U.S. Department of Transportation

Federal Railroad Administration

Evaluation of Education and Outreach Methods and Strategies: A Case Study of a Web-Based Rail Safety Education Initiative

Office of Research
and Development
Washington, DC 20590

DOT/FRA/ORD-14/09

Final Report
April 2014

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	April 2014	Technical Report June 2011–June 2013

4. TITLE AND SUBTITLE
Evaluation of Education and Outreach Methods and Strategies: A Case Study of a Web-Based Rail Safety Education Initiative

5. FUNDING NUMBERS
RR97A4/JT334
RR97A5/LLA45

6. AUTHOR(S)
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Department of Transportation
Research and Innovative Technology Administration
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55 Broadway
Cambridge, MA 02142

8. PERFORMING ORGANIZATION REPORT NUMBER
DOT-VNTSC-FRA-13-04

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Department of Transportation
Federal Railroad Administration
Office of Railroad Policy and Development
Office of Research and Development
Washington, DC 20590

10. SPONSORING/MONITORING AGENCY REPORT NUMBER
DOT/FRA/ORD-14/09

11. SUPPLEMENTARY NOTES
Program Manager: Tarek Omar, D.Sc.

12a. DISTRIBUTION/AVAILABILITY STATEMENT
This document is available to the public through the FRA Web site at http://www.fra.dot.gov.

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

The U. S. Department of Transportation's (U.S. DOT) Research and Innovative Technology Administration's (RITA) John A. Volpe National Transportation Systems Center (Volpe Center), under the direction of the U.S. DOT Federal Railroad Administration (FRA) Office of Research and Development (R&D), conducted a research study to evaluate the impact of an education program on highway-rail grade crossing safety. The Volpe Center worked in collaboration with Operation Lifesaver, Inc., to evaluate the impact of the Web-based Rail Safety for Professional Drivers e-Learning Challenge (ProDriver Challenge). The evaluation was conducted using Federal safety data and information on the ProDriver Challenge collected from users about their experiences.

The evaluation of the ProDriver Challenge e-learning module showed that it was targeting the appropriate audience; it was expanding the number of participants in OLI training, and users valued the experience. The evaluation also revealed areas for program improvement as well as next steps for education and outreach.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Highway-rail grade crossing, education, outreach, program evaluation, safety	48
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	

METRIC/ENGLISH CONVERSION FACTORS

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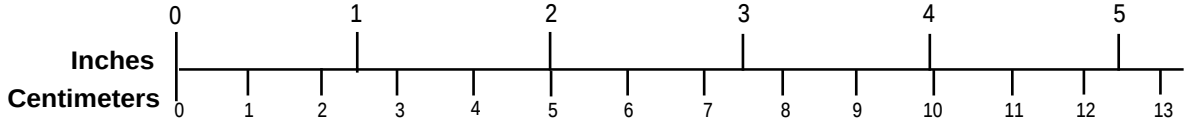

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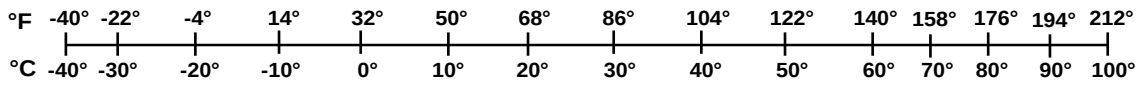

For more exact and or other conversion factors, see NIST Miscellaneous Publication 286, Units of Weights and Measures. Price $2.50 SD Catalog No. C13 10286

Updated 6/17/98

Acknowledgements

The U.S. Department of Transportation Federal Railroad Administration Office of Research and Development sponsored the work leading to this report. The authors would like to thank Sam Alibrahim, Chief of the Train Control and Communications Division, and Tarek Omar, Program Manager, Train Control and Communications Division, for their guidance and direction during the project and in developing this report.

Special thanks to Joyce Rose, Wende Corcoran, and Helen Sramek (formerly), all of Operation Lifesaver, Inc., who graciously provided needed program information and satisfied all of our data requests.

The authors would also like to acknowledge Arturo Torres, formerly of MacroSys, LLC, for his support in the background and literature review.

Cover photo is from Operation Lifesaver, Inc., Railroad Safety for Professional Drivers e-Learning Challenge at www.oli.org (May 24, 2013).

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Executive Summary

The U.S. Department of Transportation (DOT) John A. Volpe National Transportation Systems Center (Volpe Center) evaluated the impact of Operation Lifesaver, Inc.'s (OLI) new virtual, Web-based training module, Rail Safety for Professional Drivers e-learning Challenge (ProDriver Challenge). The ProDriver Challenge provides an opportunity to communicate OLI's rail safety message to professional drivers who otherwise might not receive one of the traditional OLI training presentations. Following this evaluation, researchers should conduct a more detailed case study of the training to gather more specific information on the program impacts and the user experience.

At the U.S. DOT Federal Railroad Administration-sponsored Research Needs Workshops on Highway-Rail Grade Crossing Safety and Trespass Prevention in 2003 and 2009, the evaluation of education and outreach programs on highway-rail grade crossing safety was identified as a high-priority research need. The purpose of this study is to examine one of the targeted training programs designed specifically for commercial truck drivers and motor carriers. The Volpe Center produced a previous report that presented strategies and methods that can be used to determine the effect of an education or outreach program. The concepts cited in that report were used for this research.

The OLI ProDriver Challenge is an interactive online training module with a video game style interface. The tool creates a simulated environment in which the user is behind the virtual dashboard of a large truck. The driver is exposed to various scenarios at highway-rail grade crossings which require critical thinking and quick response. The ProDriver Challenge was rolled out nationwide via OLI's Web site (www.oli.org) in June 2011. The evaluation included a brief literature review, the development of logic models, and analyses of Federal safety data and data collected by OLI from surveys of the ProDriver Challenge users.

The evaluation of the ProDriver Challenge e-learning module showed that it was targeting the appropriate audience; it was expanding the number of participants in OLI training, and users valued the training. Since the program launch in June 2011, ProDriver Challenge has been accessed by 4,707 users who identify themselves as truck drivers with a commercial driver's license. The Web-based instruction provides a low-cost and consistent method of supplementing the rail safety education program for professional drivers, as well as occupational training beyond that available to individual operators. The analysis of safety data from Federal sources showed that while commercial drivers make up only a small portion of roadway traffic, they are involved in a high percentage of collisions at highway-rail grade crossings. The data on commercial driver behavior at highway-rail grade crossings suggests that this is a fitting population to target for enhancing safety. More than 95 percent of users who took the survey at the conclusion of the ProDriver Challenge had a better understanding of crossing safety, understood the message, and were satisfied with the training.

The evaluation of the ProDriver Challenge revealed some areas for program improvement. OLI can try to increase the number of participants by exploring free or low cost marketing opportunities. They can also investigate why users are not completing the entire training module to improve the user experience. As a next step, a case study on a specific State or trucking company with ProDriver Challenge as part of its learning management system would offer a more detailed evaluation of the program.

1. Introduction

Highway-rail grade crossings are the second largest contributor to railroad-related incidents and deaths annually, second only to trespass-related casualties. The U.S. Department of Transportation (DOT) Federal Railroad Administration (FRA) sponsors the Highway-Rail Grade Crossing Safety and Trespass Prevention Research Program at the U.S. DOT Research and Innovative Technology Administration John A. Volpe National Transportation Systems Center (Volpe Center). The goal of this research program is to explore new and enhanced means to improve safety along the railroad right-of-way that will reduce incidents, injuries, and fatalities.

Grade crossings are the points of interaction between the transporting public and the railroad. The encounter with a crossing may be infrequent for many roadway users; this lack of familiarity may result in lapses in safety-related decisionmaking. Recent studies have cited driver behavior as a major factor in grade crossing incidents.[1] Grade crossing safety improvement is often classified by the three Es: Engineering, Enforcement, and Education. One study theorized that risky drivers are unaffected by the engineering solutions designed to improve safety at a crossing.[2] Promoting grade crossing safety to communities through education and outreach efforts can help impact the behavior of those roadway users that are unfamiliar with grade crossings or impervious to their safety features.

The benefits from a technology improvement or an enforcement campaign are often evident and can readily be measured. Quantifying the benefits of the education component has remained a challenge for researchers, regulators, and practitioners. The evaluation of education and outreach programs for highway-rail grade crossings has long been an unmet research need. It was identified as a high-priority need at the FRA-sponsored Research Needs Workshop on Highway-Rail Grade Crossing Safety and Trespass Prevention in 2003 and 2009.[3,4]

1.1 Background

Education and outreach programs are becoming more widespread as approaches to improving safety at highway-rail grade crossings. The Final Rule on the Use of Locomotive Horns[5] allows education and enforcement to be included as alternative safety measures when applying for quiet zone establishment. In addition to community sponsored education and enforcement activities, outreach is part of the grade crossing safety programs for all rail stakeholders.

1.1.1 Federal Initiatives

Safety is the primary strategic goal of the U.S. DOT and FRA. Improving safety on the Nation's rail system involves composing and enacting policy, regulations, and legislation, as well as administering programs and research to advance the safety mission. Under the Office of Research and Development, FRA conducts research into highway-rail grade crossing safety initiatives and technologies. These research projects result in technical reports and research briefs that are available to the public and posted on FRA's Web site (www.fra.dot.gov). FRA also promotes crossing safety through its Office of Railroad Safety, Highway-Rail Grade Crossing and Trespass Prevention Division. This division issues guidelines and policy related to highway-rail grade crossings and produces safety data and statistics for the benefit of the public.

FRA has also initiated a public information campaign that includes multimedia and education components. The goal of the campaign, "Always Expect a Train," is to increase awareness of

the dangers at crossings and on and along railroad property. For this campaign, FRA is partnering with State and local governments, community groups, railroads, and nonprofit organizations to spread the message of highway-rail grade crossing safety.

The Federal Motor Carrier Safety Administration (FMCSA), together with FRA and the Federal Highway Administration (FHWA), provides highway rail-grade crossing safety information via its Web site and visor cards. Its "Highway-Rail Grade Crossings: 7 Steps for Safety" visor card lists what a driver should do when approaching a crossing. The card also contains special instructions and emergency phone numbers if the vehicle stalls on the railroad tracks. On its Web site (www.fmcsa.dot.gov), FMCSA also directs drivers to the Commercial Driver's License Manual Section 2.15 on highway-rail grade crossings.[6]

The Federal Transit Administration (FTA) selected Operation Lifesaver, Inc. (OLI) as a safety education partner when officials became concerned about a trend in pedestrian and driver casualties around light rail systems. FTA asked OLI to develop a toolkit that could be implemented or customized by individual transit agencies. OLI organized a working group with representatives from 23 transit agencies to develop a character, messages, and collateral materials. The character for this children's campaign was a squirrel mascot, Earl P. Nutt, who travels across America. The campaign used posters and artwork, a several-minute-long cartoon in English and Spanish, interactive activities based on his name, his character, and a mnemonic device for five basic rules on light rail safety. The mnemonic device, ACORN, stood for "Always look both ways, Cross only at crosswalks, Obey all signs and Signals, Railroad tracks are for trains only, and Never try to outrun a train". [7]

1.1.2 Railroad Initiatives

Railroad operators and owners have a vested interest in preserving safety at highway-rail grade crossings. In addition to partnering with government agencies and nonprofit organizations to spread highway-rail grade crossing safety awareness, many railroads also implement their own safety outreach campaigns. For example, CSX issued a campaign called "Better Safe" that intended to augment safety messages issued by other rail safety partners.[8] The campaign aimed to increase awareness of the dangers of railroad crossings and targeted young adults through a variety of media approaches.

Norfolk Southern has run the "Train Your Brain" public safety awareness program since 2007 in Tennessee, North Carolina, Indiana, and Ohio.[9] The campaign features a costumed giant pink walking brain as its mascot. The campaign's message is to think smart at highway-rail grade crossings and stay off railroad property and equipment. In 2010, the campaign distributed more than 45,000 novelties, including T-shirts, stress brains, puzzle sheets, and car decals.

1.1.3 Operation Lifesaver, Inc.

OLI is perhaps the most recognized name in highway-rail grade crossing and rail safety education and outreach. OLI's mission is "to end collisions, deaths and injuries at highway-rail grade crossing and along railroad rights of way."[10] OLI is a nonprofit organization that is cosponsored by Federal, State, and local governments, highway safety offices, and American railroads to spread the rail safety message to the public. The organization was founded in 1972 in Idaho and then spread nationwide. OLI frequently partners with FRA, FTA, railroads, local communities, law enforcement agencies, schools, and other stakeholders to provide rail safety

education and outreach. Many of the Federal and railroad outreach initiatives are designed with OLI as a partner, are based on an OLI initiative, or are intended to enhance OLI efforts.

The core of OLI's operation is volunteer presentations and training. The volunteers are certified in teaching OLI's rail safety message and provide classroom-style training. Presenters have access to supplemental materials such as videos to enhance their training. OLI also utilizes other means of outreach, including ad campaigns. Safety messages are run as public service announcements on television and radio and are available in print forms such as billboards or posters. To keep apace with the information age, OLI has also engaged in Internet outreach through sites such as YouTube and through interactive games and training made available through its Web site.

OLI tailors its safety messages to different target audiences. For example, there are education materials designed for school children, professional drivers (including school bus drivers), driver education classes, law enforcement agencies, emergency responders, and the general public. In the United States in 2012, OLI reached:

- 2.7 million people through OLI State programs, training, and events
- 35,000 professional drivers and commercial bus operators through 2,100 presentations
- 5,000 people through the professional driver e-learning challenge
- 174,000 new drivers through 7,400 driver education presentations

In addition, the OLI Web outreach and social media ventures were successful in expanding their reach in 2012.

- The OLI Web site had 470,000 page views and 126,500 visits.
- Facebook "likes" increased by 67 percent.
- Twitter followers tripled.
- Pinterest followers more than doubled.[11]

1.1.4 Previous Work

In fiscal year 2010, the Volpe research team completed a draft report titled *Evaluation of Education and Outreach Programs*. This work identified strategies and methods to evaluate the effects of rail safety education and outreach programs. The report discusses the benefits, limitations, and applications of each evaluation strategy. The strategies included:

- Logic models
- Before and after studies
- Control groups
- Historical data
- Cost-benefit analyses
- Surveys
- Focus groups

- Media exposure

The variety of strategies can be used individually or in concert to assess the effectiveness of an outreach program. The recommendation at the end of this work was to conduct a pilot study to analyze the effectiveness of a highway-rail grade crossing safety education campaign.

1.2 Objectives

The objective of the education and outreach evaluation pilot study is to determine the impact of a specific highway-rail grade crossing education or outreach program. The information and results from the pilot evaluation can then be used to improve the program and future programs, develop a methodology for evaluating rail safety education and outreach programs, and, ultimately, determine the overall effectiveness of education and outreach activities as a safety strategy.

1.3 Scope

The authors identified criteria for an ideal program for a pilot evaluation study. The criteria included the following:

- The program is at the beginning or design phase.
- The program or evaluation has a duration of 1 year to 18 months.
- The program targets a focused audience.
- The program is the primary rail safety or highway-rail grade crossing safety message medium to the audience.

The Volpe research team worked with OLI and project sponsors to identify a grade crossing safety outreach initiative that would be a good candidate for the pilot study. At the time of this project kick-off, OLI was implementing a new Web-based training module for professional drivers. This training program met many of the criteria set forth by the research team for a program evaluation and was selected for the pilot study.

1.3.1 Railroad Safety for Professional Drivers e-Learning Challenge

Railroad Safety for the ProDriver Challenge was developed by OLI in conjunction with Allen Interactions as an interactive online training module with a video game style interface. The tool creates a simulated environment in which the user is behind the virtual dashboard of a large truck. Figure 1 shows a screenshot of what the user sees when participating in the training. The driver is exposed to various scenarios at highway-rail grade crossings which require critical thinking and quick response. The tool is intended to "provide relevant, engaging, and behavior-changing learning experiences that the professional driver can apply on the job."[13]

The training module is intended to take 15 to 20 minutes and offers three different trips in a variety of vehicles. The first trip is a box or semi-truck on a rural or suburban route, the second is a semi-truck hauling hazardous materials where inclement weather is a factor, and the third is a low-boy trailer on a routine route, but with challenges encountered during country driving. For each trip the user must make the right choices at and around highway-rail grade crossings to avoid crashing or getting a ticket. The user earns points for the choices made (i.e., the best choice earns the most points) and is penalized for crashing or getting a ticket by having to start the trip over. The three different trips aim to teach the user a different aspect of highway-rail

grade crossing and truck safety. The user is able to print a completion certificate upon finishing the training.

Figure 1: Screenshot of ProDriver Challenge (www.oli.org/training/professional-drivers)

The ProDriver Challenge is available for free through the OLI website (www.oli.org) and is accessible to the public, professional driver or not. A link to ProDriver Challenge is also on the Web sites of OLI partners:

- FMCSA
- The American Trucking Association
- The Owner Operated Independent Drivers Association
- The Commercial Vehicle Safety Alliance

OLI also offers the option of incorporating the ProDriver Challenge into the companies' learning management systems (LMS) for seamless integration into their training programs. The integration of the module into a trucking company LMS offers the opportunity to further evaluate the program's effectiveness because it provides a dedicated audience who received the training. A dedicated audience can be asked to participate in surveys or focus groups regarding their experiences with the program. A dedicated audience also presents the opportunity to specifically track their performance and behavior at highway-rail grade crossings for accidents and violations. Although at the time of this study the ProDriver Challenge had not been integrated into a company's LMS, it remains an opportunity for further research.

Based on the program characteristics and target audience, the ProDriver Challenge is an appropriate choice for evaluation. OLI was willing to participate in this study and proved to be a cooperative and engaged partner with the most recognized name in rail-safety awareness. In 2012, 24.5 percent of all highway-rail grade crossing collisions involved a truck or truck-trailer.[14] This indicates that professional drivers have a high safety risk at highway-rail grade

crossings. In addition to the prevalence of collisions between trucks/truck-trailers and trains, highway-rail grade crossing collisions with commercial vehicles also tend to have more injuries and fatalities than collisions with passenger vehicles. The ProDriver Challenge has a well-defined target audience in professional drivers. Data are more readily collected and available on professional drivers than on the general motoring public. FMCSA keeps organized databases of commercial motor vehicle violations and collisions which can be queried by State, carrier, or other attribute. In addition to safety data collected by Federal agencies, OLI collects information provided by the ProDriver Challenge users. This provides an additional source of information about the program and its participants.

At the inception of this study, the ProDriver Challenge was designed but not implemented. It was rolled out June 9, 2011. Having a before period during which no drivers were exposed to the program presented an advantage to evaluating it. The new method of outreach (Web-based interaction) for this program also presented the opportunity for comparison with OLI's traditional presentation trainings.

1.4 Overall Approach

The approach for this research project involves using strategies for evaluating education and outreach programs to analyze the impact of OLI's ProDriver Challenge. The first step in this work is to conduct a literature review of studies that evaluated education and outreach activities specifically at highway-rail grade crossings, in other areas of transportation safety, and for computer or Web-based training applications. The intent of the literature review is to provide information about the effectiveness of education and outreach programs.

The next step in this research study is to analyze the impact of the program using data collected from OLI and Federal databases. The research team created logic models, which are depictions of the relationship between program resources, activities, and benefits, of both the ProDriver Challenge and OLI's traditional presentation model to understand and describe the programs. Highway-rail grade crossing crash and violation data are available through FRA and FMCSA. The ProDriver Challenge includes brief survey questions at the beginning and end of the training to collect demographic data on users, as well as capture the user experience. Data are also collected by OLI on its presenters' activities and audience levels. Finally, recommendations for next steps and additional studies in this subject area are presented.

1.5 Organization of the Report

This report is organized as follows:

- Chapter 2 provides an overview of the literature review that was conducted as part of this study.
- Chapter 3 describes the analysis and results of the pilot evaluation of the ProDriver Challenge.
- Chapter 4 presents the conclusions of the study and recommendations for next steps.

2. Literature Review

A literature review was performed to identify previous studies that attempted to evaluate the effect of highway-rail grade crossing safety outreach programs. The findings related to highway-rail grade crossing safety programs were limited, so the review was expanded to include roadway safety education and outreach programs. Studies comparing classroom instruction with Web- or computer-based training were also reviewed to supplement the analysis of OLI's two programs, ProDriver Challenge and classroom presentation training.

2.1 Evaluation of Highway-Rail Grade Crossing Safety Initiatives

A limited number of evaluations of education and outreach initiatives at highway-rail grade crossings have been conducted. Even though there has been a significant reduction in crossing accidents in the United States and Canada since OLI started, it is unclear whether all of the reduction in crossing accidents is due to its activities. One study attempted to identify key influences on crossing safety and found that that the presence of OLI meant a 15 percent reduction in crashes and 19 percent reduction in fatalities. The authors also cited other factors that may account for the effect, such as a reduction in road and rail traffic during an economic downturn and deregulation of the trucking and railroad industries.[15] A follow-up study that controlled for the amount of road traffic and the number of trains and considered the number of presentations given, not just the presence of OLI, concluded that increasing education initiatives meant a reduction in crashes but the effect on fatalities was uncertain.[16]

The U.S. DOT Volpe Center produced two reports with divergent findings on the effectiveness of the Public Education and Enforcement Research Study (PEERS) initiatives. The results indicated that active, targeted education initiatives with persistent enforcement activity were more effective than passive initiatives aimed at the general population. One Chicago-area community, Arlington Heights, saw a reduction in violations of highway-rail grade crossing warning devices of nearly 31 percent from the pre-test to post-test period compared with no decrease in violations from the pre-test to post-test period in Macomb, another Illinois community.[17,18] Some of the differences between the two communities that may have influenced the study findings included:

- Arlington Heights was a more urban community, whereas Macomb was rural.
- The population of Arlington Heights was more stable, whereas nearly half of Macomb's population was comprised of college students who joined and left the community at the beginning and end of every school year.
- In Arlington Heights, the programs targeted pedestrians at the commuter rail station and included police presence throughout the campaign lifecycle, whereas the programs in Macomb were intended for the community in general.
- The gates at Arlington Heights were down for an average of 2.1 minutes per train event; in Macomb, the gates were down for 3.7 minutes per train event. Macomb residents may have perceived a "higher cost" in waiting for the train.

In Australia, an education and enforcement campaign at four crossings, both active and passive, yielded little effect. The campaign was conducted over a period of 4 weeks and was limited to press releases and distribution of brochures with different levels of enforcement based on the

type of crossing. Only one crossing with a STOP sign showed a significant increase in the number of vehicles stopping. Unfortunately, the sites were selected based on accident and near-miss data, but driver behavior in terms of violations were different between the control and treatment sites.[19]

2.2 Evaluation of Roadway Safety Initiatives

A few meta-analytic papers (comparing and contrasting results for many different studies in the same topic area) have been published that attempt to explain the effectiveness of road safety campaigns.[20] These studies are international in scope, address different road safety issues (drunk driving, speeding, etc.), and use different approaches to assess and compare the effectiveness of campaigns. Taking into account some publication bias, these studies have suggested that road safety campaigns can result in a reduction of approximately 9 percent in accident levels while the campaign is ongoing and up to 15 percent after the conclusion of the campaign. These studies have found great variation in campaign effect though, likely due to large differences in campaign design and how results are summarized.

These studies suggest that road safety campaigns become less successful over time (e.g., campaigns in the 1980s had an overall accident reduction of 16 percent compared with those in the 2000s with a reduction of 5 percent). It is unclear whether this variation is because road user behavior has become safer or more recent campaigns differ systematically from earlier ones. The possibility of a ceiling for campaign effects has been identified as a potential area of research, underscoring the importance of pre-campaign measurement. Other findings of these studies include the following:

- Campaigns with personal communication ("intimacy") and roadside delivery ("immediacy") were most effective.
- The most recent meta-analytic study finds that there does not appear to be a link between the effectiveness of a campaign and monetary scale. The finding of no link between effectiveness and monetary scale contradicts a previous meta-analytics study from 2004.
- Though regional campaigns had the greatest overall effect compared with local or national campaigns, the difference is not significant.
- Campaigns lasting more than 1 year are less effective than campaigns of a shorter duration, possibly because a saturation point is reached. In shorter, intense campaigns, the message is more likely to be received at a time closer to the moment of carrying out the behavior.

Shared qualities of effective road safety campaigns are listed in Table 1.[21]

Table 1. Qualities of an Effective Road Safety Campaign

Quality	Explanation, Additional Information
1. Identifies target group.	The effects of campaigns targeting a single group are estimated to mean accident reduction that is 50 percent stronger than campaigns that do not specify a target group.
2. Uses personal communication (lessons or seminars delivered in person, two-way discussions with a teacher, peer, safety expert or distributor of campaign media, group discussions, or personally addressed letters) that provide "intimacy" of delivery.	Benefit may be due to more effective processing of the campaign message by the target audience. Road safety campaigns that use only mass media tend to be the least effective types of campaigns.
3. Uses roadside delivery of a message (roadside billboards and both variable and fixed roadside message signs) that provides "immediacy" of delivery. Roadside posters or posters mounted on public transportation (e.g., buses) may also be used.	Beneficial effect of roadside delivery supported by driving behavior theories that emphasize the importance of situational influences on driving behavior. The delivery of a persuasive message at the roadside can create cues that activate desirable attitudes within the immediate context of the target behavior. When attitudes are made accessible in a context-relevant way, the correspondence between attitudes and behavior is increased, thus increasing campaign effectiveness. It is unclear whether it is active feedback or simple delivery of a message in a driving context that is important.
4. Uses emotional and rational content in an appeal.	Rational appeal only is considered ineffective. (Too few campaigns use emotional appeal to make a determination on its effectiveness.)
5. Addresses the social norm.	Address the subjective social norm by conveying to the target individual the accepted, tacit rules valued by others. For example, a road safety campaign that addresses social norms may attempt to convey to male youths that attractive girls find speeding a turn-off.
6. Benefits from accompanying enforcement.	Enforcement activity by the police to highlight the saliency of punitive risks has been effective in reducing the number of accidents.[20] In large-scale campaigns, it is possible that enforcement provides a channel of "immediacy" for mass-media messages delivered in less immediate ways.
7. Tries to persuade by highlighting the risk involved in unsafe behavior.	Though addressing risk is beneficial, it can be more beneficial if the risk of detection by police is addressed, rather than risk of harm to self or others.

2.3 Comparison of Classroom and Web-based Training

Computer and Web-based methods of instruction have become more prevalent as technology has improved. There are distinct advantages to making training and educational programs available through electronic media. However, the impact of switching from classroom-style training to Web- or computer-based instruction continues to be studied. The advantages of Web-based instruction include reduced travel and overall costs. Although computer or Web-based training may have higher development costs, over the lifespan of the training savings are expected to be realized through reduced participant travel, instructor fees, space requirements, and material production. Web-based training courses also have increased accessibility for students.[22] They can access the course materials at any time and from any location with Internet access. The computer or Web-based instruction environment may also be viewed as less threatening and more accommodating to participants. They may feel less intimidated by teachers or other students and feel free to learn at their own pace. Trainees are given control over what they feel they need to learn and how long they need to study the subject matter. Because all users of a Web-based training module receive the same information in the same format, the message is always consistent and would not reflect any biases or omissions that may occur in the classroom.[23,24]

The advantages of Web-based instruction are balanced by some limitations. Unreliable technology can result in frustrations for users and a failure to reach the intended audience. Technological limitations may arise from small viewing areas, slow frame refresh speed, and delays in responsiveness due to high traffic loads.[22,24] The opportunity for interaction and feedback is also limited or absent with a Web-based training module.[23] The computer-based interface is not a replacement for an instructor who can respond to questions and motivate a class using verbal and nonverbal strategies.[24]

Whether Web-based instruction results in improved learning is still debated. Some studies suggest Web-based instruction shows an improvement over conventional classroom instruction, with it being most appropriate for critical messages that target many people.[23] Other studies, including one meta-analysis, suggest that the effectiveness of training is a function of the delivery method and the training subject matter. According to those studies, trainees learned the same amount (in the classroom or using a computer) when the same delivery method was used.[25]

3. Analysis

The main objective of this research is to analyze the effectiveness of the ProDriver Challenge training program in improving safety at highway-rail grade crossings for commercial drivers. The ultimate success of this training program will be demonstrated if it vastly increases the number of drivers completing the training and there is a measureable drop in truck-train collision and/or commercial driver violations at highway-rail grade crossings.

The evaluation of the ProDriver Challenge included describing the program and OLI's traditional presentation program through logic models and then analyzing the available data from Federal sources and from OLI. Since the e-Learning training program had been available for less than 2 years at the time of this research, changes in safety data were not observable. But, the analyses provide information on the professional driver activity at highway-rail grade crossings, program reach, and user experience.

3.1 Operation Lifesaver Logic Models

A logic model is a tool to describe the program or study and the relationship between the resources, activities, and benefits. The key components of a logic model are the inputs (resources, investments), outputs (activities, participants), and outcomes (short, medium and long term results). A logic model can help determine how to assess the program impact.

The first step in evaluating OLI's ProDriver Challenge is to create a logic model to understand the program and view it from a systems perspective. Because the evaluation also includes a comparison of the ProDriver Challenge and OLI's traditional classroom training, the team also developed a logic model for the presentation model.

Figure 2 is the logic model for the ProDriver Challenge. Figure 3 is the logic model for the OLI Presentation Model. Each of the logic models identifies what it takes to execute the program successfully and the intended goals, as well as a means to measure progress. Logic models are useful in formulating the evaluation plan; however, they are not a standalone method for evaluating the impacts of a program. They can be used to decide which strategy of evaluation is most appropriate and ensure that the correct information and data are collected.

Inputs	Outputs		Outcomes -- Impact		
	Activities	*Participation*	*Short*	*Medium*	*Long*
Financial Investment Marketing materials and effort Time Host server Software design	Develop and host web version of OL professional driver training Incorporate e-learn into their learning management systems Improve and expand OL program • Collect feedback • Develop new and relevant messages and delivery methods Publicize (advertise) the e-learning module	Drivers • Individuals • New/Young • Professionals Public/Community Carriers Trucking associations Carriers Trucking associations Training managers Professional drivers Operation Lifesaver Volunteers Partners Funders Operation Lifesaver Volunteers Partners Funders	Gain awareness and knowledge about dangers of grade crossings • Identify or practice safe crossing behavior Implement a less expensive form of training • Relative cost between e-learn and traditional training is less Expose more professional drivers to OL than current presentations Companies buy into the grade crossing safety message • Increase in companies that include module in LMS Identify and define improvement areas and best practices Increase awareness of OL • e-learn site receives more hits • Increase in requests for more information	Change behaviors at grade crossings (increased compliance) • Fewer warning device violations Less burden on OL resources and volunteers • OL/volunteers don't make decisions about who receives training More professional drivers are receiving the grade crossing safety message Driver awareness of the value employer places on grade crossing safety Refine the program	Reduces accident risk at grade crossings • Fewer accidents, incidents, fatalities Achieve an optimal use of OL resources • Efficient use of limited funds and volunteer time Safer professional drivers at grade crossings OL message is a formal part of training for professional drivers Nationwide reach with consistent message

Figure 2: Logic Model for OLI ProDriver Challenge

Inputs	Outputs		Outcomes -- Impact		
	Activities	*Participation*	*Short*	*Medium*	*Long*
Volunteers Funding Classroom materials Room space Time Partners	Advocate safety at railroad crossings • Inform/educate • Provide guidance on behavior Promotes company/ organization value of crossing safety • Encourage companywide training or incorporation into learning management system Improve and expand the Operation Lifesaver program • Collect feedback • Develop new and relevant messages and delivery methods	Drivers • Individuals • New/Young • Professionals School children Public/Community Railroads Carriers Trucking organizations Schools Community Railroads Training managers Operation Lifesaver Volunteers Partners Funders	Gain awareness and knowledge about dangers of grade crossings • Identify or practice safe crossing behavior Gain awareness and knowledge about dangers of grade crossings • Additional interest in OL activities Identify and define improvement areas and best practices	Change behaviors at grade crossings (increased compliance) • Fewer warning device violations Behavior change leads to safer drivers, fewer citations • Increase in attendance at presentations Refine the program	Reduces accident risk at grade crossings • Fewer accidents, incidents, fatalities OL is core part of CMV safety training • OL part of mandatory curriculum Nationwide reach with consistent message

Figure 3: Logic Model for OLI Presentation Training

3.2 Highway-Rail Grade Crossing Violation and Accident Data

Violation and accident data, specifically past information about driver behavior, can be helpful in determining the effectiveness of a particular public education and outreach evaluation strategy. This data can be used with a before-after study. A before-after study typically involves collecting data before the treatment (pre-test) and then again after the treatment (post-test). Any difference in the results between the two groups is attributed to the intervention.

By focusing the data collection for this study on commercial motor vehicle violations and accidents at highway-rail grade crossings, the change in behavior for this particular group of drivers can be observed. The ProDriver Challenge is specifically designed for drivers with a commercial driver's license; inferences can be made about the effectiveness of the program by analyzing the accident and violation data along with information collected on the ProDriver Challenge.

FRA collects accident/incident data at highway-rail grade crossings and this data can be queried by the type of vehicle involved. FMCSA collects violation data for commercial motor vehicles, including a subset of violations that relate to actions at highway-rail grade crossings.

3.2.1 FRA Railroad Accident/Incident Reporting System

The FRA Railroad Accident/Incident Reporting System (RAIRS) database was used for the analysis of commercial vehicle incidents at highway-rail grade crossings. To identify commercial vehicle incidents, the research team used incidents involving vehicles that usually require a commercial driver's license (CDL) to operate: a truck, truck-trailer, bus, or school bus.

The yearly Highway Statistics Series[26] published by the FHWA Office of Highway Policy Information was used to obtain vehicle miles travelled (VMT). Highway Statistics 2012 was not available as of May 2013; therefore, it was estimated by adding the slope value of the 2008 to 2011 VMT trend line to 2011.

The research team analyzed the incidents at highway-rail grade crossings over the 5-year period from 2008 to 2012. During this period, there were a total of 10,436 incidents. Approximately 22.3 percent, or 2,327 of the incidents, involved commercial vehicles. Figure 4 shows the percent of VMT and the number of incidents for commercial and noncommercial vehicles. The figure below shows that over the 5-year period, the proportion of VMT attributed to commercial vehicles decreased slightly from 10.9 percent in 2008 to 9.1 percent in 2012. However, the proportion of grade crossing incidents involving commercial vehicles increased from 21.1 percent in 2008 to 24.7 percent in 2012.

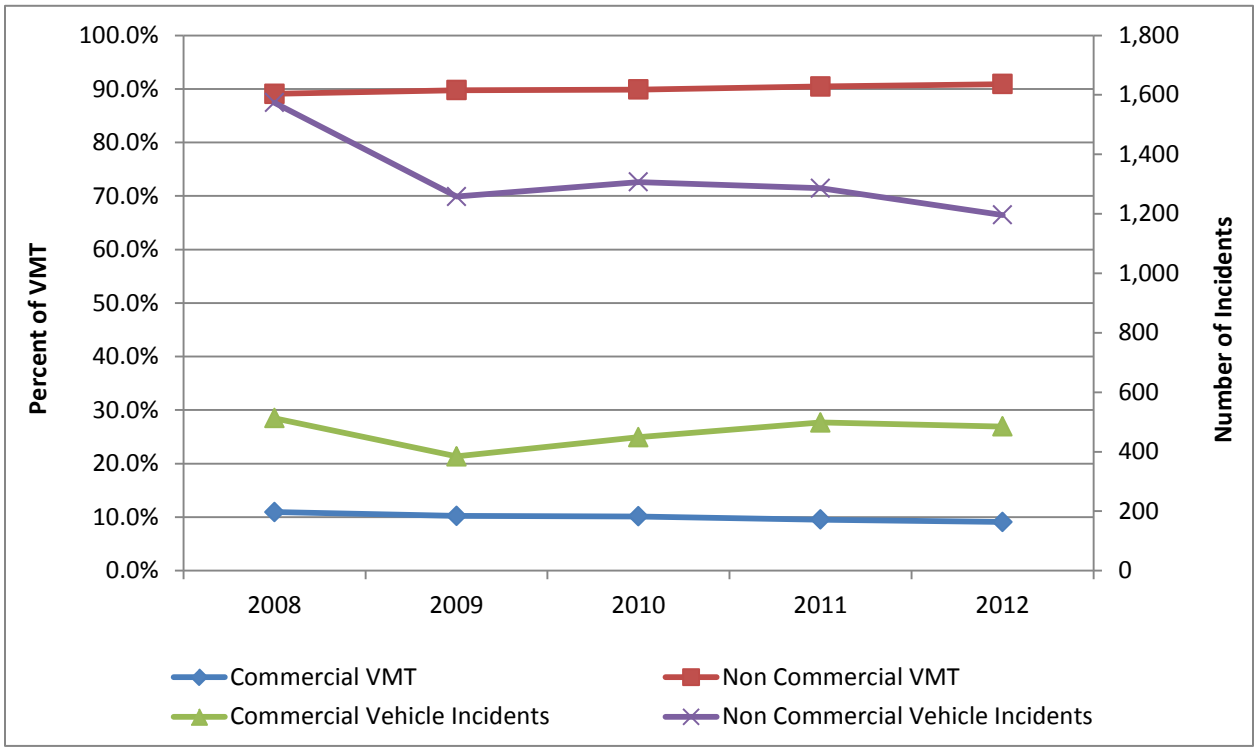

Figure 4: Percent of VMT and Number of Grade Crossing Incidents for Commercial versus Noncommercial Vehicles

Figure 5 shows the grade crossing incident rate per billion VMT for commercial, noncommercial, and all motor vehicles. As can be seen from the figure, commercial vehicles had the highest rate of grade crossing incidents per VMT and the incident rate increased over the 5-year period. The grade crossing incident rate for commercial vehicles increased by 15.1 percent, from 1.58 in 2008 to 1.81 in 2012. This is compared with a 24.6 percent decrease in the noncommercial vehicle incident rate.

The result of the commercial vehicle incident analysis from 2008 through 2012 shows that commercial vehicles are involved in a larger percentage of incidents than noncommercial vehicles, based on VMT. The overall incident rate decreased slightly, but the commercial vehicle incident rate increased during the study period. With the limited funding available to improve safety at highway-grade crossings, focusing on commercial driver safety at highway-rail grade crossings could provide a substantial return on investment.

The research team also looked at commercial vehicle grade crossing incidents by State for the same time period, from 2008 to 2012. Figure 6 shows the distribution of commercial vehicle incidents by State. As can be seen from the map, Alaska, District of Columbia, Hawaii, and Rhode Island did not have any incidents at highway-rail grade crossings involving commercial motor vehicles. States with the highest number of grade crossing incidents involving commercial motor vehicles over the 5 years were Texas (316), Louisiana (134), Georgia (128), Illinois (114), and California (114). Appendix A includes a complete list of the States and the reported number

of commercial vehicle incidents, commercial driver highway-rail grade crossing violations, and ProDriver Challenge users.

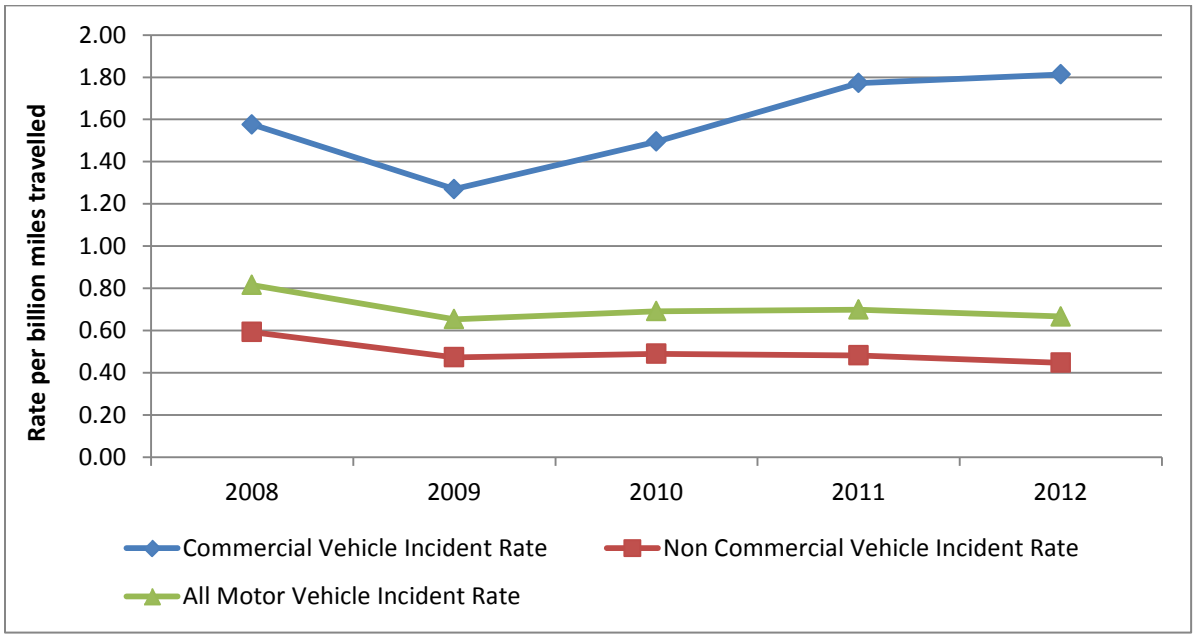

Figure 5: Grade Crossing Incident Rate per Billion VMT for Commercial, Noncommercial, and All Motor Vehicles

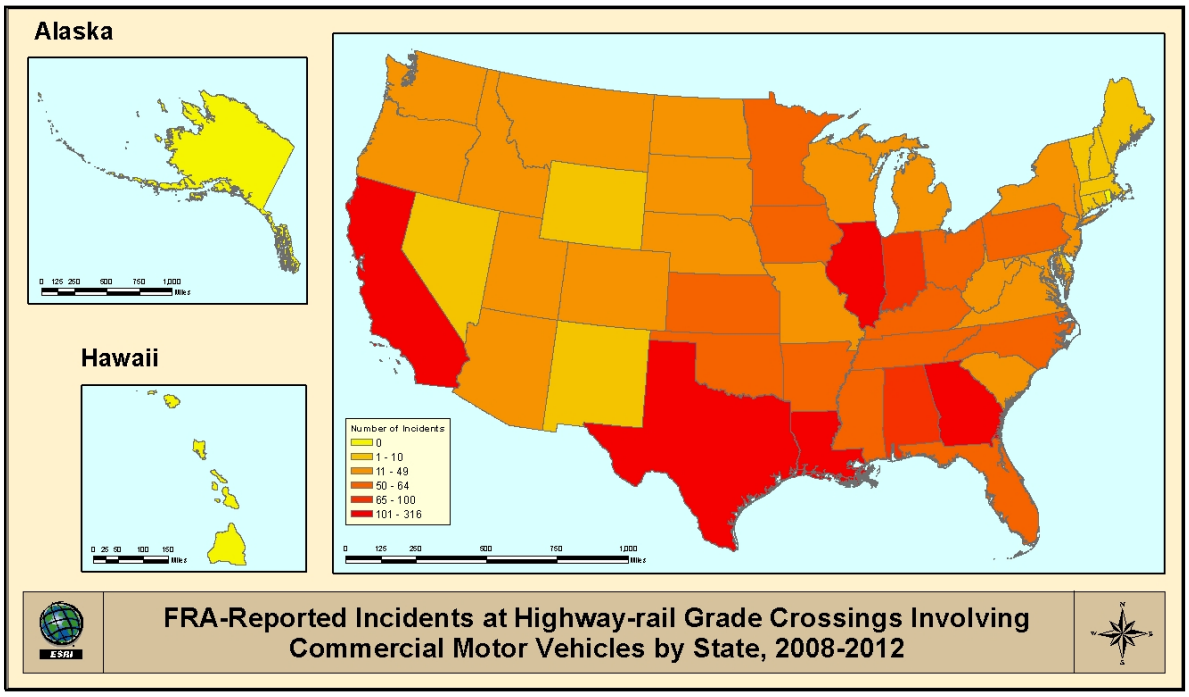

Figure 6: FRA-Reported Incidents at Highway-rail Grade Crossings Involving Commercial Motor Vehicles by State, 2008-2012

3.2.2 FMCSA Motor Carrier Management Information System

Title 69 Code of Federal Regulations (CFR) 392.10 requires the driver of specified commercial motor vehicles to stop at a grade crossing and look in both directions for an approaching train before crossing the railroad tracks. Commercial drivers that fail to obey the regulation can be cited with a violation of the Federal Motor Carrier Safety Regulations. Data on commercial drivers failing to stop at railroad grade crossings are stored in the FMCSA Motor Carrier Management Information Systems (MCMIS) database and are available through FMCSA's Analysis and Information Online Web site (www.ai.fmcsa.dot.gov). The database contains information about the number of violations for each year by following type:

- 392.10A1 -- Failing to stop at railroad grade (RR) crossing-bus
- 392.10A2 -- Failing to stop at (RR) crossing-chlorine
- 392.10A3 -- Failing to stop at (RR) crossing-placard
- 392.10A4 -- Failing to stop at (RR) crossing-HM cargo

The research team analyzed commercial driver violations at grade crossings for 2008 to 2012. During this period, there were a total of 1,947 citations issued to commercial drivers for failing to stop at highway-rail grade crossings. Of the 1,947 grade crossing violations issued, 41.2 percent (803) were to drivers of commercial motor vehicles (CMV) with a hazardous material placard; 37.4 percent (729) were to drivers of CMVs carrying hazardous materials cargo; 19.7 percent (384) were to bus drivers; and 1.6 percent (31) were to drivers of CMVs carrying chlorine. Figure 7 shows the number of FMCSA-reported violations by year and type.

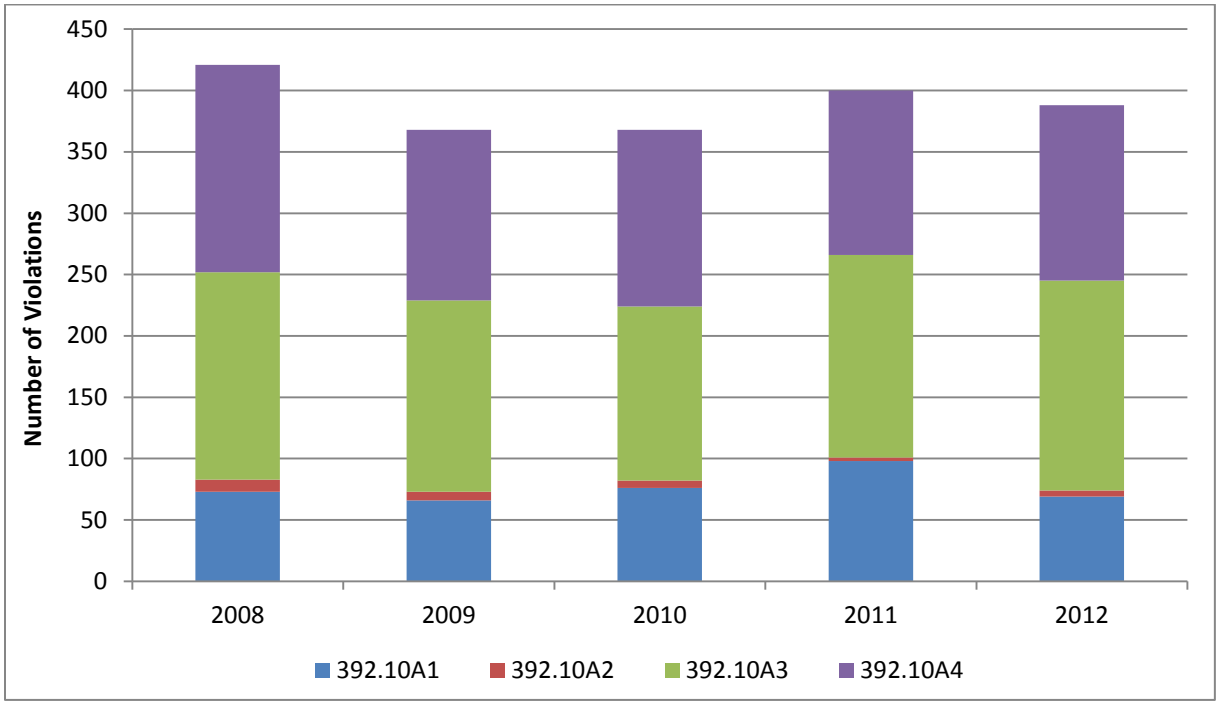

Figure 7: FMCSA-Reported Commercial Driver Violation at Grade Crossings

Figure 8 shows the distribution of FMCSA-reported commercial driver violations at highway-rail grade crossings by State for the years 2008 to 2012. As can be seen from the map, Hawaii and Delaware did not have any grade crossing violations issued to commercial drivers. Texas (316), Florida (198), and Washington (190) had the highest number of citations issued for grade crossing violations.

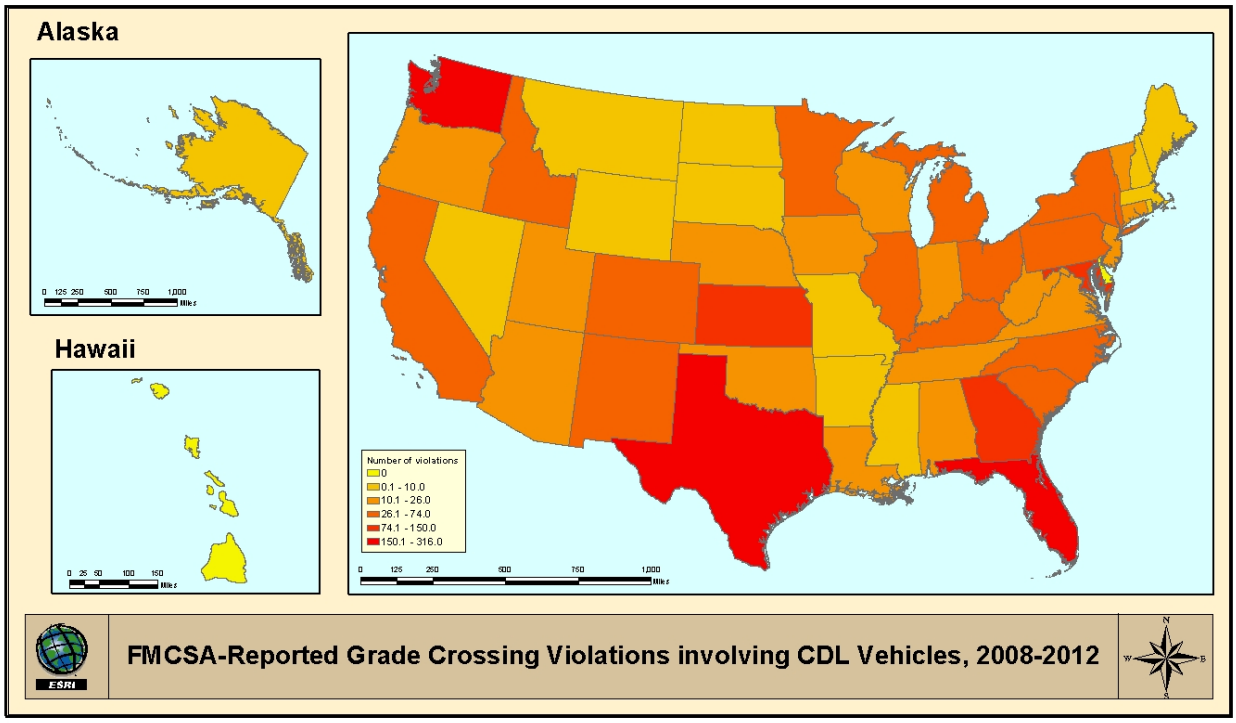

Figure 8: FMCSA-Reported Grade Crossing Violations Involving CDL Vehicles, 2008–2012

3.3 ProDriver Challenge Data

Participants who accessed the e-Learning training program were surveyed twice, once before starting the training and again after the conclusion of the training. The survey questions at the start of the training include the four questions listed below. The system automatically captures the date and time that participants access the training program. Appendix B provides response options for each question.

1. *Are you a CDL truck driver?*
2. *What is your age range?*
3. *What is your home zip code?*
4. *How did you find out about the Railroad Safety for Professional Drivers e-Learning tool?*

In August 2012, the Volpe Center team made a verbal request to Wendy Corcoran, Vice President of OLI, for the survey results of the e-Learning training program. In September 2012, OLI forwarded the e-Learning survey results for the period from June 2011 to August 2012 (Data Set I). In March 2013, the Volpe Center made a second request for the latest e-Learning survey results data. The second data set was received on March 2013 and it covered the period from June 2011 through February 2013 (Data Set II). Data Set II was missing one data element that shows the number of interactive trips that trainees have completed and therefore Data Set I was used for the analysis of that data element. Data Set II was used to analyze the e-Learning training program reach and the safety message effectiveness.

3.3.1 Program reach

During the 21-month period from June 2011 to February 2013, there were a total of 11,469 individuals who accessed the ProDriver Challenge e-Learning module. Figure 9 shows the distribution of the 11,469 participants by type of driver. Out of a possible 11,469 records, approximately 58.9 percent (6,751) identified themselves as noncommercial drivers, 41.0 percent (4,707) identified themselves as CDL truck drivers, and 0.1 percent (11) left the type of driver option blank.

The participants were asked to provide their home zip code at the start of the training. The results of the survey data received from OLI were in Microsoft Excel format and the zip codes were stored as numbers. Any zip codes with leading zeros were truncated; so, the team made the assumption that any numbers with less than five digits began with zero. The zip codes entered by participants were cross-referenced with a registry of official U.S. zip codes to determine their validity. The lists of U.S. zip codes were obtained from http://www.unitedstateszipcodes.org/.

Of the 11,469 participants, 88.5 percent, or 10,150 participants, entered valid U.S zip codes; 11.4 percent (1,306) provided invalid U.S zip codes; and 0.1 percent (13) left the zip code field blank. Some of the invalid zip codes contained names of other countries and some appeared to be zip codes of other countries. Figure 10 provides the distribution of training participants by type of driver and valid zip code.

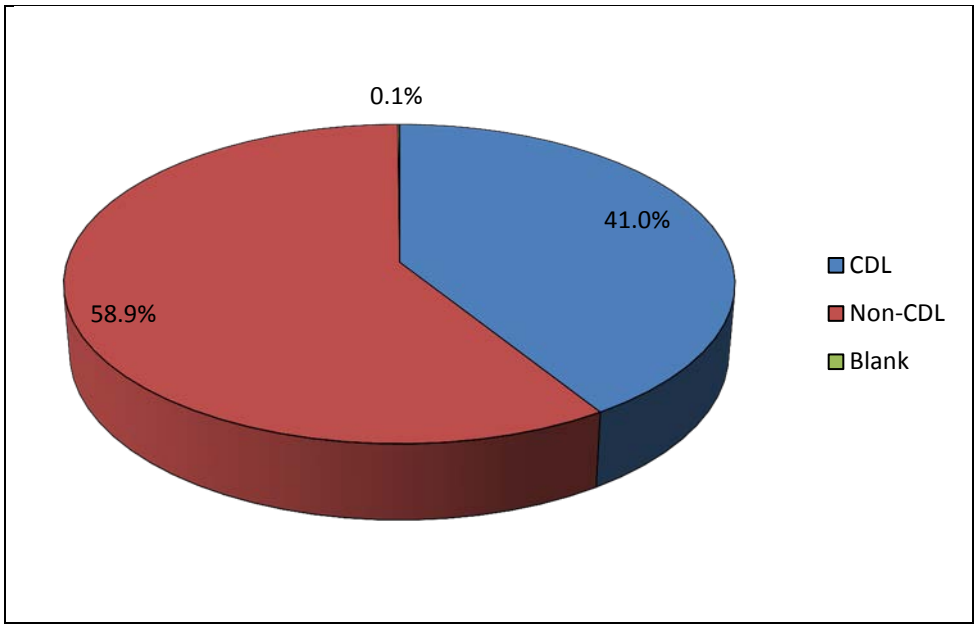

Figure 9: Distribution of ProDriver Challenge Trainees by Driver Type

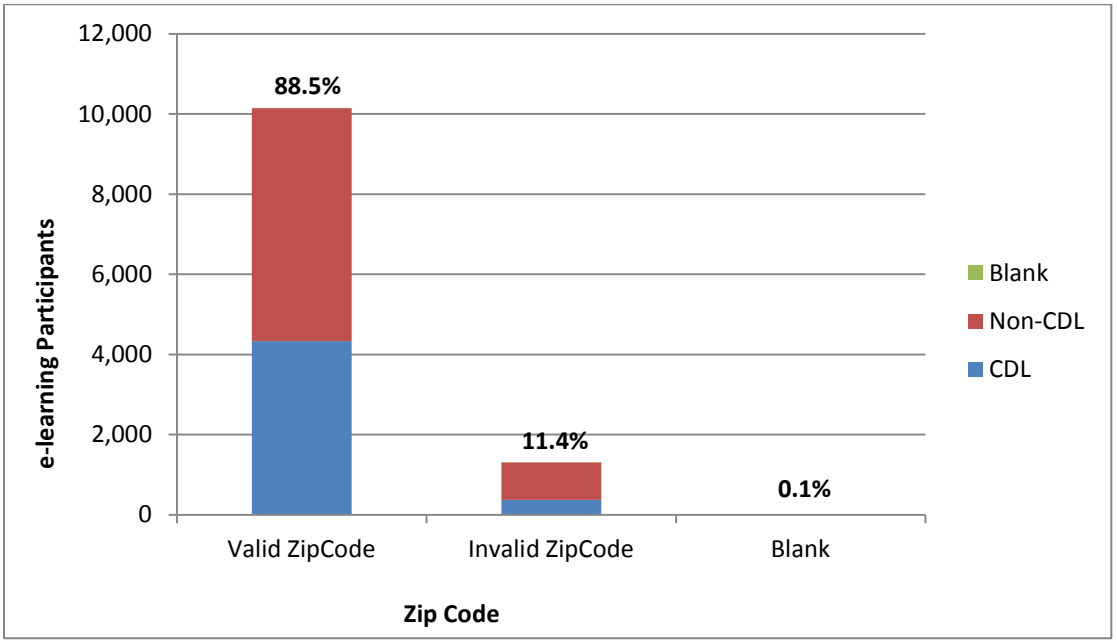

Figure 10: ProDriver Challenge e-Learning Trainees Zip Code

The team extrapolated the trainees' State information from the zip codes. Figure 11 shows the distribution by State of trainees that participated in the ProDriver Challenge. As can be seen from the map, all fifty States had at least six trainees that accessed the program. Florida (749), California (732), Texas (685), Pennsylvania (561), and Minnesota (486) had the highest number of trainees. Figure 12 illustrates the distribution of CDL trainees by State. The number of trainees ranged from 2 for Hawaii to 347 for Texas.

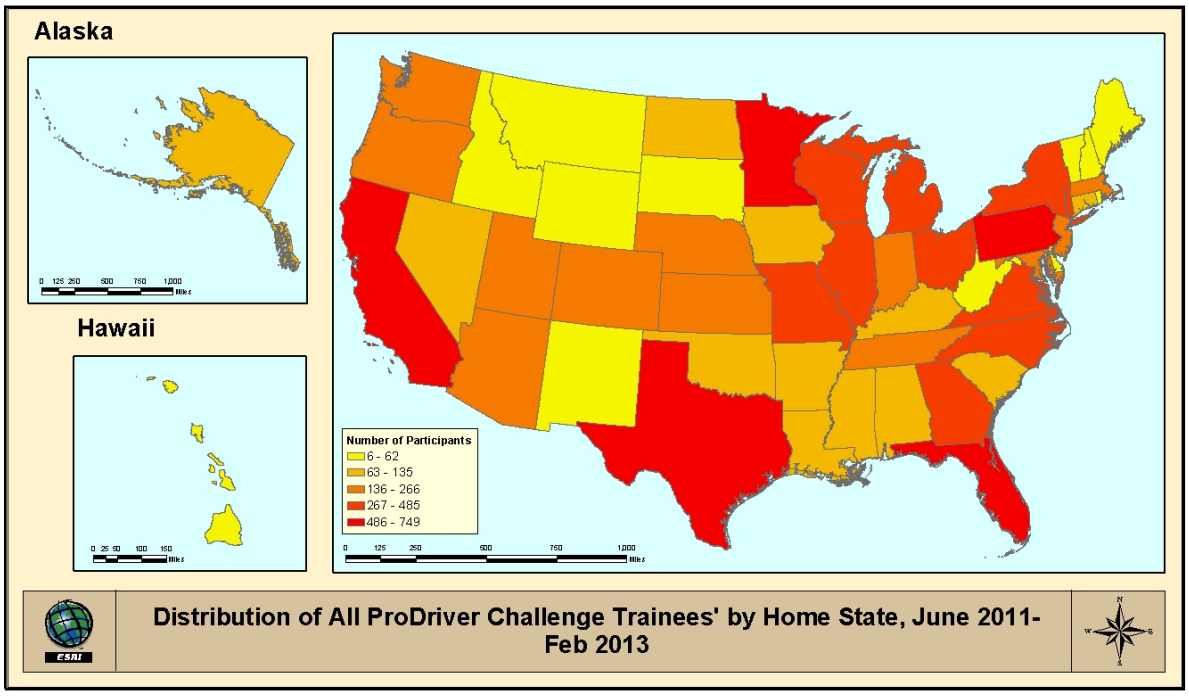

Figure 11: Distribution of All ProDriver Challenge Trainees by Home State, June 2011–Feb 2013

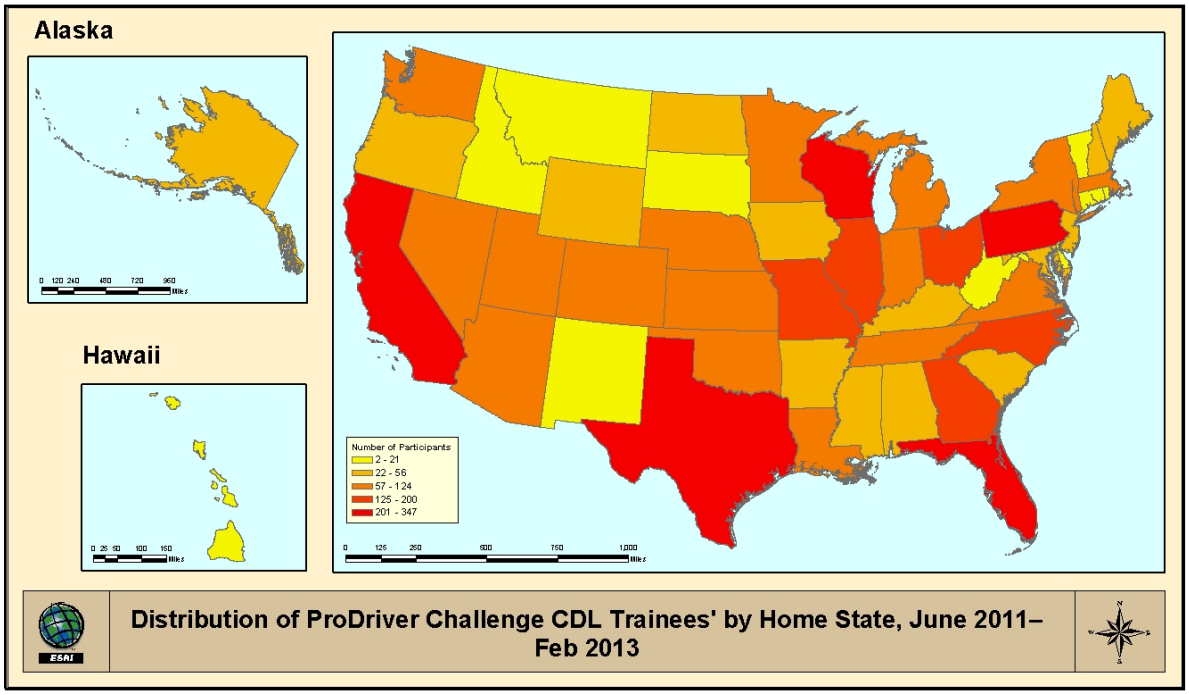

Figure 12: Distribution of ProDriver Challenge CDL Trainees by Home State, June 2011–Feb 2013

Age was another data element collected before the participants began the ProDriver Challenge training. The age-range drop down menu contains the age ranges 18 to 30, 31 to 40, 41 to 50, 51 to 60, and greater than 60. Figure 13 shows the breakdown of participants by age group and driver type. As can be seen from the chart, the age range from 41 to 50 years old had the most overall participants at 26.7 percent (3,063), as well as the most commercial driver participants at 29.5 percent (1,388).

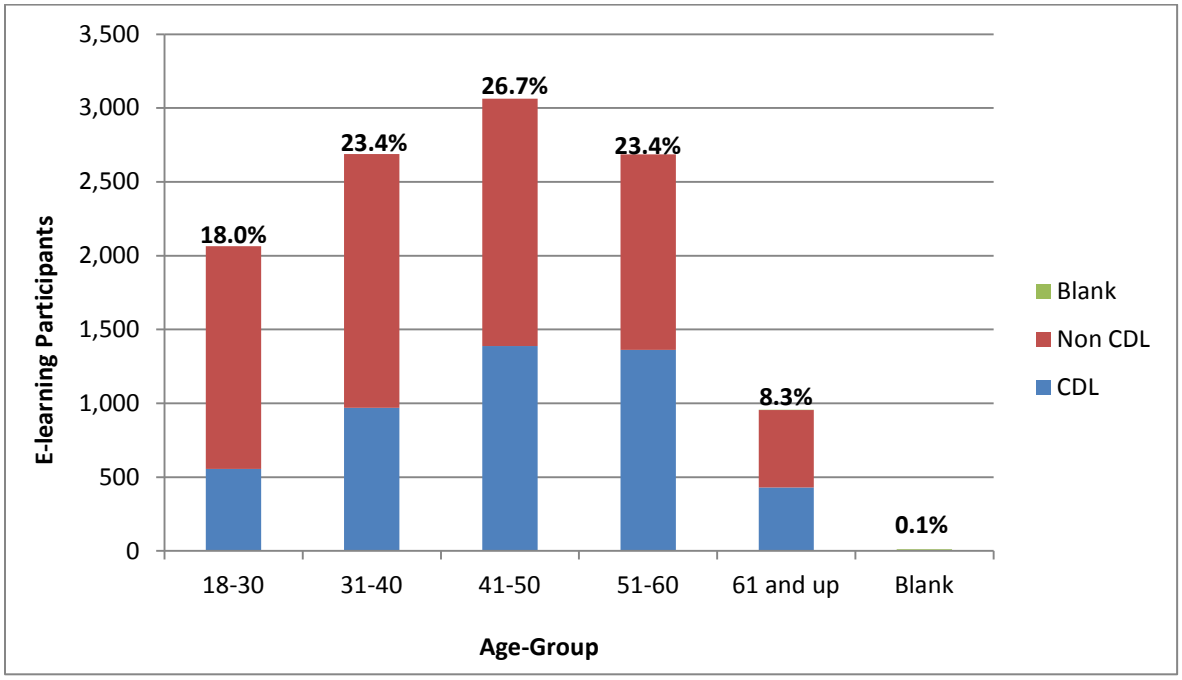

Figure 13: Distribution of ProDriver e-Learning Trainees by Age-Group

The ProDriver Challenge training module also captures the date and time that a participant accesses the system. Figure 14 shows the distribution of the 11,469 participants by month and driver type. The chart shows that August 2011 had the highest number of training participants. This spike correlates with a USA Today article[27] that was published on August 12, 2011, highlighting OLI's ProDriver Challenge (This date is represented with a red triangle on the graph.). Since then, the numbers of participants that accessed the module each month have declined. From February 2012 to February 2013 the ProDriver Challenge averaged approximately 122 CDL participants and 204 NonCDL participants per month. The graph also shows two major awards that the program received. The date of the Davey Gold award is represented with a red square and the date of the Brandon Hall award is represented with a red circle on the graph.

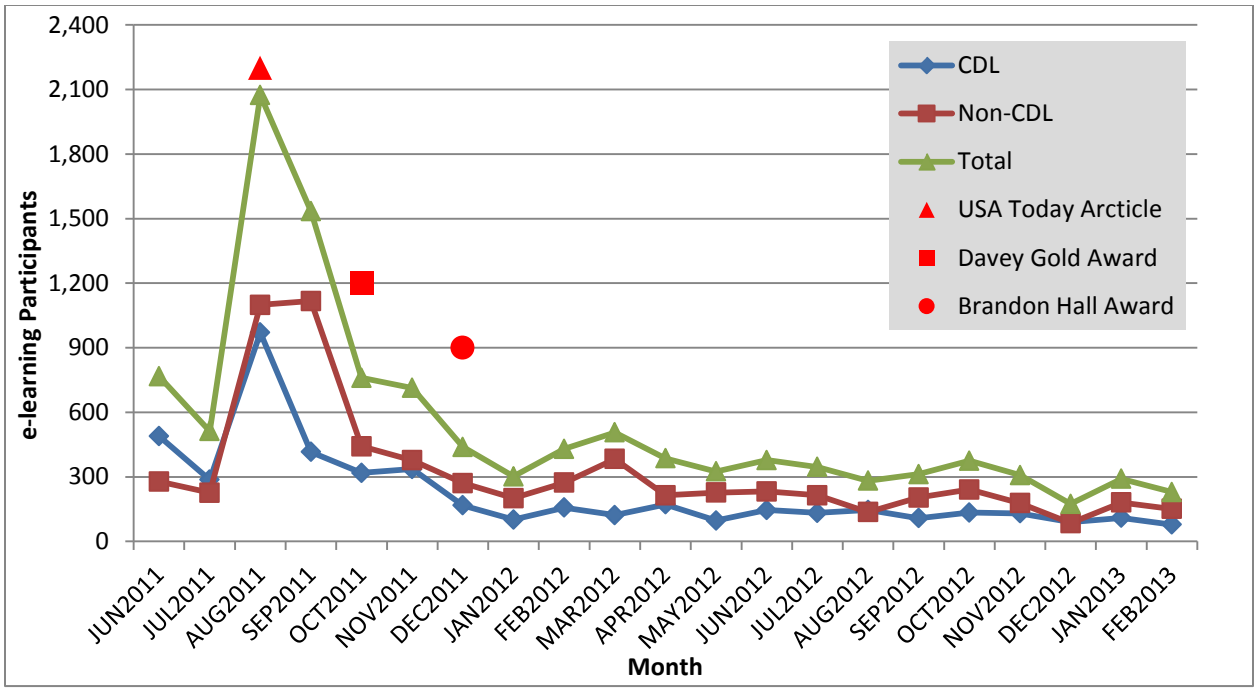

Figure 14: ProDriver Challenge e-Learning Trainee Participants by Month

Another question asked at the beginning of the training module is how the participants found out about the ProDriver Challenge. The participants selected the answer from a dropdown list. Figure 15 illustrates how the trainees found out about the training. The horizontal axis of the Figure 15 lists the possible answers from which a trainee can choose. Most participants indicated that they found out about the training through some other means not listed as an option. No additional field was provided for trainees to identify the "Other" category.

One of the response options, "Operation Lifesaver or FRA Web site," is not available in the latest version of the ProDriver Challenge; but, it was in the survey results that OLI provided to Volpe. This option was only available for selection at the beginning of the study period in June 2011.

As previously discussed, the training module consists of three different trips. The system captures number of trips that a trainee completes. Data Set I was used for this analysis because Data Set II did not contain information about number of trips completed. Data Set I covered June 2011 through August 2012. During this period, 9,763 trainees accessed the ProDriver Challenge. Of the 9,763 trainees, 75.7 percent did not complete any trips and 24.3 percent completed at least one trip (9.4 percent completed only one trip, 5.8 percent completed only two trips, and 9.1 percent completed all three trips).

When analyzed by driver type, the data shows that 26.1 percent of CDL drivers completed at least one trip compared with 23 percent of nonCDL drivers. Figure 16 shows the distribution of trainees by number of trips completed and type of driver. As can be seen from the chart, 11.5 percent of CDL drivers completed all three trips compared with 7.4 percent for nonCDL drivers.

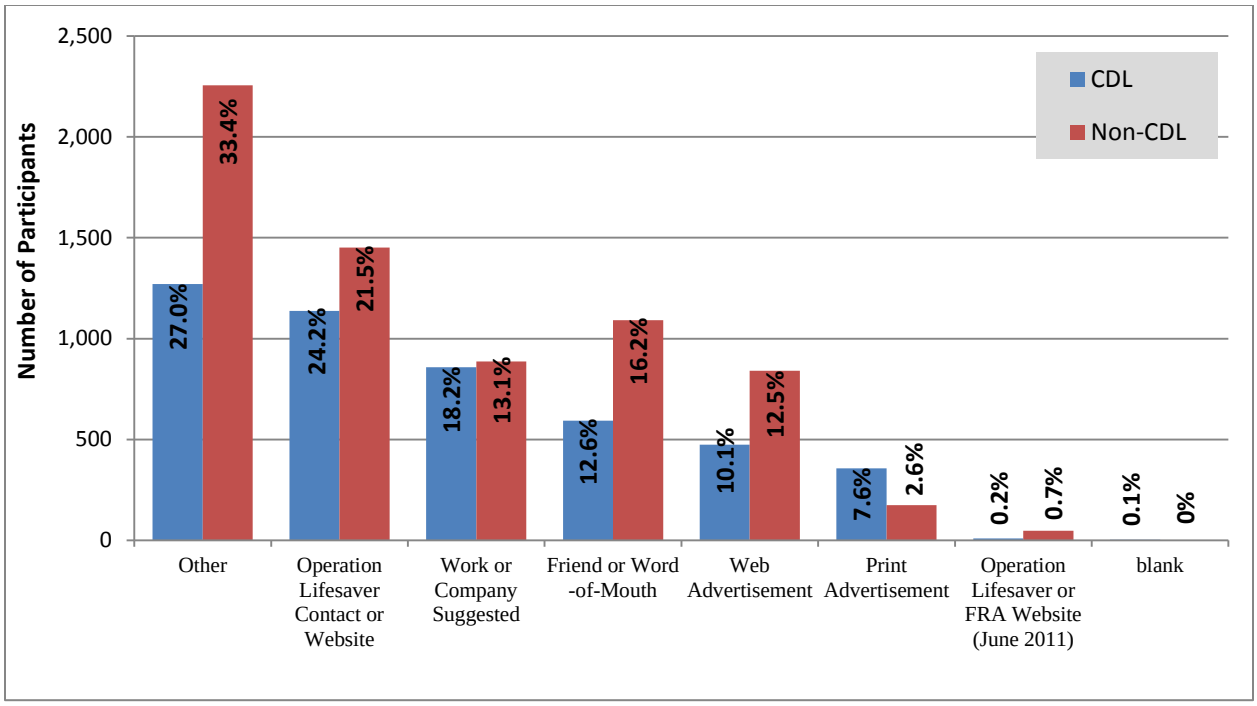

Figure 15: How Trainees found out about the ProDriver Challenge e-Learning Program

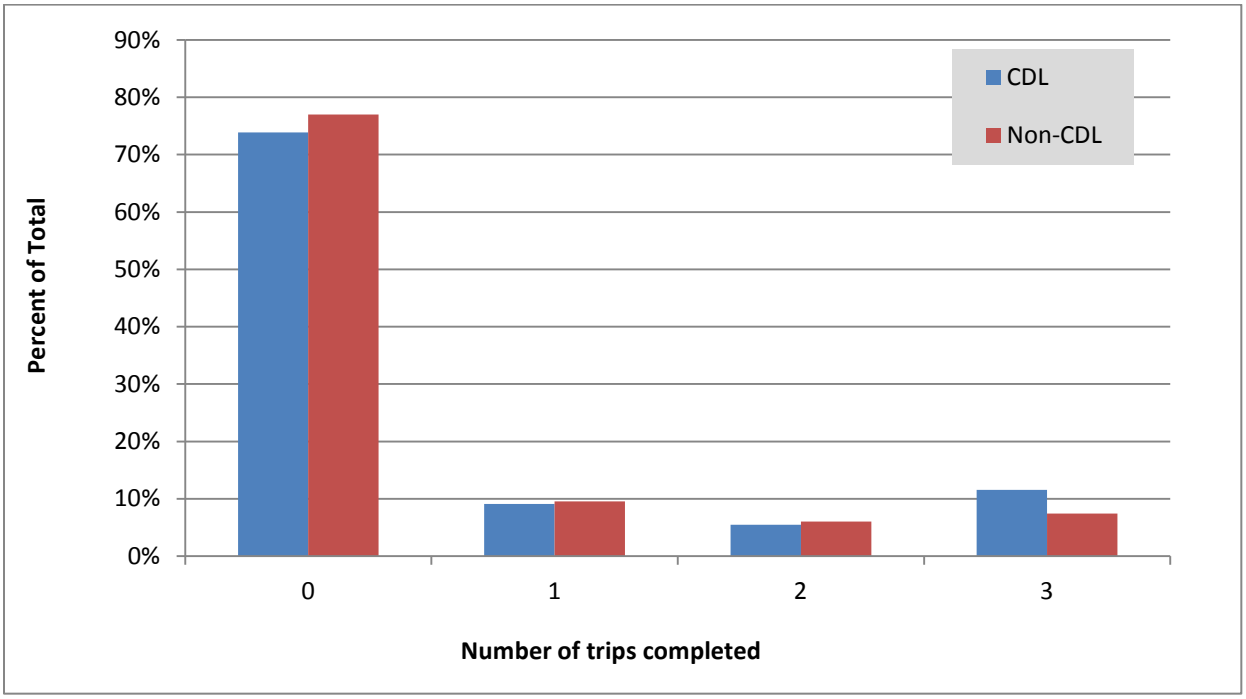

Figure 16: Distribution of Trainees by Number of Trips Completed and Driver Type

Figure 17 shows the distribution of CDL trainees by number of trips completed and age-group. As can be seen from the chart, younger CDL drivers completed at least one interactive trip

slightly more often than older CDL drivers. But, younger CDL drivers (18–30 and 31–40) were more than twice as likely to complete all three trips compared with older CDL drivers (61 and up).

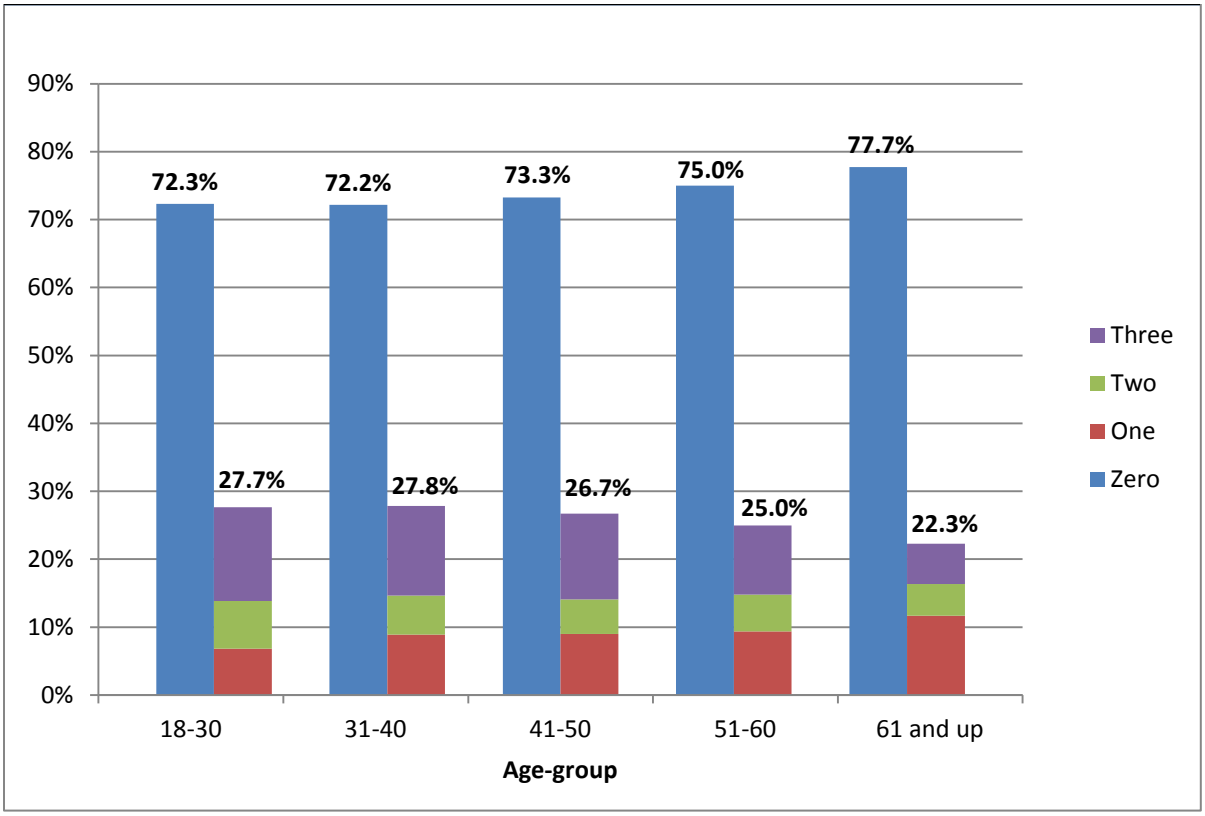

Figure 17: Distribution of CDL Trainees by Number of Trips Completed and Age-Group

3.3.2 Completion Survey Responses

This section presents the results of the survey questions that trainees took after completion of the training. The trainees were offered an optional three questions after completing all three trips to assess their view of the training. The participants were asked to rate the each of three statements listed below as Strongly Agree, Agree, or Strongly Disagree.

1. *After completing this program, I now have a better understanding of safe operation at highway-rail grade crossings.*
2. *The words used to describe the e-learning trips were ones familiar to professional truck drivers.*
3. *Overall, I am very satisfied with the Operation Lifesaver e-learning program and would recommend it to other professional truck drivers.*

Out of a possible 11,469 trainees that accessed the ProDriver Challenge, only 394, or 3.4 percent, participated in the post training survey. Of the 394 trainees that participated in the survey, 57.9

percent of the trainees identified themselves as CDL drivers compared with 42.1 percent nonCDL drivers. Figure 18 illustrates the distribution of the trainees that participated in the survey by type of driver.

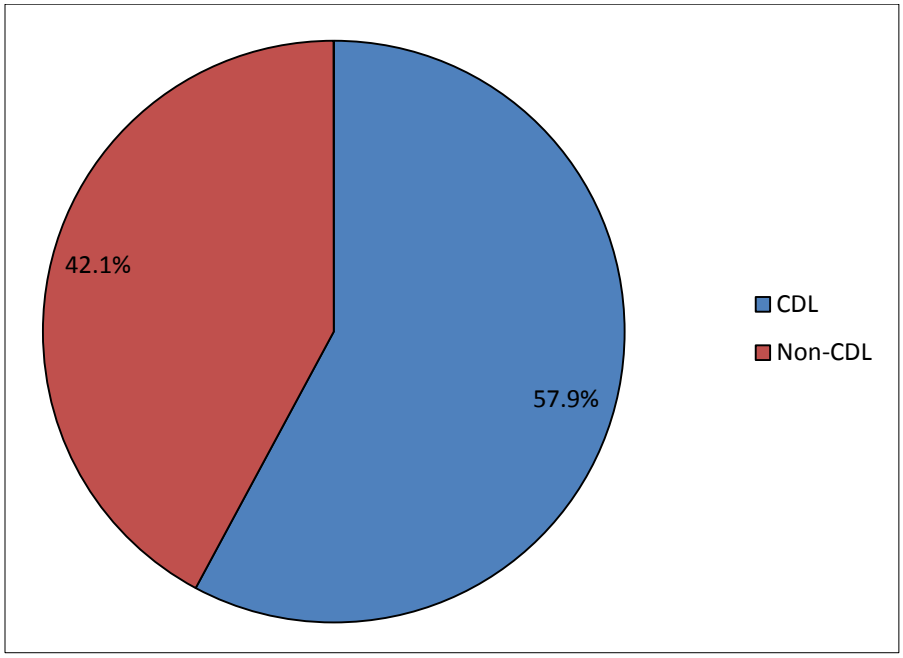

Figure 18: Distribution of Trainees that Participated in Survey by Driver Type

Have a Better Understanding

When asked if the trainees had a better understanding of safe operation at highway-rail grade crossings after completing the training, the majority of participants (64.2 percent) strongly agreed with the statement, 33.5 percent agreed, and 2.3 percent strongly disagreed.

When the responses from only CDL drivers were analyzed, the trend was similar to that of all drivers: 61.8 percent strongly agreed with the statement, 36.0 percent agreed, and 2.2 percent strongly disagreed. Figure 19 shows, by age-group, the CDL trainees' responses to the statement, "After completing this program, I now have a better understanding of safe operation at highway-rail grade crossings."

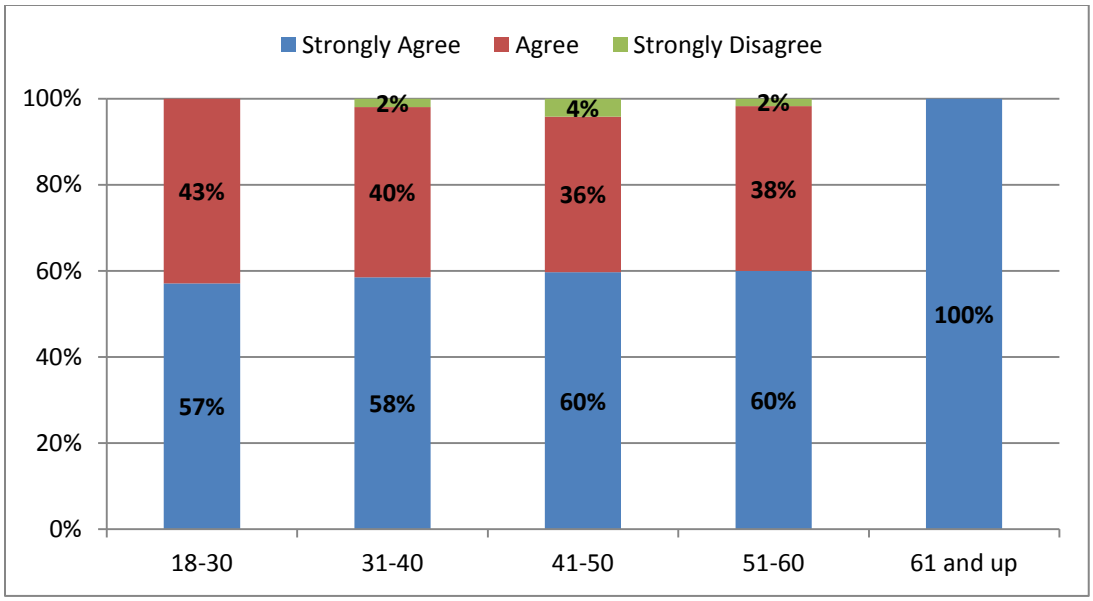

Figure 19: Distribution of CDL Trainees' Response to "Have Better Understanding" by Age-Group

Words were Familiar

Overall, participants' responses to the survey question about the familiarity of words used in the e-learning trips showed that 57.4 percent strongly agreed with the statement, 40.4 percent agreed, and 2.3 percent strongly disagreed. When analyzed for only CDL drivers, 60.5 percent strongly agreed, 37.7 percent agreed, and 1.8 percent strongly disagreed with the statement. Figure 20 shows the results of this survey questions by age-group. As can be seen from the chart, older drivers tended to strongly agree with it more often than younger drivers.

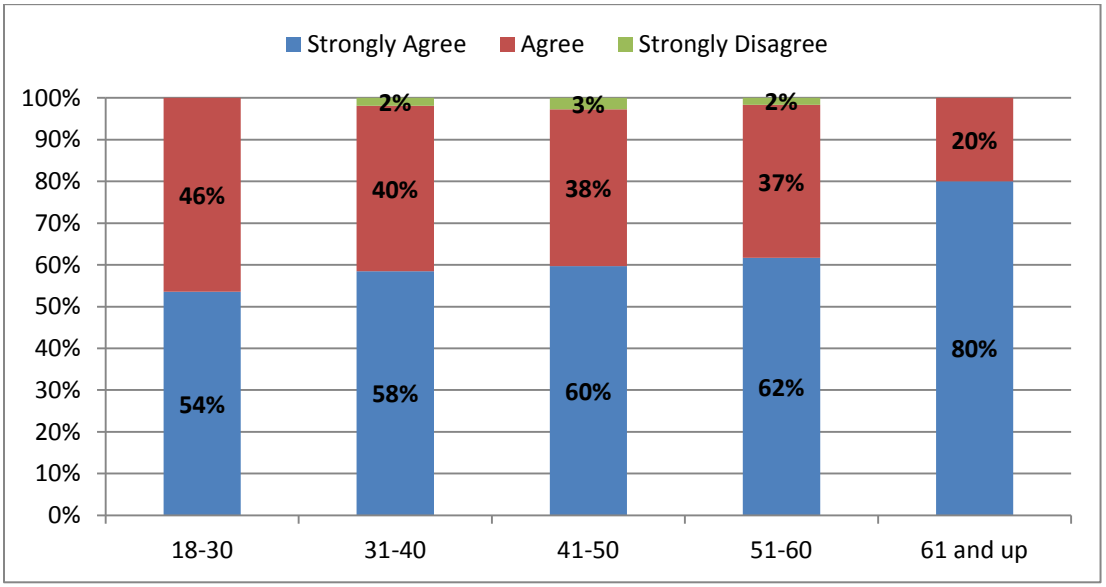

Figure 20: Distribution of CDL Trainees' Response to "Words were Familiar" by Age-Group

Satisfied with the Program and Would Recommend to Others

The last question of the survey addresses the trainees' satisfaction with the ProDriver Challenge and if they would recommend it to other professional drivers. The majority of the participants, 68 percent, strongly agreed with the statement, 28.4 percent agreed, and 3.6 percent strongly disagreed. When analyzed for only CDL drivers, 67.5 percent strongly agreed, 30.3 percent agreed, and 2.2 percent strongly disagreed. Figure 21 shows the results of this survey question by age-group. As with the other two survey questions, older drivers tended to strongly agree more often than younger drivers.

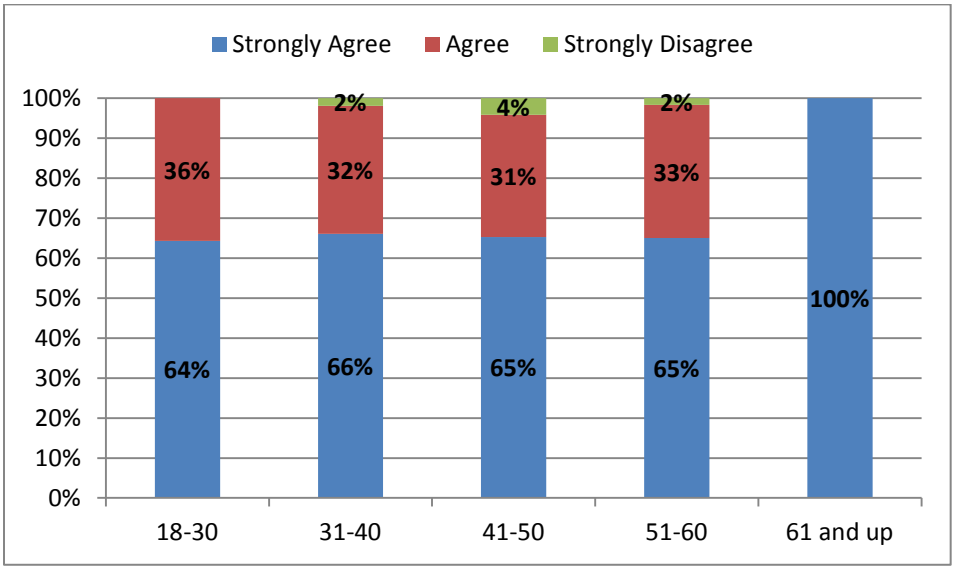

Figure 21: Distribution of CDL Trainees' Response to "Satisfied" by Age-Group

3.4 Comparison of OLI Presentation Model and e-Learning

As previously discussed, OLI has traditionally delivered its safety message through State programs, training, and special events nationwide. The commercial driver safety message has traditionally been delivered by OLI safety training through its volunteers' outreach to trucking associations, companies, and driving schools in all 50 States. The ProDriver Challenge offers another means of delivering the rail safety message to professional drivers. The advantages and drawbacks of both program implementations are discussed below.

3.4.1 Program Reach

In 2012, approximately 32,000 professional truck drivers representing approximately 1 percent of the targeted driver population were reached through 1,821 presentations delivered by OLI certified presenters.[28] Although OLI is moving away from the certified presenter model to a new volunteer education program over the course of 2013, there are several benefits to the presenter approach. One of the major benefits in terms of program reach is that OLI State coordinators and presenters can target specific audiences, which in this case are professional drivers, and therefore maximize their effectiveness. Additionally, the use of presenters is a community-based approach. This means the volunteers live and work in and around the communities they target and present OLI-approved materials to. Another benefit is the sense of "immediacy" and

"intimacy" in delivery due to the physical presence and interaction with a presenter.[21] One disadvantage specific to the truck driver target audience is the difficulty of reaching small or owner-operated trucking companies.

In comparison with the presenter model, the ProDriver Challenge reached fewer drivers, approximately 4,700 CDL drivers from June 2011 to February 2013. Although over the past year the ProDriver Challenge model had a smaller reach than the traditional method, it should be noted that this initiative was only recently launched and that OLI is still actively marketing the approach to large trucking companies for inclusion in their in-house safety training systems. A benefit to the ProDriver Challenge approach in terms of program reach is that the safety message can be delivered to anyone with Internet access at any location and any time. Unlike the traditional approach, it is not limited by physical resources. Additionally, the message can be easily translated into other languages. The Spanish translation is especially beneficial since the population of Spanish-speaking professional drivers is second to English-speakers. One disadvantage of the Web-based training is the difficulty of reaching certain segments of the target audience, particularly older drivers, who may not have Internet access or may have limited exposure to the technology.

3.4.2 Message Consistency

Operation Lifesaver has developed a "Presenter's Guide" that is used by the certified presenters during their outreach efforts. The guide provides all of the OLI-approved training materials, including visual aids and talking points, associated with the overall grade crossing and trespass prevention safety message. Presenters are directed to develop their own subset of materials from the 50 slides in their toolbox, with the requirement that they include a minimum of seven talking points and deliver an approximately 20-minute long presentation.

One of the benefits to this approach is the direct interaction between the trainer and the students, which may provide a more interactive training environment. However, this may only be the case for strong presenters. One disadvantage to this approach is that with certified presenters, the message comes from the presenter/individual person. This adds to the likelihood of liability issues and emphasizes differences in presentation quality, knowledge, and opinions of trainers and presenters. The message may be nonstandard because individual presenters may tailor materials to their own preferences, or highlight certain items of interest or importance to them, even though all presenters would still use OLI approved materials.

Operation Lifesaver aims to mitigate the nonstandard delivery and potential liability issues associated with the certified presenter model by replacing it with a volunteer model. With the new volunteer model, the safety message will be contained in the media (video, poster, and online content), and the volunteer will facilitate. This new volunteer model will be rolled out over the course of 2013.

Unlike the traditional delivery associated with certified presenters or volunteers, the e-Learning model allows delivery of a consistent message to each participant. This approach eliminates the human factor present in the other delivery models. Additionally, the safety message delivered by this approach can be revised or updated easily if it needs to be changed or a new training element added. The delivery method also allows for individuals to proceed at their own pace. It allows novice users to spend more time on materials with which they are unfamiliar and potentially

reduces the probability of boredom for advanced users by allowing them to proceed at a faster pace.

3.4.3 Costs/Resource Allocation

The explicit costs associated with the certified presenter or volunteer model are the costs of developing the presenter materials, dealing with the legal liability of its delivery, and securing funding for back office tasks such as recording and reporting program information. This model relies on a network of certified presenters or volunteers, none of whom are paid for their services. However, there is a cost associated with their involvement. This cost includes travel to and from training events, training materials (handouts, laptop), and the value of the presenters and volunteers' time. These costs remain a financial burden to each volunteer. Yet another financial consideration for this model is the cost associated with the involvement of OLI State coordinators, for whom time is either not reimbursed or is paid for by other organizations such as State Departments of Transportation.

In terms of resource allocation, this approach requires significant staff involvement to continually monitor the program, address legal implications, and adjust and disseminate the safety message to all the State coordinators and presenters when necessary.

Compared with the traditional delivery model, the e-Learning model is a much more cost-effective approach. There is a one-time upfront cost to develop the training module, which in this particular case was approximately $80,000, with additional in-kind services donated by the company OLI selected to develop the training module.[29] Follow-on costs are composed of hosting and maintenance, which although not quantified herein, are customarily low-cost items. One other cost is generated by OLI's marketing efforts, which aim to publicize the training module to the target audience. Even though this activity may be generally costly, there are very effective ways to garner free or relatively low-cost media exposure. One of the ways is by earning the recognition of industry peers. Another way is to leverage existing relationships with other safety partners.

Most of the resource needs after the development of the module are related to spreading the word. As mentioned above, there are very low-cost ways of doing this, but there are some resource needs internal to OLI to monitor, maintain, update, and market the tool.

4. Conclusions and Next Steps

Evaluating the impact of highway-rail grade crossing safety education and outreach efforts remains a challenge for researchers and practitioners. Although a large scale evaluation of OLI's education programs was not conducted, the newly implemented Web-based ProDriver Challenge and available data provided insight into what is useful when implementing an education and outreach program and what opportunities exist for improvement and future studies.

4.1 Conclusions

The ProDriver Challenge is a Web-based training program aimed at professional truck drivers. The program was intended to expand OLI's reach to a specific population of drivers. An analysis of user data collected by OLI since the program launch in June 2011 showed that the ProDriver Challenge was accessed by 4,707 users who identified themselves as CDL truck drivers. Although this is fewer professional drivers than OLI usually trains through its traditional presentation training, it is still an opportunity to reach drivers that might not otherwise have access to the training. The Web-based instruction provides a low-cost and consistent method of supplementing the rail safety education program for professional drivers.

An analysis of available commercial driver incident and violation data from Federal sources showed that while commercial drivers make up only a small portion of roadway traffic, they are involved in a high percentage of accidents at highway-rail grade crossings. In addition, subsets of commercial drivers are subject to additional operating regulations at highway-rail grade crossings. Constraints that limit the implementation of safety programs (economic or otherwise) require a prioritization of resources. The data on commercial driver behavior at highway-rail grade crossings suggests that this is a fitting population to target for enhancing safety.

The survey at the conclusion of the ProDriver Challenge gives users an opportunity to assess their experience with the training. The vast majority of users who took the survey found value in the training. More than 95 percent of users who took the survey indicated that they had a better understanding of crossing safety, understood the message, and were satisfied with the training.

4.2 Recommendations for Program Improvements

The analysis of Federal and OLI data also revealed opportunities to improve the reach of ProDriver Challenge. The analysis of user data showed a large spike in users at the same time that the USA Today article on the program was published. Marketing opportunities, such as nationwide media attention, can boost the number of participants that take part in the training.

The majority of the training participants selected "Other" when asked how they found out about the ProDriver Challenge. By including a free text field for users to identify by what other means they learned of the training, OLI can take advantage of opportunities to spread the word about the availability of the training.

The data from OLI showed that a low percentage of ProDriver Challenge participants completed all three trips of the training. An investigation into why users are not completing the full training may result in program improvement and a better user experience.

4.3 Next Steps in Program Evaluation

The intent of this initial pilot ProDriver Challenge evaluation was to determine the impact of the program on all participants and on nationwide highway-rail grade crossing safety. Due to constraints with the availability of data and challenges met while evaluating the general population, the evaluation was limited in scope. Nevertheless, the difficulties encountered with the project highlight the benefits of conducting a case study evaluation of ProDriver Challenge. A case study offers a more manageable population of users and the opportunity to conduct a more detailed analysis.

One option for a case study is to pursue the evaluation of a trucking company that incorporates ProDriver Challenge into their LMS. Conducting a case study of such an implementation would grant the researchers access to a fixed set of participants whose behavior at highway-rail grade crossings can be tracked. Those participants could also be included in surveys and focus groups to provide feedback on their training experience and self-report on their actions and behaviors. Another option for a case study is to conduct a State-specific evaluation. The analysis of Federal data performed during this pilot study identified States with a significant number of commercial driver violations and incidents at highway-rail grade crossings, as well as States with many participants in the e-Learning training program. An engaged State OLI Coordinator who could provide information on State education and outreach initiatives would also be beneficial for a State-specific case study.

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Appendix A.
Grade Crossing Incidents, Violations, and ProDriver Challenge Participants by State

State	FRA Reported Grade Crossing Incidents, 2008–2012	FRA Reported Commercial Vehicle Incidents at Grade Crossings, 2008–2012	FMCSA Reported CDL-required Driver Violations at Grade Crossings, 2008–2012	OLI ProDriver Challenge Participants, June 2011–Feb 2013	OLI ProDriver Challenge CDL Participants, June 2011–Feb 2013
ALABAMA	393	89	11	74	34
ALASKA	8	0	9	82	53
ARIZONA	103	19	13	169	77
ARKANSAS	272	61	6	80	39
CALIFORNIA	628	114	37	732	246
COLORADO	118	32	31	214	91
CONNECTICUT	24	3	11	68	19
DELAWARE	18	6	0	54	8
DISTRICT OF COLUMBIA	1	0	2	38	5
FLORIDA	304	54	198	749	310
GEORGIA	480	128	108	309	163
HAWAII	0	0	0	6	2
IDAHO	72	23	52	31	21
ILLINOIS	599	114	74	388	138
INDIANA	579	94	26	230	102
IOWA	263	57	21	107	51
KANSAS	217	57	86	178	100
KENTUCKY	282	58	31	89	48
LOUISIANA	478	134	25	135	73
MAINE	17	2	2	62	31
MARYLAND	83	18	150	168	51
MASSACHUSETTS	37	3	7	208	77
MICHIGAN	258	35	57	318	124
MINNESOTA	225	64	41	486	117
MISSISSIPPI	251	57	6	72	42
MISSOURI	237	43	10	393	180
MONTANA	75	15	3	25	14
NEBRASKA	179	47	11	172	74
NEVADA	14	3	10	110	67

NEW HAMPSHIRE	7	3	6	45	29
NEW JERSEY	168	40	16	145	56
NEW MEXICO	46	6	39	31	16
NEW YORK	158	28	30	338	118
NORTH CAROLINA	263	58	36	317	139
NORTH DAKOTA	98	38	5	120	40
OHIO	384	58	53	351	186
OKLAHOMA	266	59	21	120	70
OREGON	74	20	16	163	39
PENNSYLVANIA	291	60	33	561	266
RHODE ISLAND	0	0	1	31	12
SOUTH CAROLINA	250	47	31	95	49
SOUTH DAKOTA	63	16	2	21	10
TENNESSEE	294	63	21	174	91
TEXAS	1052	316	316	685	347
UTAH	63	16	13	169	90
VERMONT	20	7	12	20	10
VIRGINIA	181	46	26	291	83
WASHINGTON	170	50	190	266	77
WEST VIRGINIA	112	24	12	46	15
WISCONSIN	247	38	21	360	203
WYOMING	13	4	7	40	28

Appendix B.
Survey Questions at the Beginning of the Training

1. Are you a CDL truck driver?
    - Yes
    - No

2. What is your age range?
    - 18–30
    - 31–40
    - 41–50
    - 51–60
    - 61 and up

3. What is your home zip code?

4. How did you find out about the Railroad Safety for Professional Drivers e-Learning tool?
    - Operation Lifesaver Contact or Web site
    - Work or Company Suggested
    - Friend or Word-of-Mouth
    - Web Advertisement
    - Print Advertisement
    - Other

Abbreviations and Acronyms

CDL	Commercial driver's license
DOT	Department of Transportation
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
LMS	Learning Management System
MCMIS	Motor Carrier Management Information System
OLI	Operation Lifesaver, Inc.
PEERS	Public Education and Enforcement Research Study
ProDriver Challenge	Rail Safety for Professional Drivers e-learning Challenge
RAIRS	Railroad Accident/Incident Reporting System
Volpe Center	John A. Volpe National Transportation Systems Center