

The Effectiveness of Driver Education and Information Programs in the State of Nevada

Alexander Paz¹, David Copeland², Pankaj Maheshwari¹, Kris Gunawan²,
Mohammad Soroush Tafazzoli³

¹Transportation Research Center, University of Nevada, Las Vegas, USA

²Department of Psychology, University of Nevada, Las Vegas, USA

³Department of Civil and Environmental Engineering, University of Nevada, Las Vegas, USA

Email: apaz@unlv.edu, david.copeland@unlv.edu, maheshwa@unlv.nevada.edu, kgunawan@unlv.nevada.edu,
tafazzol@unlv.nevada.edu

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Abstract

According to National Highway Traffic Safety Administration, pedestrian and driver crashes are increasing at an alarming rate due to technological advancements and human errors. There is a need to improve existing driver education programs to mitigate the chances of crashes. The objectives of this research were 1) to examine the quality of Nevada's driver education by evaluating the effectiveness of its programs, and 2) to provide recommendations to improve driving education in Nevada based on the results from this study. Two different surveys were conducted in Clark County, Southern Nevada. The first survey focused on assessing the strengths and limitations of the current Driver Education Programs in Nevada by capturing the opinions and attitudes of those who went through the process as teenagers. The second survey focused on driver safety through the involvement of pedestrians on the road. These surveys and the corresponding statistical analysis as well as the exiting literature have provided insights to improve driving education. The corresponding recommendations were organized into seven major categories: 1) lack of rigor of online driver education, 2) interactive learning and technology, 3) follow-up exams, 4) practice/training at home, 5) collecting information about crashes, 6) pedestrians, and 7) additional emphasis. Finally, due to the dangers of driving distractions (texting and calling on the cell phone) and impairments (driving under the influence of alcohol or drugs), more emphasis on these topics—as well as more public announcements through billboards, television commercials, and magazines—can help to constantly remind drivers about having good driving habits.

Keywords

Driver Education, Driving Distractions, Interactive Learning Techniques, Statistical Analysis, Driver and Pedestrian Interactions

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1. Introduction

In a recent report by the National Highway Traffic Safety Administration (NHTSA) [1], 33,561 motor vehicle fatalities occurred nationally in year 2012, a 3.3% increase overall from year 2011. In a similar analysis for 2012, the Insurance Institute for Highway Safety [2] reported that teenagers were involved in 8% (2823 out of 33,561) of the total number of motor vehicle fatalities. Young drivers between 16 and 19 years old are nearly three times more likely than people over 20 years of age to have fatal vehicle crashes [2]. Traditionally driver education programs are considered successful if students meet learning objectives and pass tests, but driver education is expected to change subsequent behavior sufficiently to produce measurable effects on crashes [3]. Some research studies have found that graduates of driver education courses have fewer crashes and violations than their counterparts [4]. In addition, there are studies emphasizing the importance of driver education [5]. For example, Mayhew [6] has suggested that there are a number of strengths of driver education, including the controlled and safe environment in which novices can receive training. Similarly, driver education is considered “very important” for 86% of the respondents of a survey conducted in the U.S. [7].

A number of studies have been conducted in pertinent issues in young driver research, specifically the nuances in dealing with young driver licensing data. Foss [8] explained the techniques to improve structure of Graduated Driver Licensing (GDL) systems. Ferguson [9] examined the risk factors underlying teen’s high crash rates and reviewed the existing GDL programs and discussed potential improvements. Dee *et al.* [10] analyzed whether restrictions such as adult supervision, daytime driving, and passenger limits have been effective in reducing traffic fatalities among teens. Their results indicated that GDL regulations reduced traffic fatalities among 15 - 17 years olds by at least 5.6%. Shope [11] provided an overview of evaluation results of GDL since the year 2002. The results indicated that the GDL programs have reduced the youngest drivers’ crash risk by roughly 20% to 40%. Senserrick [12] provided recent developments in young driver education, training and licensing in Australia and recommended increased supervision, delayed licensure, and passenger and nighttime restrictions on provisional licenses. Twisk and Stacey [13] reviewed European trends regarding teen drivers’ accident risk and the effects of countermeasures; and suggested multiphase licensing systems, accompanied driving, protective measures, and probation periods as methods to reduce accident risk.

The purpose of the driver education program is to promote safety for inexperienced drivers, especially teens. This program is associated with the GDL system, implemented in year 2005 in Nevada [14]. The GDL system adds more driving restrictions to teenage drivers under the age of 18. In California, fatal and severe injury crash rates were reduced for 16- and 17-year-old drivers after the state implemented a stricter GDL program in year 1998 [15]. Similarly, other states have shown a decrease in the number of vehicle crashes for teenage drivers when implementing their own restricted driver program [16] [17].

Although driver education programs provide some benefits making young drivers more aware about safe driving, improvements still are needed to enhance driver safety and reduce the chances of fatalities involving young drivers. With the availability and accessibility of driver education in the U.S., more teenagers are likely to get their driver license early; this trend could lead to more crashes [18]. Clinton and Lonero [19] argued that having young and novice drivers go through a driving course does not necessarily reduce the risk of crashes; other factors must be considered when examining driver education.

According to the Nevada Department of Transportation (NDOT) [20], Nevada ranks among the top 10 for the highest crash rates in the United States. Some of the factors contributing to these crash cases were failing to stay in the proper lane, speeding, drinking, falling asleep, and using drugs. In 2010, Nevada sustained a \$1.809 billion loss due to crashes. In 2006, the NDOT, the Nevada Department of Public Safety, and other safety agencies began an aggressive safety program, the Nevada Strategic Highway Safety Plan [21]. This plan includes a Zero Fatalities campaign started in 2010 to promote safe driving and to eliminate or reduce the possible chance of losing more lives from car crashes. Although this program may not be the only contributing factor in creating safer drivers, reports have shown that between 2006 and 2012, traffic fatalities went from 431 to 258, about a 59.9% reduction [22].

Further actions are required to continue this downward trend for fatalities and injuries caused by drivers in Nevada. In fact, findings have shown that male and female drivers between the age group of 26 and 35 are prone to causing more vehicle crashes than the younger age groups in Nevada [20]. Based on the driving exposure, older drivers tend to driver more often than young drivers, which may explain their higher crash rates. Therefore, more research is needed to determine whether such programs as driver education courses and the GDL system are effective in the long term.

The purpose of this research was to examine the effectiveness of driver education and information programs in the State of Nevada. The results from this paper were used to provide recommendations and suggestions for ways to enhance the current driver education system as well as driver safety. The following objectives were addressed: a) Effectiveness of current driver education programs in Nevada, b) Data collection regarding driver and pedestrian safety in Nevada, c) Development of mechanisms to educate and inform Nevada drivers and pedestrians about traffic safety, and d) Development of simple yet innovative tools to train drivers about driver safety.

The paper is organized as follows. Section 2 provides the methodology and data required to conduct the surveys. Results and analysis are presented in Section 3. Recommendations for improving driver education and pedestrian knowledge are discussed in Section 4. The overall conclusions and findings are described in Section 5.

2. Methodology

This section describes the survey and analysis approach. A survey on the effectiveness of driver's education program is discussed in Section 2.1. Section 2.2 discusses a survey on the driver experience and knowledge whereas Section 2.3 discusses separate survey on driver and pedestrian safety.

2.1. A Survey on the Effectiveness of Driver Education

A survey was designed and conducted to examine the effectiveness of Driver Education Programs in Nevada. Although studies about the Driver Education Programs and GDL Systems have shown benefits for teenage drivers who still are teenagers, the findings are limited only to that particular age group. More of a challenge is tracking those who are now in college, or beyond 18 years of age, on whether the safety habits and skills that they learned in driver training have been effective over time. This survey attempted to evaluate and provide insights about this issue.

A total of 330 people participated in this survey, all living within Clark County in Southern Nevada. It was a pen and paper (offline) survey and a convenience sampling technique was used to conduct the survey. The sample was taken from a college population at the main campus of the University of Nevada, Las Vegas (UNLV). Of this group, 225 were Las Vegas residents, 62 were Henderson residents, 35 were North Las Vegas residents, seven were from Boulder City, and one was from Pahrump. The sample consisted of 108 males and 222 females, with an average age of 20.54 years, Standard Deviation (SD) = 4.309 years. Of those who held a vehicle document in the sample, 35 were out-of-state licenses, 268 were Nevada driver licenses, and 27 were Nevada instruction permits. In addition, all the participants had completed their driver's education course within the past eight years to avoid any recall bias; *i.e.* the study ensures the accuracy of information by participants regarding past experiences.

2.2. A Survey on the Driver Experience and Knowledge

2.2.1. Driver Experience

For the following analyses, 268 people with Nevada driver licenses were included. The general focus was to examine some of their driving habits and skills. A multiple regression analysis was conducted to determine whether the following variables were associated with the likelihood of vehicle accidents:

- The number of years a person has had experience driving (Driver Experience),
- Current age (Age),
- The number of close calls or near accidents (Close Calls),
- The number of times being pulled over (Pulled Over),
- The number of police warnings (Warnings), and
- The number of times a person has received a police ticket (Ticket).

One of the participants was excluded from the analysis because his/her response was incomplete. For this multiple regression model, 267 responses were analyzed.

2.2.2. Driver Knowledge

This section discusses about the driver's knowledge regarding driving laws in Nevada. The ratings of the respondents' confidence ranged from "1" (extremely confident that there is no law) to "7" (extremely confident

that there is a law). The following questions were asked to test driver's knowledge about the laws in Nevada.

- Using hand-held phones while driving,
- Driving under the influence of alcohol,
- Using hands-free cell phones while driving,
- Driving under the influence of prescription drugs, and
- Driving under the influence of recreational drugs.

2.3. A Survey on Driver and Pedestrian Safety

The NHTSA [23] reported that between 2011 and 2012, the number of pedestrian fatalities and injuries in the United States significantly increased to 6.4% (from 4457 to 4743) and 10% (from 69,000 to 76,000), respectively, due to traffic crashes. According to the Nevada Strategic Highway Safety Plan [24], Nevada faces unique issues regarding pedestrians involved in traffic crashes. Between 2007 and 2011, 227 pedestrian fatalities and 881 injuries occurred. These problems—both nationally and in the State of Nevada—demonstrate the urgent need to provide information and education regarding safety on the roads. Solutions must focus not only on drivers but also on the pedestrians who share the road with them.

The aim of this survey was to examine the opinions and attitudes of drivers and pedestrians about the quality and safety of the traffic environment in Nevada. The survey focused on: a) The effectiveness of the crosswalks, b) The attention and respect that drivers and pedestrians give to each other, and c) The assessment of the current laws and penalties given for violations made by drivers and pedestrians.

A total of 148 randomly selected people volunteered to take part in the survey. From this group, 107 residents were from Las Vegas, 39 from Henderson, and two from North Las Vegas. Of these volunteers, 65 were males and 83 were females. They ranged from 18 to 68 years of age with a mean age average of 25.84 years and a standard deviation of 8.647 years. Four people chose not to respond to question regarding age. From those taking the survey, 138 responded “yes” to being able to drive and 8 responded ‘no’ to not being able to drive.

3. Results and Analysis

This section presents the results and analysis of three surveys described in Section 2.1, Section 2.2 and Section 2.3 respectively. Section 3.1 provides the results of survey based on Effectiveness of Driver Education. Section 3.2 summarizes the results of survey based on Driver Experience and Knowledge whereas Section 3.3 illustrates the results of survey based on Driver and Pedestrian Safety.

3.1. Results of Survey Based on Effectiveness of Driver Education

A total of 166 out of the 268 people received their licenses before the age of 18 in Nevada. They were asked several questions about going through the Driver Education Program.

Question 1 asked about the place to obtain their Certificate of Completion. The online course was the most popular for those who went through the Driver Education Program to obtain their Certificate of Completion ($n = 75$). The second largest group was those who went through their driver education at their high school ($n = 60$). The rest either took it at a professional driving school certified by the Nevada Department of Motor Vehicles ($n = 26$) or did not give a response to the question ($n = 5$).

Question 2 corresponds to rating the effectiveness of the Driver Education Program from “1” being very ineffective and “5” being very effective. On average, people responded to “teaching skills to drive in a vehicle” as neither ineffective nor effective ($M = 3$, $SD = 1.301$). People rated as somewhat effective ($M = 4.25$, $SD = 0.795$) “teaching the traffic rules and laws”. Regarding “teaching how to deal with hazardous conditions”, they rated that as neither ineffective nor effective ($M = 3.47$, $SD = 1.095$). For “teaching how to purchase a vehicle”, they gave an average rating of somewhat ineffective ($M = 1.59$, $SD = 1.029$). Lastly, for “teaching the process of obtaining a driver license”, the rating was neither ineffective nor effective ($M = 3.4$, $SD = 1.258$).

Question 3 dealt with how well certain topics were covered in the training on a scale from 1 (Not Covered At All) to 5 (Covered Extremely Well). The topics that were covered extremely to fairly well were about the traffic rules and laws ($M = 4.16$, $SD = 0.958$) as well as about being a considerate and safe driver ($M = 3.61$, $SD = 1.141$). The topics that were covered moderately to slightly well were a) Knowing how to deal with risky conditions ($M = 3.49$, $SD = 1.152$), b) Avoiding and dealing with distractions while driving ($M = 3.43$, $SD = 1.270$), c)

Controlling negative emotions while driving ($M = 2.82$, $SD = 1.297$), and d) Planning a driving route ahead of time ($M = 2.51$, $SD = 1.339$).

Question 4 enquired whether they were taught about the distractions that can affect driving. The four highly selected types of distraction that driver education programs taught the students well were driving under the influence (87.95%), dealing with weather (86.14%), texting on their cell phone (85.54%), and handling passengers in a vehicle (85.54%). The four types of distraction taught least were grooming and doing make-up (50.00%), eating (54.22%), dealing with environmental factors (63.25%), and driving under the influence of other drugs besides alcohol (81.93%).

Question 5 asked how much safety did motivated their driving habits and behaviors after completion of training. The results showed that about 82.5% of those who took part in the Nevada Driver Education Program reported that their motivation to have safe driving habits and behaviors were moderately important ($n = 17$), an important influence ($n = 70$), or a top priority ($n = 50$). This finding demonstrated that taking a course in driver education could increase their motivation level for safety.

Question 6 asked if they had to take a driver education training again, would they prefer an online or in-person class. The results showed that about 52.40% (87/166) of the sample preferred to retake their driver training in person. In other words, while people took driver education online, they acknowledged that may be they should have taken it in person.

Question 7 asked about rating the difficulty of their training. About 71.1% (118/166) rated their driver education training as either somewhat easy ($n = 24$), easy ($n = 34$), or very easy ($n = 60$). The ratings are very informative in that they indicate that the Driver Education Programs in Nevada are not as rigorous or challenging as needed. This is a potentially serious concern because better learning typically is associated with higher levels of effort [25] [26].

Question 8 asked about the satisfaction level with learning how to drive. Regarding their ability to learn to drive, 51.8% (86/166) rated “somewhat satisfied” ($n = 31$), “satisfied” ($n = 38$), or “very satisfied” ($n = 17$). Out of 166 people, 35 (21.1%) had a neutral stance regarding their satisfaction; 26 (15.7%) were ‘somewhat dissatisfied’ ($n = 17$), “dissatisfied” ($n = 5$), or “very dissatisfied” ($n = 4$); and 19 (11.4%) gave no response to this question.

Question 9 asked if they could practice using a driving simulator (*i.e.*, a virtual reality driving machine), would they use it for the behind-the-wheel experience. About half of the people in the sample (94/166 people; 56.6%) responded by saying that they would probably ($n = 55$) or definitely ($n = 39$) practice their driving through a simulator, 32 (19%) did not know whether they would be interested in the driving simulator, and 40 (24.1%) responded that they probably or definitely would not be interested in using the driving simulator.

Question 10 asked about the changes that would make them better drivers. The top four selected changes that people thought would improve the quality of driver education were using a driving simulator to practice driving (53.01%), improving the teaching methods in the classes (46.39%), and requiring an exit exam to graduate from the program (37.35%). Tied for fourth was extending the number of required driving hours with an instructor (36.14%) and taking an annual driving exam for X number of years after earning their license (36.14%).

3.2. Results of Survey Based on Driver Experience and Knowledge

3.2.1. Driver Experience

The results of the survey based on driver experience are shown below. A multiple regression model was used to conduct the analysis. For this multiple regression model, 267 responses were analyzed. Descriptions of the predictor and outcome variables are shown in **Table 1(a)**. The findings indicated a significant multiple regression, $F(6, 260) = 7.510$, $p < 0.001$, when entering the explanatory variables to estimate the outcome variable (Accidents). **Table 1(b)** shows that based on the R-squared value, only 14.8% of the variability of the predictors could account for the likelihood of drivers getting into accidents. The results of each predictor are shown as follows. Interpretation of each predictor variable is true only if the other predictors are held constant. The B represents unstandardized beta coefficients, reflecting on the directionality of the predictive relationships.

Driver Experience: When a person has fewer years of driving experience, they are likely to get into more vehicle accidents ($B = -0.065$), $t(266) = -2.847$, $p < 0.01$.

Age: As age increases, the number of vehicle accidents also increases ($B = 0.058$), $t(266) = 2.926$, $p < 0.01$. Although it may seem odd that age and driver experience do not show a similar prediction, the sample consisted

Table 1. Descriptive Statistics.

(a) Description of Variables				
Predictor Variables	<i>M</i>	<i>SD</i>	Minimum	Maximum
Driver Experience	3.03 years	3.744 years	0 years	29 years
Age	20.69 years	4.419 years	17 years	45 years
Close Calls	3.61	5.851	0	50
Pulled Over	1.25	2.269	0	20
Warnings	0.6	1.42	0	14
Tickets	0.65	1.399	0	14
Outcome Variable	<i>M</i>	<i>SD</i>	Minimum	Maximum
Accidents	0.51	0.833	0	5
<i>M</i> = Mean	<i>SD</i> = Standard Deviation			
(b) Multiple Regression				
Predictors	<i>B</i>	<i>SE B</i>		
Constant	-0.63	0.352		
Driver Experience*	-0.065	0.023		
Age*	0.058	0.02		
Close Calls	0.003	0.009		
Pulled Over*	0.177	0.048		
Warnings	-0.092	0.052		
Tickets	-0.06	0.062		

R-squared = 14.8% B = Unstandardized Beta Coefficients, *p < 0.05, SE B = Standard Error.

of those who may have received their Nevada driver license at an older age, hence, giving them less overall experience.

Close Calls: The number of close calls or near accidents did not significantly contribute to the model for predicting the number of vehicle accidents, $t(266) = 0.348$, $p = 0.728$.

Pulled Over: As people get pulled over in greater numbers by the police, there is an increased likelihood that they also would get into vehicle accidents ($B = 0.177$), $t(266) = 3.702$, $p < 0.001$. Being pulled over may be a sign of people's aggressive driving behavior, which may contribute to vehicle accidents.

Warnings: There was no significance in predicting the number of vehicle accidents with the number of police warnings, $t(266) = -1.784$, $p > 0.05$.

Tickets: The number of police tickets did not significantly predict the likelihood of getting into accidents, $t(266) = -0.970$, $p = 0.333$.

The regression model shown in **Table 1(b)** indicates that driver experience, age, and being pulled over all were predictive of vehicle accidents. However, due to a limited sample, these findings may only be predictive to those in this survey. As noted earlier, only 14.8% of the variance could be accounted for between the predictor variables and the number of vehicle accidents. Even so, it may be possible that the number of close calls, police warnings, and police tickets can affect people's behavior regarding getting into vehicle accidents. Further research is needed by increasing the sample size in order to determine whether the predictors are likely to influence vehicle accidents.

Other analyses were conducted based on survey questions about their driving habits and experiences. Question 1 asked whether they ever committed any violations while driving even if they did not get a ticket or warning for it. The results indicated that the three top violations committed were driving over the speed limit (81.34%), talking on the cell phone while driving (55.60%), and texting while driving (51.49%). Question 2 asked how frequently they use their cell phone without a headset while driving. The results showed that 75%

(201/268) use their cell phones without a headset while driving (which is illegal). Question 3 asked how frequently do they text on their cell phone while driving. A significant number of respondents (81%; 217/268) stated that they texted while driving (which is illegal). Question 4 asked if they text on their cell phone while driving, when do they do the texting. The results showed that 78.36% (210/268) people text when they stop at a traffic stop and 8.96% (24/268) pull over and text. However, 18.28% (49/268) admitted to texting while driving the vehicle. Question 5 asked whether they had ever driven under the influence of alcohol. Out of the 268 people in this sample, 22.80% (61/268) had driven under the influence of alcohol and 77.20% (207/268) had not. While 22% still is high, it should be noted that these values were much lower than the percentages of people who reported texting or using a cell phone without a headset. The high cell phone and texting numbers were especially alarming because psychological research had shown comparable negative effects for both cell phones as well as intoxication on driving [27]. Question 6 asked whether they had ever driven under the influence of other drugs (e.g., prescribed or recreational drugs). The results indicated that 14.20% (38/268) people had driven under influence of other drugs whereas 85.80% (230/268) people had never done drugs while driving. Question 7 asked whether they had ever driven while being close to falling asleep. The results showed that 64.60% (173/268) people had driven while close to falling asleep.

3.2.2. Driver Knowledge

The results of the survey based on driver knowledge are shown below. When asked how confident they were about the laws in Nevada, on average, people were confident to extremely confident that there were laws against the following (Table 2):

- Using hand-held phones while driving (M rating = 6.58, SD = 1.111),
- Driving under the influence of alcohol (M rating = 6.83, SD = 0.900),
- Driving under the influence of prescription drugs (M rating = 5.60, SD = 1.736), and
- Driving under the influence of recreational drugs (M rating = 6.71, SD = 0.989).

In addition, on average, they were confident that there was no law regarding using hands-free cell phones while driving (M rating = 2.51, SD = 1.712).

Table 2. Confidence Levels Regarding Driving Laws in Nevada.

Is there a law in Nevada that...	... bans the use of hand-held cell phones while driving?		... bans the use of hands-free cell phones while driving?		... prohibits driving under the influence of alcohol?		... prohibits driving under the influence of prescription drugs (e.g., painkillers, allergy medications, sleep aids, etc.)?		... prohibits driving under the influence of illegal drugs (e.g., marijuana, heroin, etc.)?		
	Ratings	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
1) Extremely confident that there is no law		5	1.87%	103	38.43%	5	1.87%	7	2.61%	4	1.49%
2) Confident that there is no law		2	0.75%	64	23.88%	1	0.37%	15	5.60%	1	0.37%
3) Somewhat confident that there is no law		2	0.75%	31	11.57%	0	0.00%	16	5.97%	1	0.37%
4) Unsure		6	2.24%	38	14.18%	1	0.37%	31	11.57%	7	2.61%
5) Somewhat confident that there is a law		7	2.61%	9	3.36%	1	0.37%	34	12.69%	6	2.24%
6) Confident there is a law		33	12.31%	10	3.73%	6	2.24%	34	12.69%	12	4.48%
7) Extremely confident that there is a law		213	79.48%	13	4.85%	254	94.78%	131	48.88%	237	88.43%
Total <i>N</i>		268		268		268		268		268	
Mean Rating Response		6.58		2.51		6.83		5.6		6.71	
<i>SD</i>		1.111		1.712		0.9		1.736		0.989	

n = number of responses; *N* = total responses; *SD* = standard deviation.

3.3. Results of Survey Based on Driver and Pedestrian Safety

The survey questions consisted of a Likert-type response [28], with only five choices for each question. In order to determine people’s opinions and attitudes, these choice/rating responses corresponded to a certain number. To conduct the statistical analysis, a one-sample t-test was used to determine whether the sample means were statistically different from the criterion value; in this case, “3” represented a neutral response (impartial). People who did not give any response to a question were excluded from the analysis. The findings showed no sex differences ($p > 0.05$) in the responses for each question; therefore, the questions were analyzed as an entire group. The results from the survey questions are shown in **Table 3**.

The results for Question 1 indicated that people rated the crosswalks in Nevada as being somewhat effective, $t(144) = 6.762, p < 0.001$. The mean score for their rating responses was at 3.43. The response to Question 2 indicated that although there was only a marginal statistical significance for their responses about how attentive drivers were to pedestrians crossing the street, $t(144) = -1.625, p = 0.106$, the patterns appear split between people who say that drivers were inattentive and people who had no opinion at all. The mean score for their rating responses was 2.89. The results for Question 3 indicated that there was no statistical difference in response for people’s attitudes about the safety of crossing at a crosswalk, $t(144) = 1.178, p = 0.241$. People felt neither unsafe nor safe ($M = 3.08$). The results to Question 4 indicated a marginally significant difference in people’s response about the respect drivers give to pedestrians when crossing the street, $t(144) = -1.608, p = 0.110$. The mean score for their rating responses was 2.88. For Question 5, the results indicated that there was no significant

Table 3. Survey questionnaire on driver and pedestrian safety.

Ratings	1) Very Ineffective 5) Very Effective		1) Very Inattentive 5) Very Attentive		1) Very Unsafe 5) Very Safe		1) Very Disrespectful 5) Very Respectful		1) Never 5) Always		1) Strongly Disagree 5) Strongly Agree	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Questions												
1) How would you rate the effectiveness of the crosswalks (e.g., stop signals for people)?	3.43	0.761										
2) How would you rate how attentive drivers are when pedestrians cross the street?			2.89	0.817								
3) How safe do you feel when crossing the crosswalk?					3.08	0.846						
4) How respectful do you feel drivers are to pedestrians when crossing the streets?							2.88	0.878				
5) How respectful do you feel pedestrians are to drivers on the streets?							2.90	0.923				
6) How often do you jaywalk (i.e., cross the street in a non-designated crosswalk?)									2.34	0.966		
7) Do you feel that the pedestrian crossings need to be improved in Nevada?											3.80	0.847
8) Do you feel that there should be a stricter law/penalty for drivers passing the crosswalk when the pedestrians have the right of way?											3.66	0.930
9) Do you feel that there should be a stricter law/penalty for pedestrians who do not follow the rules of crossing in designated crosswalks (e.g., jaywalking)?											3.78	0.975

M = mean; SD = standard deviation.

difference in people's responses about the respect pedestrians give to drivers, $t(144) = -1.260$, $p = 0.210$. The mean score for their rating responses was 2.90, which indicated that pedestrians had "neither disrespectful nor respectful" attitudes about drivers on the street. The response to Question 6 indicated that pedestrians "rarely" jaywalked, $t(144) = -8.251$, $p = 0.001$. The mean score for their rating responses was 2.34. The results for Question 7 showed a significant difference in people's responses about whether they felt pedestrian crossings in Nevada needed to be improved, $t(144) = 11.379$, $p = 0.001$. The mean score for their rating responses was 3.80, indicating that more people agreed to have improvements made to the crosswalks. For Question 8, the results indicated that, people, on average, were more likely to agree that there should be a stricter law or penalty for drivers passing the crosswalk when the pedestrians had the right of way, $t(144) = 8.576$, $p = 0.001$. The mean score for their rating responses was 3.66. For Question 9, the analysis indicated that people agreed to the idea that there should be a stricter law or penalty for pedestrians who jaywalk and do not follow the rules for crossing, $t(144) = 9.623$, $p = 0.001$. The mean score for their rating was 3.78.

4. Recommendations

This section proposes recommendations to make improvements in the existing driver education programs in the State of Nevada. The recommendations have been developed from:

- Results of the surveys conducted in this study, which clarifies the limitations and what efforts are needed.
- Assessment of randomly selected programs in Nevada for online driver education.
- Recommendations/conclusions in similar studies, particularly those that are conducted in the U.S.

It is important to note that the research literature on driver education and adolescents describes a number of factors that contribute to crashes that cannot be included in policy recommendations. For example, it has been determined that such factors as gender [29], personality [30], and socio-economic/education status [31] affect the likelihood of adolescent drivers being in a crash. However, because these types of factors cannot be included in testing, the corresponding policies or laws are not considered in this research. The following sections include recommendations that can be implemented to improve driver education and knowledge.

4.1. Regarding Ease/Lack of Rigor of Online Driver Education

- Make online driver education courses more challenging.
- Develop a more accurate assessment of the time spent completing topics. Time that currently is wasted can be filled with other learning activities.
- Use cognitive techniques [32] [33], such as frequent tests and cumulative tests.
- Avoid multiple-choice questions.
- Improve the validation process of who actually is completing the online course by means of technological fixes or by having the final exam given at a testing location.

4.2. Regarding Interactive Learning and Technology










- Rather than using online-only courses, create hybrid courses that require students to learn from an instructor.
- Another possibility is to use driving simulators in addition to the instructions received online (Figure 1).
- Convert online courses from passive learning to active learning by including animated activities.

The research team has begun developing various web-based interactive teaching modules to study and demonstrate the potential of this recommended method. Figure 2(a), Figure 2(b) and Figure 2(c) provide various screen shots for a prototype implementation.



Figure 1. An example of a driving simulator.

Matching game
Drag and drop these following labels with their respective sign. If you make a mistake, you will have to start over.

ROUTE MARKER			
RAILROAD CROSSING			
RAILROAD			
SCHOOL ZONE			
STOP			
NO PASSING			
TRAFFIC REGULATIONS			
WARNING			
YIELD			

(a) Matching Game

Stopping Distance and Time

Click on the mouse to stop the car without touching any obstacles !



(b) Stopping Distance and Time

Passing line

Regarding the lines, Is it legal to pass the white car ?



(c) Passing Lines

Figure 2. Prototype of web-based and interactive driving education tool.

4.3. Regarding Follow-Up Exams

- Provide follow-up exams to make sure that people are currently aware of the driving laws and regulations before getting their driver licenses renewed.
- Restrict how many questions they can miss on the follow-up exam before getting their renewed license.
- Failure to pass the follow-up exam would result in people having to take the driver education course and repeating the same process of a new licensed driver.

4.4. Regarding Practice and Training at Home

- Instead of just requiring young drivers to complete a minimum number of hours, require the practice and completion of specific driving skills as well.
- Include an online tutorial for parents that refresh them on some important driving skills/rules. This will help ensure that they are passing on correct information to their child as they practice driving with them.
- Provide another option for driver education training, in which the parents or guardians are given a more active role in monitoring their teenager's learning [34].

4.5. Regarding Collecting Information about Crashes

- Retrieve more information about people's participation in a driver education program by having it recorded as part of a police report.
- Document people's driver education background when they apply for a driver license.
- Collaborate with insurance companies to examine the types of vehicle crashes [35] people commit between those who have taken and not taken a driver education course.

4.6. Regarding Pedestrians

- Through the driver education program, emphasize information about drivers and pedestrians sharing the road and being vigilant of each other's safety [36].
- Place more cautionary signs for pedestrians on the streets to remind them of their own safety.
- Improve the infrastructure of the streets by using more lighting near traffic signals or providing barriers to prevent people from illegally crossing the streets or drivers hitting them.
- Implement stricter laws for people who violate the driver or pedestrian rights of way by increasing the fines.

4.7. Additional Emphasis

- Continue and/or increase the emphasis on the dangers of driving under the influence of alcohol or drugs.
- Greatly increase the emphasis on the dangers of cell phone use and texting on driving. Drivers need to understand that cell phone use and texting can impair driving to similar extents as alcohol [27]. As mentioned earlier, demonstrations of these effects by using interactive applications may help.
- Address the dangers of distractions on the road through public announcements, such as billboards, television commercials, and magazines.
- Remind drivers about the penalties and fines involved for disobeying the law (e.g., texting while driving) by posting more signs on the road about them.

5. Conclusions and Recommendations

Nevada's Driver Education Program is an important tool to promote awareness of driver safety with the objective of reducing or eliminating the number of traffic fatalities and injuries in the state. Survey data reveal that some people seem to have acquired the necessary knowledge for driving safely; however, they do not use that knowledge. Therefore, the driver education program needs to have greater quality with regard to the learning process.

One of the biggest concerns is that the courses are not challenging enough for young drivers for them to realize adequately that driving is a privilege, not a right. More cumulative testing in these courses may have a beneficial effect to ensure that students remember what they learn in their driving courses. In addition, more interactions are needed, most preferably in person rather than online. With the use of technology, students can enhance

their understanding of their driver education program. One way to do this is by incorporating driver simulators into the program so that they can experience firsthand various driving situations in a safe environment. Another way that might be less costly is to use interactive animations in an online course instead of relying heavily on text to learn the materials. Because drivers may forget over time the knowledge that they have learned from driver education, one recommendation is to provide follow-up exams. When they need to renew their driver license, they could be tested on the driving rules and regulations.

Although the driver education program focuses more on the driver, additionally, it may be beneficial to inform people about pedestrian safety. By emphasizing that drivers and pedestrians share the road equally, this awareness may help reduce the number of car accidents and injuries in Nevada. Further, by changing the infrastructure of the streets—adding more lighting near traffic signs at night, providing more warning signs for pedestrians, and building barriers to prevent people from jaywalking—this solution may help drivers and pedestrians avoid dangerous interactions. Finally, due to the dangers of driving distractions and impairments, more emphasis on these topics in driver education—as well as more public announcements can help to constantly remind drivers about having good driving habits.

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