students taking driver education at each school who were involved in crashes that year. Analysis of data for 1999 - 2001 show that commercial schools were significantly higher than public schools in 1999 and 2000 but not different in 2001. Crash rates varied from 12% to 20%. All schools showed an increase from 1999 to 2000, then a decrease in 2001. For 1999, commercial schools were significantly higher than public schools with crash rates of 16.1% compared to 12.1%. Private schools crash rates of 13.3% was higher than public schools but lower than commercial. In 2000, commercial schools again had significantly higher crash rates of 20% compared to 16% for both public and private schools. For 2001, commercial and public schools are similar to each other, with crash rates of 16% and 14% respectively, but private schools are significantly lower with a rate of 9.4%.

Question 2: Based on Virginia crash data, is there a difference in motor vehicle crash rates for graduates of driver education programs using simulators versus graduates of programs not using simulators?

When the three school districts with simulators are compared with all others, crash data show no significant differences in crash rates for any of the years. For 1999, simulator schools have a slightly lower rate, 11.9%, compared to 12.1%. Similarly, in 2001, with a rate of 13.1% compared to 14.00, simulator schools have a slightly lower rate. However, simulator schools have a higher crash rate of 17.6% compared to 16.6% in 2000. Furthermore, simulator and non-simulator public schools show similarities with each other within each year and greater differences over time. The data do not support the hypothesis that simulators lead to lower crash rates. However, since many factors can contribute to crashes, this crude analysis should not be used as the primary evaluation of simulator effects. The data do not allow comparisons of the injury severity (none, minor, incapacitated, fatal) of crashes nor other driving violations that could show differences.

Question 3: Are Virginia driver education standards the same for commercial and public school driver education programs?

Analysis of interview and survey data suggested that respondents recognize that Virginia driver education standards are the same for commercial and public school driver education programs (refer to the Virginia Administrative Code (Regulations)).

Question 4: Are there differences in the level of parental involvement required by commercial and public school driver education programs?

The state of Virginia Driver Education Program requires the same amount of parental involvement for both public and commercial driving schools: 40 hours of supervision with 10 hours after sunset for all drivers younger than 18 years old. Survey data suggest some differences in administrators' perceptions of the amount of time parents provide. While not significantly different, a slightly greater number, 89%, of public school administrators believed that students receive at least eight hours of parental supervision compared to 78% of commercial school administrators.

Question 5: Is there a difference in the training requirements for commercial and public school driver education instructors?

There is a significant difference between the education level of the public school and commercial school administrators. Public school administrators have significantly more education; all have graduated from college and 80% have graduate degrees. In contrast, 50% of the commercial school administrators do not have a degree and only a third had a graduate degree.

Public and private school classroom driver education teachers must have a teaching license with six semester hours in driver education. Reports by administrators show that both emphasize this requirement. A significantly greater percent of commercial administrators emphasized past driving records (100% to 63%), national criminal background check (60% to 26%), number of general education courses completed (50% to 18%), number of years driving experience (80% to 15%), and past student evaluations (40% to 0%). Commercial school administrators were also more likely to use current driving records (100% to 93%), local criminal background check (70% to 56%), substance use/DUI (80% to 52%), and college credits in driver education (100% to 82%) while more public school administrators were likely to emphasize teaching qualifications (not statistically significant).

Credentials of instructors also differ. While 90% of commercial instructors have some college, only 34% have completed college compared to 98% of public school instructors.

Question 6: How effectively does the state monitor driver education programs?

Based upon results of interviews and administrator surveys, the state auditors are effectively monitoring the licensing, curriculum, record keeping, instructors' certification, equipment and materials for classroom and behind-the-wheel instruction. Nevertheless, commercial school administrators are more likely to evaluate instructors every six months than are administrators in public schools (33% to 26%). The difference is not statistically significant.

Question 7: Is there a difference in the rigor of monitoring and sanctions applied to commercial schools as opposed to public schools?

Results of interview data suggest that there is no difference in the frequency of state monitoring. Commercial and public school driver-training programs are audited on an annual basis. There is a difference regarding the specificity of the audit and action taken for infractions. Commercial driver-training program audits are subjected specific whereas public school driver-training program audits are more general in scope.

When evaluating driver-training instructors, commercial school administrators compared to public school administrators are significantly more likely to use criminal background checks (80% to 18%), substances use/DUI (60% to 26%), student evaluations (60% to 15%). Slightly more public school administrators emphasize instructors= classroom teaching content (89% to 60%).

For criteria used to disqualify or terminate a driver education instructor, the only significant difference between the commercial and the public school administrators was noted for substance use/DUI, (80% to 100%, respectively). Both use the number of demerits on license (80% to 82%), criminal behavior (80% to 85%), not providing proper teaching instructions (80% to 74%), number of crashes with students in the car (70% to 59%), and without students in the car (100% to 100%) frequently and about equally.

Data on driving infractions by instructors show that more than 50% of both had been cited for speeding, but overall, fewer public school instructors had infractions than commercial instructors. A much larger number of commercial instructors was likely to be terminated, while, public school instructors were more likely to receive written warnings or be suspended, suggesting more strict monitoring for commercial instructors in this instance. Reports by instructors show little difference with more than 95% reporting 0 -1 demerits. None of the commercial instructors has received more than six demerits while 6% of public school instructors have.

While controversy has been expressed about the unequal treatment of instructors in the different types of schools, data from instructors show that 70% or more of

instructors from each type tends to believe they are more closely monitored, provide better quality of instruction, have the toughest standards for instructors, and are more closely supervised. Instructors differ in that a larger number of commercial instructors believe that their schools are monitored more closely and receive the most severe penalties for infractions.

Question 8: Are all schools using the same driver education instructional curriculum?

All schools, commercial and public, are using the same driver education instructional curriculum, which is specified in the Curriculum Guide for Driver Education in Virginia and 60% - 70% of administrators report that it is the basis for all instruction. Public school administrators are more likely to report spending one week or more covering certain topics in class: alcohol/drug use (68% to 33%), speed (37% to 11%), radio/cell phones (16% to 11%), adjusting seats/mirrors (16% to 11%), and eating/drinking & driving (21% to 11%).

Instructors from both schools report that these topics are covered. Reports by students about classroom experience suggest no differences between public and commercial schools. About 75% - 80% of students from both schools receive "some" to "a great deal" of time on seatbelts, alcohol and drugs.

Question 9: Are students being provided sufficient time for behind-the-wheel training?

Administrator reports show few differences between schools. About 65% or more of both indicate that students spend two hours or less on interstates. More than 50% report two or less hours on rural roads; the majority report three to five hours out of the required seven on residential roads. Some differences are observed for time on busy streets with commercial administrators indicating students receive more time on busy streets than public administrators so state.

Student reports are similar to administrators. Only a small amount of time is spent on interstates, but commercial students have more experience on busy streets. Students' reports suggest that they do not generally spend excessive time riding with others or on residential streets. The variability of results, especially for public school students, does suggest that some students may fall though the cracks receiving inadequate experience. Perhaps, more experience on interstates is needed.

These results indicate that students in commercial and public driver-training programs were receiving at least the minimum number of required periods of behind-the-wheel training. However, according to interview data, instructors of commercial and public driver-training programs felt that the number of periods of behind-the-wheel instruction provided to students was not sufficient for providing an optimal level of driver proficiency.

Question 10: Is there a difference in standards for record keeping for commercial and public driver education programs?

All administrator reports indicate that students' records are kept for at least four years by commercial schools and five or more years for public schools. Instructors' responses are consistent with this.

Question 11: Are driver education programs that utilize simulators more or less effective than traditional driver education programs?

A driving record index was constructed by combining citations for speeding, reckless driving, and crashes and an unsafe driving index computed by combing reported frequency of speeding, reckless driving, and tailgating. The mean scores for both are very low and not significantly different.

Similar findings are observed for crashes with 75% of simulator users and 79% of non-users reporting no crashes. A greater number of simulator students reported citations for reckless driving. Speeding was engaged in more by non-simulator students, 53% of those who had not used simulators and 21% of those who had received a citation for speeding.

These findings generally show no better performance effects for use of simulators. However, only a small number of students reported using simulators so this is too inconclusive to draw major conclusions. Furthermore, results of interviews suggested that time spent on simulators should not be substituted for behind-the-wheel driving experience, but should be used as a supplement.

Question 12: Are driver education programs that utilize simulators more, or less, cost-effective than traditional driver education programs?

Because there are various types of simulators in use at the school jurisdictions included in this study, the costs and, therefore, cost-effectiveness of simulator use varies. No commercial schools participating in the study utilized simulators for driver training. The price of simulators used by public schools ranged from $1,500 to more than $7,000. Analysis of student and instructor survey data indicated that there is no difference in students from schools using simulators and non-simulators in obtaining their driver's license after completion of training and no difference in involvement in crashes.

Question 13: How could such technology be implemented in a cost-effective manner (such as regional, per school, etc.)?

Results of interview data indicated that the most cost-effective manner to integrate simulation technology in a driver-training program would be to purchase mid- to high-

level priced interactive simulators that would be centrally located within a jurisdiction and shared by schools within that jurisdiction. Past research suggests that the most effective simulation technology allows the driver-training student to fully interact with and respond to the simulated road experience (Decina, Gish, Staplin and Kirchner, 1996 and Garcia-Ros et al., 1999).

Question 14: Are Reported Student Outcomes Different For Students From Commercial Driver Education Programs Compared to Those Attending Public Driver Education Programs?

Student reports show no significant differences in crashes and citations. Seventy percent of commercial students and 81% of public school students reported having no crashes; 30% of commercial and 19.2% of public school students reported one to two crashes. Regarding speeding, findings show that 30% of both commercial and public school students say that they sometimes speed. Slightly more commercial students engage in speeding and have received citations for speeding. A greater percent of commercial students (60% to 42%) engage in speeding sometime or frequently, but this difference is not statistically significant. Only a small percent (4% to 6%) report tailgating. About one-third of the students carry 2 to 4 passengers and about 41% use cell phones while driving. The driving record index scores for students who took road training in commercial and public schools are low and not significant showing that there is no difference between students from public and commercial schools.

State of Virginia Survey on Adolescent Driver Education Report of Findings

Executive Summary

Background

In Virginia, as across the nation, there exists a problem of disproportionate numbers of motor vehicle crashes occurring from young novice drivers as opposed to older and more experienced drivers. Driver's license applicants under the age of 19 are required to have proof of successful completion of a state-approved driver education program. Though many persons receive their training in public school driver education programs, a large number of applicants receive all or part of their training through licensed commercial driver-training schools.

The Virginia Department of Motor Vehicles and the Virginia Department of Education in response to Senate Joint Resolution (SJR) 110 commissioned the current study. The resolution requested that The Virginia Department of Motor Vehicles, with the assistance of the Superintendent of Public Instruction, study the adequacy of driver education programs available to youthful drivers. The focus of the study was on crash data for graduates of public and commercial driver education programs, standards used in public and commercial driver education programs (e.g., curriculum and instructor qualifications), the effectiveness of traditional programs and simulator-based programs in the preparation of novice drivers, and the cost-effectiveness of the two modes of instructional delivery for driver education programs. Results of statewide surveys could assist in assessing the adequacy of driver education programs available to young novice drivers.

Methodology

The present study involved analysis of The Virginia Department of Motor Vehicles crash data for 1999-2001 and analysis of data obtained from young novice drivers, commercial and public driver-training instructors, and commercial and public driver-training program administrators. With the exception of crash data, data analyzed in this report were obtained from interviews and questionnaires developed by the researchers. A number of methodologies were employed to investigate these issues. The following techniques were employed.

An extensive **literature review** was conducted to assess generally the state of knowledge concerning the use of simulators in training and comparisons of commercial and public school driver education.

In-depth interviews were conducted with 12 commercial school owners or administrators selected from a list of commercial schools provided by The Virginia Department of Motor Vehicles in order to obtain additional/supplemental information not obtained through survey data on driver education training in Virginia. Three simulator researchers from Virginia Polytechnic Institute, University of Iowa, and University of Colorado were also interviewed for the purpose of obtaining technical information pertaining to simulators (e.g., costs and skill development issues). The respondents selected for the interviews were considered to be experts in their field.

Crash Data collected by The Virginia Department of Motor Vehicles for the years 1999, 2000 and 2001 involved secondary analysis of crash data. Schools were listed by crashes and all schools were identified by name, jurisdiction code and by type of school: commercial, public and private. The data files included all schools in the state of Virginia that taught driver education during a particular year. Data were analyzed separately by year. Schools were listed in three groups by type: commercial, public and private and were also identified by name. This information was used to code schools into the 3 types to measure the independent variable of school type. Public schools were coded as having simulators based on their jurisdiction. All school in Chesapeake, Newport News, and Richmond cities and those in Henrico and Arlington Counties were identified as simulator schools. The cities of Richmond and Newport News have a central location for their simulators. All other public schools were coded as non-simulator schools.

Survey Data were collected from instructors, administrators, and students of commercial and public school driver education. A partially random stratified cluster sample was selected of 391 driver education teachers from public and commercial schools and 421 students in Virginia. The sampling frame was the 139 commercial and 306 public schools in the 2001 crash data files. The sample was stratified by type of school (public versus commercial), use of simulators, and geographic area for District Offices: South West (1) South Central (2), North Central (3), North East (4), East Central (5), and South East (6).

Simulator Sample of Instructors (Non Random) First, all of the schools that use simulators Chesapeake, Newport News, and Richmond cities and Henrico and Arlington counties were identified. Each of these simulator districts was matched with an adjacent district. This produced a list of about 34 public and 24 commercial schools. Two or three questionnaires were sent to school administrators who in turn selected instructors to form a sample of about 160 instructors.

Non-Simulator (Random) of Instructors Stratified by Type of School & Location. The 240 instructors were selected using stratified proportionate cluster sampling of 120 schools. One hundred and twenty schools were randomly selected, proportionately by area and type of school. Finally, two or three questionnaires were sent to school administrators who then selected instructors to constitute a sample of about 231 instructors. This brought the total number of instructors to 391.

Student Sample (Random) Stratified by Type of School & Location. Based on the proportions determined for the instructor sample, The Virginia Department of Motor Vehicles selected a random sample of 421 students stratified by the geographic areas and type of school (public, commercial).

Literature Review

Novice Driver Problem

According to the National Highway Transportation Safety Association (2002), teenage drivers have the highest risk for motor vehicle crashes of any age group. Chen, Baker, Braver, and Li (2000), reported that the leading cause of death among teenagers in the United States is motor vehicle crashes which account for 36% of all deaths of persons aged 15 to 19. The National Highway Traffic Safety Administration (NHTSA) indicates that the problem is worst among 16 year-olds, due to limited driving experience and an immaturity that frequently results in risk-taking behind-the-wheel (NHTSA, 2002).

Ensuring Quality of Instruction at Commercial Driver Training Schools

Previous data had indicated that students who attended commercial driver-training schools were involved in crashes at a higher rate than those who attended either public or private driver-training programs (Joint Legislative Audit and Review Commission 1999). An increasing demand for driver training by young potentially novice drivers cannot be met adequately by the public schools. There has been a heightened role of commercial driver-training schools to meet this demand (Joint Legislative Audit and Review Commission 1999). Therefore, much focus has been placed on ensuring that commercial driver-training schools are providing uniform and high quality instruction. Whereas the Department of Education is responsible for state oversight of public school driver education programs, The Virginia Department of Motor Vehicles is responsible for the oversight of commercial driver-training schools. Both the public and the commercial driver education programs are required to follow state law and meet requirements established in the *Curriculum and Administrative Guide for Driver Education in Virginia*.

The *Curriculum and Administrative Guide for Driver Education in Virginia* requires a total of seven periods of behind-the-wheel instruction. Those seven periods of instruction may include simulator instruction, range instruction, and/or on-the-road instruction, but a minimum of 2 periods must be on-the-road instruction.

Utilizing Simulation Technology to Increase Novice Driver Experience

Much research has indicated that a primary cause of the high rate of motor vehicle crashes among young novice drivers is lack of driving experience. A primary method to provide novice drivers with needed driving experience is through on-the-road driving practice. By exposing driver-training students to various driving situations that they will

likely experience, once they become licensed drivers, they will be better prepared to avoid the risks associated with motor vehicle crashes.

Several studies have looked at the use of simulation technology as a means to provide a variety of driving experiences to driver-training students, without the risk of actually being on the road. Benefits of training enhanced by simulation include enhanced training efficiency (by exposing trainees to numerous specific training scenarios, with immediate repetition if desired), training control (ability to specify precisely the type and level of driving task elements and demand), performance measurement (ability to measure trainee performance objectively and reliably in ways that cannot be done on the road), training feedback (performance information can be provided to the trainee in real time or after completion of the training segment), and environment manipulation (ability to generate risky environments that can be manipulated systematically without the danger of being in real traffic on the road) (Triggs, 1994).

Graduate Driver Licensing to Address the Novice Driver Problem

In response to the serious problems posed by young drivers, several states have implemented graduated driver licensing (GDL) systems (Foss, 2000). Research of graduated driver licensing suggests it is a promising strategy for promoting safe driving behaviors and reducing the incidence and severity of motor vehicle crashes among young drivers. GDL allows new drivers to acquire driving experience in low-risk settings and gradually lifts restrictions until an unrestricted license is earned. In addition, up to 24 months may be required to obtain an unrestricted license; therefore, drivers are older and more mature when they become fully licensed.

Research Questions and Preliminary Findings

Preliminary findings of this study were as follows:

Question 1: Based on Virginia crash data, is there a difference in motor vehicle crash rates for graduates of commercial driver training programs versus graduates of public school driver education programs?

Analysis of Virginia crash data for 1999-2001 indicated that there was no significant difference in motor vehicle crash rates for graduates of commercial driver training programs versus graduates of public school driver education programs.

It was predicted that students taking driver education in commercial school would have higher crash rates than those taking driver education in public or those students in private schools. Analysis of data for 2001, 2000 and 1999 show differences by year. For 2001, commercial, public and private schools showed crash rates of 15. 6, 13. 9 and 9.4 respectively. A one-way analysis of variance shows significant differences. Private

schools are significantly lower than public and commercial, but there are no significant differences between commercial and public. The results for 2000 show commercial schools had significantly higher crash rates of 20 compared to 16 for both public and private schools. Crash rate data for 1999 also display significant differences similar to 2000. Commercial schools had crash rates of 15.6 compared to 13.9 and 9.4 respectively for public and private schools. Commercial schools have significantly higher rates than public but private and commercial are not significantly different. In summary, commercial and public schools are not significantly different from each other for 2001, with crash rates of 16 and 14 respectively but private schools are significantly lower with a rate of 9.4. For 1999 however, commercial schools have significantly higher crash rates of 16.1 compared to 12.1 for public schools. Private schools showed a crash rate of 13.3 higher than public schools but lower than commercial. Over time the data show that commercial schools were significantly higher than public schools in 1999 and 2000 but no different in 2001. All schools showed an increase from 1999 to 2000, then a decrease in 2001.

Question 2: Based on Virginia crash data, is there a difference in motor vehicle crash rates for graduates of driver education programs using simulators versus graduates of programs not using simulators?

Analysis of Virginia crash data for 1999-2001 revealed that there was no difference in motor vehicle accident rates for graduates of driver education programs using simulators versus graduates of programs not using simulators.

Data were analyzed to determine if there were any significant differences in mean crash rates between schools that used simulators and those that did not use simulators. The results of *t*-test analyses for the three years show no significant differences in crash rates for any of the years. For 1999, simulator schools have a slightly lower rate, 11.9, compared to 12.1. Similarly in 2001 with a rate of 13.1 compared to 14.00. However, simulator schools have a higher crash rate of 17.6 compared to 16. 6 in 2000. Furthermore, simulator and non-simulator public schools show similarities with each other within each year and greater differences over time. The data do not support the hypothesis that simulators lead to lower crashes. However, since many factors can contribute to crashes, this crude analysis should not be used as the major evaluation of simulator effects. The data do not allow comparisons of the injury severity (none, minor, incapacitated, fatal) of crashes nor other driving violations that could show differences.

Question 3: Are Virginia driver education standards the same for commercial and public school driver education programs?

Analysis of interview and survey data suggested that respondents recognize that Virginia driver education standards are the same for commercial and public school driver education programs (refer to the Virginia Administrative Code (Regulations)). As noted below, there are differences in practice in contrast to administrative standards, however.

Question 4: Are there differences in the level of parental involvement required by commercial and public school driver education programs?

The state of Virginia Driver Education Program requires the same amount of parental involvement for both public and commercial driving schools. Parents must provide 40 hours of supervision with 10 hours after sunset for all drivers younger than 18 years old. However, the survey data indirectly indicates different perceptions of the amount of time parents provide on-the-road supervision. Public school administrators stated that students receive at least eight hours of parental supervision more so than commercial school administrators (89% to 78%). This difference is not statistically significant.

Question 5: Is there a difference in the training requirements for commercial and public school driver education instructors?

Public and private school classroom driver education teachers must have a teaching license with an endorsement (6 semester hours) in driver education. Analysis of survey data indicated that the minimum training requirement of six semester hours of endorsement in driver education from an approved teacher preparation program was the same for commercial school driver education instructors. However, administrators were asked to identify which of ten criteria were used to hire driving instructors. Administrators of commercial schools were significantly more likely to use five factors compared to administrators in public schools: past driving record (100% to 63%), national criminal background check (60% to 26%), number of general education courses completed (50% to 18%), number of years driving experience (80% to 15%), and past student evaluations (40% to 0%). The commercial school administrators also were more likely to use the factors of current driving record (100% to 93%), local criminal background check (70% to 56%), substance use/DUI (80% to 52%), and college credits in driver education (100% to 82%). None of these differences is statistically significant. Teaching qualifications was the only criterion used more by public school administrators compared to commercial school administrators in hiring driver education instructors (96% to 80%). This difference is not statistically significant.

Question 6: How effectively does the state monitor driver education programs?

Based upon results of interviews and administrator surveys, the state auditors are effectively monitoring the licensing, curriculum, record keeping, instructor certification, equipment and materials for classroom and behind-the-wheel instruction. Nevertheless, commercial schools are more likely to evaluate instructors every six months than are public schools (33% to 26%). The difference is not statistically significant.

Question 7: Is there a difference in the rigor of monitoring and sanctions applied to commercial schools as opposed to public schools?

Results of interview data suggest that there is no difference in the frequency of state monitoring. Commercial driving-training programs and public school driver-training programs are audited on an annual basis. Administrators of commercial and public programs do note differences that are not statistically significant. For example, more public school administrators (35%) state the driving records of instructors are checked every six months than do commercial school administrators (11%).

There is a difference in state monitoring with regards to the specificity of the audit and action taken for infractions. Commercial driver-training program audits are subject specific whereas public school driver-training program audits are more general in scope. When evaluating driver-training instructors, commercial school administrators compared to public school administrators are more likely to use criminal background checks (80% to 18%), substance use/DUI (60% to 26%), student evaluations (60% to 15%), and the instructor's driving record (80% to 63%), although the last is not statistically significant. Public school instructors are more likely to be evaluated on the basis classroom teaching content (89% to 60%) and in-vehicle teaching content (74% to 70%). The latter is not a statistically significant difference.

In terms of six criteria used to disqualify or terminate a driver education instructor, the only significant difference between the commercial and the public school administrators was noted for substance use/DUI, (80% to 100%, respectively). The differences for: number of demerits on license (80% to 82%), criminal behavior (80% to 85%), not providing proper teaching instructions (80% to 74%), number of crashes with students in the car (70% to 59%), and number of crashes without students in the car (100% to 100%) are not statistically significant.

As regards the quality of instruction and monitoring, instructors from both schools tend to believe they are more closely monitored and provide better quality of instruction. Seventy-eight percent of the commercial schools instructors indicated that the commercial schools have the better instruction, and 80 percent of the public schools instructors said the public schools have the better instruction. On the questions of standards, as expected, 74 and 72 percent of the commercial and public schools instructors answered that their schools have the toughest standards for instructors. Eighty-three percent of the commercial schools instructors reported that their schools are monitored more closely than the public schools (63%). The instructors differ a great deal in terms of penalties for infractions. Ninety-one percent of the commercial schools instructors stated that their schools receive the most severe penalties for infractions compared to 36 percent of the public schools instructors. The data show that there is a slight difference with regard to instructor supervision—63 percent of the instructors in commercial schools reported that they are more closely supervised than their counterparts in public schools. However, 69 percent of the instructors in public schools said they are more closely supervised than those in the commercial schools.

Question 8: Are all schools using the same driver education instructional curriculum?

All schools, commercial and public, are using the same driver education instructional curriculum, which is specified in the Curriculum Guide for Driver Education in Virginia. The administrators of the different schools do state some difference in the extent to which instruction is based on the *Curriculum and Administrative Guide for Driver Education in Virginia*. While 70 percent of the public school administrators states that all the instruction is based on the Guide, 60 percent of the commercial school administrators do so. However, based on interview and survey data, some commercial and public schools are also utilizing supplemental materials.

The public schools are more likely to spend one week or more covering certain topics in class: alcohol/drug use (68% to 33%), speed (37% to 11%), radio/cell phones (16% to 11%), adjusting seats/mirrors (16% to 11%), and eating/drinking & driving (21% to 11%).

Question 9: Are students being provided sufficient time for behind-the-wheel training?

Results of student surveys indicate that students in commercial and public driver-training programs were receiving at least the minimal number of required periods of behind-the-wheel training. However, according to interview data, instructors of commercial and public driver-training programs felt that the number of periods of behind-the-wheel instruction provided to students was not sufficient for providing an optimal level of driver proficiency.

Question 10: Is there a difference in standards for record keeping for commercial and public driver education programs?

Results of data analysis of instructors' responses indicated that there was no difference between the commercial and public schools with regard to their record keeping of students. However, there are differences in the length of record maintenance, with public school instructors indicating a longer period of time for record maintenance. For example, 52% of the commercial school instructors indicated that student records were maintained for 2-4 years and 44% indicated that records were maintained for five or more years. In comparison, approximately 30% of the public school instructors indicated that student records were maintained for 2-4 years and 66% of public school instructors reported that student records were maintained for five or more years.

Information from the administrators presents a consistent picture for record maintenance. A larger percentage of the public school administrators stated that records were kept for five or more years: classroom records (100% to 33%), behind-the-wheel

records (96% to 33%), instructor's license numbers (77% to 67%), and instructor's driving records (67% to 50%).

Question 11: Are driver education programs that utilize simulators more or less effective than traditional driver education programs?

Based on survey results, student reports of crashes and citations were compared by use and non-use of simulators. A driving record index was constructed to enhance understanding. The mean scores of .375 for those who used simulators and .325 for those not using are low and not significantly different. Concerning involvement in crashes, specifically, data show no differences with 75% of simulator users and 79% of non-users reporting no crashes. An unsafe driving index also shows no significant differences with scores for both groups.

Some differences are observed regarding speeding with fewer of those who used simulators (13%) reporting a citation for speeding compared to 21% of those not using simulators. Similarly, 38% of simulator users compared to 53% of non-simulator users reported engaging in speeding sometimes or frequently. However, results of interviews suggested that time spent on simulators should not be substituted for behind-the-wheel driving experience, but should be used as a supplement.

Question 12: Are driver education programs that utilize simulators more, or less, cost-effective than traditional driver education programs?

Because there are various types of simulators in use at the school jurisdictions included in this study, the costs and, therefore, cost-effectiveness of simulator use varies. No commercial schools participating in the study utilized simulators for driver training. The price of simulators used by public schools ranged from $1,500 to $7,000 or more. Analysis of student and instructor survey data indicated that there is no difference in students from schools using simulators and non-simulators in obtaining their driver's license after completion of training and no difference in involvement of crashes.

Question 13: How could such technology be implemented in a cost-effective manner (such as regional, per school, etc.)?

Results of interview data indicated that the most cost-effective manner to integrate simulation technology in a driver-training program would be to purchase mid- to high-level cost interactive simulators that would be centrally located within a jurisdiction and shared by schools within that jurisdiction. Results of the literature review indicates that the most effective simulation technology is that technology which allows the driver-training student to fully interact with and respond to the simulated road experience (Decina, Gish, Staplin and Kirchner, 1996 and Garcia-Ros et al., 1999).

RECOMMENDATIONS

1. Our research data indicate that there are not significant differences in the quality of instruction provided by public schools' driver education programs compared to commercial schools' driver education programs. However both programs can be improved, for example by providing: a.) increased monitoring of driver education by state administrators; b.) information and materials to reflect the best practices of teaching techniques and knowledge of good driving behaviors; c.) periodic review and revision of the curriculum guide in order to produce better novice drivers; and d.) rigorously enforcement of the required hours for behind-the-wheel driving particularly parental involvement for students engaged in behind-the-wheel driving.

2. The use of simulators has been shown to be effective in other areas such as flight training, medical training, and even training for truck drivers, but little research has been done evaluating their effectiveness in novice driver education. No studies have shown them to be a replacement for actual experience even though some proponents have argued this. Several states, including Virginia, substitute some simulation hours for road training hours. It is suggested that more in-depth research is needed before decisions are made regarding simulators. The present findings do not show any additional reduction in crashes or unsafe driving as a result of using simulators. But these data are incomplete and should not be interpreted as a final test of effectiveness. Future research should track individual students and also examine citations and seriousness of crashes by use of simulators.

3. Based on interviews, students do not receive enough behind-the-wheel experience, so the number of required hours for behind-the-wheel learning should be increased. Until there is more conclusive research on the effectiveness of simulators, simulator hours should not be counted as part of on-the-road training. Simulator hours should be in addition to 14 required on-the-road training hours.

4. There is some evidence that parents and guardians are not adhering to the required 40 hours supervision of on-the-road training. There needs to be a closer monitoring of the role of parents. Future research on the behavior and opinions of parents and guardians is also recommended.

5. The graduated licensing program that has been shown to reduce crashes maybe strengthened and enhanced by continuing oversight through collecting, analyzing, and reporting relevant crash data. Increasing the public awareness of the graduated licensing program's advantages is also appropriate.

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State of Virginia Survey on Adolescent Driver Education

Report of Findings

January 2003

BACKGROUND AND PROBLEM

In Virginia, as across the nation, there exists a problem of disproportionate numbers of motor vehicle crashes occurring from young novice drivers in contrast to older and more experienced drivers. Driver's license applicants under the age of 19 are required to have proof of successful completion of a state-approved driver education program. Though many persons receive their training in public school driver education programs, a large number of applicants receive all or part of their training through licensed commercial driver-training schools.

The Virginia Department of Motor Vehicles and the Virginia Department of Education in response to Senate Joint Resolution (SJR) 110 commissioned the current study. The resolution requested that The Virginia Department of Motor Vehicles, with the assistance of the Superintendent of Public Instruction, study the adequacy of driver education programs available to youthful drivers. The focus of the study was on crash data for graduates of public and commercial driver education programs, standards used in public and commercial driver education programs (e.g., curriculum and instructor qualifications), the effectiveness of traditional programs and simulator-based programs in the preparation of novice drivers, and the cost-effectiveness of the two modes of instructional delivery for driver education programs. Results of statewide surveys could assist in assessing the adequacy of driver education programs available to young novice drivers.

Past research shows that young novice drivers have high accident rates. No specific factors have been found to explain these findings. Adolescent personality characteristics and immaturity have been implicated as possible influences. Strategies to address the problem have been suggested such as changes in driver education and licensing procedures. One promising strategy that has been shown to reduce crashes is graduated licensing.

Another suggested strategy is to provide greater experience in driver education. One way to achieve this is through the use of simulators. Simulators have been used in some driver education courses for over 30 years, but their use is not systematically incorporated. Simulators have been shown to be very effective for training airline pilots, truck drivers and even medical students. Meanwhile, sophisticated simulators are being developed for use in diagnostic and testing driving. But past research in driver education has not investigated the possible contributions that they make to driver education.

The characteristics of driving teachers and programs have also been raised as possible influential factors in the success of driver education. In Virginia, as in other states, adolescent novice drivers

can receive training in both public and commercial schools. The state regulations determine what students are required to learn but the different types of schools are regulated by different agencies and seemingly evaluated by different criteria. The following research questions were posed.

In the present study, we examine the influences on driver education of the use of simulators and type of school in the state of Virginia. Five school systems (Arlington County, Henrico County, Chesapeake City, Newport News City, and Richmond City) in the state use simulators and these can be compared to non-simulator schools. We also make comparisons between driver outcomes and teacher characteristics in commercial and public schools to determine any differences between the two. The following hypotheses are predicted:

H1 Students taught driver education in public schools will have lower accident rates per student than those taught in commercial schools.

H2 Schools using simulators will have lower accident rates per student than those schools without simulators.

H3 Students taught driver education in public schools will have fewer and less serious driving infractions and accidents than those taught in commercial schools.

H4 Students taught driver education in schools using simulators will have fewer and less serious driving infractions and fewer and less serious crashes.

H5 Instructors from commercial and public schools will differ on their educational backgrounds, driving experience, driving records, and their attitudes about the comparison of public/ commercial schools and about student driving.

H6 Commercial and public schools will differ on the reported driving outcomes of their students.

H7 Commercial and Public Schools will differ on their record keeping, the condition of safety equipment and signs for their vehicles.

H8 Commercial and public schools will differ in the quality of training provided to students and the topics addressed in their curricula.

LITERATURE REVIEW

Effectiveness of Driver Education Programs

In the United States in 1991, approximately 6,000 persons aged 16-20 died from motor vehicle crashes (MVCs)—twice as many as from any other cause of death in this age group (CDC, 1994). Driver education is important for developing the knowledge and skills necessary to equip novice drivers with safe driving practices and reduce the number of motor vehicle crashes. Mayhew and Simpson (1999) summarized research that showed that driver education programs have been evident in the United States school systems since the 1950's. It has long been believed that formal driver education would be effective in reducing crashes among the teenage population. However, several studies indicate that driver education programs are ineffective in reducing motor vehicle crashes (Vernick, Li, Ogaitis, MacKenzie, Baker, and Gielen (1999); Robertson & Zador (1978) and Roberts, Kwan, & the Cochrane Injuries Group Driver Education Reviewers, 2002). Robertson and Zador (1978) indicated that high school driver education programs actually contribute to motor vehicle injuries and deaths, by allowing for the licensing of young people below the age of 18. Most states will not license persons below the age of 18 if they have not completed a driver education program.

Because of the inability of the public school systems to meet the ever-growing demand of potential young drivers for driver training, many states rely on commercial driving schools to help satisfy this need. In some instances, the question has been raised as to whether public school driver education or commercial driver-training programs are more effective in reducing motor vehicle crashes.

The Commonwealth of Virginia Joint Legislative Audit and Review Commission (1999) reported findings of a study which investigated the effectiveness of State oversight of commercial driver-training schools (Joint Legislative Audit and Review Commission, 1999). The Virginia Department of Motor Vehicles (DMV) is the agency designated by State statute to provide oversight of commercial driver-training schools. The report concluded that though most commercial driver-training schools in Virginia comply with DMV's regulations and graduates of those programs are more likely than graduates of public or private school driver educations programs to be involved in crashes.

A research study sponsored by the Insurance Bureau of Canada (IBC) identified the most critical factors related to the acquiring driving experience as psychomotor skills related to handling the vehicle (e.g., steering and braking), perceptual skills related to perceiving the driving environment accurately (e.g., sign recognition, scanning, hazard detection), cognitive skills related to making appropriate decisions and judgments (e.g., speed adjustment for driving conditions, passing), and attitudes and motivations that are related to concern for safety and the willingness to exercise responsible driving behavior (e.g., overconfidence, caution, fear, risk taking, sensation seeking) (IBC, 1995). The IBC study concluded that there was a need to develop new methods and approaches to driver education and training that place more emphasis on the critical experience-related factors that can decrease collision risk. The study

found that existing driver training and testing programs in Canada were not adequately addressing eight critical experience-related factors. Those factors included steering control, speed control, visual search/scanning, hazard perception, decision making, personal risk assessment, lifestyle, and risk-taking (IBC, 1995). The IBC (1995) suggested that those factors should be given the highest priority when implementing changes to improve the effectiveness of driver training and testing programs.

There is an apparent need to review the factors that might contribute to the elevated rate of motor vehicle crashes among young novice drivers, even after completing driver education programs. The identification of such factors may assist in the development of driver education curriculum, in both public and commercial schools, which will equip young novice drivers with necessary skills and experience to reduce the high rate of motor vehicle crashes among that population. In order to tailor driver education programs to this population, we must first understand the characteristics of the young novice driver.

Ensuring Quality of Instruction at Commercial Driver Training Schools

Previous data had indicated that students who attended commercial driver-training schools were involved in crashes at a higher rate than those who attended either public or private driver-training programs (Joint Legislative Audit and Review Commission 1999). An increasing demand for driver training by young potentially novice drivers cannot be met adequately by the public schools. This has been a heightened role of commercial driver-training schools to meet this demand (Joint Legislative Audit and Review Commission 1999). Therefore, much focus has been placed on ensuring that commercial driver-training schools are providing uniform and high quality instruction. Whereas the Department of Education is responsible for state oversight of public school driver education programs, The Virginia Department of Motor Vehicles is responsible for the oversight of commercial driver-training schools. Both the public and the commercial driver education programs are required to follow state law and meet requirements established in the *Curriculum and Administrative Guide for Driver Education in Virginia*.

Young Novice Drivers

According to the National Highway Transportation Safety Association (2002), teenage drivers have the highest risk for motor vehicle crashes of any age group. The National Center for Injury Prevention and Control (2001) reported that there is an average of one teen death every 91 minutes as a result of motor vehicle crashes. Chen, Baker, Braver, and Li (2000) reported that the leading cause of death among teenagers in the United States is motor vehicle crashes that account for 36% of all deaths of persons aged 15 to 19. For persons in the age group 15 –20 comparable statistics support this assertion and indicate that motor vehicle crashes account for 32% of all deaths, with homicide accounting for 24% and suicide accounting for 13% of deaths in this age group (American Driver & Traffic Safety Education Association, 2000). The National Highway Traffic Safety Administration (NHTSA) indicates that the problem is worst among 16 year-olds, due to limited driving experience and an immaturity that frequently results in risk-taking behind the wheel (NHTSA, 2002).

Results of a study commissioned by the California Office of Traffic Safety reported that teenage traffic deaths could dramatically increase over the next decade. It was projected that, by 2007, the number of teenage drivers would increase by one-third, which would be the highest proportion of teenagers since the 1980's. "Teens are far more likely to be involved in traffic collisions than any other age group and a surge in the teen population- the echo of the baby boom- is vastly increasing the number of teenage drivers" (American Driver & Traffic Safety Education Association, 2000, p. 1).

In addition to the cost in lives and quality of life, there are economic costs associated with motor vehicle crashes involving young novice drivers. During 1999, the economic cost of police-reported crashes for young drivers between the ages of 15 – 20, was approximately 32 billion dollars (National Center for Injury Prevention and Control, 2001).

Many factors have been attributed to motor vehicle crashes by young novice drivers including driver error, speeding, high occupancy, infrequent seatbelt use, night driving, and alcohol. According to Cvijanovich, Cook, Mann and Dean (2001) in addition to the age-independent factor of inexperience, age-dependent factors that contribute to the increased crash rate among teenage drivers include under-developed decision-making abilities and judgment, overestimating their own skills and considering themselves less vulnerable in the event of a crash.

Novice Driver Subtypes

In order to identify the specific driver education needs of teenage drivers it might prove useful to associate risk factors for motor vehicle crashes with subtypes of novice drivers. The purpose of a study by Deery and Fildes (1999) was to obtain empirical support for the existence of driver subtypes in the young novice driver population. The researchers conducted two separate studies on young novice drivers. The aim of study 1 was to identify novice driver subtypes. In study 1, 198 participants (55% male) aged 16 to 19 completed an extensive self-report questionnaire. Five novice driver subtypes were identified through a cluster analysis of personality and driving-related measures. The standardized cluster means of the variables used in the k-means analysis identified "Cluster 1" as a relatively high-risk or deviant group. Individuals in this cluster reported relatively high levels of driving related aggression, competitive speed, and driving to reduce tension. They also showed high levels of assertiveness, sensation seeking, assaultiveness, and verbal hostility. "Cluster 2" was the most inhibited while driving and reported an external locus of control. They were also more depressed, irritable, hostile, and resentful than other clusters. "Cluster 3" tended to score moderately on all measures. "Cluster 4" was the least deviant group, showing the lowest levels of driving-related aggression, competitive speed, and driving to reduce tension. They also showed that they were more emotionally and behaviorally well adjusted than other cluster groups. The final cluster was the highest risk or most deviant group. It was similar but not identical to Cluster 1. "Cluster 5" showed high levels of driving-related aggression, competitive speed, driving to reduce tension, sensation seeking, and verbal hostility. In addition, Cluster 5 was more depressed, resentful, irritable, hostile (indirect), and emotionally maladjusted than those in Cluster 1. Furthermore, Cluster 5 reported the riskiest driving style and a poor traffic accident record. They were also likely to take part in other high-risk behaviors, such as drinking large quantities of alcohol regularly, smoking tobacco, and using illicit drugs. Clusters 1 and 5 had the highest accident involvement (Deery and Fildes, 1999).

In study 2 (Deery and Fildes, 1999), a subset of participants from each of the subtypes drove several scenarios in a driving simulator. The simulator consisted of a full sized passenger car body (Ford Falcon) with cabin controls that operated in the same manner as a normal vehicle. Five simulated driving scenarios were used. The results of the first drive to assess participants' driving style showed that there were no statistically significant difference between the young driver subtypes. However, results did suggest that the young driver subtypes differed in terms of risk perception and on attentional control tasks. Findings of the study indicated that the most significant difference among subtypes was in driving skill, with lower levels of skill being demonstrated by the two highest-risk subtypes (Clusters 1 and 5). Most of the participants in Clusters 1 and 5 were male. Significant differences among subtypes were also observed in ability to control attention among concurrent tasks in high workload situations, responses to emergency situations, and several potential traffic hazards. The authors recommended that results can be used in designing training programs and other counter measures to address the young novice driver crash problem (Deery and Fildes, 1999).

Risky Driving Behaviors Among Young Novice Drivers

Risk-taking behaviors have been associated with an increased rate of injury and death among adolescents and teenagers. The tendency for young drivers to take more risks than older drivers is reflected by the significant overrepresentation of young drivers in alcohol and drug related crashes, speeding, and infrequent use of seat belts (Byrd, 1997).

Waller (1983) differentiates between hazard perception and risk perception and risk acceptance. The assertion is that even though young drivers may perceive the risk the same as older drivers, they may be more likely to accept the risk (Waller, 1983). This may be the result of young drivers underestimating the danger of hazardous situations.

According to Cvijanovich et al. (2001) young novice drivers consider themselves less vulnerable in the event of a crash than do older more experienced drivers. The teenage driver's tendency to take risks "may be increased by peer pressure, emotional liability, and other stresses. Finally, teenagers drive more frequently under higher risk conditions (i.e., at night and/or without seatbelts)" (Cvijanovich et al., 2001, p. 632).

A research study was commissioned by the Insurance Bureau of Canada (IBC) to identify changes in approaches to driver training and testing that would help reduce the collision risk of new drivers (IBC, 1995). Based upon scientific evidence, risk-taking was identified as one of eight critical experience-related factors that influenced the level of risk faced by new drivers. The study concluded that, with regard to reducing risky driving behaviors among young novice drivers, there should be an introduction of lifestyle education to discourage risky behaviors at an early age, long before the age of driver licensing (IBC, 1995).

Factors Associated with Motor Vehicle Crashes (MVCs)

Aggressive Driving

Aggressive driving has surpassed drunk driving as motorists' primary concern, when on the road, and is considered to be on the rise (Fakhry and Salaita, 2002). The increase in aggressive driving is thought to be attributed to an increase in traffic congestion. Despite this trend, only four states currently have laws that specifically address aggressive driving (Arizona, Delaware, Nevada, and Rhode Island). Specific driver behaviors that contribute to aggressive driving were identified as speed violations, following too closely, improper lane changes, traffic signal and sign violation, failure to yield the right-of-way, improper passing, and disregard of school bus safety laws. "Crash data from the Virginia Department of Motor Vehicles and the Maryland State Highway Administration for the years from 1996 to 1999 indicates that 38% of all crashes in suburban Maryland occur at intersections, and 25% are at signals. In Northern Virginia, 37% of all crashes occur at intersections, and 28% are at signals" (Fakhry and Salaita, 2002, p. 218).

Fakhry and Salaita (2002) conducted a nine-month study in the D.C. Metropolitan Region, which included Suburban Maryland, Northern Virginia, and the District of Columbia. The study investigated driving behaviors that are considered to be indicative of aggressive driving (i.e., speeding on major roads or highways, stop-sign violations, and red-light violations). The multiple sources used to obtain the data used in the study included highway speed data from monitoring stations located at 10 sites in Suburban Maryland and Northern Virginia, red-light camera data provided through the contractors who developed, installed, and oversaw the technology with permission of the appropriate police department in each jurisdiction, cameras monitoring 82 intersections in the D.C., Metropolitan Region. Results of the study indicated that, on major roadways, 40-80% of vehicles drove at speeds that were 10 mph or more over the speed limit, and red-light violations occurred at equivalent rates (30,000 per month). The number of stop-sign violations was also substantial as indicated by 17.5 violations per 1,000 vehicles. The researchers' findings were confirmed by video review and were considered to represent high risk for crashes. However, during this nine month period, there was a decline in red-light violation rates in the District of Columbia, which the researchers felt was attributed to an automated detection and enforcement system that may be successful in reducing violation rates when other measures have failed (Fakhry & Salaita, 2002).

Distractions

Collisions caused by distractions are developing as a serious health problem, due to the increasing use of portable cell phones and personal organizers while driving, more-sophisticated entertainment systems and instrument panel controls, navigation and television displays in vehicles, and "promises of sophisticated wireless e-mail, fax, and internet services in the vehicle" (G.A. Peters and B.J. Peters, 2002, p. 34).

Schweber (2002) discussed the problems associated with networked, wired, multimedia and internet-enabled cars being introduced to beginner drivers. If drivers are busy adjusting all of these extra functions, they could become distracted and pose risks to themselves and others.

One suggestion is to change the standard driver's education course by adding extra sessions to train drivers in handling a car's features. A driver's license could have clearance codes, showing the level of expertise the student is qualified for, such as "authorized to use GPS navigation but not e-mail." Driver's education would have to use simulators, similar to airplane models, to train and qualify students. The critical factor that makes driver's education, as well as pilot-training programs, succeed is the large amount of standardization in cars and aircraft. Until the auto industry standardizes all of these high-tech additions, it will be important to rethink how people learn to drive and manage the "telemetric-centric" car (Schweber, 2002).

Over the years, numerous research studies have shown a direct relationship between various distractions and motor vehicle crashes. According to federal statistics, driver distraction was identified as a factor in 10% of fatal crashes occurring in the United States in 1999 (Associated Press, 2001).

Cell phones have been targeted as a major distraction to driving and identified as a major cause of many motor vehicle crashes. In 2000, 27 states considered legislating the use of cell phones. According to the Conference of State Legislatures, the legislation ranged from banning the use of cell phones while driving to requiring drivers to use hands-free devices. In response to this concern, automakers and electronics companies have been attempting to add telemetric services that are controlled by spoken commands, such as On Star in General Motors vehicles (Associated Press, 2001).

"Recent research shows that voice-controlled systems could pose a serious risk to safety concerns. One study suggests that talking with a computer—understanding a digitized voice, speaking slowly, remembering a list of spoken commands—takes more thought than talking to a passenger. Another experiment conducted at the University of Iowa showed that when e-mail was read to drivers, their response time to brake lights from a vehicle in front of them increased by 30%" (Dow Jones News, 2001).

Fatigue

In order to safely operate a motor vehicle, the driver is required to be alert and to possess quick and accurate perception, judgment, and action. Drivers suffering from sleepiness are at risk of injury and death, from falling asleep while driving, and loss of attention or slowing of reactions during critical driving tasks or maneuvers (Lyznicki, Doege, Davis and Williams,1998).

In recent years, health and safety experts have raised concerns about the potentially devastating consequences of sleepiness in highway crashes. In June 1996, the American Medical Association (AMA) House of Delegates adopted a policy recommending research on devices and technologies to detect the signs of sleepiness and prevent the deterioration of driver alertness and performance (Lyznicki, Doege, Davis and Williams, 1998).

A study by Dureman and Boden (1972) was conducted to assess the effects of four hours of continuous driving in a car simulator on (a) performance, (b) subjective fatigue, (c) pulse rate, respiratory rate, skin resistance and neck muscle tension, and (d) intra-subject correlations between the latter variables and performance over time. Participants of the study were six women and two

men, aged 20-25. The results showed that all subjects had a progressive decrease in performance over time in parallel with increased feelings of fatigue. There was also a decrease in pulse rate and respiratory rate. Skin resistance showed continuous increment over time. Co-variations over time between performance variables and physiological variables were rather high in most individuals.

Seat Belt Use

According to the National Highway Traffic Safety Administration, from 1982 to 1995 safety belts are estimated to have saved 74,769 lives (Mayrose, 2002). Motor vehicle death rates in the United States have declined dramatically during the past two decades as a result of increased seatbelt use (Foss, 2000). Although, seat belts have been proven to save lives, many persons still do not use them. A study by Cvijanovich, Cook, Mann, and Dean concluded that teenage drivers wear seatbelts less often than do adult drivers. Bross and Spellicy (1994) indicated that only one out of every four teenagers use safety belts nationally. Driver education programs include instruction to promote the use of seatbelts. Previous studies have found that seatbelt use increased nationally from 42% in 1988 to 67% in 1994 because of the combination of public information and education programs (Mayrose, 2002).

Changing Driver Behavior to Reduce MVCs

A Perceptual – Motor Skill Approach

Lewin (1982) recommended a perceptual-motor skill approach to driver training. He argued that modern cognitive psychology, and, in particular, the psychology of perceptual – motor skill learning "can provide a more sophisticated basis for making tentative assumptions for bringing about desired changes in driving behavior" (p. 917).

According to Lewin (1982), the process of perceptual–motor skill learning passes through three different stages, which he identified as the cognitive, the associative, and the autonomous stages. The cognitive stage is associated with intellectualization or efforts to understand the task, to recognize the important cues to be attended to and to identify the major actions to be performed. Lewin provides some examples of this stage in operation when learning to drive as understanding how starting the car affects the engine, identifying the required operations, identifying the brake pedal and differentiating it from the accelerator and the clutch pedal. In the associative stage the correct patterns of the driver's motor actions are refined and co-coordinated as errors in initial understanding are eliminated by experience and practice. During the associative stage, the importance of cognitive processes gradually declines and conscious knowledge is transformed into action. The final stage is the autonomous stage. During the autonomous stage, skill becomes increasingly automatic and rapid; errors are minimized; resistance is developed to interference from other activities, which may sometimes be performed concurrently. The autonomous stage is said to continue indefinitely and improvement continues, even after years of practice. The stage of skill acquisition is the principal determinant of the number of tasks a person can perform simultaneously

Lewin (1982) suggests a categorization of six major sources associated with driving errors.

1. Competing motivation: In addition to the desire to avoid crashes out of safety motives, other motives may be operating at a given moment, which may sometimes act in a direction contrary to the maximal safety requirements; and sometimes they may override the safety motive. Such motives include hurrying to meet an important appointment or willingness to show off and to exhibit proficiency."

2. Lower subjective probability: Drivers frequently underestimate the probability of the occurrence of an accident.

3. Temporary lowering of skill efficiency: Certain psychological and psycho – physiological factors operate to reduce driving skill temporarily; for example, fatigue, drugs, alcohol, or the frustration of the driving itself.

4. Changes in perceptual and motor abilities with age: Most individuals experience a reduction in perceptual and motor abilities after middle age.

5. Inexperience and lack of knowledge: The minimal amount of teaching novice drivers receive before starting driving on their own barely covers most of the normal range of situations and difficulties they encounter daily, let alone the abnormal ones.

6. Established improper and wrong habits: Although driving skill improves with experience, the driving milieu sometimes allows incorrect or inadequate behavior to creep in, to be reinforced and to become established, for example, filtering across stop signs." (p. 918).

Lewin (1982) discussed two research projects that applied the perceptual-motor skills theoretical procedure to driver training. The two research projects suggested two different solutions to the practical problem. The first project used mass observation to identify driving errors and personal communication to change behavior. According to Lewin, the theoretical conclusion appeared to be that drawing the attention of drivers to a specific driving violation, specifying time and place, might be enough to transfer the drivers' behavior from the autonomous mode to the cognitive mode, thereby bringing about improvement.

The second project used subjective near – accident incidents to identify driving errors and a mental practice technique to change behavior. The objective of the study was to identify inadequate driving behavior and attempt to substitute more adequate ones. The identification of inadequate behavior was based on subjects' evaluations of near accident situations. Subjects were asked to record the details of any near-crash incident every evening before going to sleep. A week later, in a one hour meeting with the experimenter, the incidents were analyzed, and suggestions were made as to how to avoid future involvement in such occurrences. Results of the studies indicated that both the defensive driving course and the technique of analyzing near accident events followed by mental (imagery) practice of the correct driving habits improve driving skills. In addition, there were some indications that the latter technique brought about more improvement than the former (Lewin, 1982).

Graduated Driver Licensing

During the past two decades, motor vehicle death rates for the general population have declined, whereas motor vehicle death rates for 16-year old drivers have increased. Research on graduated driver licensing suggests it is a promising strategy for promoting safe driving behaviors and reducing the incidence and severity of motor vehicle crashes among young drivers. In response to the serious problems posed by young drivers, several states have implemented graduated driver licensing (GDL) systems (Foss, 2000).

GDL allows new drivers to acquire driving experience in low-risk settings and gradually lifts restrictions until an unrestricted license is earned. In addition, up to 24 months may be required to obtain an unrestricted license; therefore, drivers are older and more mature when they become fully licensed. "Driving restrictions may include prohibiting unsupervised nighttime driving, requiring zero or near-zero blood alcohol concentration, requiring all occupants to be properly restrained, and limiting the number of passengers and the distances and types of roads traveled" (CDC, 1994, p. 406).

The GDL system gradually phases in driving privileges for young novice drivers and limits initial driving experience to low-risk situations. According to McCartt (2001), 43 states and the District of Columbia have enacted one or more GDL elements and 34 states and the District of Columbia have enacted the full three-stage GDL system.

The National Highway Transportation Safety Association also suggests that graduated licensing is an effective way to reduce the number of fatal motor vehicle crashes. "Driving privileges are phased in to restrict beginners' initial experience to lower risk situations. The restrictions are gradually lifted, so teenagers are more experienced and mature when they get their unrestricted licenses. Graduated systems are designed to restrict night driving, limit teen passengers, establish zero tolerance for alcohol, and require specified amount of supervised practice during the initial phase. Graduated licensing laws have reduced teenagers' crash rates in the United States, Canada, and New Zealand, but not all states have such laws. For those that do not, parents can establish rules based on the graduated model" (National Highway Transportation Safety Association, 2002, p.2).

Evaluation results of GDL programs in North Carolina and Michigan indicated a 27% and 25% (respectively) reduction in motor vehicle crashes involving 16-year old drivers. The study compared

data from 1996, prior to the implementation of GDL, and 1999, subsequent to the implementation of GDL. There was an even greater reduction in number of crashes at night presumably because GDL programs restrict unsupervised night driving. Similar results of GDL evaluation were reported in Florida, New Zealand, Nova Scotia, and Ontario (McCartt, 2001).

Foss, Feaganes, and Rodgman (2001), conducted a study that focused on the overall effect of the North Carolina GDL system. The results of the study indicated that crash rates declined sharply for all levels of severity among 16-year-old drivers after the GDL program was enacted. More specifically, fatal crashes declined by 57%, crashes with no or minor injuries decreased by 23%, nighttime crashes decreased by 43% and daytime crashes decreased by 20%.

Utilizing Simulation Technology to Increase Novice Driver Experience

Much research has indicated that a primary cause of the high rate of motor vehicle crashes among young novice drivers is lack of driving experience. A primary method to provide novice drivers with needed driving experience is through on-the-road driving practice. By exposing driver-training students to various driving situations that they will likely experience, once they become licensed drivers, they will be better prepared to avoid the risks associated with motor vehicle crashes.

Several studies have looked at the use of simulation technology as a means to provide a variety of driving experiences to driver-training students, without the risk of actually being on the road. Benefits of training enhanced by simulation include enhanced training efficiency (by exposing trainees to numerous specific training scenarios, with immediate repetition if desired), training control (ability to specify precisely the type and level of driving task elements and demand), performance measurement (ability to measure trainee performance objectively and reliably in ways that cannot be done on the road), training feedback (performance information can be provided to the trainee in real time or after completion of the training segment), and environment manipulation (ability to generate risky environments that can be manipulated systematically without the danger of being in real traffic on the road) (Triggs, 1994).

The *Curriculum and Administrative Guide for Driver Education in Virginia* requires a total of seven periods of behind-the-wheel instruction. Those seven periods of instruction may include simulator instruction, range instruction, and/or on-the-road instruction, but a minimum of 2 periods must be on-the-road instruction.

Benefits of Driver Simulators

The benefits of using simulators to improve instruction have been well documented (Triggs, 1994; and Decina, Gish, Staplin, and Kirchner, 1996). Simulations differ from interactive tutorials, which help the student learn by providing information and using appropriate question – answer techniques. In a simulation the student learns by actually performing the activities to be learned in a context that is similar to the real world (Alessi and Trollip, 1991). Alessi and Trollip (1991) propose a four phase teaching model that can be enhanced by simulation: (1) presenting the student with information; (2) guiding the student in acquiring the information or skills; (3) providing practice to enhance retention and fluency; and (4) assessing learning. Tutorials generally engage in the first two of these

instructional phases, and drills always almost deal with the third. Simulations may be used for any of the four phases, that is, they may serve for initial presentation, for guiding the learner, for practice, for assessing learning, or for any combination of these.

Simulation is able to enhance safety, provide experiences not readily available in the real world, to modify the time frame, to control the complexity of the learning situation for instructional benefit, and to save money. Simulations have three major advantages over conventional tutorials, drills, and tests. The first is that they enhance motivation; the second is that they have better transfer of learning; and third is that they are more efficient.

Flow of a simulation:

- A scene is presented
- The student is required to react
- The student reacts
- The system changes in response to this action

The factors that affect the nature of a simulation are broken down into:

- The introduction
- The presentations and interactions
- The completion of the simulation

(Alessi and Trollip, 1991).

With regard to the behavioral applications of driver simulators, Snapper and Seaver (1973) stated that psychologists interested in the problems of highway safety view driving performance as a function of driver skills and capabilities and the dynamic characteristics of the vehicle itself. Although accident researchers sometimes tend to attribute crashes either to human error or vehicle failure, this two-state classification is a gross oversimplification. Optimally, vehicle design and driver training should be compatible in order to minimize the incidence of traffic crashes. Many of the optimization problems can be attacked with driving simulators, relying on on-line computer control. Many simulators, especially those used in driver education programs, cannot provide realistic feedback, either visual or kinesthetic, because they rely on non-interactive displays. A crucial feature of simulators should be the ability to represent faithfully the dynamic characteristics of different vehicles. Thus, the simulation system should be capable of representing a wide range of the possible dynamic characteristic of vehicles, as determined by a large number of combinations of continuous parameters, road conditions, and driving scenarios. Usually, these requirements can be met only with driving simulators controlled on-line by computers, programmed to model vehicle dynamics.

The National Advanced Driving Simulator is a testing system aimed at improving highway safety in the U.S. Financed by the National Highway Traffic Safety Administration, the driving simulator is based on the airline simulators and is touted to be the most realistic in the world. The testing system modeled on airline simulators fight off its critics by being cost-effective (Derra, 1998).

The Effectiveness of Simulators in Driver Education Programs

Novice driver education has been under attack for many years for being ineffective in producing safer drivers and the AAA Foundation's driver-ZED™ CD-ROM was designed specifically to address this problem (AAA Foundation for Traffic Safety, 1998). The Driver-ZED™ CD-ROM focuses on the development of the visual and decision-making skills needed to manage driving risks. Driver-ZED™ has been evaluated under real driving conditions and has been shown to produce statistically significant improvements in the risk management skills of young teen drivers. Students at a Vermont high school participated in this study. The Vermont driver educators used a technique called "commentary driving" to evaluate how well their students were scanning the driving environment for potential risks. Students are trained to articulate what they are doing as they do it and to search the driving environment by breaking it into a series of zones. Students identified what they saw by naming the situation or object and were graded on "missed" targets, called "visual demerits". The higher the number of visual demerit points, the poorer the performance. The students who were trained by the driver-ZED™ program before taking their evaluation drive scored far fewer visual demerits that the students who were trained by the program. Also, the students liked the driver-ZED™ program, rating it at a 7.0 in a scale of 1 to 10, with ten being the highest rating. Nearly three out of for of the students who completed the program said they would recommend it to their friends; only 11% said they would not.

Wolffelaar, Bayarri, and Coma (1999) state that driving simulation applications are difficult to generate and maintain due to the complexity associated with maintaining "consistency in different correlated layers in the static database –*scene*- (visualization data, road network topology, surface geometry, tracking paths, active traffic elements, etc.) and also generate and control in real-time a set of participants whose behavior must be referred to the scene, to their own goals and to other participants as well" (p. 1).

Based on previous research, the National Highway Traffic Safety Administration (NHTSA) funded the development of the Safe Performance Curriculum (SPC), which incorporates the use of simulators in driver education programs. "The SPC consists of approximately 32 hours of classroom instruction, 16 hours of simulation instruction, 16 hours of driving range instruction, three hours of instruction in evasive maneuvers, and five hours of on-street instruction, two of which are behind the wheel" (Waller, 1983, p.3). Early results of the study comparing the effectiveness of the SPC and traditional driver education programs showed little differences, however later results appeared more promising (Weaver, Stock, Ray, & Brink, 1981 and Stock, Weaver, Ray, Brink, & Sadof, 1983). Though the SPC may be more effective, it is much more expensive than traditional driver education programs and society may therefore be less inclined to support funding for such a program (Waller, 1983).

A study commissioned by the U.S. Department of Transportation, National Highway Traffic Safety Administration, addressed the feasibility of using "new" simulation technology to train novice drivers (Decina, Gish, Staplin and Kirchner, 1996). It was reported that, due to the high cost and limited accessibility of driving simulator hardware, the applicability of such technology for the safety training of novice drivers was restricted. However, certain elements of driver training programs could be amply delivered through software used on less expensive IBM-compatible personal computers. The advantage of the personal computer over the driving simulator was reported to be versatility, cost, accessibility, and popularity. Those driver-training elements that were considered to be most amenable included hazard anticipation, visual scanning behavior, foveal/peripheral visual

performance, and knowledge elements. Driver training elements that were considered to be least amenable were peripheral visual performance, performance degradation, and speed and headway choice. Specific software packages identified in the study that could be used to develop amenable training elements for novice drivers include "Director, mTropolis, Oracle Media Objects, Strata Media Forge, and Quark Immedia" (Decina, Gish, Staplin and Kirchner, 1996, p. ix).

Triggs (1994) conducted a study to show how driving simulators could be used as a central component of a young driver road safety program. Triggs reported that " the young driver problem is an international one that is experienced in all countries with an advanced road transport system" (p.23). Benefits of training enhanced by simulation included enhanced training efficiency (by exposing trainees to numerous specific training scenarios, with immediate repetition if desired), training control (ability to specify precisely the type and level of driving task elements and demand), performance measurement (ability to measure trainee performance objectively and reliably in ways that cannot not be done on the road), training feedback (performance information can be provided to the trainee in real time or after completion of the training segment), and environment manipulation (ability to generate risky environments that can be manipulated systematically without the danger of being in real traffic on the road). Four general areas were identified as being important for directing the development of detailed scenarios for the simulator driver training curriculum: 1) risk perception, 2) calibration, 3) timesharing, and 4) attentional control. These areas were considered to be most appropriate for addressing the problems associated with novice drivers (Triggs, 1994).

Garcia-Ros, Montoro, Valero, Martinez and Bayarri (1999) designed and evaluated a system for computer-assisted instruction in road education. This study was conducted in Spain where, just as in the United States, there exists a serious problem of motor vehicle crashes caused by novice drivers. In Spain, a network of private driving schools provides the education programs to prepare novice drivers with safe driving practices. The researchers identified the two primary components of driver education as theoretical (knowledge of the legal code, signs, maneuvers, etc.) and practical (driving a car in real situations). The researchers indicated that teaching the theoretical component was the most challenging "since many of the contents which must be explained are based on relatively sophisticated graphics representations" (Garcia-Ros et al., 1999). The primary challenge is for teachers to find methods that allow the students to visualize complex driving scenarios. This study first evaluated the weaknesses of the traditional instructional tools by filming the driving instructors' instructional sessions and using observational data analysis.

The SIVAS system was designed to improve upon the limitations of video presentations by creating, editing, and presenting complex traffic situations that are of didactic interest for teaching the concepts, rules and behaviors that are relevant in road safety education and driving. The system would be incorporated into the curriculum and used in the daily instructional sessions. SIVAS would be designed to facilitate the selection, organization, and development of the classroom sessions in a manner that allowed for student interaction. The system requires a PC compatible personal computer with a Pentium processor with 32 megabytes of memory. The system consists of three modules: (a) a program to model geometric-topological scenes which modifies the geometry and visual aspects of the road and surroundings to be incorporated in the situation to be used; (b) a program to design the didactic situations which supported by the previous program, permits the selection of the vehicles involved in the situation as well as the parameters that describe their

movement and (c) a program for planning and presenting the lessons to be used by the instructor" (Garcia-Ros et al., 1999).

The preliminary evaluation of the SIVAS system indicated that it gave driving instructors improved control over the content to be shown as compared to video and other such tools, which allowed for a greater variety of information being conveyed to the students. Initial results also suggested that the driving school teachers are able to understand and use the tool from the beginning.

METHODOLOGY

The present study involved analysis of The Virginia Department of Motor Vehicles crash data for 1999-2001 and analysis of survey data obtained from young novice drivers, commercial and public driver-training instructors, and commercial and public driver-training program administrators. With the exception of crash data, data analyzed in this report were obtained from interviews and questionnaires developed by the researchers. A number of methodologies were employed to investigate these issues. The following techniques were employed.

In-depth interviews

These were conducted with 12 commercial school owners or administrators selected from a list of commercial schools provided by The Virginia Department of Motor Vehicles in order to obtain additional/supplemental information not obtained through survey data on driver education training in Virginia. Three simulator researchers from Virginia Polytechnic Institute, University of Iowa and University of Colorado were also interviewed for the purpose of obtaining technical information pertaining to simulators (e.g., costs and skill development issues). The respondents selected for the interviews were considered to be experts in their field.

Crash Data

Population and Sampling

This involved secondary analysis of accident data collected by the Virginia Department of Motor Vehicles for the years 1999, 2000 and 2001. The crashes were listed by school and all schools were identified by name, jurisdiction code and by type of school: commercial, public and private. The population of schools included all schools in the state of Virginia that taught driver education during that year so this is identified as a census rather than a sample. Data were analyzed separately by year.

Measurement

Schools were listed in three groups by type: commercial, public and private and were also identified by name. This information was used to code schools into the 3 types to measure the independent variable of school type. Public schools were coded as having simulators based on their jurisdiction.

All schools in Chesapeake, Newport News, and Richmond Cities and those in Henrico and Arlington Counties were coded as simulator schools. All others were coded as non simulator schools. Commercial and private schools were coded as missing data for simulator analysis.

Survey Data: Instructors/ Administrators/ Students

Population and Sampling

Data were collected from instructors, administrators, and students of commercial and public school driver education. A partially random stratified cluster sample was selected of 391 driver education teachers from public and commercial schools and 421 students in Virginia. The sampling frame was the 139 commercial and 306 public schools in the 2001 crash data files. The sample was stratified by type of school (public versus commercial), use of simulators, and geographic area for District Offices: South West (1) South Central (2), North Central (3), North East (4), East Central (5), and South East (6) (See Map) proportionate to the number of students listed in the crash data (See Table 3).

Simulator Sample of Instructors (Non Random)

First, all of the school districts using simulators: City of Chesapeake, City of Richmond, City of Newport News, Arlington County, and Henrico County were identified. Each of these simulator districts was matched with an adjacent district. Since some of the matching districts have more schools than the simulator districts, a number of schools were randomly selected from the matching district equal to the simulation district. (There are 3 schools in Arlington compared to about 13 in Fairfax; 3 Fairfax schools were randomly selected from the 13). This produced a list of about 34 public and 24 commercial schools. Two or three questionnaires were sent to school administrators who in turn selected instructors to form a sample of about 160 instructors.

Table 1 Schools Included in Simulator Sample

Simulator counties:	Arlington	Chesapeake	Henrico
Non simulator matching counties:	Fairfax	Virginia Beach	Chesterfield

Non-Simulator (Random) of Instructors Stratified by Type of School & Location.

The 240 instructors were selected using stratified proportionate cluster sampling of 120 schools. First, we determined the total number of students in the 137 commercial (27,477 students = 40%) and 276 public schools (42,992 students = 60%). Next, using jurisdiction code, the geographic area

of each school was identified. Then, the percent of total students in each geographic area was determined and further broken down into percent of students in commercial and public schools. Based on this information, 120 schools were randomly selected proportionately by area and type of school. Finally, two or three questionnaires were sent to school administrators who then selected instructors to constitute a sample of about 231 instructors. This brought the total number of instructors to 391. (See Tables 2 - 4)

Student Sample (Random) Stratified by Type of School & Location.

Based on the proportions determined for the instructor sample, The Virginia Department of Motor Vehicles selected a random sample of 421 students stratified by the geographic areas and type of school (public, commercial). (See Table 2)

Table 2 Frequencies and Percentages of Students and Instructors Included in Sample By Area and Type of School

Area	# of Students	#Commercial Instructors	# Commercial Instructors	#Public (Random) Instructors	# Public (Simulator) Instructors
1	34	3	–	16	--
2	55	13	--	19	--
3	57	9	--	24	--
4*	108	39	24	22	24
5*	75	9	22	34	26
6*	92	21	20	22	34
Total	**421**	**94**	**66**	**137**	**94**

* Areas have public schools with simulators

Table 3 Frequencies and Percentages of Students in Each Area and Type of School

Area	#Schools	Students Total #	%	Commercial #	%	Public #	%
1	59	(4850)	7.6	(663)	13.7	(4187)	86.3
2	65	(8391)	13.2	(3514)	41.9	(4877)	58.1
3	57	(8681)	13.6	(2301)	26.5	(6380)	63.5
4	85	(16412)	25.8	(10410)	63.4	(6002)	36.6
5	74	(11398)	17.9	(2419)	21.2	(8979)	78.8

6	87	(13972)	21.9	(5642)	40.4	(8380)	59.6
Total	**427**		**100**		**100**		**100**

Table 4 Frequencies and Percentages of Commercial and Public Students and Schools in Geographic Areas

Geographic Area	Total # Students	%	STUDENTS Commercial f	STUDENTS Commercial % of Total in Geographic Area	STUDENTS Public f	STUDENTS Public %	SCHOOLS Commercial f	SCHOOLS Commercial % of Total in Geographic Area	SCHOOLS Public f	SCHOOLS Public %
All Schools										
1 SW	4850	7.6	663	13.7	4187	86.3	8	13.6	51	86.4
2 SCen	8391	13.2	3514	42.0	4877	58.1	22	33.8	43	66.2
3 NCen	8681	13.6	2301	26.5	6380	73.5	13	22.8	44	77.2
4 NE	16412	25.8	10410	63.4	6002	36.6	42	49.4	43	50.6
5 ECen	11398	17.9	2419	21.2	8979	78.8	15	20.0	60	80.0
6 SE	13972	21.9	5642	40.4	8380	59.6	29	32.6	60	67.4
Total	63704	100								
Simulation Schools				**% Total in Geographic Area**				**% Total in Geographic Area**		
4 Arlington			692	6.6	297	4.9	4	9.5	3	7.0
5 Henrico			993	41.1	1750	19.5	1	6.7	8	13.3
6 Chesapeake			215	3.8	2000	23.9	6	20.7	6	10.0

Comparison Schools

4 Fairfax	2533	24.3	2808	46.8	4	9.5	24	55.8
5 Chesterfield	497	20.5	2060	22.9	4	26.7	8	13.3
6 VA Beach	2444	43.1	1589	19.0	6	20.7	13	21.7

Measurement

The quality of instruction was measured by asking administrators, instructors and students about the amount of time spent on various classroom topics (drugs, alcohol) and activities in road training such as time behind the wheel, on interstates and busy streets. Administrators and instructors were also asked about the quality of their equipment (cars) and their training and experience. Administrators were asked about the criteria for hiring and evaluating instructors and record keeping. This information was further used to measure educational quality and was also employed to assess the equality of standards for commercial and public schools. Additionally, instructors and administrators were also asked about their perceptions of the relative quality of the two types of schools with questions about which schools have the strictest standards and which offer the best quality education.

Student outcomes were measured by asking about the number of crashes students had been involved in, citations received for speeding, drunk driving, reckless driving, and other behaviors they engaged in such as speeding and tailgating.

RESULTS

Data analysis was organized to address the research questions posed earlier.

Question 1: Based on Virginia crash data, is there a difference in motor vehicle crash rates for graduates of commercial driver training programs versus graduates of public school driver education programs?

Analysis of Virginia crash data for 1999-2001 indicated that significant difference in motor motor vehicle crash rates for graduates of commercial driver training programs versus graduates of public school driver education programs varied by year.

It was predicted that students taking driver education in commercial school would have higher crash rates than those taking driver education in public or those students in private schools. Analysis of data for 2001, 2000 and 1999 show differences by year. For 2001, (illustrated in table 5) commercial, public and private schools showed crash rates of 15.6, 13.9 and 9.4 respectively. A one-way analysis of variance shows significant differences. Private schools are significantly lower than public and commercial, but there are no significant differences between commercial and public. Results for 2000 show commercial schools had significantly higher crash rates of 20 compared to 16 for both public and private schools. Crash rate data for 1999 also display significant differences similar to 2000. Commercial schools had crash rates of 16.3 compared to 12.10 and 13.34 respectively for public and private schools. Commercial schools have significantly higher rates than public In summary, commercial and public schools are not significantly different from each other for 2001, with crash rates of about 16 and 14 respectively but private schools are significantly lower with a rate of 9.4. For 1999, displayed in table 5) however, commercial schools have significantly higher crash rates of 16.1 compared to 12.1 for public schools. Private schools showed a crash rate of 13.3 higher than public schools but lower than commercial. Over time the data show that commercial schools were significantly higher than public schools in 1999 and 2000 but no different in 2001. All schools showed an increase from 1999 to 2000, then a decrease in 2001.

Table 5 Mean Crash Rates By School Type By Year

	2001*	2000+	1999++
	Mean (Std.Dev)	**Mean** (Std.Dev)	**Mean** (Std.Dev)
School Type			
Commercial	**15.63** (7.60)	**20.0** (13.1)	**16.13** (12.55)
Public	**13.93** (7.90)	**16.6** (6.10)	**12.10** (5.49)
Private	**9.38** (1.31)	**16.3** (17.0)	**13.34** (21.12)

* F = 11.55; p = .0009 +F = 5.75: p= . 003 ++ F= 7.24; p = .001

Question 2: Based on Virginia crash data, is there a difference in motor vehicle crash rates for graduates of driver education programs using simulators versus graduates of programs not using simulators?

Data were analyzed to determine if there were any significant differences in mean crash rates between schools that used simulators and those that did not use simulators. The results of *t*-test analyses for the three years displayed in table 6 show no significant differences in crash rates for any of the years. For 1999, simulator schools have a slightly lower rate, 11.9, compared to 12.1. Similarly in 2001 with a rate of 13.1 compared to 14.00. However, simulator schools have a higher crash rate of 17.6 compared to 16.6 in 2000. Furthermore, simulator and non-simulator public schools show similarities with each other within each year and greater differences over time. The data do not support the hypothesis that simulators lead to lower crashes. However, since many factors can contribute to crashes, this crude analysis should not be used as the major evaluation of simulator effects. The data do not allow comparisons of the injury severity (none, minor, incapacitated, fatal) of crashes nor other driving violations that could show differences.

Table 6 Mean Crash Rates for Public Schools With and Without Simulators By Year

	2001*	2000+	1999++
	(Std.Dev.)	(Std.Dev.)	(Std.Dev.)
Simulators	**13.06** (5.43)	**17.56** (4.64)	**11.88** (4.02)
No Simulators	**13.99** (8.02)	**16.58** (6.18)	**12.11** (5.58)

* t= .465; p= .641 + t= -.643; p= .521 ++ t = .164; p= .870

Question 3: Are Virginia driver education standards the same for commercial and public school driver education programs?

Analysis of interview and survey data suggested that respondents recognize that Virginia driver education standards are the same for commercial and public school driver education programs (refer to the Virginia Administrative Code (Regulations)). As noted below, there are differences in practice in contrast to administrative standards, however.

Question 4: Are there differences in the level of parental involvement required by commercial and public school driver education programs?

The state of Virginia Driver Education Program requires the same amount of parental involvement for both public and commercial driving schools. Parents must provide 40 hours of supervision with 10 hours after sunset for all drivers younger than 18 years old. However, the survey data indirectly indicates different perceptions of the amount of time parents provide on-the-road supervision. More public school administrators stated that students receive at least eight hours of parental supervision than commercial school administrators (89% to 78%). This difference is not statistically significant.

Question 5: Is there a difference in the training requirements for commercial and public school driver education instructors?

Public and private school classroom driver education teachers must have a teaching license with an endorsement (6 semester hours) in driver education. Analysis of survey data indicated that the minimum training requirement of six semester hours of endorsement in driver education from an approved teacher preparation program was the same for commercial school driver education instructors.

Administrators were asked to indicate whether they used ten specific factors in deciding whom to hire as instructors. A higher percentage of public school administrators than commercial school administrators relied on "teaching qualifications," 96 percent and 80 percent, respectively, but the difference is not statistically significant. On the other hand, commercial school administrators were more likely to consider the other nine factors with five differences being

statistically significant. All of the commercial school administrators used a person's "current driving record," "college credits in driver education," and "past driving record" compared to 93 percent, 82 percent, and 63 percent of the public school administrators reported using these criteria, respectively. Past driving shows a statistically significant difference. The other factors that had statistically significant differences with more of the commercial school administrators using them to make hiring decisions are: a "national criminal background check," the "number of general education courses," "number of years driving experience," and "past student evaluations." Commercial school administrators were more likely than the public school administrators to look at a "local criminal background check," and "substance use/DUI" records of prospective instructors. The statistics relevant to these observations are presented in Table 7.

Public school administrators have significantly more education than the commercial school administrators. All of the public school administrators have graduated from college while 50 percent of the commercial school administrators have not. Four-out-of-five of the public school administrators have graduate degrees compared to almost one-third of the commercial school administrators.

One of the questions guiding the present research asks, "Is there a difference in the training requirements for commercial and public school driver education instructors?" While the public and private school instructors are required to have teaching certification, the commercial school instructors are not. However, all instructors must have six semester hours of endorsement in driver education from an approved teacher preparation program.

Reports by Instructors do show that credentials of instructors differ. Table 8 illustrates that while about 90% of commercial instructors have some college, only 34 % have completed college compared to about 98% of public school instructors.

Table 7 Percentage Distribution of the Use of Selected Factors in Hiring Driver Education Instructors by Type of School

	Type of School	
Factors Considered in Hiring Driver Education Instructors	Commercial	Public
Current driving record	100.0	92.6
College credits in driver education	100.0	81.5
Past driving record	100.0	63.0 *
Teaching qualifications	80.0	96.3
Substance use/DUI	80.0	51.9
Number of years of driving experience	80.0	14.8 **
Local criminal background check	70.0	55.6
National criminal background check	60.0	25.9 *
Number of general education courses	50.0	18.5 *
Past student evaluations	40.0	0.0 **

* Statistically significant at .05 measured by chi-square
** Statistically significant at .01 measured by chi-square

Table 8 Percentage Distribution of Education Background of Commercial and Public Schools Instructors

	Commercial Schools	Public Schools	Total
Education			
High School/GED	4.3	-	1.1
<1yr. College	4.3	1.5	2.2
2-3yr. College	43.6	1.5	12.2
College Graduate	34.8	70.1	61.2
Master=s & Higher	13.0	26.9	23.3
Total	100.0	100.0	100.0
College Preparation			
Business	34.8	1.5	10.0
Education	39.2	85.0	73.3
Liberal Arts	13.0	6.0	7.8
Others	13.0	7.5	8.9
Total	100.0	100.0	100.0
College Credit Hrs. of Driver Education			
Less than 6hrs.	4.3	9.0	7.8
6 Credit hrs.	56.6	40.3	44.4
7 or more Credit hrs.	39.1	50.7	47.8
Total	100.0	100.0	100.0
	N = 23	N = 67	N = 90

Question 6: How effectively does the state monitor driver education programs?

Based upon results of interviews and administrator surveys, the state auditors are effectively monitoring the licensing, curriculum, record keeping, instructor certification, equipment and materials for classroom and behind-the-wheel instruction. Nevertheless, administrators report (see Table 9) that commercial schools are more likely to evaluate instructors every six months than are public schools (33% to 26%). The difference is not statistically significant.

Question 7: Is there a difference in the rigor of monitoring and sanctions applied to commercial schools as opposed to public schools?

Results of interview data suggest that there is no difference in the frequency of state monitoring. Commercial driver-training programs and public school driver-training programs are audited on an annual basis. Administrators of commercial and public programs do note differences that are not statistically significant. For example, as reported in Table 10, more public school administrators (35%) state the driving records of instructors are checked every six months than do commercial school administrators (11%).

There is a difference in state monitoring regarding the specificity of the audit and action taken for infractions. Commercial driver-training program audits are subject specific whereas public school driver-training program audits are more general in scope. When evaluating driver-training instructors, as Table 11 illustrates that commercial school administrators compared to public school administrators are more likely to use criminal background checks (80% to 18%), substance use/DUI (60% to 26%), student evaluations (60% to 15%), and the instructor's driving record (80% to 63%), although the last is not statistically significant. Public school instructors are more likely to be evaluated on the basis classroom teaching content (89% to 60%) and in-vehicle teaching content (74% to 70%). The latter is not a statistically significant difference.

Table 12 presents data regarding six criteria used to disqualify or terminate a driver education instructor. The only significant difference between the commercial and the public school administrators was noted for substance use/DUI, (80% to 100%, respectively). The differences for: number of demerits on license (80% to 82%), criminal behavior (80% to 85%), not providing proper teaching instructions (80% to 74%), number of crashes with students in the car (70% to 59%), and number of crashes without students in the car (100% to 100%) are not statistically significant.

Table 13 illustrates administrator reports of driving infractions of instructors. Data show that over 50% of both had been cited for speeding, but fewer public school instructors had infractions than commercial instructors. A much larger number (62%) of commercial instructors were likely to be terminated, while, public school instructors were more likely to receive written warnings or be suspended, suggesting more strict monitoring for commercial instructors in this instance. Reports by instructors show little difference with over 95% reporting 0 -1 demerits. None of the commercial instructors have received over 6 demerits while 6% of public school instructors have. Perhaps, commercial instructors with demerits have already been terminated.

While controversy has been expressed about the unequal treatment of instructors from the different schools, data from instructors, presented in Table 16 show that instructors from both schools tend to believe they are more closely monitored, provide better quality of instruction and

have higher standards. Seventy-eight percent of the commercial schools instructors indicated that the commercial schools have the better instruction, and 80 percent of the public schools instructors said the public schools have the better instruction. On the questions of standards, as expected, 74 and 72 percent of the commercial and public schools instructors answered that their schools have the toughest standards for instructors. Eighty-three percent of the commercial schools instructors reported that their schools are monitored more closely than the public schools (63%). The instructors differ a great deal in terms of penalties for infractions. Ninety-one percent of the commercial schools instructors stated that their schools receive the most severe penalties for infractions compared to 36 percent of the public schools instructors. The data show that there is a slight difference with regard to instructor supervision—63 percent of the instructors in commercial schools reported that they are more closely supervised than their counterparts in public schools. However, 69 percent of the instructors in public schools said they are more closely supervised than those in the commercial schools.

Table 9 Percentage Distribution of the Frequency of Evaluating Driver Education Instructors by Type of School

	Type of School	
Frequency of Evaluating Driver Education Instructors	**Commercial**	**Public**
Every six months	33.3	25.9
Every year	44.5	48.2
Every two years or more	22.2	25.9
Total	100.0	100.0

Table 10 Percentage Distribution of the Frequency of Checking the Driving Records of Driver Education Instructors by Type of School

	Type of School	
Frequency of Checking the Driving Records of Driver Education Instructors	**Commercial**	**Public**
Never	11.1	11.5
Every six months	11.1	34.6
Annually	77.8	53.8
Total	100.0	100.0

Table 11 Percentage Distribution of the Use of Selected Factors to Evaluate Driver Education Instructors by Type of School

	Type of School	
Factors Considered in Evaluating Driver Education Instructors	**Commercial**	**Public**
Driving record	80.0	63.0
Criminal background check	80.0	18.5 **
In-vehicle teaching content	70.0	74.1
Classroom teaching content	60.0	89.9 *
Substance use/DUI	60.0	25.9 *
Student evaluations	86.0	14.8 **

* Statistically significant at .05 measured by chi-square
** Statistically significant at .01 measured by chi-square

Table 12 Percentage Distribution of the Use of Selected Factors to Disqualify Driver Education Instructors by Type of School

	Type of School	
Factors Considered to Disqualify Driver Education Instructors	**Commercial**	**Public**
Number of accidents without students in car	100.0	100.0
Substance use/DUI	80.0	100.0 *
Criminal behavior	80.0	85.2
Number of demerits on license	80.0	81.5
Not providing proper teaching instruction	80.0	74.1
Number of accidents with students in car	70.0	59.3

* Statistically significant at .05 measured by chi-square

Table 13 Percentage Distribution of Driving Infractions of Driver Education Instructors within Last Five Years by Type of School

	Type of School	
Driving Infractions of Driver Education Instructors	**Commercial**	**Public**
Speeding	60.0	55.6
Alcohol/drug use	10.0	7.4
Reckless driving	10.0	3.7
Parking	10.0	0.0
Other infraction	20.0	14.8

Table 14 Percentage Distribution of Action Taken for Driving Infractions of Driver Education Instructors by Type of School

	Type of School	
Action Taken for Driving Infractions of Driver	**Commercial**	**Public**
Education Instructors		
Verbal warning	12.5	16.0
Written warning	12.5	36.0
Suspended	12.5	36.0
Terminated	62.5	12.0
Total	100.0	100.0 *

* Statistically significant at .05 as measured by chi-square

Table 15 Percentage Distribution of Driving Record of Commercial and Public Schools Instructors

	Commercial Schools	Public Schools	Total
How many demerits does your current driving record have?			
0 – 1	95.5	97.0	96.6
2 – 3	4.5	1.5	2.2
4 – 5	0.0	1.5	1.1
Total	100.0	100.0	100.0
Has your driving record ever Exceeded six demerits?			
No	100.0	94.0	95.6
Yes	0.0	6.0	4.4
Total	100.0	100.0	100.0

Question 8: Are all schools using the same driver education instructional curriculum?

All schools, commercial and public, are using the same driver education instructional curriculum, which is specified in the Curriculum Guide for Driver Education in Virginia. The administrators of the different schools do state some difference in the extent to which instruction is based on the *Curriculum and Administrative Guide for Driver Education in Virginia*. While 70 percent of the public school administrators states that all the instruction is based on the Guide, 60 percent of the commercial school administrators do so. However, based on interview and survey data, some commercial and public schools are also utilizing supplemental materials.

Table 17 also shows that administrators report public schools are more likely to spend one week or more covering certain topics in class: alcohol/drug use (68% to 33%), speed (37% to 11%), radio/cell phones (16% to 11%), adjusting seats/mirrors (16% to 11%), and eating/drinking & driving (21% to 11%). Instructors from both schools report that these topics are covered.

Reports by students about classroom experience suggest no differences between public and commercial schools (see Table 18). About 75% of students from both schools receive some to a great deal of time on seatbelts. Over 80% of both receive some to a great deal of time on alcohol and drugs. Public school students are more likely to report "a great deal" of time on alcohol and drugs but no statistical significance is observed. Based on these findings we conclude that students from both schools report receiving a reasonable amount of attention given to alcohol, drugs and seatbelts in the classroom. They also receive about the required amount of on road driving experience.

Table 16 Percentage Distribution of Responses on Quality of Driver Education Schools by Commercial and Public Schools Instructors

	Commercial Schools	Public Schools	Total
Which schools have the best quality of instructions?			
Public	0.0	79.7	56.8
Commercial	78.3	0.0	20.7

The Same	21.7	20.3	20.7
Total	100.0	100.0	100.0
	N=23	N=64	N=87
Missing values		3	5
Which schools have the toughest standards for instructions?			
Public	0.0	71.9	52.9
Commercial	73.9	6.3	24.1
The Same	26.1	21.9	23.0
Total	100.0	100.0	100.0
	N=23	N=64	N=87
Missing values		3	5

Table 17 Percentage Distribution of Length of Time Spent Covering Specific Topics by Type of School Reported By Administrators

Length of Time Covering Topic	Commercial Schools Type of Topic				
	Alcohol and Drug Use	Speeding	Radio and Cell Phone	Eating, Drinking and Driving	Adjusting Seats and Mirrors
At least one day	22.2	0.0	33.3	44.4	55.6
Several days	44.4	88.9	55.6	44.4	33.3
One week	22.2	0.0	0.0	0.0	0.0
Two weeks or more	11.1	11.1	11.1	11.1	11.1
Total	100.0	100.0	100.0		100.0

Length of Time Covering Topic	Public Schools Type of Topic				
	Alcohol and Drug Use	Speeding	Radio and Cell Phone	Eating, Drinking and Driving	Adjusting Seats and Mirrors
At least one day	0.0	15.8	52.6	52.6	21.1
Several days	31.6	47.4	31.6	26.3	63.2
One week	57.9	15.8	15.8	15.8	10.5

Two weeks or more	10.5	21.1	0.0	5.3	5.3
Total	100.0	100.0	100.0	100.0	100.0

Table 18 Frequencies and Percentages Of Students Reporting Some/ A Great Deal of Time Given To Classroom Topics By Type of School

	Public Classroom	Commercial
Seat Belts	(24) **75**	(8) **73**
Alcohol	(28) **88**	(9) **82**
Drugs	(25) **79**	(9) **82**

Table 19 Percentage Distribution of Behind-the-Wheel Hours Reported by Administrators by Type of School

On Interstate Highways

	Type of	School
Number of Hours	**Commercial**	**Public**
Less than two hours	66.7	70.8
Three to five hours	33.3	16.7
Six to eight hours	0.0	4.2
Nine hours or more	0.0	8.3
Total	100.0	100.0

On Residential Streets

	Type of	School
Number of Hours	**Commercial**	**Public**
Less than two hours	50.0	33.3
Three to five hours	37.5	54.2
Six to eight hours	12.5	8.3
Nine hours or more	0.0	4.2

Total	100.0	100.0

On Busy City Streets

	Type of	School
Number of Hours	**Commercial**	**Public**
Less than two hours	11.1	39.1
Three to five hours	66.7	52.2
Six to eight hours	22.2	8.7
Nine hours or more	0.0	0.0
Total	100.0	100.0

On Rural Roads

	Type of	School
Number of Hours	**Commercial**	**Public**
Less than two hours	62.5	52.2
Three to five hours	25.0	26.1
Six to eight hours	0.0	13.0
Nine hours or more	12.5	8.7
Total	100.0	100.0

Question 9: Are students being provided sufficient time for behind-the-wheel training?

Administrator reports (see Table 19) show few differences between schools. About 65% or more of both indicate that students spend 2 hours or less on interstates. Over 50% report 2 or less hours on rural roads; the majority report 3 to 5 hours out of the required 7 on residential roads. Some differences are observed for time on busy streets with commercial administrators indicating students may receive more time on busy streets than public administrators.

To investigate student perceptions of teaching quality, we asked students about the amount of time they received for behind the wheel and classroom activities. Table 20 shows no significant differences for total time behind the wheel, time spent riding, time on interstate, residential streets. Over one third of both groups report 9 or more hours behind the wheel, 46% for public school students. About one fourth of public and over 50% of commercial students report receiving 6 - 8 hours, 7 being the required state minimum. Thus, 93% of commercial students and 70% of public school students report receiving 6 or more hours behind the wheel. But about one third of public students compared to only 6% of commercial students report receiving less than 6 hours. It appears that most students receive about the required number of hours with commercial students not likely to get more or less. While some public students receive more than the required, a larger proportion (compared to commercial students, also receive less than the required; 15% reporting less 2 or less hours.

Regarding interstate experience, there appears to be a deficit of training; about 75% of both groups receive 0 - 2 hours. But commercial students do report receiving significantly more experience on busy streets (chi square = 17.13; p = .002). While almost 58% of public students report 0 - 2 hours, 40% of commercial students report 6 or more hours on busy streets.

Time on residential streets and riding with others is less desirable experience that students should receive the least of. No differences in reported times are observed for commercial and public school students. Thirty percent of each report 9 or more hours riding with others and about 12% of each report 0 to 2 hours. About 25% of commercial and 30% of public students report 6 or more hours on residential streets. Sixty to 70% report 5 or less hours.

In summary, only a small amount of time is spent on interstates but commercial students have more experience on busy streets. Students' reports suggest that they do not generally spend excessive time riding with others or on residential streets. Generally, they were receiving at least the minimal number of required periods of behind-the-wheel training. The variability of results, especially for public school students, does suggest that some students may "fall though the cracks" receiving inadequate experience. Perhaps, more experience on interstates is needed

Furthermore, according to interview data, instructors of commercial and public driver-training programs felt that the number of periods of behind-the-wheel instruction provided to students was not sufficient for providing an optimal level of driver proficiency.

Table 20 Frequencies and Percentages Of Student Perceptions Of Hours Spent On The Road In Driving Activities By Type of School

	0 – 2		3 – 5		6 – 8		9 or More		Total		X2 p
Type of School	**Pub**	**Com**	**Pub**	**Com**	**Pub**	**Com**	**Pub**	**Com**	**Pub**	**Com**	
	(f) %										
Behind Wheel	(4)	(0)	(4)	(1)	(6)	(9)	(12)	(6)	(26)	(16)	**6.38**
	15.3	**0**	**15.4**	**6.3**	**23.1**	**56.3**	**46.2**	**37.5**	**100**	**100**	.172
Interstate	(20)	(13)	(3)	(2)	(0)	(1)	(3)	(0)	(26)	(16)	**3.92**
	11.5	**12.5**	**11.5**	**12.5**	**0**	**6.3**	**11.5**	**0**	**100**	**100**	.417
Riding	(4)	(2)	(8)	(3)	(6)	(6)	(8)	(5)	(26)	(16)	**1.68**
	15.3	**12.6**	**30.8**	**18.8**	**23.1**	**37.5**	**30.8**	**31.3**	**100**	**100**	.794
Busy Streets	(18)	(1)	(2)	(8)	(2)	(2)	(4)	(4)	(26)	(15)	**17.1**
	57.7	**6.7**	**7.7**	**53.3**	**7.7**	**13.3**	**15.4**	**26.7**	**100**	**100**	.002
Residential	(8)	(4)	(10)	(8)	(4)	(2)	(4)	(2)	(26)	(16)	**1.05**
	30.7	**25.0**	**38.5**	**50.0**	**14.4**	**12.5**	**15.4**	**12.5**	**100**	**100**	.902
Simulators	(22)	(14)	(0)	(0)	(2)	(1)	(2)	(0)	(26)	(15)	**.684**
	84.6	**93.3**	**0**	**0**	**7.7**	**6.7**	**7.7**	**0**	**100**	**100**	.877

Question 10: Is there a difference in standards for record keeping for commercial and public driver education programs?

Information from the administrators, illustrated in Table 21, presents a consistent picture for record maintenance. A larger percentage of the public school administrators stated that records

were kept for five or more years: classroom records (100% to 33%), behind-the-wheel records (96% to 33%), instructor's license numbers (77% to 67%), and instructor's driving records (67% to 50%).

Results of data analysis of instructors' responses in Table 22 indicated that there was no difference between the commercial and public schools with regard to their record keeping of students. However, there are differences in the length of record maintenance, with public school instructors indicating a longer period of time for record maintenance. For example, 52% of the commercial school instructors indicated that student records were maintained for 2-4 years and 44% indicated that records were maintained for five or more years. In comparison, approximately 30% of the public school instructors indicated that student records were maintained for 2-4 years and 66% of public school instructors reported that student records were maintained for five or more years.

Table 21 Percentage Distribution of Length of Keeping Records by Type of Record and Type of School

	Commercial Schools				Public Schools			
	Type of Records				Type of Records			
Length of Time Records Are Held	Classroom	Behind-The-Wheel	Instructor's License Number	Instructor's Driving Record	Classroom	Behind-The-Wheel	Instructor's License Number	Instructor's Driving Record
None	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5
One to two years	0.0	0.0	11.1	12.5	0.0	0.0	11.5	16.7
Three to four years	66.7	66.7	22.2	37.5	0.0	3.7	11.5	4.2
Five years or more record	33.3	33.3	66.7	50.0	100.0	96.3	76.9	66.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 22 Percentage Distribution of Responses to Statements on Record Keeping by Commercial and Public Schools Instructors

	Commercial Schools	Public Schools	Total
School Keeps Students Records-- Name, Address, Phone Number			
Yes	100.0	97.0	97.8
Don't Know	0.0	3.0	2.2
Total	100.0	100.0	100.0
School Keeps Student Record Instruction, Date, Fees paid, Instructor=s name.			
Yes	100.00	95.5	96.7
No	0.0	1.5	1.1
Don=t Know	0.0	3.0	2.2
Total	100.0	100.0	100.0
Number of Years Student Records Maintained.			
At Least 1 year	4.3	4.7	4.6
2-4 Years	52.2	29.7	35.6
5 or more Years	43.5	65.6	59.8
Total	100.0	100.0	100.0
Don't Know	0.0	6.1	4.5
Total	100.0	100.0	100.0

Question 11: Are driver education programs that utilize simulators more or less effective than traditional driver education programs?

A driving record index was constructed by combining citations for speeding reckless driving and crashes, presented in table 23. The mean scores of .375 for those who used simulators and .325 for those not using are low and not significantly different. An unsafe driving index (presented in Table 24) also shows no significant differences with scores for both groups (computed by combing reported frequency of speeding, reckless driving and tailgating). There were no significant differences between students who used simulators and those who did not in the driving record index

or hazardous driving scores

Similar findings are observed for crashes (Table 25) with 75% of simulator users and 79% of non-users reporting no crashes. However, as illustrated in Table 26, fewer (6%) of non simulator students compared to 13% of simulator students reported citations for crashes, and a greater number of simulator students reported citations for reckless driving. Speeding was engaged in by 53% of those who had not used simulators, and 21% had received a citation for speeding. This is greater than simulator students with 38% engaging in speeding and 13% with citations. Some differences are observed regarding speeding with fewer of those who used simulators (13%) reporting a citation for speeding compared to 21% of those not using simulators. Similarly, 38% of simulator users compared to 53% of non-simulator users reported engaging in speeding sometimes or frequently.

These findings generally show no improvement effects for use of simulators. However, only a small number of students (8) reported using simulators so this is too little data to draw major conclusions. Furthermore, results of interviews suggested that time spent on simulators should not be substituted for behind-the-wheel driving experience, but should be used as a supplement.

Table 23 Driving Record Scores (Accidents, Citations) For Students By Type of School and Use of Simulator Mean (Standard Deviation)

	Commercial	Public	*t*	p
Road Training	.294	.384	.442	.661
	(.470)	(.752)		
Classroom	.272	.375	-.446	.658
	(.467)	(.707)		
Used Simulator		.375	-.199	.843
		(.518)		
No Simulator		.325		
		(.684)		

Table 24 Unsafe Driving Scores For Students By Type of School and Use of Simulator Mean (Standard Deviation)

	Commercial	Public	*t*	p
Road Training	25.00	25.00	.442	.661
	(.470)	(.752)		
Classroom	24.89	25.32	-.278	.783
	(5.44)	(3.60)		
Used Simulator		25.17	.033	.974
		(5.64)		
No Simulator		25.23		
		(3.75)		

Table 25 Frequencies and Percentages of Number of Crashes Reported By Students By Type of School and Use of Simulator

	Public % (f)	Commercial	Simulator	No Simulator
None	81	71	75	79
	(21)	(12)	(6)	(27)
1 – 2	19	29	25	21
	(5)	(5)	(2)	(16

Table 26 Frequencies and Percentages of Unsafe Activities and Citations Reported By Students By Type of School and Use of Simulator

	Public % (f)	Commercial	Simulator	No Simulator
2 – 4 Passengers	33	32	14	38
	(8)	(5)	(1)	(12)
Use Cell Phone	42	41	50	42
(Some/Frequently)	(11)	(7)	(4)	(14)
Speeding	42	59	38	53
(Some/Frequently)	(11)	(10)	(3)	(17)
Tailgating	4	6	0	6
(Some/Frequently)	(1)	(1)	(0)	(2)
Cited For Crash	8	18	13	6
	(2)	(3)	(1)	(2)
Cited For Speeding	19	18	13	21
	(5)	(3)	(1)	(7)
Cited For Recklessness	8	12	13	2
	(2)	(2)	(1)	(1)

Question 12: Are driver education programs that utilize simulators more, or less, cost-effective than traditional driver education programs?

Because there are various types of simulators in use at the school jurisdictions included in this study, the costs and, therefore, cost-effectiveness of simulator use varies. No commercial schools participating in the study utilized simulators for driver training. The price of simulators used by public schools ranged from $1,500 to $7,000 or more. Analysis of student and instructor survey data indicated that there is no difference in students from schools using simulators and non-simulators in obtaining their driver's license after completion of training and no difference in involvement in crashes.

Question 13: How could such technology be implemented in a cost-effective manner (such as regional, per school, etc.)?

Results of interview data indicated that the most cost-effective manner to integrate simulation technology in a driver-training program would be to purchase mid- to high-level cost interactive simulators that would be centrally located within a jurisdiction and shared by schools within that jurisdiction. The literature review indicates that the most effective simulation technology is that technology which allows the driver-training student to fully interact with and respond to the simulated road experience (Decina, Gish, Staplin and Kirchner, 1996 and Garcia-Ros et al., 1999).

Question 14: Are Reported Student Outcomes Different For Students From Commercial Driver Education Programs Compared to Those Attending Public Driver Education Programs?

Student reports of crashes and citations were compared by type of school and use of simulators presented in Table 25. Results show no significant differences. Seventy percent of commercial students and 81% of public school students reported having no crashes; 30% of commercial and 19.2% of public school students reported 1 to 2 crashes. Regarding speeding, findings, in Table 26, show that 30% of both commercial and public school students say that they sometimes speed. However, 58% of public and 41% of commercial school students say that they rarely or never speed while 42% of public and 59% of say they speed sometimes or frequently. Slightly more commercial students engage in speeding and have received citations for speeding.

The driving record index was created including citations for an crashes, speeding, reckless driving, suspended license. Table 23 presents mean index scores by school type and experience with simulators. Earlier analysis showed that these students who completed the survey had low driving record scores; 72% had no citations. Comparing students who took road training in commercial and public schools, the mean driving record index scores .294 and .384 respectively. The *t*-test is not significant showing that there is no difference between the two groups. When we compare students who took classroom driving in public versus commercial schools, we also find low scores for both and no significant differences.

Table 26 illustrates specific comparisons on specific reported number of crashes, number of citations and driving activities engaged in. Results show that none of the chi-squares are statistically significant, indicating no differences between students from public and commercial schools. About one third of students carry 2 - 4 passengers and about 41 percent use cell phones while driving. A greater percent of commercial students (60% to 42%) engage in speeding sometime or frequently, but this difference is not statistically significant. Only a small percent (4% to 6%) report tailgating. Regarding citations, less than 20% of both reports similarly receiving a speeding citation. Crash citation are also less than 20% but 10% more commercial students report crashes. A larger percent of commercial students (12% to 8%) also report reckless driving citations.

RECOMMENDATIONS

1. Our research data indicate that there are not significant differences in the quality of instruction provided by public schools' driver education programs compared to commercial schools' driver education programs. However both programs can be improved, for example by providing: a.) increased monitoring of driver education by state administrators; b.) information and materials to reflect the best practices of teaching techniques and knowledge of good driving behaviors; c.) periodic review and revision of the curriculum guide in order to produce better novice drivers; and d.) rigorously enforcement of the required hours for behind-the-wheel driving particularly parental involvement for students engaged in behind-the-wheel driving.

2. The use of simulators has been shown to be effective in other areas such as flight training, medical training, and even training for truck drivers, but little research has been done evaluating their effectiveness in novice driver education. No studies have shown them to be a replacement for actual experience even though some proponents have argued this. Several states, including Virginia, substitute some simulation hours for road training hours. It is suggested that more in-depth research is needed before decisions are made regarding simulators. The present findings do not show any additional reduction in crashes or unsafe driving as a result of using simulators. But these data are incomplete and should not be interpreted as a final test of effectiveness. Future research should track individual students and also examine citations and seriousness of crashes by use of simulators.

3. Based on interviews, students do not receive enough behind-the-wheel experience, so the number of required hours for behind-the-wheel learning should be increased. Until there is more conclusive research on the effectiveness of simulators, simulator hours should not be counted as part of on-the-road training but should be in addition to seven periods required for on-the-road training.

4. There is some evidence that parents and guardians are not adhering to the required 40 hours supervision of on-the-road training. There needs to be a closer monitoring of the role of parents. Future research on the behavior and opinions of parents and guardians is also recommended.

5. The graduated licensing program that has been shown to reduce crashes may be strengthened and enhanced by continuing oversight through collecting, analyzing, and reporting relevant crash data. Increasing the public awareness of the graduated licensing program's advantages is also appropriate.

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REFERENCES

The AAA Foundation for Traffic Safety (1998). Does driver-ZED Do Any Good. [On-line]. Available: www.driverzed.org/d-zed.cfm

Alessi, Stephen M. & Trollip, Stanley R. (1991). Computer-Based Instruction: Methods and Development (2nd ed.). Englewood, NJ: Prentice Hall.

The Associated Press (2001, January 24). *Ford to Test Driving Distractions; Simulator to Measure Effect of Using Gadgets.* Money, p. 5.

American Driver & Traffic Safety Education Associations (2000). A Youthquake Is Coming. [On-line]. Available: www.adtsea.iup.edu and www.ots.ca.gov

Bross, B. H. & Spellicy, M. J. (1994). *Safety Belt Education Using Visual Crash Images and Low-cost Incentives.* Journal of School Health, 64, 103-104.

Byrd, Christine (1997). *Injury Prevention Program For Youthful Traffic Offenders.* Journal of Emergency Nursing, 23, 326-329.

Center for Disease Control (1994). *Risky Driving Behaviors Among Teenagers—Gwinnett County, Georgina, 1993.* Morbidity and Mortality Weekly Report, 43, 405-409.

Chen, L.; Baker, S.P.; Braver, E.R.; & Li, G. (2000). *Carrying Passengers As A Risk Factor for Crashes Fatal 16- and 17-year-old drivers.* Journal of American Medical Association, 283, 1578-1582.

Cvijanovich, N. Z., Cook, L. J., Mann, N. C., & Dean, J. M. (2001). *A Population-Based Study of Crashes Involving 16- and 17-Year-Old Drivers: The Potential Benefit of Graduated Driver Licensing Restrictions.* Pediatrics, 107, 632-636.

Decina, Lawrence E., Gish, Kenneth W., Staplin, Loren, & Kirchner, Albert H. (1996). Feasibility of New Simulation Technology to Train Novice Drivers (Report No. DOT HS-000-000). Springfield, VA: National Technical Information Service.

Deery, Hamish A. & Fildes, Brian N. (1999). *Young Novice Driver Subtypes: Relationship To High-Risk Behavior, Traffic Accident Record, and Simulator Driving Performance.* Human Factors, 41, 628-643.

Derra, Skip (1998). *Driving Simulator Focuses on Saving Lives.* R & D, 40, 59-61.

Dow Jones New (2001, January 12). *Distraction Hazards: Driving Simulator to Test Risks of In-Car Internet.* Wheels, p. 7.

Dureman, E. I. & Boden, C. (1972). *Fatigue in Simulated Car Driving.* Ergonomics, 15, 59-61.

Fakhry, Samir M. & Salaita, Kathy (2002). *Aggressive Driving: A Preliminary Analysis of A Serious Threat to Motorists in a Large Metropolitan Area.* The Journal of Trauma Injury, Infection, and Critical Care, 52, 217-224.

Foss, Robert D. (2000). *Reducing Fatal Crash Risk Among Teenaged Drivers: Structuring an Effective Graduated Driver Licensing System.* Journal of American Medical Association, 283, 1617-1618.

Foss, Robert D., Feaganes, J. R., & Rodgman, E. A. (2001). *Initial Effects of Graduated Driver Licensing on 16-Year-Old Driver Crashes in North Carolina.* Journal of American Medical Association, 286, 1588-1592.

Garcia-Ros, Rafael, Montoro, Luis, Valero, Pedro, Martinez, Tomas, & Bayarri, Salvador (1999). *Designing A System For Computer-Assisted Instruction In Road Education: A First Evaluation.* International Journal of Instructional Media, 26, 403-407.

Insurance Bureau of Canada (1995). *Driver Training and Testing in Canada: Improving Effectiveness and Reducing Collision Risk.* The Role of Driving Experience. Toronto, Canada: Insurance Bureau of Canada.

Joint Legislative Audit and Review Commission (1999). State Oversight of Commercial Driver-Training Schools In Virginia (House Document No. 5). Richmond, VA: Author.

Lewin, Isaac (1982). *Driver Training: A Perceptual-Motor Skill Approach.* Ergonomics, 25, 917-924.

Lyznicki, James M., Doege, Theodore C., Davis, Ronald M., & Williams, Michael A. (1998). *Sleepiness, Driving, and Motor Vehicle Crashes.* . Journal of American Medical Association, 279, 1908-1913.

McCartt, Anne T. (2001). *Graduated Driver Licensing Systems: Reducing Crashes Among Teenage Drivers.* Journal of American Medical Association, 286, 1631-1632.

National Highway Traffic Safety Administration (2002). Beginning Teenage Drivers. [On-line]. Available: www.highwaysafety.org/safety_facts/teens/beginning_drivers.htm

National Center for Injury Prevention and Control (2001). Injury Fact Book 2001-2002. Atlanta, GA: Centers for Disease Control and Prevention.

Peters, George & Peters, Barbara (2002). *The Distracted Driver: How Dangerous is "Multitasking?"* Professional Safety, 47, 34-40.

Roberts, Ian, Kwan, Irene, & the Cochrane Injuries Group Driver Education Reviewers (2002). *School Based Driver Education For Traffic Crashes.* The Cochrane Review, 2.

Robertson, L. S. & Zador, P. L. (1978). *Driver Education and Fatal Crash Involvement of Teenaged Drivers.* American Journal of Public Health, 68, 959-965.

Schweber, Bill (2002, March). *The New Curriculum of Driver's Education.* Cahners Business Information, p. 29.

Snapper, Kurt J. & Seaver, David A. (1973). *Behavioral Applications of Vehicle-Dynamics Simulation.* Behav. Res. Meth. & Instru., 5, 114-116.

Stock, J. R., Weaver, J. K., Ray, H. W., Brink, J. R., & Sadof, M. G. (1983). Evaluation of the Safe Performance Secondary School Driver Education Curriculum Demonstration Project. Final Report. Columbus, OH: Battell Columbus Laboratories.

Triggs, Thomas J. (1994). *Human Performance And Driving: The Role Of Simulation In Improving Young Driver Safety.* IEA Vol. 1: Regards Inernationales, 23-26.

van Wolffelaar, Peter, Bayarri, Salvador, and Coma, Immaculada (1999). Script-based Definition of Complex Driving Simulator Scenarios. Paper presented at the Driving Simulator Conference DSC: Paris.

Vernick, Jon S., Li, Guohua, Ogaitis, Susanne, MacKenzie, Ellen J., Baker, Susan P., & Gielen, Andrea C. (1999). *Effects of High School Driver Education on Motor Vehicle Crashes, Violations, and Licensure.* American Journal of Preventive Medicine, 16, 40-46.

Waller, Patricia F. (1983). *Young Drivers: Reckless or Unprepared?* International Symposium on Young Driver Accidents: In Search of Solutions (pp. 3-31). Chapel Hill: University of North Carolina Highway Safety Research Center.

Weaver, J. K., Stock, J.R., Ray, H. W., & Brink, J. R. (1981). Safe Performance Secondary School Driver Education Curriculum Demonstration Project. (Report No. DOT HS-806 192). Springfield, VA: National Technical Information Service.

schools are significantly lower than public and commercial, but there are no significant differences between commercial and public. The results for 2000 show commercial schools had significantly higher crash rates of 20 compared to 16 for both public and private schools. Crash rate data for 1999 also display significant differences similar to 2000. Commercial schools had crash rates of 15.6 compared to 13.9 and 9.4 respectively for public and private schools. Commercial schools have significantly higher rates than public but private and commercial are not significantly different. In summary, commercial and public schools are not significantly different from each other for 2001, with crash rates of 16 and 14 respectively but private schools are significantly lower with a rate of 9.4. For 1999 however, commercial schools have significantly higher crash rates of 16.1 compared to 12.1 for public schools. Private schools showed a crash rate of 13.3 higher than public schools but lower than commercial. Over time the data show that commercial schools were significantly higher than public schools in 1999 and 2000 but no different in 2001. All schools showed an increase from 1999 to 2000, then a decrease in 2001.

Question 2: Based on Virginia crash data, is there a difference in motor vehicle crash rates for graduates of driver education programs using simulators versus graduates of programs not using simulators?

Analysis of Virginia crash data for 1999-2001 revealed that there was no difference in motor vehicle accident rates for graduates of driver education programs using simulators versus graduates of programs not using simulators.

Data were analyzed to determine if there were any significant differences in mean crash rates between schools that used simulators and those that did not use simulators. The results of *t*-test analyses for the three years show no significant differences in crash rates for any of the years. For 1999, simulator schools have a slightly lower rate, 11.9, compared to 12.1. Similarly in 2001 with a rate of 13.1 compared to 14.00. However, simulator schools have a higher crash rate of 17.6 compared to 16. 6 in 2000. Furthermore, simulator and non-simulator public schools show similarities with each other within each year and greater differences over time. The data do not support the hypothesis that simulators lead to lower crashes. However, since many factors can contribute to crashes, this crude analysis should not be used as the major evaluation of simulator effects. The data do not allow comparisons of the injury severity (none, minor, incapacitated, fatal) of crashes nor other driving violations that could show differences.

Question 3: Are Virginia driver education standards the same for commercial and public school driver education programs?

Analysis of interview and survey data suggested that respondents recognize that Virginia driver education standards are the same for commercial and public school driver education programs (refer to the Virginia Administrative Code (Regulations)). As noted below, there are differences in practice in contrast to administrative standards, however.