



**Evaluation of the Michigan Center for Truck  
Safety: Effectiveness of Training Programs**

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16. Abstract Five training courses offered by the Michigan Center for Truck Safety (MCTS) including the Michigan Center Decision Driving (MCDD) Course, Defensive Driving Course (DDC), Professional Driver Coaching (PDC), Fatigue Management Course (FMC), and the Mobile Truck Simulator Program (MTSP) courses were evaluated. Crashes and violations from the Michigan Driver Database of MCTS course participants before and after course training were compared to drivers with commercial driver licenses (CDLs) but no MTCS training. Significant reductions in the per driver rate of traffic violations while driving a truck were found for drivers with MTSC training but not among CDL drivers without MTSC training. No reduction in crashes was identified for course participants after training. Analysis of crash characteristics found that drivers with MCTS training were less likely to have a hazardous action in commercial motor vehicle (CMV) crashes than comparison drivers. Analysis of course evaluation forms for the MCDD and DDC courses, found that participants were extremely positive about most aspects of the courses, except course length, which many indicated was too short. Structured interviews with a sample of trucking company safety managers revealed that they found the MDCC and DDC courses to be useful but few had experience with the other courses.					
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## **Evaluation of the Michigan Center for Truck Safety: Effectiveness of Training Programs**

### **Executive Summary**

#### **Objective and Measures**

The Michigan Truck Safety Commission (MTSC) had an interest in determining the effectiveness of the Michigan Center for Truck Safety (MCTS) driver training program in terms of safety outcomes, and was also interested in identifying what portions of the program were working well and which portions of the program could be improved. MTSC selected the University of Michigan Transportation Research Institute (UMTRI) to conduct an evaluation of the MCTS training program and present the results along with recommendations for improvements to MCTS. The evaluation focused on five MCTS courses and involved the following four outcomes measures:

- *Demographic description of participants of the MCTS training courses.* UMTRI was provided with records of course participation from the MCTS database.
- *Safety.* UMTRI matched driver history records to records of course participants and compared crash and violation experience before and after the MCTS training. These records were also compared to crashes and violations of drivers who had not participated in MCTS courses. Crash types and hazardous actions of course participants after MCTS training were compared against drivers with commercial driver licenses (CDLs) who had not participated in MCTS courses.
- *Perceptions of the courses from the perspective of the trainees.* Course evaluation records were provided to the UMTRI team by the MCTS and included information about the trainees and their responses to a set of evaluation questions about some of the courses.
- *Perceptions of effects of courses from perspective of fleet safety managers.* Structured telephone interviews were conducted with a sample of fleet safety managers who had sent drivers to the MCTS training courses to assess the effects of the training courses on the safety and operations.

#### **The Courses**

##### **Michigan Center Decision Driving (MCDD) Course**

The objectives of the MCDD Course are to increase professional truck drivers' understanding of stopping and skid control techniques unique to the type of vehicle they drive, to provide knowledge of fundamental crash avoidance techniques, and to develop decision-making skills and quick reactions needed in emergency situations. The MCDD Course is held at the Michigan Center for Decision Driving at the Eaton Corporation proving grounds in Marshall, Michigan. The MCDD Course is an eight hour course that includes classroom instruction and "hands-on" activities on the facility's skid pad course.

##### **Defensive Driving Course (DDC)**

The DDC addresses the everyday challenges of driving large vehicles and offers practical information on key defensive driving techniques and safe maneuvers to avoid collisions and violations. Topics in this four-hour course include the driving environment, preventable collisions, personal responsibility, driving to protect others, and hazard recognition. The course can be presented in any classroom setting and is often scheduled on site at the request of trucking companies.

### **Fatigue Management Course (FMC)**

The FMC is a self-paced online interactive program consisting of seven lessons that cover causes of fatigue, effects of fatigue on the safe operation of commercial vehicles, common myths about driver fatigue, and methods that drivers can use to manage or avoid fatigue.

### **Mobile Truck Simulator Program (MTSP)**

The MTSP is a state-of-the art simulator that can emulate automatic, 9, 10, and 13 speed transmissions and various tractor-trailer combinations including vans, tankers, and flatbeds and straight trucks including dump trucks and snowplows. Trained instructors travel around the state with the simulator and teach four-hour courses in which professional truck drivers experience and practice emergency maneuvers and collision avoidance techniques without risk of personal injury or property damage.

### **Professional Driver Coaching (PDC)**

The objective of this course is to provide professional truck drivers with an assessment of their driving skills. Driving skills are evaluated during a one hour, on-road session on an established course by a driving coach who observes the driving behavior and responses of a driver relative to a set of standards, and then shares evaluation results with the driver and with their company.

### **Course participants**

#### **Trucking Companies and Organizations**

Drivers from trucking companies located in 22 US states and one Canadian province have attended MCTS training. Of these companies, 86% were located in Michigan, while another 3% were located in Ohio. About 85% of these companies operated as carriers, 4% as carrier/brokers, and 3% as shipper/carriers. The companies that sent drivers to MCTS were more likely to be engaged in interstate operations and in the transport of hazardous materials than other Michigan firms.

#### **Trainees**

The MCTS database for course participation records from 2003-2012 indicated almost 25,000 course participants among all courses offered. Of these, 16,768 were complete records with a valid Michigan driver license number. Of all the MCTS training participants, 50% were drivers, 38% were students, 4% were managers, 2% were mechanics, 1% were from law enforcement, and the remaining 5% were others.

About one-half of participants attended the MCDD course, 15% attended the DDC, 10% attended the PDC course, 8% attended the FMC, and 3% attended the MTSP course. Overall participation in the MCDD course was the highest of any program, but participation has declined since 2007. The DDC course consistently had the second highest enrollment and this level has remained relatively steady since 2006.

### **Safety outcomes**

#### **Analysis of Crashes and Violations**

The records of drivers who had participated in MCTS courses were matched with records from the Michigan Department of State (MDOS), Bureau of Driver and Vehicle Records, Driver Database extracted in March 2013. The MDOS Driver Database is an active database that retains seven years of the most recent data. To have sufficient and clearly defined before and after data, the analysis was limited to drivers who participated in one MCTS course in the years 2008, 2009, and 2010. Student drivers and drivers younger than age 23 at the time of the MCTS course were not included because they would not have had a full two years of professional truck driving experience before their MCTS training.

A random sample of drivers with CDLs, who were not found in the MCTS course records, was drawn from the MDOS Driver Database. The sample was proportional to the set of MCTS drivers by age and sex. The selected drivers were randomly assigned to a fictitious "course date" in

2008, 2009, 2010, and the crashes and violations for each driver were extracted from the MDOS Driver Database file and assigned to the before or after period. This set of drivers is referred to as "comparison drivers." It should be noted that the only information known about the comparison drivers is that they had a CDL. Their annual mileage or if they were professional truck drivers is not known. This must be kept in mind when the results are interpreted.

There were 1,766 MCTS drivers and 4,558 comparison drivers in this analysis. The average age of the MCTS drivers was 44.2 years and the average age of the comparison drivers was 43.2 years. Both groups were 96% male.

Crashes and violations in all vehicle types (trucks and passenger vehicles) and crashes and violations for trucks only, in the before and after periods, were examined by the MCTS course and age of the driver at the time of the course. The crashes and violations of the comparison drivers were compared with the MCTS drivers by age. Appropriate statistical tests were used to test the significance of the differences.

Analyses of crashes among all vehicle types showed that of all the drivers, 65% of the MCTS drivers and 68% of the comparison drivers were not involved in any crashes over the entire before and after period. The overall crash rate per driver was lower for the comparison group than for the MCTS drivers in both the before and after period. The changes in the overall crash rate for the MCTS drivers between the before and after period was not statistically significant. However, there was a significant decrease in the overall crash rate of the comparison drivers between the two time periods.

A likely reason for the difference in crash rates as well as the decrease in the crash rate between the periods for the comparison group is the greater exposure with respect to miles of travel of professional truck drivers (the MCTS drivers are mostly employed professional drivers) and drivers with CDLs who are not necessarily professional truck drivers. The difference could have been further exacerbated by the poor economy, which likely led to overall decreases in vehicle mileage.

Comparison of truck crash involvement showed that the proportion of truck crashes to all crashes was higher in the MCTS driver group by a ratio of about two-to-one. In the before period, truck crashes accounted for about one-half of all the crashes of the MCTS drivers and about one-quarter of the crashes of the comparison group. This is a likely indication that the comparison drivers have lower mileage in trucks than the MCTS drivers. There was an overall decrease in the number of truck crashes per driver between the before and after course periods among the MCTS drivers that approached statistical significance. However, this was matched by a statistically significant decrease among the comparison drivers in the two time periods, indicating no effect of course participation on this measures.

Comparison of violations in trucks between the before and after course periods identified a significant decrease among the MCTS drivers which was not found for the comparison drivers. The reduction in violations was mostly from a reduction of speeding violations.

### **Analysis of Crash Characteristics**

Characteristics of truck crashes involving MCTS course participants were examined and compared against those from a sample of CDL drivers with no MCTS training. Records of drivers who had taken one or more of the five courses (MCDD, DDC, PDC, FAC, and MTSP) were matched with CMV crashes from the Michigan Crash Data files. Only crashes occurring after the date of the MCTS course for drivers with one course and after the date of the second course for drivers with more than one course were retained for analysis. These crashes were compared to the crashes of a random sample of drivers with CDLs in the Michigan Crash Data files.

The study identified 5,402 unique drivers from the MCTS course participants and matched them to 1,479 crashes. Of these crashes, 739 occurred after the date of the first or second course

depending on whether the driver participated in one or more courses. Of these drivers, 40% had taken the MCDD course. There were 15,606 drivers in the comparison sample of which 1,605 were matched to a CMV crash record.

The crash involvement rate for the MCTS drivers was almost twice that of the comparison groups (0.137 vs. 0.65 crashes per driver). Overall, there was not much difference in the severity of crashes between the MCTS trainees and the comparison drivers. Comparing types of crashes indicates that overall there was not much difference between the groups, although the MCTS drivers were involved in a lower proportion of angle crashes (12% vs. 15%) and in higher proportion of sideswipe-same-direction crashes (29% vs. 26%). Angle crashes were more severe than sideswipe crashes, so the distribution of the MCTS driver crash types had a slightly higher proportion of less severe crash types than the comparison groups.

Examination of hazardous actions in these crashes found that drivers with MCTS training were less likely to be coded with a hazardous action in a CMV crash than comparison drivers with no MCTS training. The largest difference between the MCTS and comparison drivers was among the youngest group drivers, those 23-30 years of age who were just starting their professional truck driving careers.

### **Perceptions of Participants**

The perceptions of participants were obtained through the analysis of available course evaluations of the MCDD and DDC courses. The participants' evaluations were overwhelmingly positive for both courses. More than 80% of MCDD trainees strongly agreed that the course was relevant and useful, that they learned a lot and would apply what they learned in their job, and that the instructors were effective and knowledgeable. Comments suggested that the course handouts and visual aids could use some updating and that the trucks used for the skid training needed maintenance. Several comments stated that the course was too short and should be expanded to multiple days. The evaluations of the DDC were also very positive relative to the course content, effectiveness and knowledge of the instructors, and the relevancy and usefulness of the material covered. The evaluations also indicated that many course participants felt that this course was too short.

### **Perceptions of Safety Managers**

A sample of safety managers of trucking companies and organizations that sent their drivers to MCTS training was interviewed to gauge the effect of the MCTS training on the safety and operation of their company or organization. Structured telephone interviews were conducted with 11 safety managers. Collectively, interviewees reported that their organizations had been sending drivers to MCTS training courses for the past five to 20 plus years. Some reported sending one to two drivers weekly to training, while others reported sending an average of five to 20 drivers annually depending on the size of the company, the specific training needs of the drivers, the company's available budget, and the schedule and time availability of the drivers. Overall, the managers reported the usefulness of the MDCC and DDC course. Few had experience with the other courses. Although none of the managers had formally tried to quantify the benefits of the courses, several mentioned that they observed fewer driver errors, crashes, and injuries among drivers following the course. Among the challenges mentioned with regard to participating in the MCTS training were difficulties in working the training into the drivers' schedules.

### **Conclusions**

The MCTS courses serve the Michigan professional trucking community. About 25,000 people have participated in its training courses over the past decade. About one-half of the course participants were professional drivers, and the rest included student drivers, management, and others. Thus, the MCTS provides training for drivers entering the field, as well as providing on-going training for professional truck drivers and managers.

The analysis of crashes did not find overall reductions in crashes in all vehicles and in trucks only for the MCDD course participants. The crash rates per driver for all crashes and for crashes involving trucks for the comparison group were lower than those of the MCDD course participants and also decreased between the two time periods. This disparity between the crash measures of MCTS drivers and the comparison drivers is most likely the result of the difference in driving exposure. Professional truck drivers drive more miles than other drivers and are, therefore, exposed to more opportunities for crashes than those who drive less. Most of MCTS drivers were employed as professional truck drivers. The comparison drivers held CDLs but whether or not they were professional truck drivers was not known. Crash rate per mile driven would have been a better crash measure for comparison. This information, however, was not available for this study.

Crashes are a result of many factors, many beyond the control the individual driver. Traffic violations, on the other hand, reflect the individual's driving practices, and are a good measure of safety effects. The analysis of driving violations found safety benefits associated with the MCTS courses. There was a significant reduction in the rate of traffic violations while driving a truck for drivers with MTSC training, which was not found among the CDL drivers who did not participate in a MTSC course.

As part of the analysis of safety effects, the study found that drivers with MCTS training were less likely to be coded as a hazardous action in a CMV crash than comparison drivers with no MCTS training. Hazardous actions coded in crash data are an indication of a driver's contribution to a crash. The largest difference between the MCTS and comparison drivers was among the youngest group drivers, those age 23-30 years who are just starting their professional truck driving careers.

The MCDD course is the premier course of the MCTS. The MCDD had the largest participation, it was well received by the course participants, and it was highly recommended by safety managers. Both drivers and safety managers reported that the hands-on experience on the skid-pad was invaluable. Among the course participants that had taken more than one MTSC course, many had repeated the MCDD course. Many course participants commented that they would like the course to be longer and that they would like more experience with the skid pad.

MCTS should continue offering this course and might consider expanding it. For example, more drivers could have an opportunity to go through the MCDD training if there was another facility. Thought should also be given to the feasibility of developing a second MCDD course that builds on the first one, offering a review of the first course and perhaps offering some more advanced techniques.

The DDC course is also a successful course. It has the advantage that it can travel around the state, thus providing time and cost savings to participants. The DDC was well received by those who took the course and by safety managers whose drivers had taken this course. However, interviews with safety managers indicated that many were not even aware of the course. A marketing strategy targeting safety managers might be useful to bring greater attention to this course. The current DDC course consists of four hours of classroom instruction. Many of the course participants commented that this was too short. Consideration should be given to the feasibility of offering the longer version of the course.

The MTSP has great potential because it offers hands-on training and can travel around the state. Its fidelity is credible and it has reasonable scenarios that simulate a variety of actual challenges for the drivers that could not otherwise be addressed with drivers. The simulator, however, is underused and has not been in the field for some time. Efforts should be made to get the simulator program operational again so its full potential can be realized.

The FMC course is a web-based self-administered course on fatigue management. Web-based courses offer considerable opportunities for the future. The material provided is useful and an

individual cannot move on to the next module until he/she has mastered the previous one. It would be useful if the last module included an evaluation which could be used to assess how well the course is received or how it can be improved.

The PDC training serves the purpose of reviewing the driving practices of professional drivers and should be continued. The interviews with safety managers indicated that the benefits to the trainee are related to the communication skills of the driving coaches. Thus, ways of refreshing the communication skills of the driving coaches could be considered.

One of the challenges faced in the evaluations concerned identification of the course participants. The MCTS database used in the study were originally entered into electronic form by MCTS from forms filled out by the trainees. In many cases, the information about driver license numbers was not correct, either because the trainees did not enter the correct number or when it was transcribed incorrectly into the database. Ways of obtaining more accurate information about the participants would benefit future evaluations and should be explored. Some thought could also be given to developing or modifying the evaluation forms for the training sessions that would provide constructive feedback for the courses. Ways of conducting the evaluations on a website should be explored. These suggestions for improvements should not detract from the overall positive responses to the MCTS training program. Most of the suggestions related to making the program more widely accessible to professional truck drivers.



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# Evaluation of the Michigan Center for Truck Safety: Effectiveness of Training Programs

## Introduction

Any motor vehicle crash is potentially tragic, but crashes involving trucks tend to be more serious than those involving other vehicles, primarily because trucks are heavier, their frames are stiffer, and their structure tends to be higher than other vehicles on the road. In recent years, commercial motor vehicles (CMVs) have comprised about 9% of registered vehicles in the United States, but have accounted for about 11 percent of fatal traffic injuries (FMCSA, 2009). Michigan's experience reflects the national experience. In addition, CMVs are over-represented in fatal crash involvements relative to all crash involvements. For example, in 2011, CMVs were involved in 2.5 percent of the vehicle crashes in the state but accounted for 7% of the fatalities (derived from 2011 Michigan crash data).

The Michigan Truck Safety Commission's (MTSC) mission is to improve truck safety by providing Michigan's trucking industry, and also its citizens, with effective educational programs. To this end, the MTSC sponsors educational and training programs for the trucking industry through a grant<sup>1</sup> to the Michigan Center for Truck Safety (MCTS). Courses are comprehensive and include all the primary instructional methods, including behind the wheel with its Professional Driver Coaching; skid pad training in the Michigan Decision Driving Course; class room instruction in the Defensive Driving Course; web-based training in the Fatigue Management Course online program; and driving simulation in the Mobile Truck Simulator Program.

The MTSC had an interest in determining the effectiveness of the MCTS driver training program in terms of safety outcomes, and was also interested in identifying what portions of the program were working well and which portions of the program could be improved. To that end, MTSC selected the University of Michigan Transportation Research Institute (UMTRI) to conduct an evaluation of the MCTS training program. The focus of the evaluation was on courses specifically targeted to CMV drivers as highlighted above. The following is a brief description of each of the courses included in the evaluation.

### Michigan Center Decision Driving (MCDD) Course

The objectives of the MCDD Course are to increase professional truck drivers' understanding of stopping and skid control techniques unique to the type of vehicle they drive, to provide knowledge of fundamental crash avoidance techniques, and to develop decision-making skills and quick reactions needed in emergency situations. The MCDD Course is held at the Michigan Center for Decision Driving located at the Eaton Corporation proving grounds in Marshall, Michigan. The course was also held at the Upper Peninsula Decision Driving Course (UPDDC) in Escanaba at one time but is currently only offered at the Marshall site. The MCDD Course is an eight hour course that includes classroom instruction and "hands-on" activities on the facility's skid pad course. The classroom portion covers information on types of vehicle crashes, their causes, decision-driving principles, and an overview of driving skills and factors affecting stopping distance. In the driving portion of the course, drivers receive hands-on training in braking control techniques, skid control techniques, evasive action exercises, and jack-knife control and recovery on both wet and dry pavements. Drivers are evaluated on their ability to make correct defensive driving decisions when confronted with potential collision situations.

### Defensive Driving Course (DDC)

The objective of the DDC is to provide professional truck drivers with knowledge and skills required for driving safely. The DDC addresses the everyday challenges of driving a large vehicle

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<sup>1</sup> Funding for MTSC programs is provided by a Truck Safety Fund established by [Public Act 348 of 1988](#) and administered by the Office of Highway Safety Planning, a division of the Michigan Department of State Police.

and offers practical information on key defensive driving techniques and safe maneuvers to avoid collisions and violations. Topics include the driving environment, preventable collisions, personal responsibility, driving to protect others, and hazard recognition. The course curriculum was developed by the National Safety Council (NSC) and course instructors are certified to teach this course by NSC. The DDC, as offered by the MTSC, is four hours long and includes classroom instruction, and videos. The course can be presented in any classroom setting and is often scheduled on site at the request of trucking companies.

### **Fatigue Management Course (FMC)**

The objective of this course is to increase professional truck drivers' awareness of and knowledge about driver fatigue issues related to commercial vehicle operation. FMC topics include causes of fatigue, effects of fatigue on the safe operation of commercial vehicles, common myths about driver fatigue, and methods that drivers can use to manage or avoid fatigue. The course is presented as an online interactive program consisting of seven lessons. Participants take the course at their own pace and those who complete the entire program receive a certification of completion.

### **Mobile Truck Simulator Program (MTSP)**

A driving simulator can recreate a multitude of hazardous and dangerous driving scenarios for various large vehicle configurations in a controlled risk-free environment. The objective of the MTSP is to allow professional truck drivers to learn, experience, and practice emergency maneuvers and collision avoidance techniques without risk of personal injury or property damage. The Michigan Mobile Truck Simulator is a state-of-the-art simulator housed in a 42-foot gooseneck trailer. The simulator can emulate automatic, 9, 10, and 13 speed transmissions and various tractor-trailer combinations including vans, tankers, and flatbeds, and straight trucks including dump trucks and snowplows. Five classes, each taking four hours, are offered. These include: Circles of Influence (hazard perception and decision making); Adverse Conditions (driving in bad weather and low visibility conditions); Emergency Maneuvers (including vehicle control and collision avoidance); Space Management (including following distance, merging and maneuvering, and a space cushion); and Speed Management (vehicle handling and stopping distance). The simulator travels around the state to different host locations, where trained instructors conduct the simulator training courses.

### **Professional Driver Coaching (PDC)**

The objective of this course is to provide professional truck drivers with an assessment of their driving skills. Driving skills are evaluated during a one hour, on-road session on an established course by a driving coach who observes the driving behavior and responses relative to a set of standards. The coach provides positive reinforcement for good driving skills as well as constructive feedback for habits that can be improved. At the end of the session, evaluation results are shared verbally with drivers and in written form with their company. The PDC program uses a number of established courses which include rural, highway, and city driving in the both the upper and lower peninsulas of Michigan.

### **Evaluation of MCTS Training Courses**

While it is generally accepted that the MCTS training program promotes greater safety and results in fewer crashes and fewer unsafe driving behaviors among its participants, the program has not undergone a rigorous evaluation nor have its safety outcomes been quantified. The objective of this research was to conduct an evaluation of the five courses highlighted earlier and report the results to MTSC.

The evaluation involved four types of outcomes measures. The first was a demographic description of the individuals who have participated in the MCTS training courses. To this end, UMTRI was provided with records of individuals who have taken at least one of the training courses. These records allowed the study to examine the characteristics of the trainees and also the companies or organizations that sent drivers to the courses. The second outcome was *safety*. UMTRI obtained the driver history records of the course participants and compared their crash

and violation experience before and after the MCTS training. These data were also compared to data from a set of drivers who had not attended MCTS courses. The third outcome was *perceptions of the courses from the perspective of the trainees*. Course evaluations were provided to the UMTRI team by MCTS which included some information about the trainees and also their evaluations of some of the courses. The fourth outcome had to do with the *perceptions of the courses from the perspective of the companies that send drivers to training*. UMTRI conducted structured interviews with safety managers and other representatives of companies and organizations that send drivers to MCTS training to discuss their perceptions about the training courses. Findings relative to these outcomes are presented in this report and conclusions based on the findings are discussed.

## **Demographics of Trucking Companies and MCTS Participants**

### ***Trucking Companies***

To determine what types of trucking companies sent drivers to MCTS training, company descriptors available from the Motor Carrier Management Information System (MCMIS) files were examined and compared to characteristics of all trucking firms in Michigan found in the MCMIS file. The names and addresses of companies and organizations that sent drivers to MCTS training courses were obtained from the MTSC database and 433 were matched with US Department of Transportation (USDOT) numbers which enabled UMTRI to get further information from the MCMIS census file. The distribution of the characteristics of these companies was examined and contrasted against all Michigan trucking firms in the MCMIS census file.

Drivers from companies located in 22 US states and one Canadian province have participated in MCTS training. Of these, 86% were located in Michigan, while another 3% were located in Ohio. Overall, 95% of all Michigan companies listed in the MCMIS census file operated as carriers. However, the operations of the companies that sent drivers to MCTS training were more diverse, with about 85% operating as carriers, 4% as carrier/brokers, and 3% as shipper/carriers.

The companies that sent drivers to MCTS were more likely to be engaged in interstate operations and in the transport of hazardous materials than other Michigan companies. Of the companies that sent drivers to MCTS, 72% were engaged in interstate operations, 24% were engaged in intrastate operations, and 24% transported hazardous materials. This was in contrast to all Michigan companies of which 28% were engaged in interstate operations, 69% were engaged in intrastate operations, and only 4% transported hazardous materials.

Of the companies that sent drivers to MCTS, almost 44% were classified as *authorized for hire*; that is, their primary business activity was the transportation of property/passengers by motor vehicle for compensation. Another 35% were classified as *private property*, which means that their highway transportation activities were incidental to, and in furtherance of, the primary business activity. The classifications of all Michigan companies were diverse with 18% classified as *authorized for hire* and 61% as *private property*.

Companies that sent drivers to the MCTS also had larger fleets. The median fleet size was 15-17 power units, with one power unit fleets accounting for 10%, and fleets exceeding 200 power units accounting for another 10%. This was in contrast to all Michigan fleets where 50% of fleets had only one power unit and 90% of the fleets had eight power units or less.

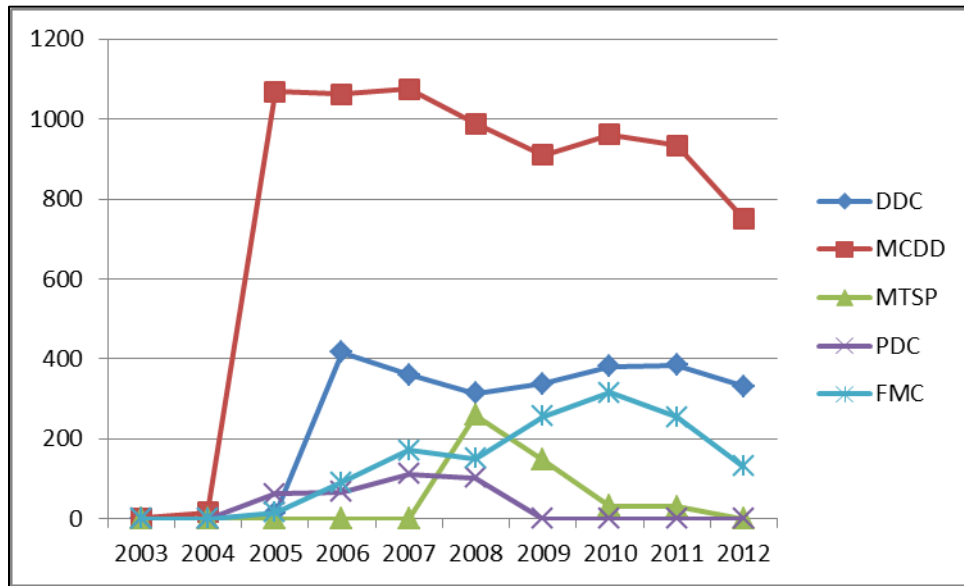
Examination of the companies and other organizations listed in the MCTS student database showed that Michigan county road commissions, cities, counties, and various departments of Michigan government sent drivers to MCTS. Truck driver training schools and programs also send their students for MCTS for courses.



**MCTS Course Participants**

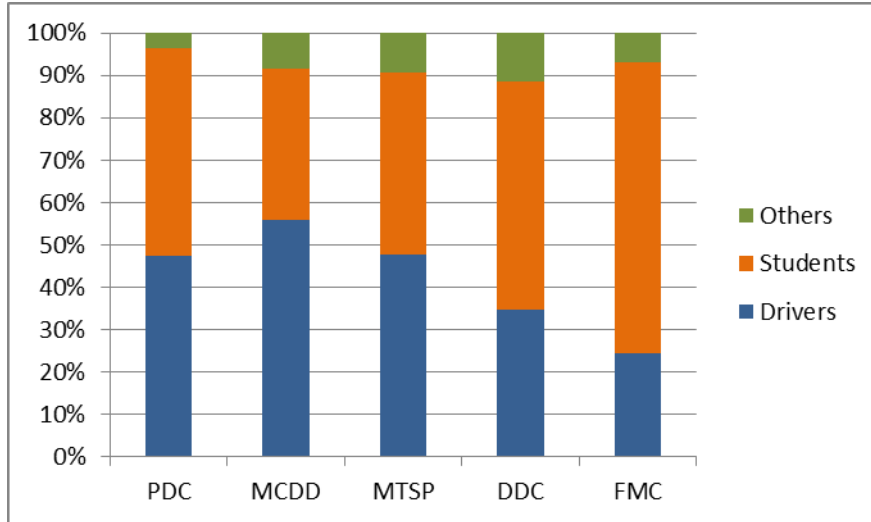
UMTRI examined the MTCS database for course participation records from 2003-2012. The records contained the following fields for course participants: name; driver license number; affiliation; whether they were a driver, student, manager, mechanic, law enforcement, or other; name of the course; and date of the course (i.e., one record per person per course). In total, there were 24,992 course participation records. Of these, 16,768 were complete records with a valid Michigan driver license number. Of all MCTS training participants, 50% were drivers, 38% were students, 4% were managers, 2% were mechanics, 1% were representatives from law enforcement, and the remaining 5% were classified as others. About one-half of participants attended the MCDD course, 15% attended the DDC, 10% attended the PDC course, 8% attended the FMC, and 3% attended the MTSP course.

Figure 1 shows participation in each of the courses by year from 2003 to 2012. As can be seen, overall participation in the MCDD course was the highest of any program, but participation has declined since 2007. The DDC course consistently had the second highest enrollment and this level has remained relatively steady since 2006.



**Figure 1: Course Attendance by Year**

Analysis of course participation records identified 12,363 unique individuals. Of these, 79% (9,788) took only one course, 11% (1,369) took two courses, 5.3% (657) took three courses, 4% (439) took four courses, and 1% (110) took five or more courses. Figure 2 shows the distribution of trainee types by course. It can be seen that a considerable portion of course participants were student drivers. Other participants included mostly management, mechanics, and law enforcement.



**Figure 2: Distribution of Participant Types by Course**

Of all trainees who participated in only one course, 64% were drivers, 20% were students, 56% took the MCDD, 12% took the DDC, and 2% took the MTSP. Of those who took two courses, 49% were drivers and 43% were students. Of the participants with two courses, 65% took the MCDD, 28% took the DDC, and 9% took the MTSP course. Among these, 15% attended the MCDD twice, 11% took a combination of DDC and FMC, 10% took a combination of MCDD and DDC, and 7% took a combination of MCDD and MTSP.

## Safety

### Analysis of Crashes and Violations

#### Methods

A key objective of the MCTS training is to improve driving skills and safety practices of CMV drivers. While crash-involvement is considered the fundamental measure of driving safety, crashes are rare events, and there can be many contributing factors beyond the control of a specific crash-involved driver. Traffic violations, on the other hand, are more likely to be affected by the individual's own actions. Thus, driving violations serve as a good indicator of driving practices. To gauge the effect of the training courses on safety, UMTRI examined crashes and violations of drivers who participated in MCTS training courses before and after their course, and compared their crash and violation experience to a group of CMV drivers who had not participated in any MCTS training courses.

The records of drivers who had participated in MCTS courses were matched with records from the Michigan Department of State (MDOS), Bureau of Driver and Vehicle Records, Driver Database. The MDOS Driver Database is an active database that retains 7 years of the most recent data (although the most serious violations and crashes are retained longer than seven years). The MDOS file used for analysis was extracted on March 24, 2013, so driver histories before 2006 were incomplete. To have sufficient and clearly defined before and after data, analyses were limited to drivers who participated in one MCTS course in the years 2008, 2009, and 2010. Student drivers and drivers younger than age 23 at the time of the MCTS course were not included because they did not have a full two years of professional truck driving experience before the year of MCTS training, as needed for the before/after analysis design.

The final subset of MCTS course participants analyzed in this study is referred to as “MCTS drivers” in the remainder of this report. The analysis record for each driver included crashes and violations for two full years before and two full years after the year of the course. The crashes and violations in the course year were allocated to the before or after period based on the exact date of the course.

A random sample of drivers with a commercial driver license (CDL) and who were not found in the MCTS course records was drawn from the MDOS Driver Database. The CDL status was used as a proxy for truck drivers. Despite some limitations, this was considered the best approach given the lack of information about employment status in the driver history files. This sample was proportional to the set of MCTS drivers by age and sex and was 2.5 times as large in number. The choice of sample characteristics followed the standard practice for this type of comparative analysis. The drivers in this sample were randomly assigned to a fictitious “course date” in 2008, 2009, or 2010, and the crashes and violations for each driver were extracted from the MDOS Driver Database file and assigned to the before or after period in the same way used for the MCTS drivers. This set of drivers is referred to as “comparison drivers” in the rest of this report. It should be noted that the only information known about the comparison drivers was that they had a valid CDL. Information about their annual mileage or whether they were professional truck drivers is not known. The study could not control for exposure in comparisons between the MCTS drivers and this comparison sample. This must be kept in mind when the results are interpreted.

UMTRI examined the crashes and violations in any vehicle and also separately for trucks by specific MCTS course and by driver age at the time of the course. The crashes and violations of the comparison drivers were compared against the MCTS drivers by age. Crashes were also compared by severity, alcohol-involvement, and the proportion that were single-vehicle. UMTRI used the original charge rather than the final conviction in the driver history file as the violation analyzed. The final conviction can be the result of plea-bargaining, while the original charge reflects more accurately what the police observed in the field. Violations were compared by more general types: speeding, alcohol-related, moving violations, license violations, and others. The z-test for differences in proportions and the  $\chi^2$  were used to test for statistical significance, as appropriate.

## **Results**

As shown in Table 1, there were 1,766 MCTS drivers and 4,558 comparison drivers. The average age of the MCTS drivers was 44.2 years and the average age of the comparison drivers was 43.2 years. Both groups were 96% male.

<b>Table 1 : Age and Sex Distribution of MTSC and Comparison Drivers</b>		
	<b>MCTS Drivers (n=1,766)</b>	<b>Comparison Drivers (n=4,558)</b>
<b>Age group</b>	n (%)	n (%)
<b>23-30</b>	204 (11.6%)	635 (13.9%)
<b>31-40</b>	438 (24.8%)	1,384 (30.4%)
<b>41-50</b>	607 (34.4%)	1,517 (33.3%)
<b>51-60</b>	425 (24.1%)	869 (19.1%)
<b>61+</b>	92 (5.2%)	153 (3.4%)
<b>Mean age</b>	44.2	43.2
<b>Age range</b>	23-69	23-68
<b>% Male</b>	95.7%	95.6%

Table 2 shows the distribution of courses taken by the MCTS drivers. The highest participation was for the MCDD course (63%). The lowest participation was in the FMC (4%). Table 2 also shows the age distribution within each course. Although the overall mean participant age was 44.2 years, MCDD participants had the youngest mean age (43.7 years) and participants in the MTSP had the oldest mean age (47.4 years). Overall, the MCTS drivers were predominantly male, with men comprising 96% of course participants. The two courses with the highest proportion of women were the PDC and FMC courses, where women accounted for 11% each of participants.

	<b>DDC (n=261)</b>	<b>FMC (n=74)</b>	<b>MCDD (n=1,111)</b>	<b>PDC (n=217)</b>	<b>MTSP (n=103)</b>	<b>Total (n=1,766)</b>
<b>Age group</b>	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
<b>23-30</b>	31 (11.5%)	5 (6.8%)	142 (12.8%)	20 (9.2%)	6 (5.8%)	204 (11.6%)
<b>31-40</b>	69 (26.4%)	18 (24.3%)	276 (24.8%)	56 (25.8%)	19 (18.4%)	438 (24.8%)
<b>41-50</b>	87 (33.3%)	24 (32.4%)	382 (34.4%)	77 (35.5%)	37 (35.9%)	607 (34.4%)
<b>51-60</b>	60 (23.0%)	24 (32.4%)	261 (23.5%)	51 (23.5%)	29 (28.2%)	425 (24.1%)
<b>61+</b>	14 (5.4%)	3 (4.1%)	50 (4.5%)	13 (6.0%)	12 (11.7%)	92 (5.2%)
<b>Mean age, years</b>	44.2	46.1	43.7	44.7	47.7	44.2
<b>Age range, years</b>	23-69	25-74	23-73	23-74	26-70	23-74
<b>% Male</b>	98.1	89.2	96.7	89.4	97.1	95.7

Table 3 shows the number of crashes and crash rate per driver in all vehicles for the before and after periods for drivers by their MCTS course. Of all the drivers in this group, 65% were not involved in any crashes over the entire before and after period. There appeared to be a small increase in the overall number and crash rate between the two time periods but the difference was not statistically significant. There also appeared to be a small decrease in the number of crashes of the PDC attendees, but this was not statistically significant. The increases in the crash rates for the other courses were not significant, except for the FMC group.

<b>Course</b>	<b>Drivers</b>	<b>Before Period</b>		<b>After Period</b>		<b>% with no crashes in before and after periods</b>
		<b>Crashes</b>	<b>Crashes per driver</b>	<b>Crashes</b>	<b>Crashes per driver</b>	
<b>DDC</b>	261	96	0.367	99	0.379	63.6
<b>FMC</b>	74	11	0.149	25	0.338	71.6
<b>MCDD</b>	1,111	340	0.306	346	0.311	65.6
<b>PDC</b>	217	76	0.350	62	0.280	65.0
<b>MTSP</b>	103	32	0.311	44	0.427	56.3
<b>Total</b>	1,766	557	0.315	576	0.326	65.1

Table 4 shows the before and after crashes of MCTS drivers in all vehicles by age. There were no statistical significant differences in crash rates for any of the age groups.

Age group	Drivers	Before Period		After Period		% drivers with no crashes in before and after periods
		Crashes	Crashes per driver	Crashes	Crashes per driver	
23-30	204	61	0.299	75	0.368	68.6
31-40	438	139	0.317	148	0.338	62.3
41-50	607	200	0.329	193	0.318	66.2
51-60	425	136	0.320	136	0.320	64.0
61+	92	21	0.228	24	0.261	68.5
<b>Total</b>	1,766	557	0.315	576	0.326	65.1

The number of crashes and crash rate of the comparison drivers in the before and after periods is shown in Table 5.

Age group	Drivers	Before Period		After Period		% drivers with no crashes in before and after periods
		Crashes	Crashes per driver	Crashes	Crashes per driver	
23-30	635	178	0.280	144	0.227	59.3
31-40	1384	288	0.208	211	0.152	68.9
41-50	1517	299	0.197	264	0.174	68.0
51-60	869	150	0.173	128	0.147	71.8
61+	153	21	0.137	12	0.078	79.6
<b>Total</b>	4,558	936	0.205	759	0.166	68.1

When crashes in all vehicles were considered, the drivers in the comparison group, overall, had a lower crash rate in both the before and after periods than the MCTS drivers. Comparing the proportions of drivers who have not been involved in a crash in the entire before and after period, shows that the proportion of such drivers was statistically greater than the comparable proportion among the MCTS drivers (68.1% versus 65.1%;  $p=.004$ ). There was a significant decrease in the overall crash rate of the comparison drivers between the two time periods. This was mostly attributable to the large decreases in the crash rates of drivers age 40 and younger. The decreases in the crash rates of drivers over age 40 were not significant.

These crashes were further examined by severity, portion of single vehicle crashes, and alcohol involvement. With one exception, there was little change between time periods and across age and course categories in these measures. Therefore, the results are only briefly summarized and additional tables for crashes in all vehicles are not presented. The crash severity distributions for the MCTS drivers and comparison drivers were very similar and stable across the two time periods, with about 82% and 18% of crashes resulting in PDO and injury, respectively. Distributions by age of the two groups were similar, and there was little difference in the severity of crashes in all vehicles by MCTS course.

Because common contributing factors to single vehicle crashes include excessive speed, driver fatigue, and alcohol, single vehicle crashes are a useful measure to examine in safety analyses. The crash rate per driver of single vehicle crashes in the before period for the MCTS drivers was .08 crashes per driver which was significantly higher than the rate of .06 crash per driver for the comparison drivers. However, neither rate changed significantly between the time periods.

There were very few alcohol and drug-related crashes for the MCTS and comparison drivers. The total number of alcohol/drug-related crashes among MCTS drivers was three in the before period and 10 in the after period. The number of alcohol/drug related crashes among the

comparison drivers was 14 in the before period and 15 in the after period. The increase in the rate of alcohol/drug per driver for MCTS drivers was significant at  $p=.05$ , and not significant for the comparison drivers. The increase in alcohol/drug related crashes in the MCTS group occurred among drivers age 51-60. The highest incidence of alcohol/drug related crashes in the comparison group was among drivers age 31 to 50. However, there was no significant change between the two time periods for that age group. No tabulation by course is presented because most of the alcohol/drug related crashes in the MCTS group involved drivers who took the MCDD course.

### Truck Crashes

Table 6 shows the number of truck crashes in the before and after periods for the MCTS and comparison drivers by age. The portion of truck crashes to all crashes for the age group and the truck crash rate per driver in the age group are also shown.

<b>Table 6: Truck Crashes by Age- MCTS and Comparison Drivers</b>				
<b>MCTS Drivers</b>			<b>Comparison Drivers</b>	
<b>Age group</b>	<b>Number (% of crashes) [Crashes/driver]</b>	<b>Number (% of crashes) [Crashes/driver]</b>	<b>Number (% of crashes) [Crashes/driver]</b>	<b>Number (% of crashes) [Crashes/driver]</b>
	<b>Before</b>	<b>After</b>	<b>Before</b>	<b>After</b>
<b>23-30</b>	18 (29.5%) [0.088]	26 (34.7%) [0.127]	30 (16.9%) [0.047]	27 (18.8%) [0.043]
<b>31-40</b>	66 (47.5%) [0.151]	61 (41.2%) [0.139]	73 (9.4%) [0.020]	46 (21.8%) [0.033]
<b>41-50</b>	112 (56.0%) [0.185]	79 (40.9%) [0.130]	82 (27.4%) [0.054]	55 (20.8%) 0.036]
<b>51-60</b>	73 (53.7%) [0.172]	65 (47.8%) [0.153]	33 (22.0%) [0.038]	34 (26.6%) [0.039]
<b>61+</b>	11 (53.4%) [0.120]	10 (41.7%) [0.120]	8 (38.1%) [0.052]	3 (25.0%) 0.020]
<b>Total</b>	280 (50.3%) [0.159]	241 (41.8%) [0.136]	226 (24.2%) [0.050]	165 (21.7%) [0.036]

In both the before and after period, the proportion of truck crashes to all crashes was higher in the MCTS driver group by a ratio close to two-to-one and the crash rate per driver was also higher for the MCTS drivers. In the before period, truck crashes accounted for about one-half of all the crashes of the MCTS drivers and about one-quarter of the crashes of the comparison group. There was an overall decrease in the number of truck crashes in both groups between the two time periods. In the after period truck crashes accounted for 42% and 22% of the crashes of MCTS and comparison drivers, respectively. However, the change in proportion of truck crashes to all crashes was significant for the MCTS drivers ( $p=.004$ ) and not significant for the comparison

drivers. The decreases in truck crash rate per driver were marginally significant for the MCTS drivers ( $p = .06$ ) and significant for the comparison drivers ( $p=.002$ ). The overall decrease was a consequence of the large decrease in truck crashes among the 41-50 age group of the MCTS drivers (from 112 crashes in the before period to 70 crashes in the after period).

Table 7 shows the number, proportion of all crashes, and per driver crash rate of truck crashes among the MCTS drivers by course.

<b>Table 7: Truck Crashes of MCTS Drivers by Course</b>		
<b>Course</b>	<b>Number (% of all crashes) [Crashes/driver]</b>	<b>Number (% of all crashes) [Crashes/driver]</b>
	<b>Before</b>	<b>After</b>
<b>DDC n=261</b>	44 (45.8%) [0.169]	39 (39.4%) [0.149]
<b>FMC n=74</b>	4 (36.4%) [0.054]	3 (12.0%) [0.041]
<b>MCDD n=1,111</b>	171 (50.3%) [0.154]	146 (42.2%) [0.131]
<b>PDC n=217</b>	41 (54.0%) [0.189]	31 (50.0%) [0.143]
<b>MTSP n=103</b>	20 (52.4%) [0.194]	22 (50.0%) [0.214]
<b>Total n=1,766</b>	280 (50.3%) [0.159]	241 (41.8%) [0.136]

There was a decrease in the truck proportion of crashes and in the rate of truck crashes per driver between the two time periods for each course. Collectively, the changes contributed to the overall significant reduction in the proportion of crashes comprised by trucks and driver truck crash rates. However, individually, only the changes in the proportion of crashes that are truck crashes in the MCDD group reached statistical significance ( $p=.03$ ).

Table 8 compares the crash severity distributions of truck crashes of MCTS and comparison drivers. There was a reduction in truck crashes at each severity for both groups. Because the overall truck crash involvement of MCTS drivers was higher than that of the comparison drivers, the crash rate per driver at each severity level was also higher.



Group	Fatal Crashes (% of truck crashes) [Crashes/driver]		Injury Crashes (% of truck crashes) [Crashes/driver]		Property Damage Only (% of all truck crashes) [Crashes/driver]	
	Before	After	Before	After	Before	After
<b>MCTS Drivers n=1766</b>	4 (1.43%) [0.0023]	0 (0.00%) [0.000]	42 (15.00%) [0.0238]	36 (14.94%) [0.0204]	234 (85.57%) [0.1325]	205 (85.06%) [0.1161]
<b>Comparison Drivers n=4558</b>	4 (1.77%) [0.0009]	0 (0.00%) [0.000]	43 (19.03%) [0.0094]	28 (16.97%) [0.0061]	179 (79.20%) [0.0393]	137 (83.03%) [0.0301]

Comparing the severity distribution of the MTSC drivers with that of the comparison drivers shows that more of the crashes among MTSC drivers were of PDO severity. Both groups experienced a significant decrease in fatal crashes ( $p=0.05$ ) between the before and after period.

Table 9 shows the truck crash severity distribution of the MCTS drivers by course. The severity distributions in each course group for the before and after period were similar and the differences in the proportion of truck crashes and crash between the periods and between the groups were not significant.

Course	Fatal Crashes (% of truck crashes) [Crashes/driver]		Injury Crashes (% of truck crashes) [Crashes/driver]		Property Damage Only (% of truck crashes) [Crashes/driver]	
	Before	After	Before	After	Before	After
<b>DDC n=261</b>	1 (2.27%) [0.0038]	0 (0.00%) [0.000]	6 (13.63%) [0.0230]	5 (12.82%) [0.0192]	37 (84.09%) [0.1418]	34 (87.18%) [0.1303]
<b>FMC n=74</b>	0 (0.00%) [0.000]	0 (0.00%) [0.000]	0 (0.00%) [0.000]	0 (0.00%) [0.000]	4 (100.0%) [0.0541]	3 (100.0%) [0.0405]
<b>MCDD n=1,111</b>	2 (2.34%) [0.0018]	0 (0.00%) [0.000]	27 (15.79%) [0.0243]	23 (15.75%) [0.0207]	142 (83.04%) [0.1278]	123 (84.25%) [0.1107]
<b>PDC n=217</b>	0 (0.00%) [0.000]	0 (0.00%) [0.000]	8 (19.51%) [0.0369]	6 (19.35%) [0.0276]	33 (80.49%) [0.1521]	25 (80.65%) [0.1152]
<b>MTSP n=103</b>	1 (5.00%) [0.0097]	0 (0.00%) [0.000]	1 (5.00%) [0.0097]	2 (9.09%) [0.0194]	18 (90.00%) [0.1748]	20 (90.09%) [0.1942]
<b>Total n=1,766</b>	4 (1.43%) [0.0023]	0 (0.00%) [0.000]	42 (15.00%) [0.0238]	36 (14.94%) [0.0204]	234 (85.57%) [0.1325]	205 (85.06%) [0.1161]

Table 10 examines the single truck crashes of the MCTS and comparison drivers by age. The number of single vehicle truck crashes, the proportion of single vehicle crashes to all the truck crashes in the age group, and the rate of single vehicle crashes per driver are shown. Overall, the proportion of single vehicle crashes and crash rates per driver were higher for the MCTS drivers than for the comparison drivers. This pattern was also evident by age groups, although the

number of crashes in some cells was quite small. Overall, the proportion of single vehicle crashes and the rate of crashes per driver did not change significantly between the before and after periods.

<b>MTSC Drivers</b>		<b>Comparison Drivers</b>		
<b>Age Group</b>	<b>Number (% of truck crashes) [Crashes/driver]</b>	<b>Number (% of truck crashes) [Crashes/driver]</b>	<b>Number (% of truck crashes) [Crashes/driver]</b>	<b>Number (% of truck crashes) [Crashes/driver]</b>
	<b>Before</b>	<b>After</b>	<b>Before</b>	<b>After</b>
<b>23-30</b>	3 (16.66%) [0.015]	1 (3.85%) [0.005]	2 (6.67%) [0.003]	4 (14.81%) [0.006]
<b>31-40</b>	13 (20.00%) [0.030]	14 (22.95%) [0.032]	9 (12.33%) [0.007]	8 (17.39%) [0.006]
<b>41-50</b>	14 (12.5%) [0.023]	15 (18.99%) [0.025]	10 (12.20%) [0.007]	5 (9.09%) [0.003]
<b>51-60</b>	16 (21.92%) [0.038]	12 (18.46%) [0.028]	3 (9.09%) [0.003]	6 (17.65%) [0.007]
<b>61+</b>	4 (36.36%) [0.043]	2 (20.00%) [0.022]	2 (25.00%) [0.0013]	1 (33.33%) [0.007]
<b>Total</b>	50 (17.86%) [0.028]	44 (18.26%) [0.025]	26 (11.5%) [0.006]	24 (14.55%) [0.005]

The distributions of single vehicle truck crashes by course are shown in Table 11. There were no significant changes in the measures of single vehicle truck involvement for any of the courses.

Analyses of alcohol/drug-involved truck crashes were not done because there was only one alcohol/drug truck crash among the MCTS drivers and none among the comparison sample.

Course	Number (% of truck crashes) [Crashes/driver]	Number (% of truck crashes) [Crashes/driver]
	Before	After
<b>DDC</b> n=261	7 (15.91%) [0.027]	7 (17.95%) [0.027]
<b>FAC</b> n=74	0 (0.00%) [0.00]	1 (33.33%) [0.014]
<b>MCDD</b> n=1,111	29 (16.96%) [0.026]	21 (14.38%) [0.019]
<b>PDC</b> n=217	4 (9.76%) [0.018]	8 (25.81%) [0.037]
<b>MTSP</b> n=103	9 (45.00%) [0.0087]	7 (31.82%) [0.068]
<b>Total</b> N=1,766	50 (17.86%) [0.028]	44 (18.25%) [0.025]

**Violations**

Traffic violations in any vehicle are shown in Table 12 for the MTSC drivers by age. Overall, 62% of the MCTS drivers did not have a traffic violation in either the before or after period. Drivers age 40 or younger were more likely to have been charged with a traffic violation than older drivers. Approximately one out of every two drivers age 23-30 and three out of every four drivers age 31-40 were charged with a traffic violation in either the before or after period. The rate of violations per driver decreased with age. The only significant changes in violations between the before and after periods rates were the reductions for drivers age 41-50 (p=.0007) and for drivers age 61 and older (p=.005).

Age group	Number of drivers	All Violations Before		All Violations After		% with no violations in before and after periods
		Number	Rate/driver	Number	Rate/driver	
<b>23-30</b>	204	95	0.466	90	0.441	54.4%
<b>31-40</b>	438	174	0.397	127	0.290	25.8%
<b>41-50</b>	607	170	0.280	154	0.254	63.1 %
<b>51-60</b>	425	104	0.245	124	0.292	65.2 %
<b>61+</b>	92	23	0.250	10	0.109	75.0%
<b>Total</b>	1,766	566	0.320	505	0.286	61.9%

Table 13 show the total number of traffic violations in all vehicles for the comparison drivers by age.

Age group	Number of drivers	All Violations Before		All Violations After		% with no violations in before and after periods
		Number of violations	Violations per driver	Number of violations	Violations per driver	
<b>23-30</b>	635	372	0.586	402	0.633	41.1%
<b>31-40</b>	1,384	574	0.418	571	0.412	75.4%
<b>41-50</b>	1,517	512	0.338	495	0.326	65.4%
<b>51-60</b>	869	210	0.241	155	0.178	72.3%
<b>61+</b>	153	20	0.131	23	0.150	79.7%
<b>Total</b>	4,558	1,688	0.370	1,646	0.361	61.4%

Sixty-one percent of comparison drivers had not been charged with a traffic violation in the before or after period. Among comparison drivers, drivers age 23-30 were more likely than the others to have been charged with a traffic violation. The violation rate decreased with age. The only significant reduction in violation rates between the before and after period was for drivers age 51-60 ( $p=.001$ ).

Table 14 shows the total number of violations of MCTS drivers by course. Examining the column with percent of drivers with no violations indicates that drivers who participated in the DDC course were least likely and the participants in the FMC and PDC course were most likely to have been charged with a traffic violation in the before and after period.

Course	Number of drivers	All traffic violations Before		All traffic Violations After		% with no violations in before and after periods
		Number of violations	Violations per driver	Number of violations	Violations per driver	
<b>MCDD</b>	1,111	342	0.307	290	0.261	63.0%
<b>DDC</b>	261	62	0.287	59	0.273	85.2%
<b>PDC</b>	217	88	0.406	93	0.429	51.6%
<b>FMC</b>	74	32	0.432	39	.0527	51.4%
<b>MTSP</b>	103	42	0.408	24	0.233	58.2%
<b>Total</b>	1,766	566	0.320	505	0.286	61.9%

Unlike crash rates, the violation rates of the MCTS and comparison drivers are somewhat similar, with the rates of the MCTS drivers age 50 and younger significantly lower than rates of comparison drivers (age 23-40 at  $p=.0000$ , age 41-50 at  $p=.0007$ ).

Table 15 shows the truck traffic violations for the MCTS and comparison drivers by age. Among the MCTS drivers, 30% of their traffic violations involved trucks, while only 17% of violations of the comparison drivers involve a truck. Thus, it is not surprising that the rate of truck violations per driver is consistently lower for the comparison drivers. Although there appeared to be an overall decrease in the violation rate of the MCTS drivers and an increase for the comparison drivers, neither change was statistically significant. Among comparison drivers there was a decrease in truck violation rates with age. However, there was no consistent pattern of violation rate by age among the MCTS drivers.

Age group	MCTS Drivers				Comparison Drivers			
	Before		After		Before		After	
	Number of Violations	Violations/Driver	Number of Violations	Violations/Driver	Number of Violations	Violations/Driver	Number of Violations	Violations/Driver
<b>23-30</b>	22	0.108	14	0.069	39	.061	60	.094
<b>31-40</b>	46	0.105	44	0.100	84	.061	103	.074
<b>41-50</b>	57	.0094	46	0.076	99	.065	89	.059
<b>51-60</b>	32	0.075	49	0.115	43	.049	34	.039
<b>60+</b>	13	0.141	5	0.054	6	.039	5	.033
<b>Total</b>	170	0.096	148	0.084	271	.059	291	.064

Table 16 compares the before and after violation rates by course for the MCTS drivers. None of the apparent changes in the rates reached statistical significance.

Course	Number of Drivers	Before		After	
		Number of Violations	Violations/Driver	Number of violations	Violation/Driver
<b>MCDD</b>	1111	96	0.086	77	0.069
<b>DDC</b>	261	14	0.054	9	0.034
<b>PDC</b>	217	28	0.129	36	0.166
<b>FAC</b>	74	13	0.176	12	0.162
<b>MTSP</b>	103	19	0.184	14	0.136
<b>Total</b>	1766	170	0.096	148	0.083

The types of violations with which the drivers were charged while driving trucks are shown in Table 17. Speeding accounted for the largest portion of traffic violations, and alcohol/drug related violations accounted for the fewest. For MCTS drivers, 60% of the violations in the before period and 48% in the after period were speed-related. Speeding accounted for 50% of the violations of the comparison drivers in both periods. The reduction of in the rate of speeding violations for the MCTS drivers between the before and after period was statistically significant at  $p=.016$ .

Violation Type	MCTS Drivers				Comparison Drivers			
	Before		After		Before		After	
	Number of Violations	Violations/Driver	Number of Violations	Violations/Driver	Number of Violations	Violations/Driver	Number of Violations	Violations/Driver
<b>Alcohol/ drugs</b>	0	0	0	0	2	0.000	1	0.000
<b>Speeding</b>	102	0.057	71	0.040	135	0.030	142	0.031
<b>Other Moving</b>	56	0.032	58	0.033	90	0.020	93	0.020
<b>Licensing</b>	1	0.001	5	0.003	13	0.003	20	0.004
<b>Other</b>	11	0.006	18	0.010	31	0.007	35	0.008
<b>Total</b>	170	0.096	148	0.083	271	0.059	291	0.064

Table 18 shows the speeding violations for the MCTS and comparison drivers by age. The changes in the speeding violation rates for the 23-30, 41-50, and 51-60 age groups were not statistically significant. The reductions in the rate for age groups 31-40 and 61+ were statistically significant at  $p = .06$  and  $p = .05$ , respectively.

Age group	MCTS Drivers				Comparison Drivers			
	Before		After		Before		After	
	Number of Violations	Violations/Driver	Number of Violations	Violations/Driver	Number of Violations	Violations/Driver	Number of Violations	Violations/Driver
<b>23-30</b>	12	0.039	6	0.029	20	0.031	27	0.043
<b>31-40</b>	29	0.066	17	0.039	45	0.033	50	0.036
<b>41-50</b>	37	0.033	27	0.044	50	0.033	42	0.028
<b>51-60</b>	16	0.038	19	0.045	18	0.021	21	0.024
<b>61+</b>	8	0.087	2	0.022	2	0.013	2	0.013
<b>Total</b>	102	0.057	71	0.040	135	0.030	142	0.031

### Crash type comparison

#### Method

The characteristics of truck crashes among the MCTS drivers were examined and compared against those from a sample of CDL drivers who had not participated in MCTS training. Records of all MTSC participants who were drivers and had taken one or more of the five courses (MCDD, DDC, PDC, FAC, and MTSP) were matched with CMV crashes from the Michigan Crash Data files. Only crashes that occurred after the date of the MCTS course for drivers with one course, and after the date of the second course for drivers with more than one course were retained for analysis. These crashes were compared to the crashes of a random sample of drivers with CDLs in the Michigan Crash Data files. The random sample was proportional to the set of MTSC driver course participants by age and sex, and was approximately three times as large. Because analyses were only interested in post-course truck crashes, the study could use a larger number of MCTS drivers for the analyses. Similarly, the CDL comparison sample was expanded.

UMTRI identified 5,402 unique drivers from among the MCTS course participants and matched them to 1,479 crashes. Of these crashes, 739 occurred after the date of the first or second course depending on whether the driver participated in one or more courses. Of these drivers, 40% had taken the MCDD course. There were 15,606 drivers in the comparison sample of which 1,605 were matched to a CMV crash record.

#### Results

The crash involvement rate for the MCTS drivers was almost twice that of the comparison groups (0.137 vs. 0.65 crashes per driver). Overall, there was not much difference in the severity of crashes between the MCTS drivers and the comparison drivers. Of all the crashes of the MCTS drivers, 83% were PDO and 17% were injury crashes. The severity distribution of crashes of the comparison drivers was 82% PDO and 17% injury. However, there was a difference in the proportions of PDO and injury crashes in the youngest drivers. Among the MCTS drivers age 23-30, 13% of crashes were injury crashes and 88% were PDO crashes. Among the comparison drivers in this age group, these proportions were 20% and 80%, respectively.

Figure 3 compares the types of crashes of both groups. Overall, there was not much difference, although the MCTS drivers were involved in a lower proportion of angle crashes (12% versus 15%) but in a higher proportion of sideswipe-same-direction crashes (29% versus 26%).

Hazardous actions are an indicator of the driver's contribution to the crash. Among the CMV-crash involved MCTS drivers, 57 % were NOT assigned a hazardous action for their crash compared to 52% of the comparison drivers who were not assigned a hazardous action for their crash. Figure 4 shows the patterns of hazardous actions for both groups. The differences were small (note the scale), but MCTS drivers were less likely than comparison drivers to be assigned the *disregard traffic control* hazardous action (1% versus 6%). However, larger proportions of the MCTS drivers were assigned *improper lane use* and *unable to stop* hazardous actions than the comparison drivers.

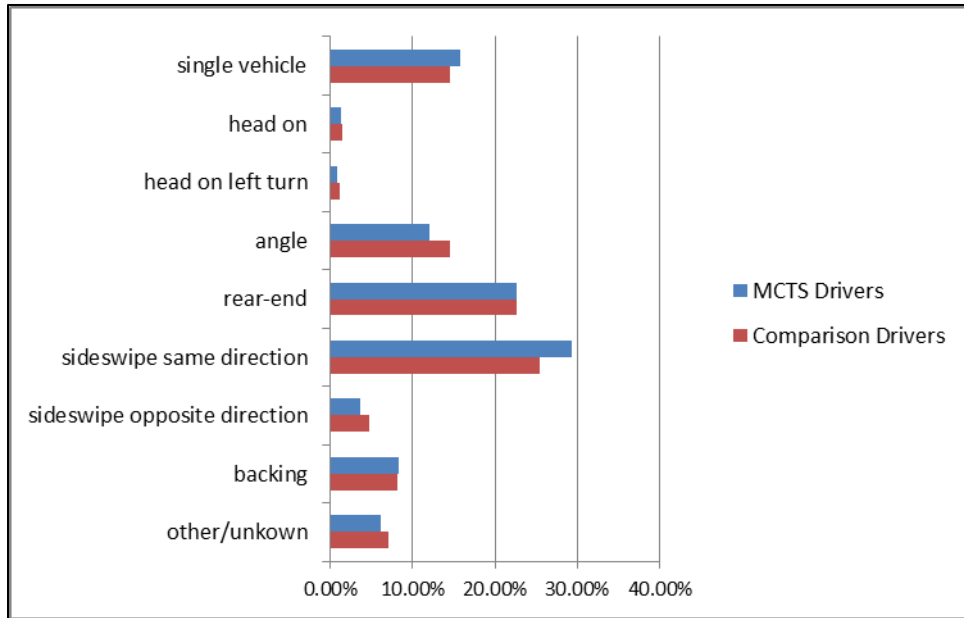


Figure 3: Comparison of Crash Type Distributions

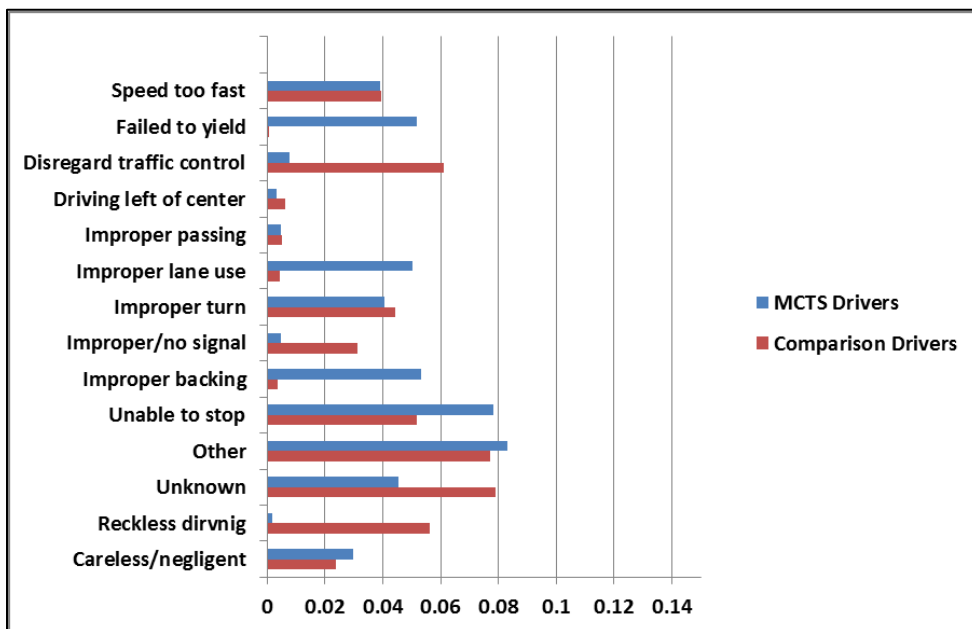
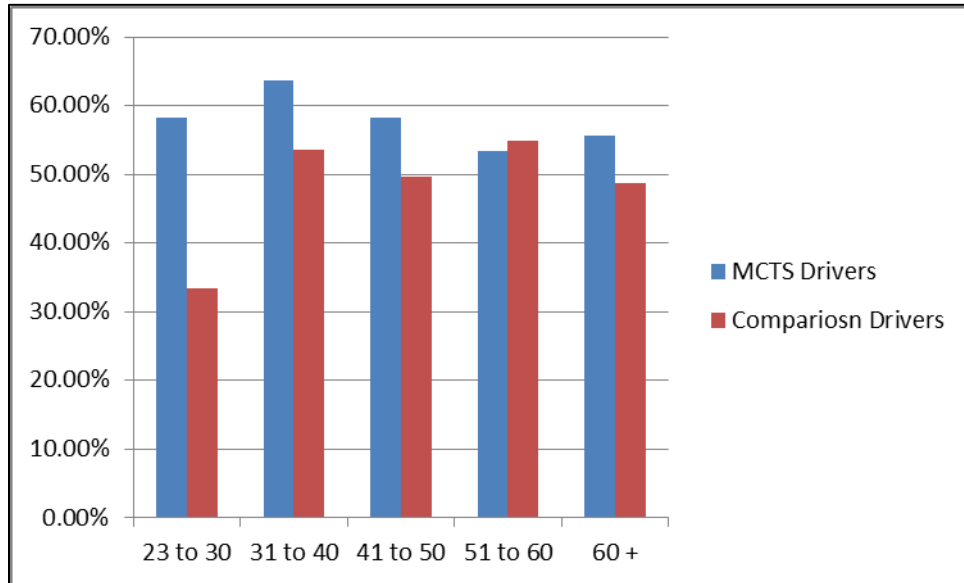


Figure 4: Comparison of Hazardous Actions

Further examination of the hazardous actions found that among MCTS drivers who took the MCDD course, no hazardous action was coded for 60% of their crashes.

Figure 5 compares the proportion of drivers by age in the MCTS and comparison groups who did not have a hazardous action in their crash. The largest difference is in the youngest driver age group. The difference in the proportions decreases with age. However, the MCTS drivers consistently were assigned fewer hazardous actions in their crashes than the comparison drivers.



**Figure 5: Comparison of No-Hazardous Action in Crash by Age**

The same distribution is also shown in Table 19 and includes a separate row for the MCTS drivers who took the MCDD course. In the youngest age group, 58% of the MCTS drivers had no hazardous action compared to 33% of the comparison drivers. Drivers who participated in the MCDD course had higher proportions of crashes with no hazardous actions for each age group. Among the youngest drivers, the proportion with no hazardous action in a crash was 61%.

Drivers	Age Group					Total
	23 to 30	31 to 40	41 to 50	51 to 60	60 +	
<b>MCTS</b>	58.3%	63.6%	58.2%	53.4%	55.7%	57.4%
<b>Comparison</b>	33.3%	53.6%	49.7%	54.9%	48.7%	51.7%
<b>MCDD</b>	61.1%	64.76%	61.2%	54.1%	60.0%	59.7%

In summary, the analyses reported in this section of the report showed that the CMV-crash involvement of the MCTS drivers was about twice as high per driver as the rate in the comparison drivers. As noted earlier, the MCTS drivers are employed as truck drivers, while all that is known about the comparison drivers is that they hold a CDL. Because of constraints on data availability, UMTRI was not able to control for driving exposure, and it is very likely that a large portion of the comparison drivers are not employed as truck drivers. However, even if they drive less than professional truck drivers, they do drive trucks and are involved in truck crashes, so comparisons can be made.



Overall, the drivers with MCTS training had similar patterns of severity and type of crashes. However, MCTS drivers were more likely not to be assigned with a hazardous action in a CMV crash than the comparison drivers, which suggests that they were less likely to be at fault in crashes than other CMV drivers. The largest difference between the MCTS and comparison drivers was among the youngest group of drivers, those age 21-30 who are just starting their truck driving careers. The CMV crashes of the MCTS drivers were more likely to be less severe, and they were much less likely to be assigned a hazardous action compared to other young CMV drivers.

### **MCTS Participant Perceptions of the Courses**

Data for evaluating this outcome measure came from paper and electronic forms sent to UMTRI by the MCTS. UMTRI did not receive any data for the PDC or the FMC, so no analyses were conducted of these courses.

### ***MCDD Course Evaluations***

Completed MCDD course evaluations were forwarded to UMTRI for analysis. These evaluations were organized by class and did not include any demographic information about the person who filled out the evaluation, with the exception of the student's name. The evaluation form contained 10 statements for which the students were instructed to indicate the degree to which they agreed or disagreed by answering "strongly disagree" (SD), "disagree" (D); "neutral" (N); "agree" (A); or "strongly agree" (SA) for each statement. The statements were as follows:

1. Overall, I learned a great deal from this course.
2. I intend to apply what I learned in this course to my job.
3. The objectives for this course were clearly presented at the beginning of the training session.
4. Course handouts and visual aids were helpful in learning course material.
5. The length of the course was appropriate.
6. The instructor(s) were knowledgeable about the course material and subject matter.
7. The instructor(s) provided effective presentations and explanations of course material.
8. The training content is relevant to my job.
9. I would recommend this course to others.
10. Overall, I was satisfied with this course.

The evaluation forms were entered electronically into a spreadsheet and analyzed using statistical software.

Overall, there were 4,808 course evaluations for the MCDD course for professional truck drivers. Evaluations spanned the time period between October 1, 2009 and September 28, 2012. Of the total evaluations, 339 were completed in 2009, 1,564 in 2010, 1,551 in 2011, and 1,354 in 2012.

Figures 6 through 15 show the distribution of evaluation responses by year and overall for each of the 10 statements. Each figure shows responses to a single statement. Overall, the responses indicated strong agreement with all of the statements. More than 80 percent of participants choose "strongly agree" for all of the statements, except for the statements about the course handouts/visual aids and the length of the course. Comments suggested that the course handouts and visual aids needed updating and that the trucks used for the skid training needed maintenance. Several comments had to do with the course being too short and in need of expansion to multiple days.

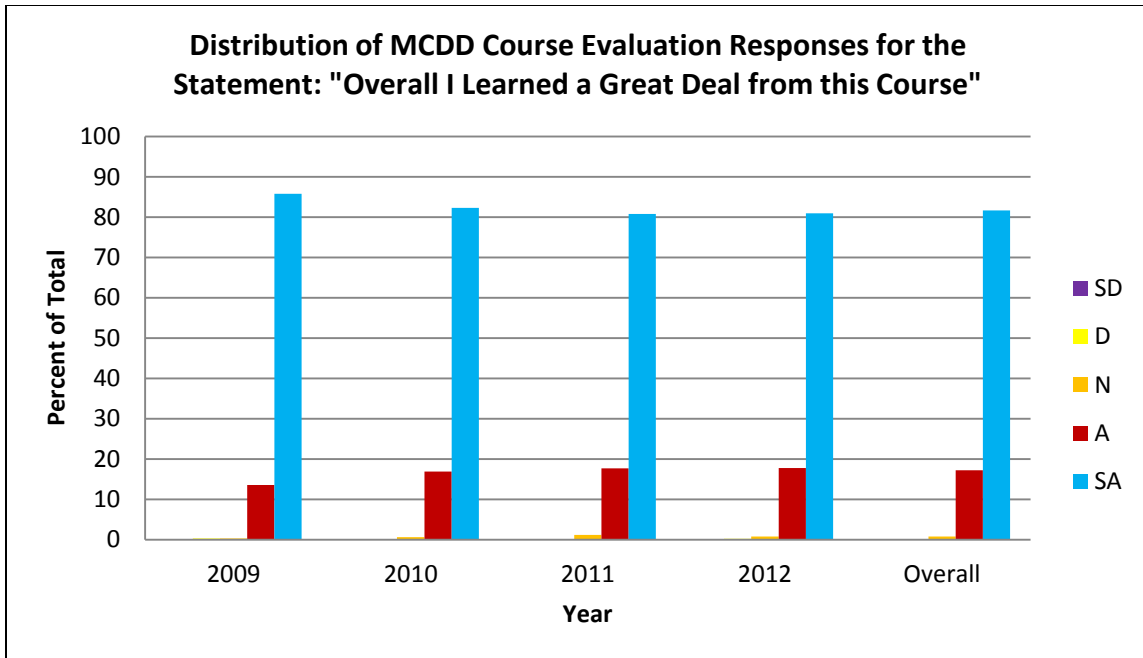


Figure 6: Distribution of MCDD Course Evaluation Responses for the Statement: "Overall I Learned a Great Deal from this Course"

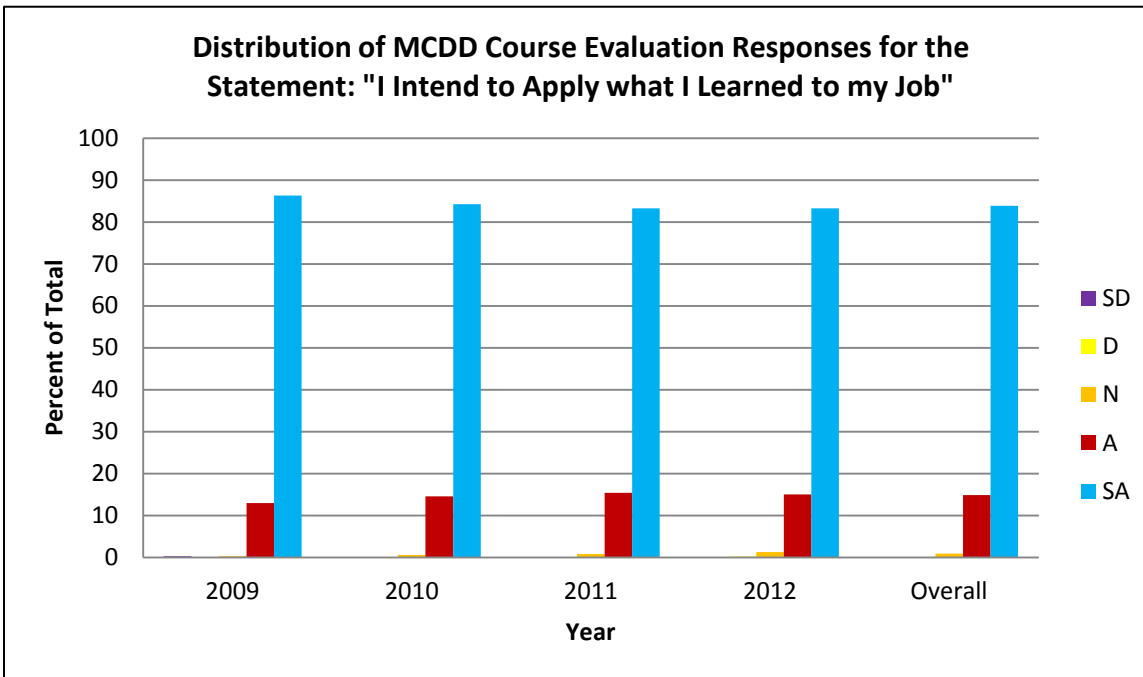
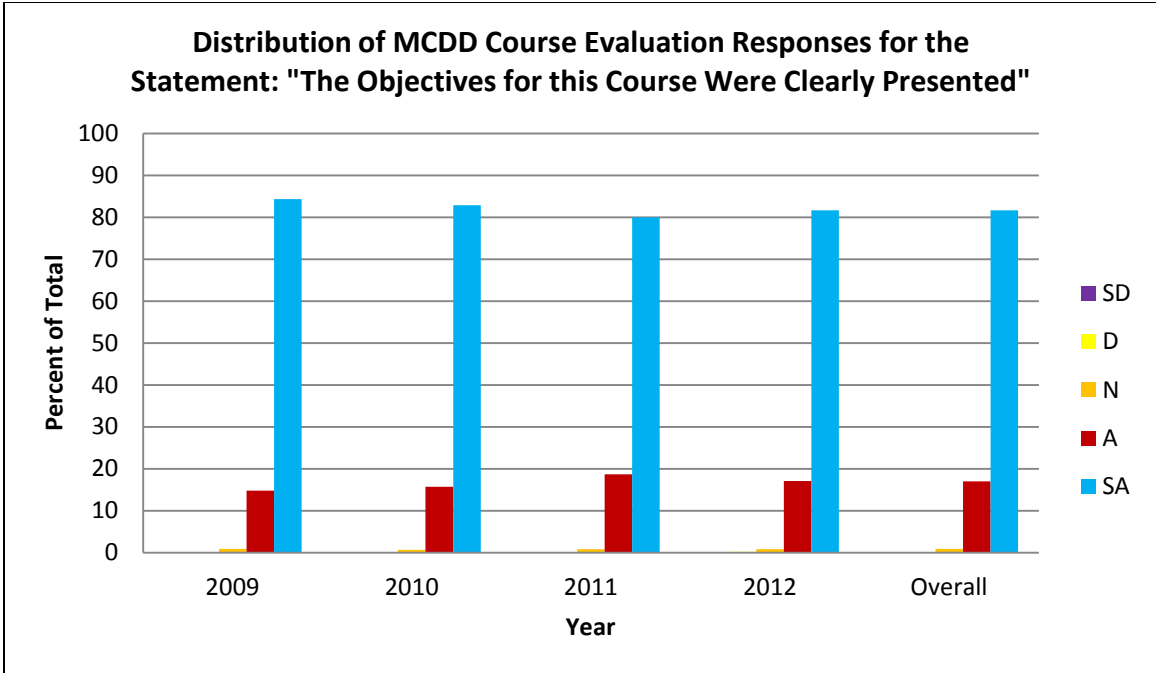
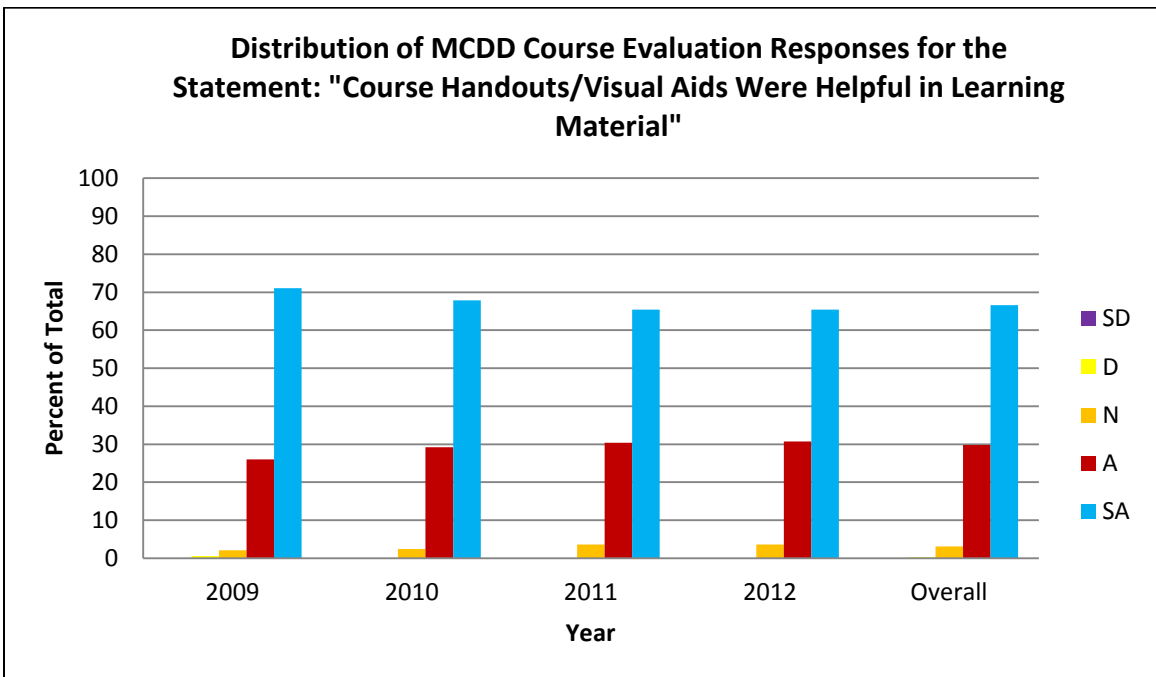


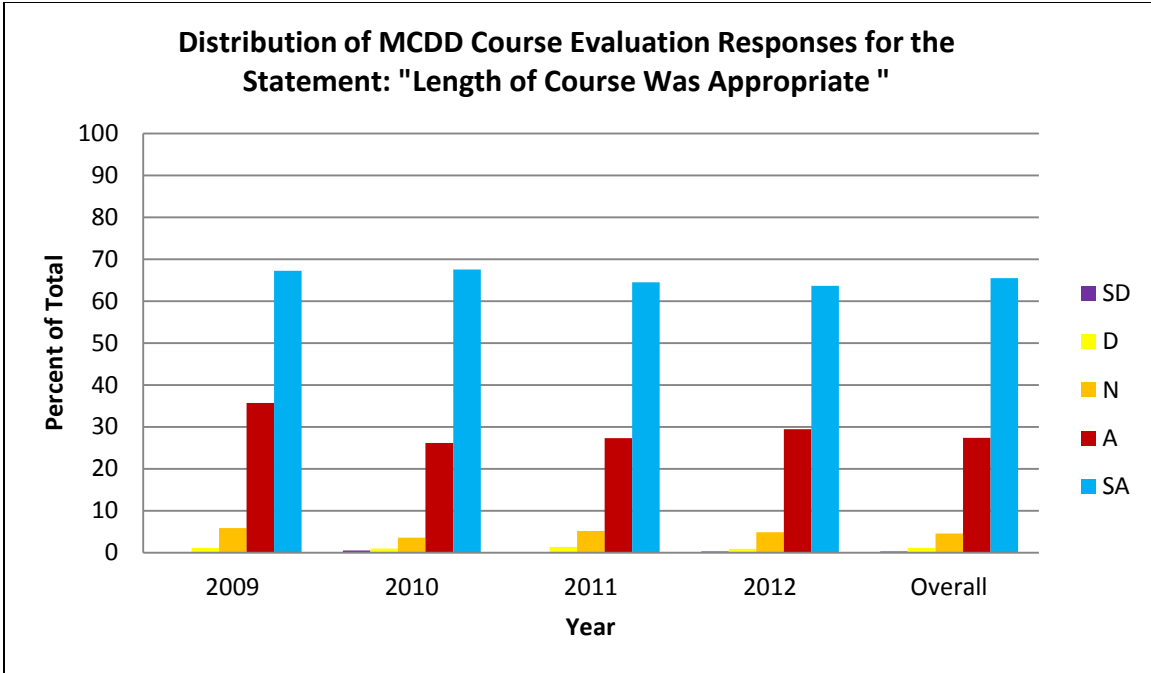
Figure 7: Distribution of MCDD Course Evaluation Responses for the Statement: "I Intend to Apply what I Learned to my Job"



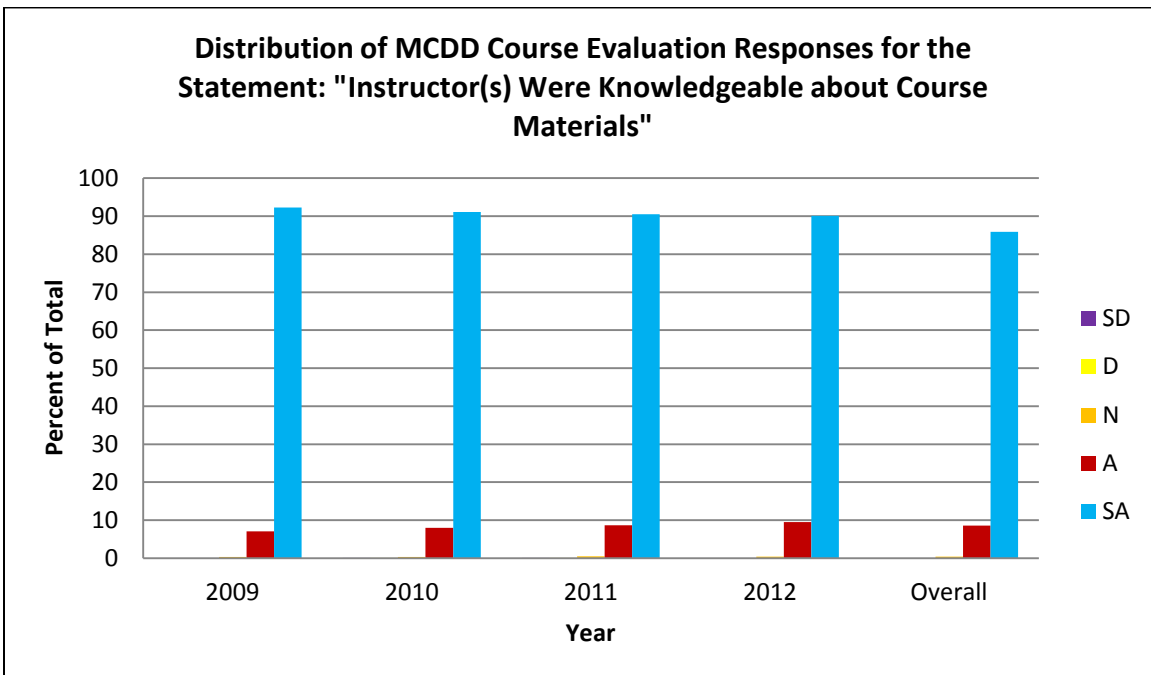
**Figure 8: Distribution of MCDD Course Evaluation Responses for the Statement: "The Objectives for this Course Were Clearly Presented"**



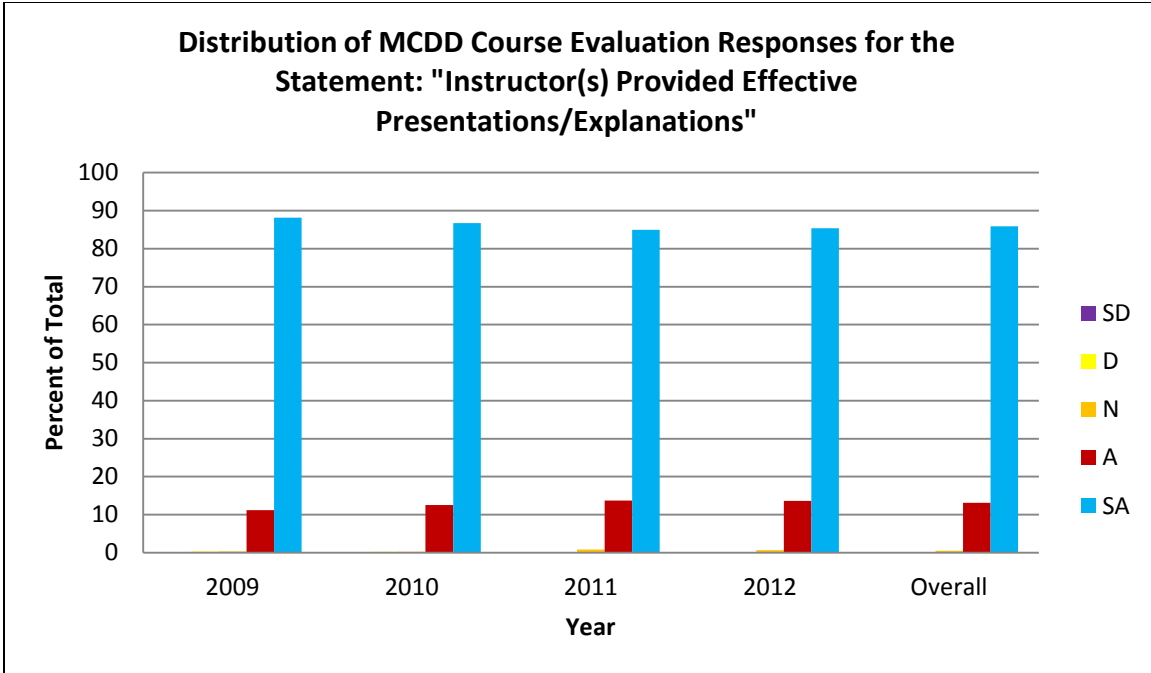
**Figure 9: Distribution of MCDD Course Evaluation Responses for the Statement: "Course Handouts/Visual Aids Were Helpful in Learning Material"**



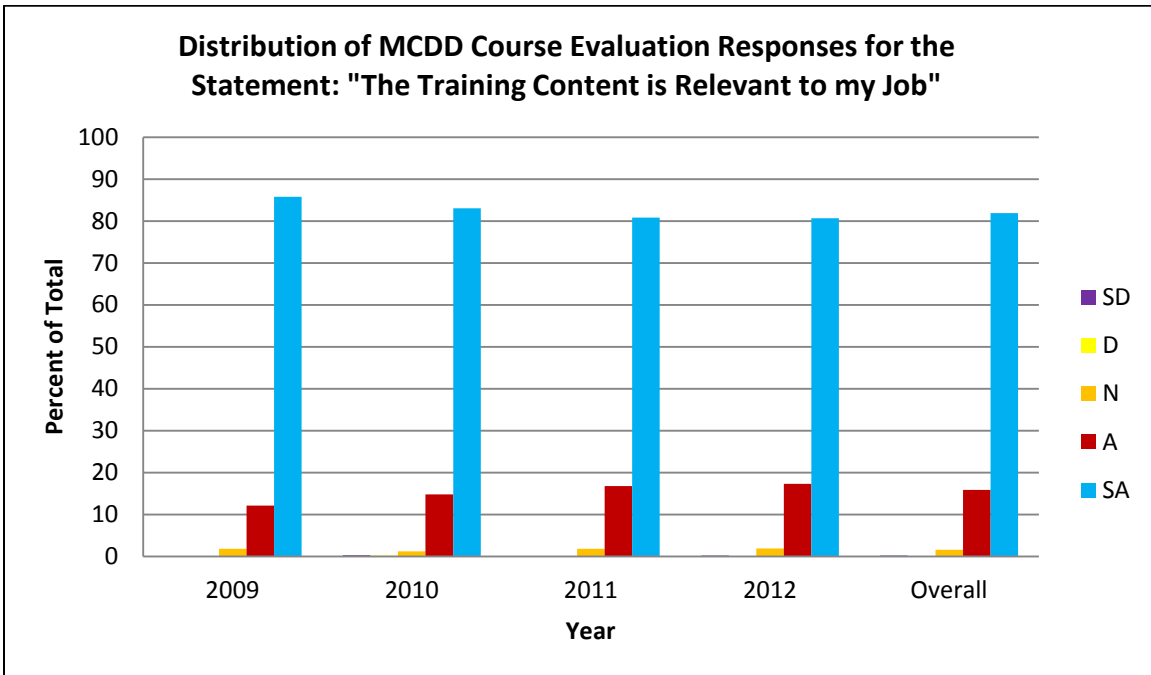
**Figure 10: Distribution of MCDD Course Evaluation Responses for the Statement: "Length of Course Was Appropriate"**



**Figure 11: Distribution of MCDD Course Evaluation Responses for the Statement: "Instructor(s) Were Knowledgeable about Course Materials"**



**Figure 12: Distribution of MCDD Course Evaluation Responses for the Statement: "Instructor(s) Provided Effective Presentations/Explanations"**



**Figure 13: Distribution of MCDD Course Evaluation Responses for the Statement: "The Training Content is Relevant to my Job"**

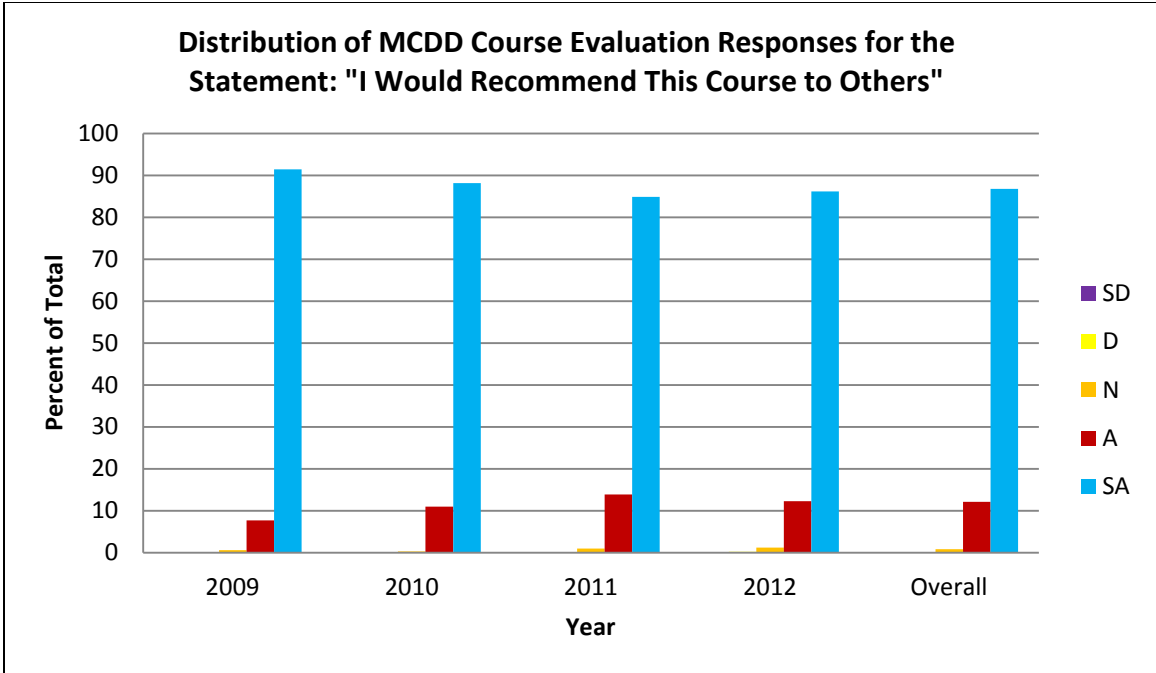


Figure 14: Distribution of MCDD Course Evaluation Responses for the Statement: "I Would Recommend This Course to Others"

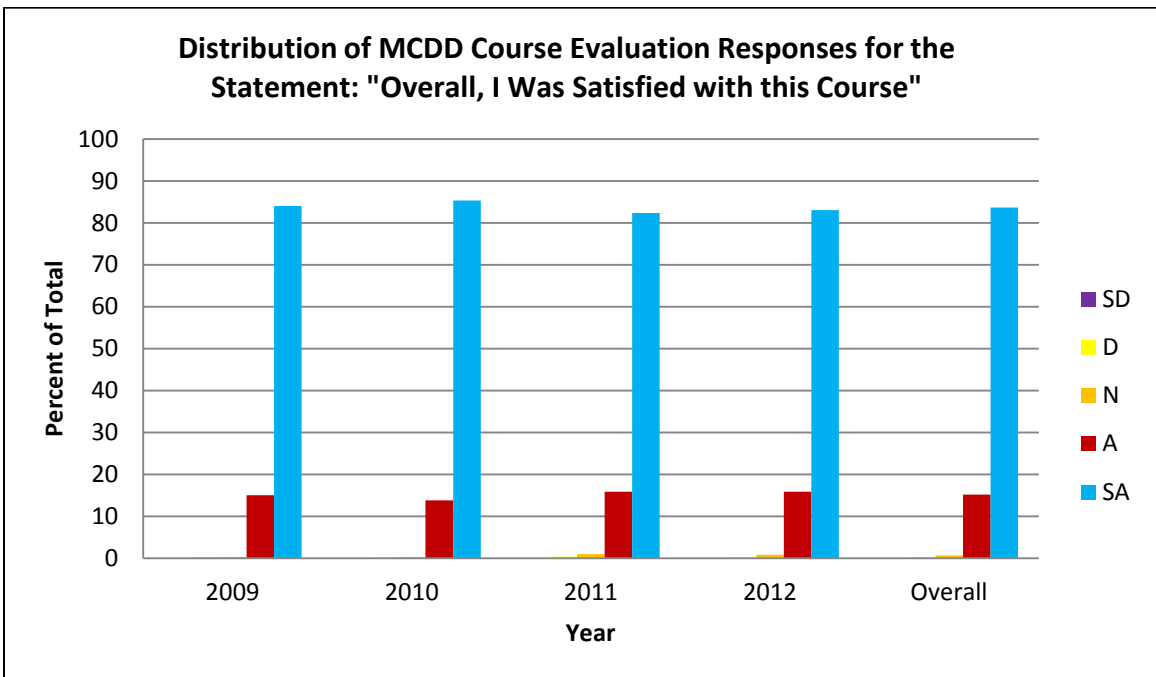


Figure 15: Distribution of MCDD Course Evaluation Responses for the Statement: "Overall, I Was Satisfied with this Course"

## Draft Final Report

About one-half of evaluations included written comments. All of the comments written on the evaluation forms were read by a researcher and synthesized by theme. The comments addressed the following themes, with examples provided.

### Skilled/high quality instructors

*"The two [instructors] did a great job and I will take all I learned and use it every day. Thank you."*

*"Instructor is very knowledgeable and gives the course a joyful way of learning."*

*"I believe both instructors were very professional and I learned more than I have at any other school."*

*"You guys know what you are talking about."*

*"The instructor was witty and on-point. I really enjoyed this course."*

*"You can't put a price on the importance of this course!"*

### The course had good content:

*"This was a very humbling experience. After 35 years as a truck driver I learned how much I did not know."*

*"All the material has been nicely put together."*

### The course overall was valuable:

*"This course should be a state requirement rather than an option. It is required by law to have our medical cards—should be the same for this course."*

*"This course has opened my eyes."*

*"Every driver with a commercial driver license should have to take this course."*

### Praise for the hands-on portion of course:

*"Very nice. The hands-on part of the course is great for learning. Would recommend."*

*"Excellent program. Learned a lot. Scared me half to death at times, but better here than out on the road."*

*"Great course. The hands-on learning was perfect."*

There were some negative comments and suggestions for improving the course.

### Smokers wanted a smoking area:

*"Need smoking spot!!!"*

*"The only thing was the no smoking. That's a hard thing to do under the stress."*

*"No smoking policy blows!"*

Course was too short:

*"The more experience with these situations the better. That's why 2, 3, 4, or 5 days would be great. I know it might not be feasible but the more the better for real-life situations."*

*"Could have gone through some of the exercises more than twice to learn it better."*

*"I think the course should be longer in length—more than 1 day."*

Poorly functioning equipment/facilities:

*"Truck number [x] has an air leak."*

*"I feel the [course] needs a better maintenance program for the trucks and equipment used..."*

*"Trucks need a tune-up—pouring out blue smoke."*

*"You could upgrade to whiteboard/dry-erase technology—but the chalkboard still works."*

*"Trucks could use some TLC. Throttles sticky, clutches and brakes out of adjustment."*

*"Please! Air conditioning in all cabs. Heat index was 109 deg."*

**Mobile Truck Simulator Program (MTSP) Evaluations**

UMTRI was forwarded five electronic files (in pdf format) of evaluations for the MTSP. These files spanned the time period from August 27, 2010 to December 13, 2012. These files included the student demographic information, but none of the course evaluation forms. As such, no analysis of the trainee's perceptions of the MTSP could be conducted.

**Defensive Driving Course (DDC) Evaluations**

UMTRI was forwarded 53 electronic files (in pdf format) of evaluations for the DDC. Each of these files contained information from a single class. The time period for these evaluations was from April 24, 2010 to September 26, 2012. Of these files, only 35 had useable course evaluation data. The reasons why files were unusable included the following: file was corrupted, file contained no evaluation forms, or file contained evaluation forms but they could not be linked back to student demographic data.

Data for the 343 useable evaluations, along with relevant student demographics data, were entered into a spreadsheet for analysis. The following information was coded for each course evaluation: date of the course, city in which course was taught, the state in which the participant was licensed, the reason for taking the course, the number of years as a professional driver, the participants' position of employment, and the 10 statements that constituted the course evaluation, as discussed previously.

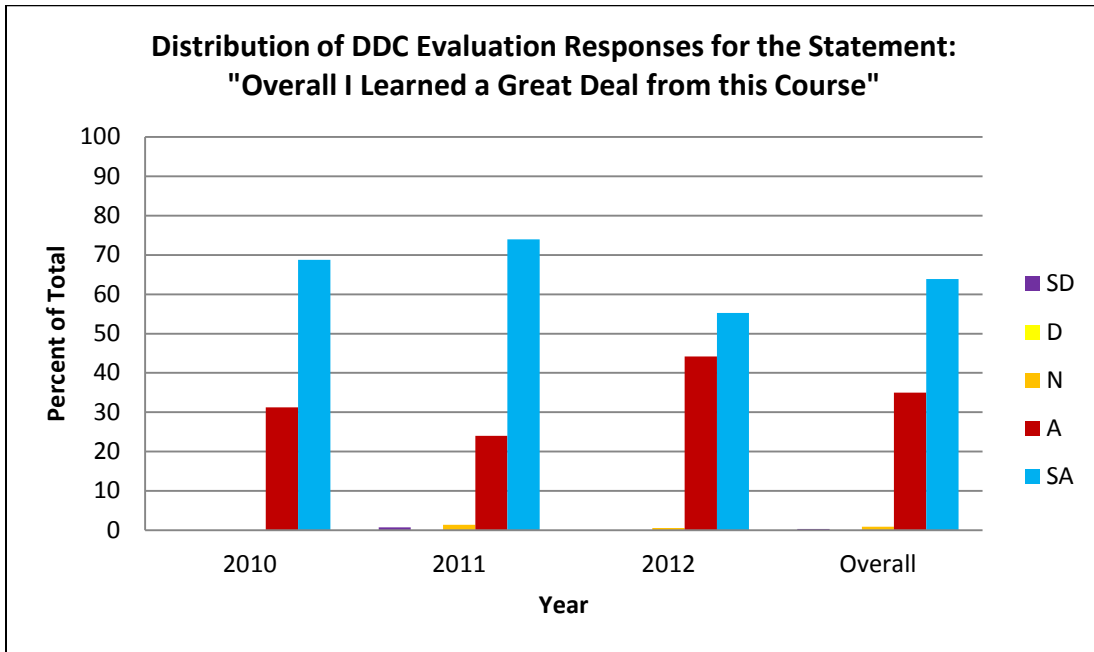
Of the 343 evaluations, 16 were completed in 2010, 146 were completed in 2011, and 181 were completed in 2013. The courses were taught in the following 12 Michigan cities: Grand Rapids (8.5%); Saginaw (4.1%); Lansing (19.8%); Flint (29.2%); Kalamazoo (13.7%); Canton (6.7%); Muskegon (4.4%); Bear Lake (3.2%); Cheboygan (5.3%); Cadillac (2.3%); Detroit (2.3%); and Romeo (0.6%). All but two participants were licensed in Michigan (Ohio and Indiana were the other states). About two-thirds (66.7%) of participants reported that they were required to attend



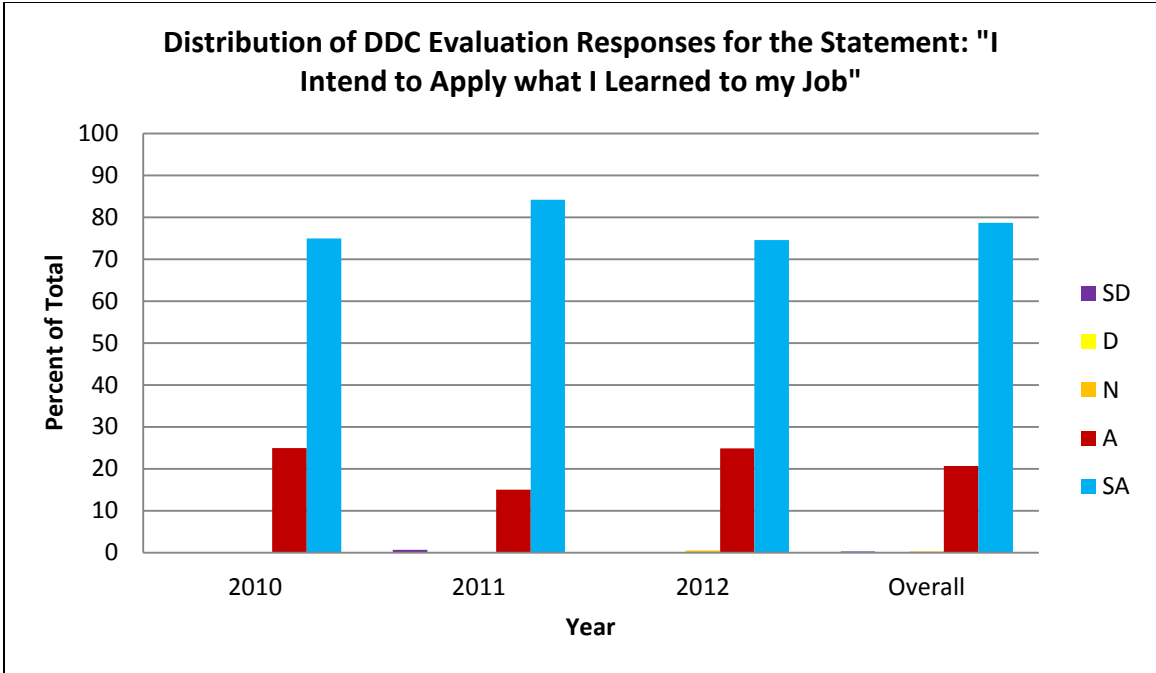
the course and 21% reported that they requested to take the course. The rest (12.5%) did not indicate a reason for taking the course. Most participants found out about the course through their company or a safety manager (59.5%). Very few reported finding out about the course through a publication (0.3%) or a website (1.8%). The rest found out in some other way (32.4%) or did not answer the question (6.1%). Most participants were either student drivers (65.6%) or current commercial drivers (29.7%), with a small number of participants from management (2.3%).

**Evaluation responses by year**

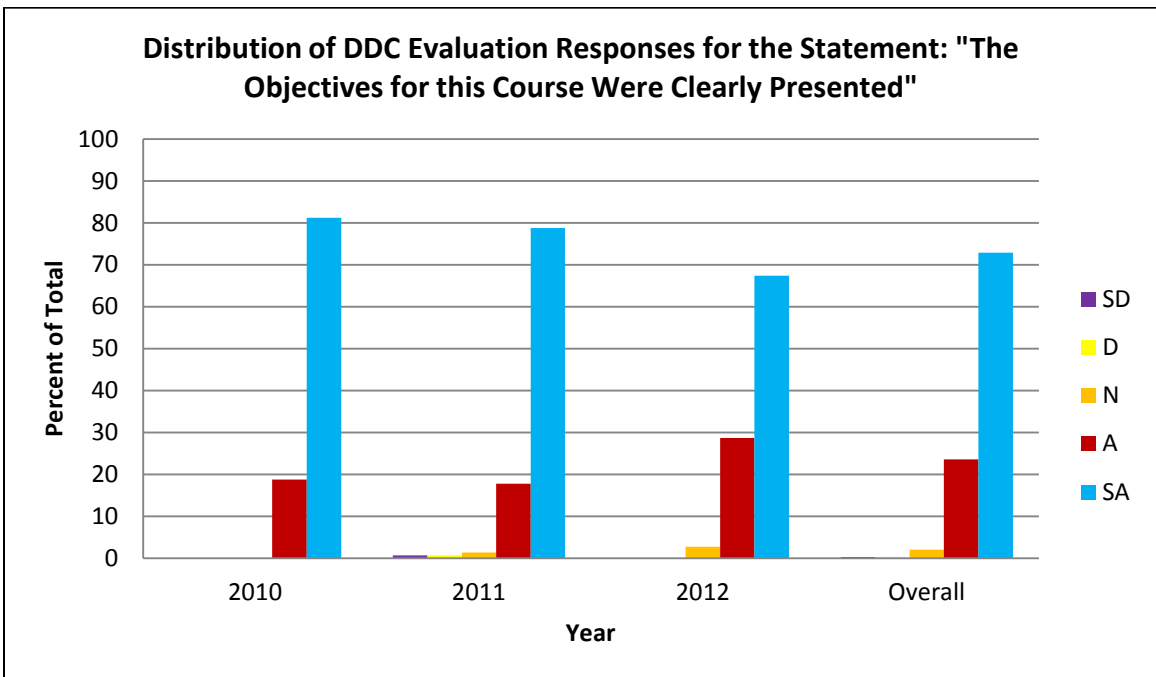
Figures 16-25 show the distribution of evaluation responses by year and overall for each of the 10 statements. Each figure shows responses to a single statement. Overall, the responses were overwhelming in strong agreement with all of the statements. The least positive support was found for the statement on the course length, with respondents wanting the course be longer.



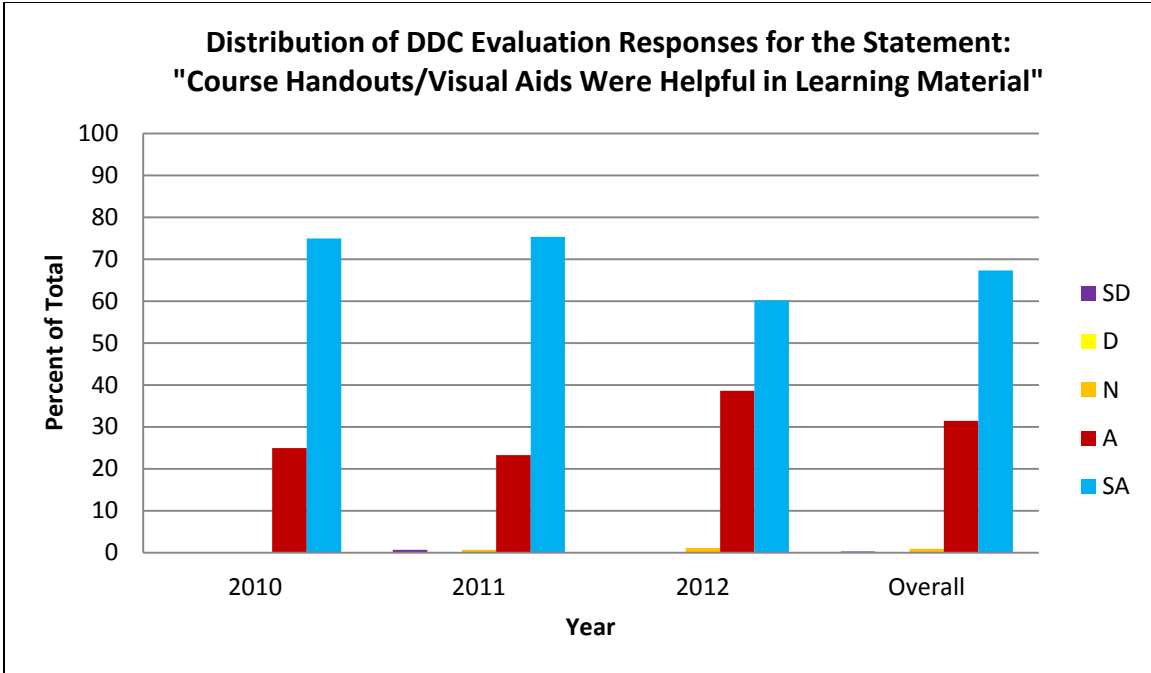
**Figure 16: Distribution of DDC Evaluation Responses for the Statement: "Overall I Learned a Great Deal from this Course"**



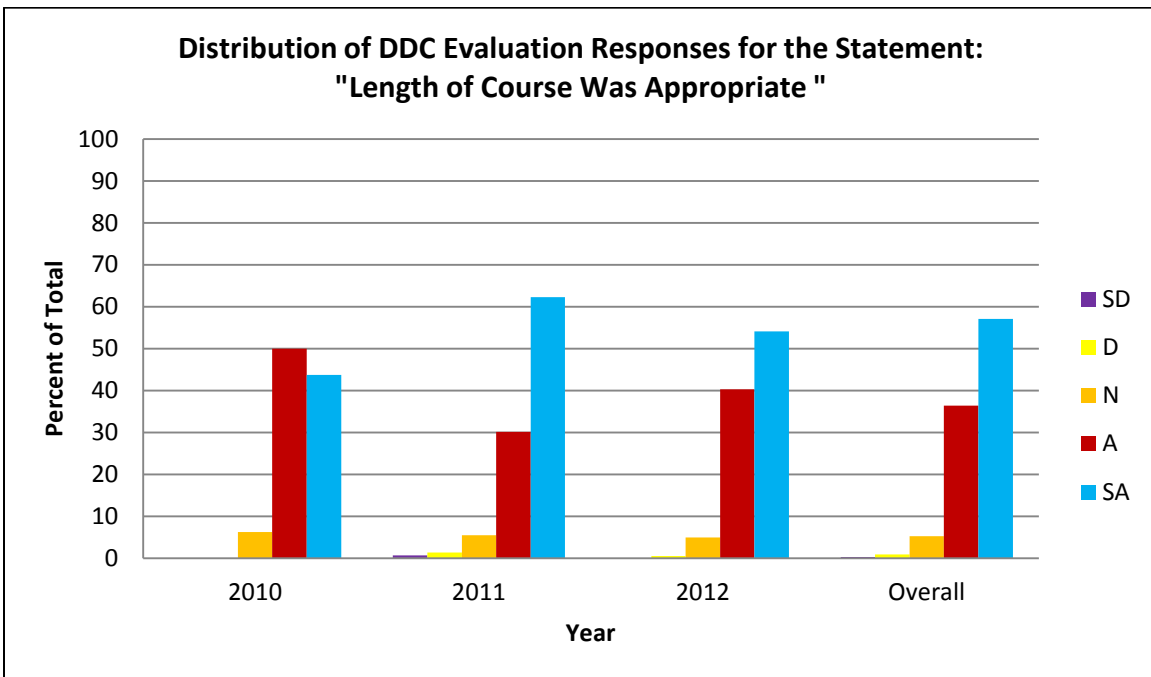
**Figure 17: Distribution of DDC Evaluation Responses for the Statement: "I Intend to Apply what I Learned to my Job"**



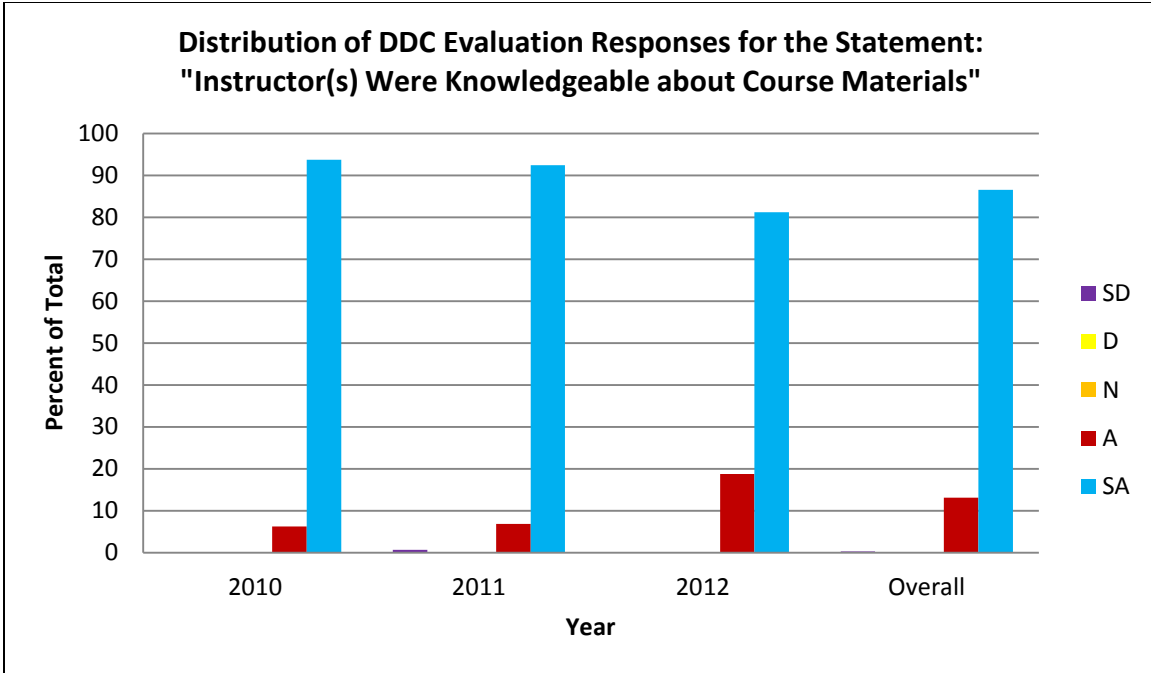
**Figure 18: Distribution of DDC Evaluation Responses for the Statement: "The Objectives for this Course Were Clearly Presented"**



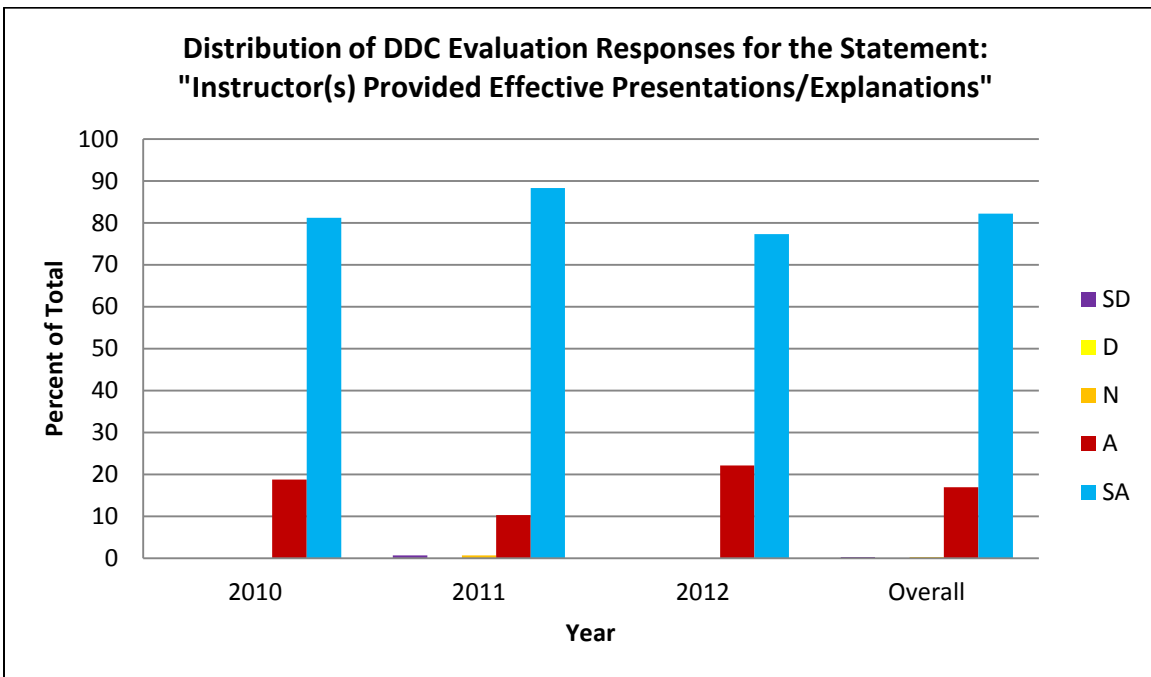
**Figure 19: Distribution of DDC Evaluation Responses for the Statement: "Course Handouts/Visual Aids Were Helpful in Learning Material"**



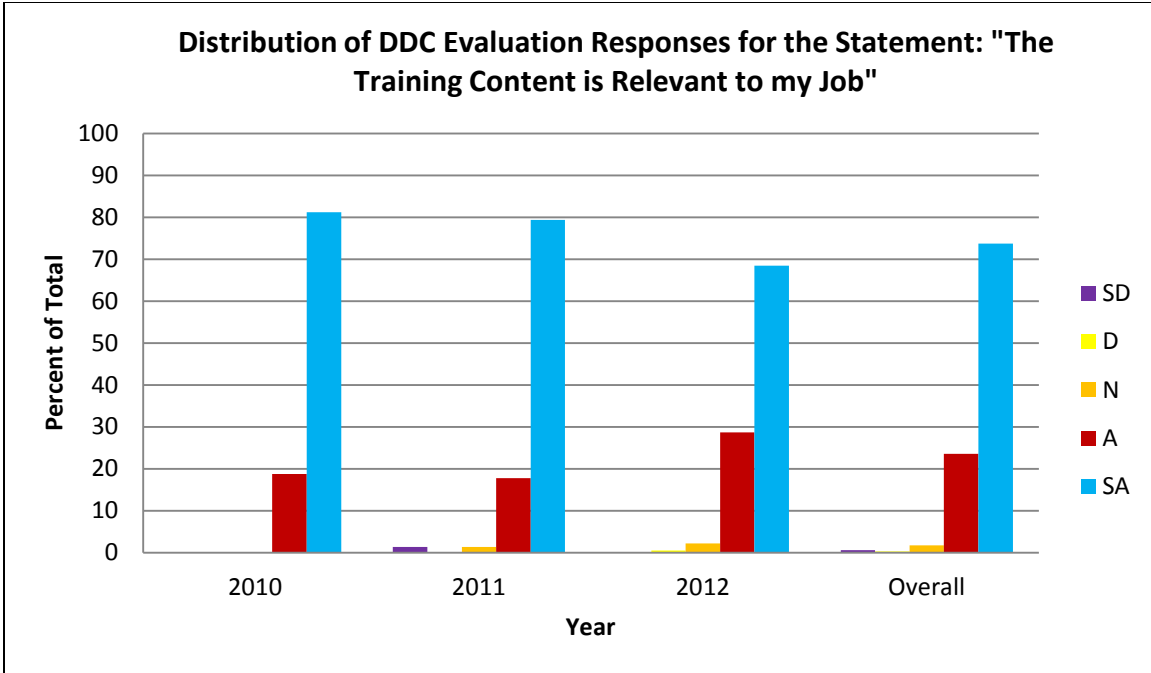
**Figure 20: Distribution of DDC Evaluation Responses for the Statement: "Length of Course Was Appropriate"**



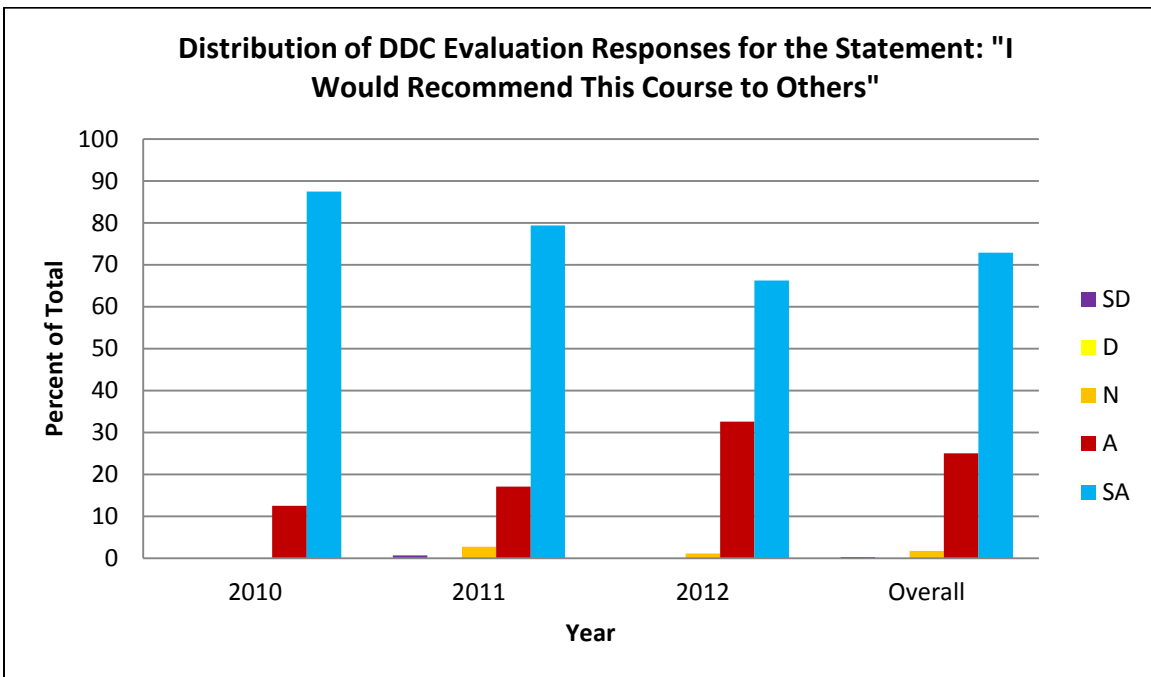
**Figure 21: Distribution of DDC Evaluation Responses for the Statement: "Instructor(s) Were Knowledgeable about Course Materials"**



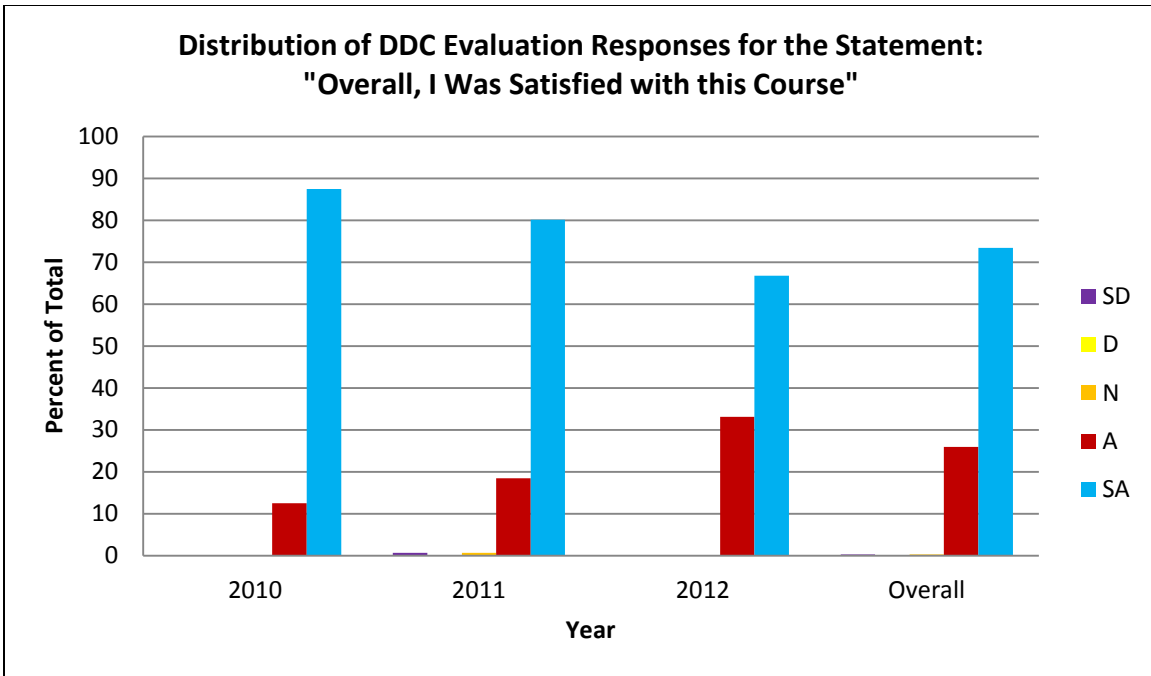
**Figure 22: Distribution of DDC Evaluation Responses for the Statement: "Instructor(s) Provided Effective Presentations/Explanations"**



**Figure 23: Distribution of DDC Evaluation Responses for the Statement: "The Training Content is Relevant to my Job"**



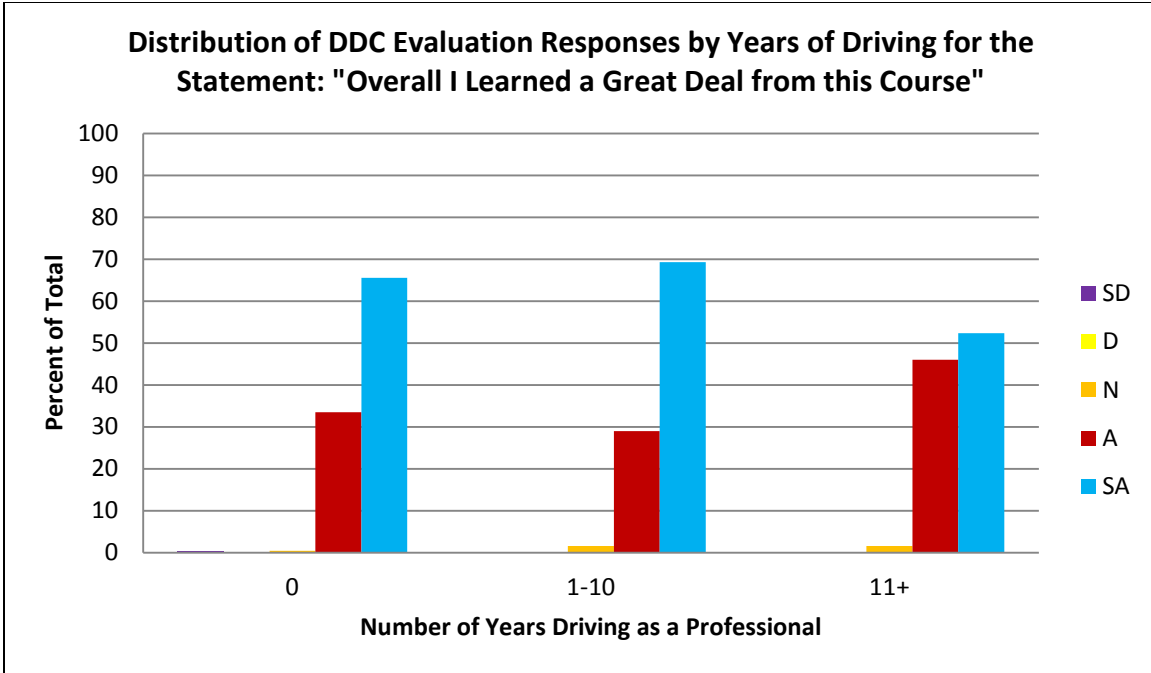
**Figure 24: Distribution of DDC Evaluation Responses for the Statement: "I Would Recommend This Course to Others"**



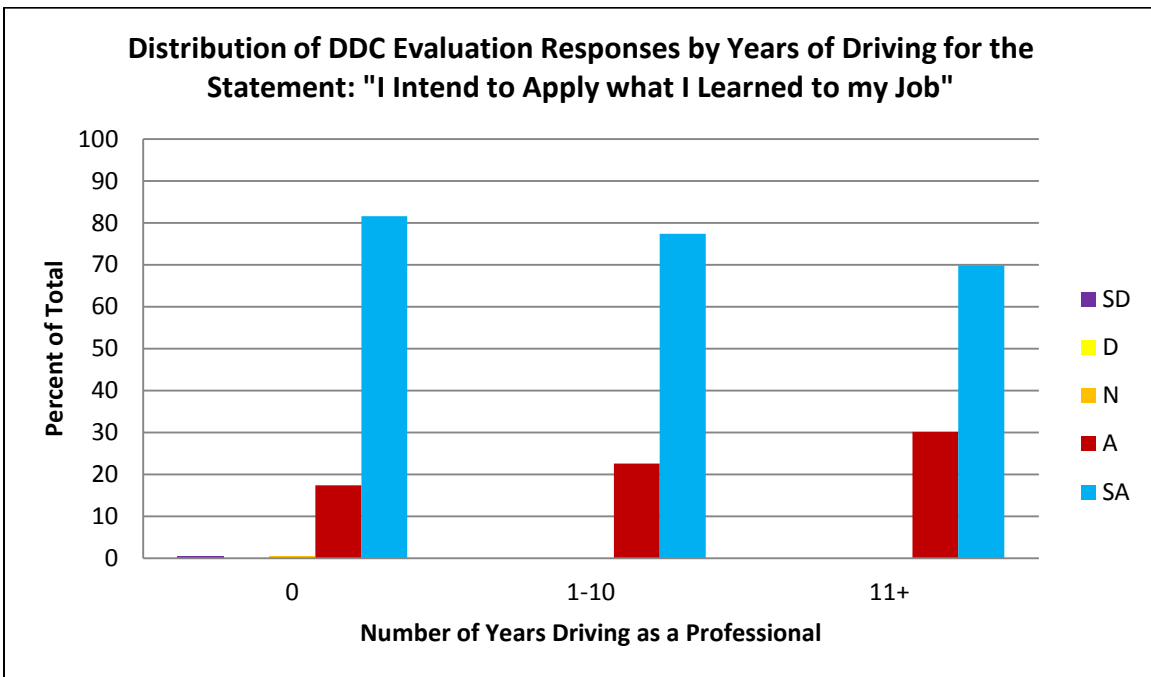
**Figure 25: Distribution of DDC Evaluation Responses for the Statement: "Overall, I Was Satisfied with this Course"**

***Evaluation responses by number of years as a professional driver***

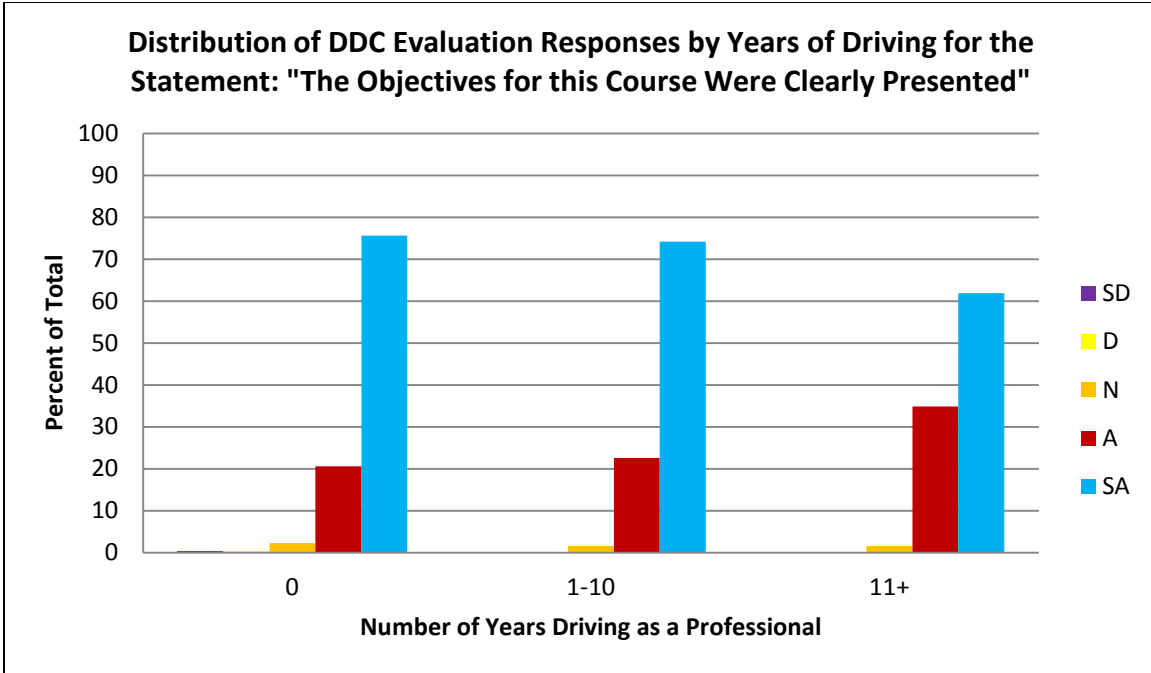
Analyses for the course evaluation were also conducted by the number of years that participants had been a professional commercial vehicle driver. Figures 26-35 show the level of agreement to the 10 statements averaged across all years. In general, participants were less enthusiastic about the DDC course if they had experience as a commercial driver. The overall responses, however, were quite positive for all participants, including those with 11 or more years of driving experience.



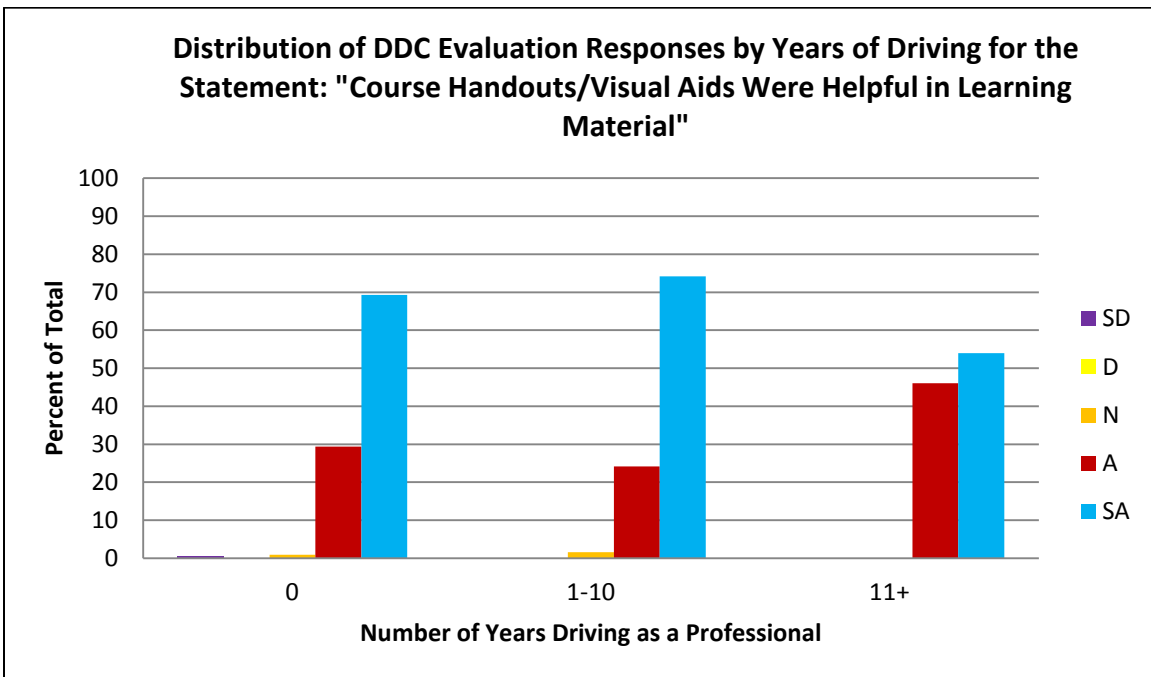
**Figure 26: Distribution of DDC Evaluation Responses by Years of Driving for the Statement: "Overall I Learned a Great Deal from this Course"**



**Figure 27: Distribution of DDC Evaluation Responses by Years of Driving for the Statement: "I Intend to Apply what I Learned to my Job"**

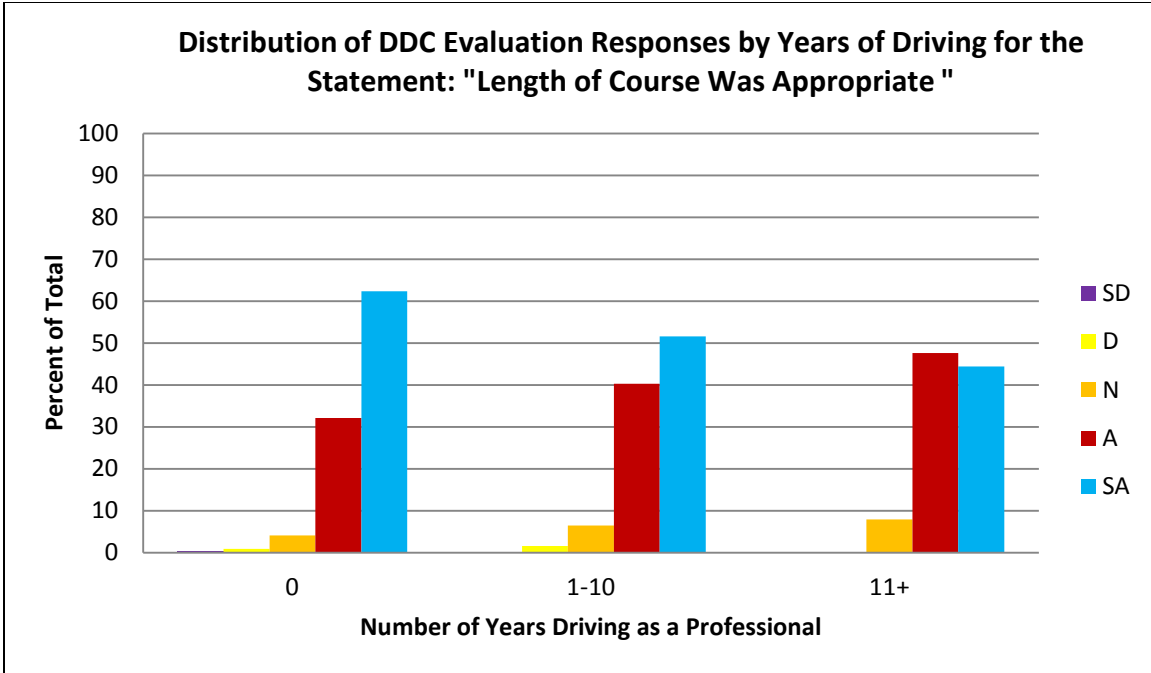


**Figure 28: Distribution of DDC Evaluation Responses by Years of Driving for the Statement: "The Objectives for this Course Were Clearly Presented"**

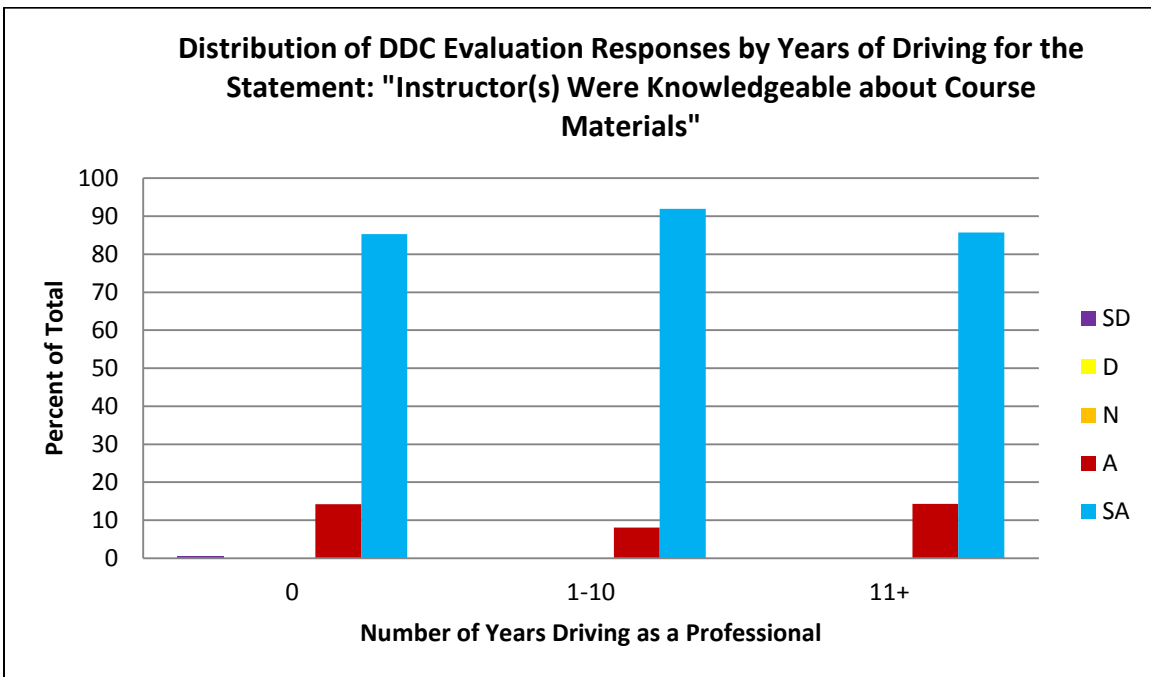


**Figure 29: Distribution of DDC Evaluation Responses by Years of Driving for the Statement: "Course Handouts/Visual Aids Were Helpful in Learning Material"**

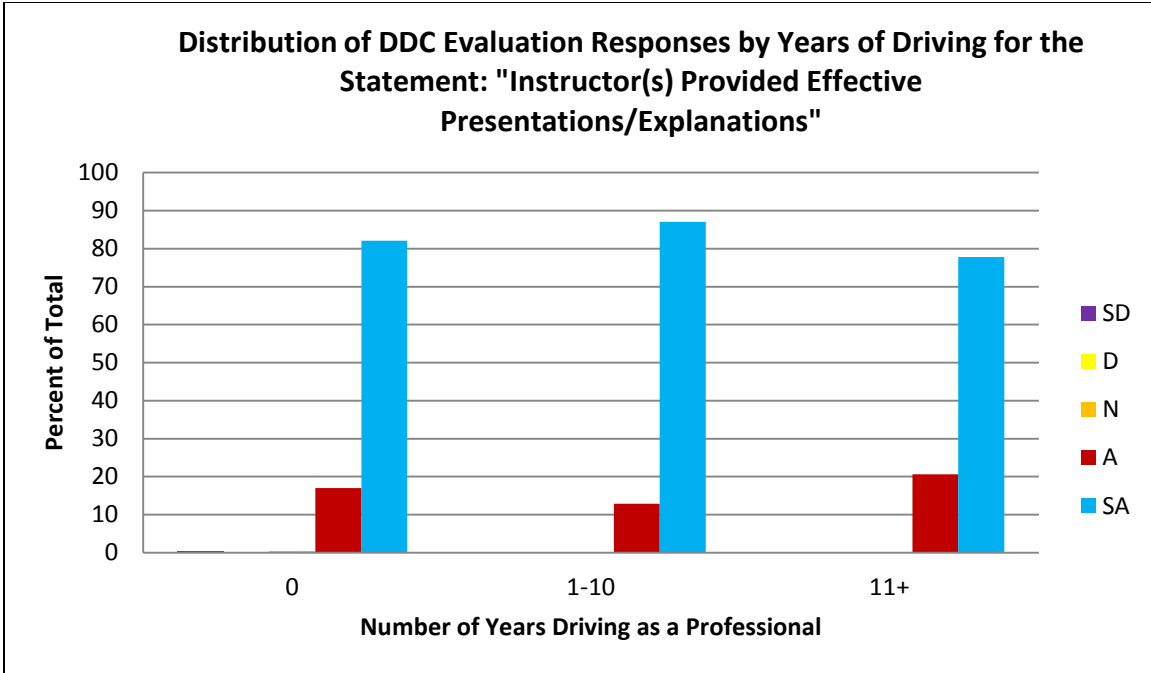




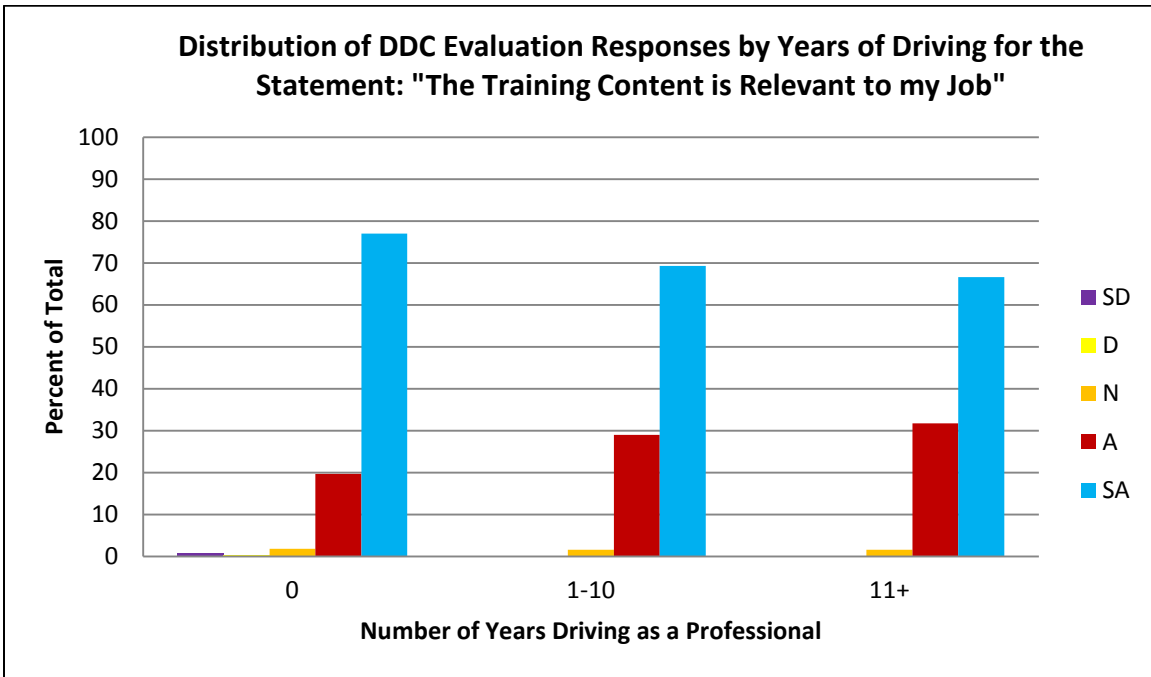
**Figure 30: Distribution of DDC Evaluation Responses by Years of Driving for the Statement: "Length of Course Was Appropriate"**



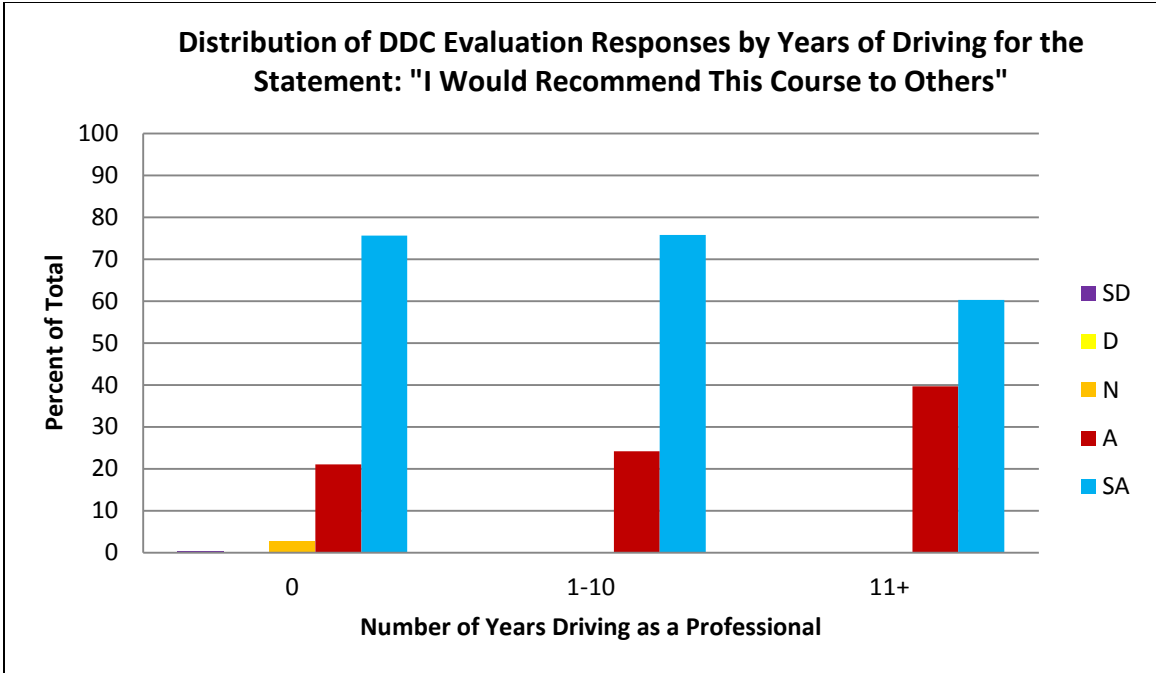
**Figure 31: Distribution of DDC Evaluation Responses by Years of Driving for the Statement: "Instructor(s) Were Knowledgeable about Course Materials"**



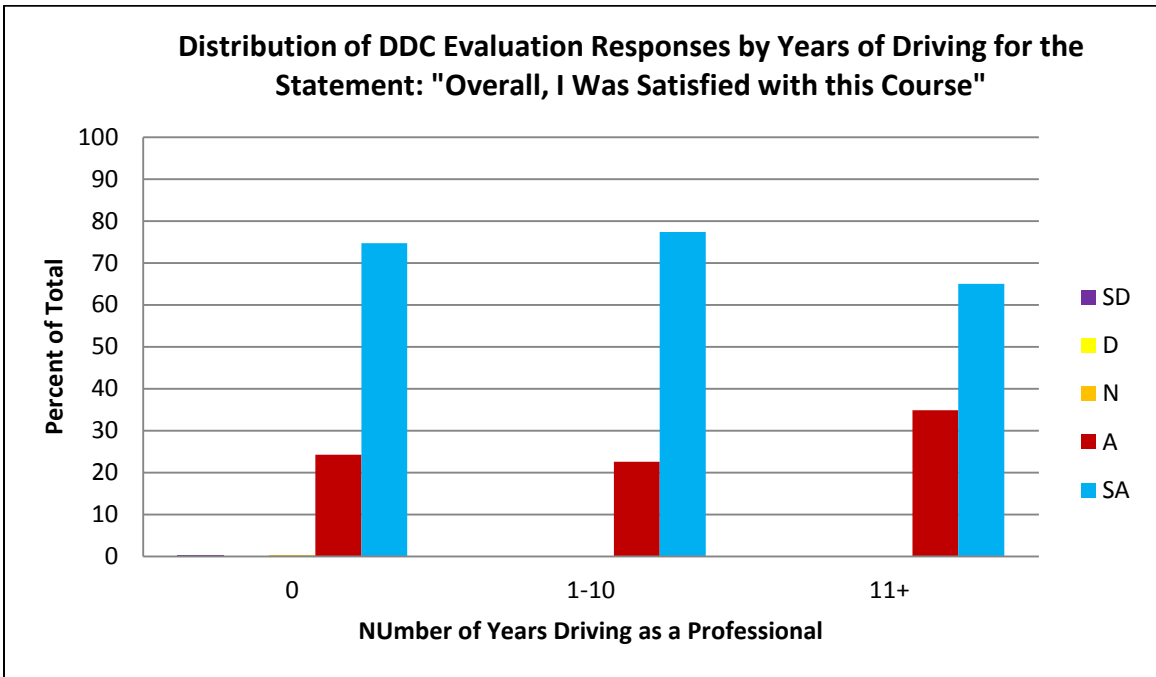
**Figure 32: Distribution of DDC Evaluation Responses by Years of Driving for the Statement: "Instructor(s) Provided Effective Presentations/Explanations"**



**Figure 33: Distribution of DDC Evaluation Responses by Years of Driving for the Statement: "The Training Content is Relevant to my Job"**



**Figure 34: Distribution of DDC Evaluation Responses by Years of Driving for the Statement: "I Would Recommend This Course to Others"**



**Figure 35: Distribution of DDC Evaluation Responses by Years of Driving for the Statement: "Overall, I Was Satisfied with this Course"**

## Draft Final Report

Over one-quarter (93) of the available evaluations included written comments. All of the comments were read and synthesized by theme. The comments addressed the following themes, with representative quotes for each provided.

### Knowledgeable/skilled/helpful instructors

*"Very knowledgeable and helpful."*

*"I appreciate that fact that our instructor was extremely knowledgeable and very willing to help us understand the material."*

*"Absolutely excellent presentation in all respects. Thank you, Sylvia."*

*"Instructor's experience was invaluable."*

*"The instructor was very informed and well prepared. Thank you for coming to teach us this very informational course."*

*"I enjoyed the class very much. The instructor was friendly and very knowledgeable."*

*"Very well [taught] course. The instructor was very good at teaching and did a wonderful job presenting the course."*

*"Mr. Wehman knows how to draw your attention in his class. You really want to get involved in class."*

### Useful/valuable course overall

*"Awesome course!!"*

*"Very helpful course that I will take into thought every time I drive for my job and in my own car."*

*"This course was very interesting and helpful. There was a lot of things I didn't know before but I do now!"*

*"Great deal of help for my future employment with my job."*

*"I was interested in the material and learned some extra safety precautions I haven't learned yet in my regular instruction."*

*"Class was very insightful and I learned a lot. Breaks however could have been at least 10 min long and more regular."*

*"The information disclosed in the DDC has been very informative and offered tips on improving time and preventive measures which makes for a safe road."*

*"Very worthwhile class. Would be valuable even for non-truckers."*

*"This course was very helpful in my everyday life."*

*"The course has helped me to identify problems and how to find solutions to help correct these problems."*

*"The course is informative and could be greatly useful in future jobs in the transportation industry."*

*Great class environment. Happy to be in class.*

*This course was helpful in knowing dangers on the road driving a commercial vehicle.*

#### Recommendations for expansion of course

*"I recommend this course to all truck drivers. Following the lessons provided by this course promote public and driver safety."*

*"More time needed to see it all."*

*"Every commercial driver needs to take this (DDC) Defensive Driving Course."*

*"Add bus driver material. Don't let Gov reduce this program"*

*"This was a great class. Very informative! Should be offered to more drivers."*

*"Strongly recommend to all drivers of CMV. Gave me a different mind frame. Be professional."*

*"This course would be helpful if everyone that applied for a driver's license took the course."*

*"Newer films. More Q & A."*

*"I think every new driver on the road before they get their license should ride in a semi for 10 hours before they get their license to see firsthand driving from our eyes."*

## **Safety Manager Perception of MCTS Courses**

### **Methods**

To assess the benefits and impacts of the MCTS training program, structured interviews were conducted with representatives of trucking companies, other organizations, and schools, whose drivers or students have participated in the courses (see Appendix A for Interview Guide). Of interest were impacts of the training on the drivers themselves, as well as on the overall company, organization, or school. Eleven interviews were conducted over a two month period in 2013. Those entities in each category (company, other organization, or school) having the largest numbers of participants in the MCTS program were targeted for inclusion. Representatives from the following companies, organizations, and schools were interviewed:

<b>Table 20: Companies Interviewed</b>	
<b>Name</b>	<b>Approximate number of Drivers/Students</b>
<b>Trucking companies</b>	
Apollo Express	100
Bay Transportation	15
Dakota Lines	400
Nationwide Truck Brokers	220
Ralph Moyle Inc.	95
<b>Companies/organizations that employ drivers</b>	
Macomb County Department of Roads	40
MDC Contracting	17
Northern A-1 Services and American Waste	212
Two Men and a Truck	28
<b>Truck driver training schools</b>	
Baker College of Flint	NA
West Michigan CDL	300-350

## **Results**

### Overview of MCTS Training

All 11 interviewees confirmed that their drivers or students had participated in training courses offered by MCTS, although a few company representatives noted that they no longer send drivers or send a reduced number of drivers now due to budgetary constraints, time and distance constraints, or lack of relevant training options. The course most frequently attended by drivers was the MCDD (cited by eight interviewees), followed by DDC (cited by three interviewees), FMC (cited by the two school representatives), and PDC (cited by one interviewee). One company reported that the only MCTS training they participated in was the FMCSA-required Hazardous Material Course offered every three years.

Collectively, interviewees reported that their organizations had been sending drivers to MCTS training courses for the past five to 20 plus years. Some reported sending one to two drivers weekly to training, while others reported sending an average of five to 20 drivers annually depending on the size of the company, the specific training needs of the drivers, the company's available budget, and the schedule and time availability of the drivers. One of the two schools reported sending over 100 students per year to the MCDD. Among the challenges mentioned with regard to participating in the MCTS training were difficulties in scheduling drivers due to the geographic dispersion of company drivers, as well as frequent changes to their driving schedules.

Some companies/organizations reported sending all their employees at once for training (usually for the MCDD and DDC) or sending drivers at fixed intervals (e.g. every two to six years). Others reported sending their drivers through the MCDD as soon as possible after being hired (usually within one year but often after at least 90 days to ensure drivers were planning to stay in the job), with several mentioning that they would send drivers for remedial training in the event that they were involved in one or more crashes. Representatives of the two truck driver training schools reported sending their students near or at the end of their training program because they thought their students would benefit most from the course at that point in their schooling.

### Usefulness of MCTS Courses

Interviewees were asked about the specific MCTS courses in which their drivers participated. Comments about the usefulness and impacts of each course are summarized below.

### ***MCDD***

In general, the MCDD was reported to be quite useful. Several interviewees mentioned the value of allowing drivers to experience skid situations in a controlled environment so they could learn proper emergency maneuvers and techniques (e.g. chop steering) and how to avoid those skids in everyday driving. The course was considered valuable for both experienced and inexperienced drivers, and provided a unique opportunity for drivers to experience how quickly things can go wrong on the road. In fact, one interviewee noted that a key safety benefit of the course was the recognition by participants that they had slower reactions to and less control over rapidly changing conditions in the environment than they had assumed. Interviewees mentioned that the course: improved driver awareness and driving skills, increased competency in emergency maneuvers, increased overall driving safety, was perceived positively by drivers, encouraged drivers to talk with one another about the tactics learned, and provided a sense of camaraderie. Most interviewees reported that instructors were knowledgeable and friendly.

When asked if they had tried to formally quantify the benefits of the course, most responded that they had not. However, several mentioned anecdotally that they had observed fewer driver errors, crashes, and injuries among drivers following their participation in the course. The cost of the course was reported to be very reasonable (\$50 for each Michigan driver), with one interviewee noting that if the course prevented just one crash it was worth the cost. Other comments were that the course was valuable, a great price for eight hours of training, and one of the best courses out there. One of the school representatives reported that its students considered the course to be quite beneficial and had increased their ability to avoid or limit the severity of a crash. One interviewee commented that he would like to see the MCDD required for all drivers of cars and trucks because of its importance, especially in Michigan with its inclement weather.

### ***DDC***

Representatives from the three companies that had participated in the DDC reported that their drivers considered it to be useful and provided positive feedback about it. Among the strengths of the course were its knowledgeable instructors and its reinforcement of basic driving safety measures. While neither company had tried to formally quantify program benefits, one interviewee thought that the course had increased safety, with crash rates dropping among drivers who took it. One of the school representatives reported that the school had used the course in the past, but was now able to conduct similar training in-house. The school does continue to use the MCTS Defensive Driving lecture.

### ***FMC***

This course was reported to be extremely valuable to one school whose representative reported using it for students. The other school's representative reported that he had personally taken the course and was considering adding it to the curriculum. A few of the company representatives who had previously been unfamiliar with the course reported that they might now consider having their drivers participate in it, although one noted that lack of web access might be a barrier to participation.

### ***PDC***

The interviewee whose company had participated in this course reported that its usefulness depended on the ability of the instructor to provide constructive feedback on how to improve driving. The company used this course for drivers who had been involved in several small crashes or for drivers with issues that could not be resolved within the company. One of the school representatives noted that he tried to schedule employees for the course but the wait was too long to get a time slot.

### ***Hazardous Material Course***

The company participating in this course did not participate in any other courses (because it does not currently see a need for other courses). However, it does find the FMCSA-required Hazardous Materials Course provided by MCTS to be a useful refresher course which provides an opportunity for drivers to ask questions or raise issues they might have.

### ***MTSP***

Most interviewees did not report taking advantage of the MCTS simulator, although one company representative mentioned that the company would use it if it was up and running. Another interviewee mentioned that while he had not seen the MCTS simulator, he found other simulators to be too unrealistic. One interviewee whose company had used the simulator reported that successful outcomes on the simulator appeared to be more closely tied to video game experience and proficiency rather than driving competency.

### General Comments on Program Improvement

Some of the interviewees who had been unaware of courses other than the MCDD noted that they would now look into them as options for their companies or organizations. One suggested that MCTS more actively market these courses to trucking companies and others, as they sounded beneficial for drivers. A few interviewees mentioned that they would like to see more locations for the skid pad course to facilitate travel to the site. One company representative who found the DDC to have limited value because of its focus on over-the-road trucking drivers, suggested developing a course geared for the construction industry and local delivery trucking industry (focusing on signage, traffic control, and working with double versus single trailers).

Suggestions for improving the overall MCTS program included making upgrades to its facilities (e.g., size, amenities, parking), as well updating equipment for the MCDD, addressing web access issues for the FMC portal, improving the response time for the “Home Run for Safety” award certificates, and increasing professionalism among instructors. It was also noted that it would be useful for instructors for the Hazardous Material course to come “after hours” as they did in the past to talk to drivers instead of only during business hours as they currently do. One interviewee suggested that MCTS do more advertising of the full range of courses they offer, perhaps with e-mails to trucking companies, so that more companies could take advantage of the courses.

Several strengths of MCTS were reported including: having a knowledgeable, well-trained, and friendly staff; being a good resource for training, especially on driving rules and regulations; having a useful website; and providing the Truck Guidebook to drivers. One interviewee referred to MCTS as a great resource for everyone, and especially for smaller companies and with regard to compliance issues. Another mentioned that the MCTS had reduced its staff in recent years, but remained a valuable resource that should continue to stay in operation. All interviewees reported that they would recommend MCTS and/or its courses to others. One interviewee mentioned that he had referred smaller companies to MCTS, while another reported no need to bring up MCTS in conversations because most Michigan companies are already aware of it. Another two interviewees mentioned that they have recommended MCTS to others and will continue to do so.

### Non-MCTS Training

All interviewees reported that their organizations offered some form of their own training for drivers in addition to the courses offered by MCTS. Examples of in-house training included classroom and on-road training, an eight hour safety course for employees, presentations from safety consultants from private company and insurance carriers on safety issues, videos and online lessons, and a “ride-alongs” with experienced drivers and/or driver trainers at the company.

## **Discussion**

The evaluation was concerned with five of the main driver training courses offered by the MCTS. These included the MCDD, DDC, PDC, FMC, and the MTSP. Four outcome measures were



used in the evaluation: demographics of the participants, safety outcomes, perceptions of the course participants, and perceptions of fleet safety managers.

The MCTS courses serve the Michigan professional trucking community. About 25,000 people have participated in its training courses over the past decade. About one-half of the course participants were professional drivers, and the rest included student drivers, management, and others. Thus, the MCTS provided training for drivers entering the field, as well as providing on-going training for professional truck drivers.

In the analysis of safety effects, the study examined the crash and traffic violation experience of professional truck drivers who had participated in a MCTS course before and after the course, and compared it to the crash and violation experience of a randomly selected set of drivers holding CDLs. The comparison sample was matched to the age and sex distribution of the course participants. The crash and violation records of the drivers were obtained from the driver history records maintained by MDOS.

The analysis of truck crashes did not identify post-course reductions in crashes overall or truck involved crashes for the MCDD course participants. The crash rates per driver for all crashes and for crashes involving trucks for the comparison group were lower than those of the MCDD course participants in both pre and post periods and also exhibited decreases between the two time periods.

This disparity between the crash measures of MCTS drivers and the comparison drivers is most likely the result of differences in exposure. Most of the MCTS drivers were employed (at least at the time of the course) as professional truck drivers. All comparison drivers held CDLs but the study did not have information about their employment status or know whether they drove trucks if they were employed. Professional truck drivers drive more miles than other drivers and are, therefore, exposed to more opportunities for crashes than those who are not professional drivers. Crash rates per mile driven would be the better crash measure for comparison in this study but information on miles driven was not available.

Crashes are a result of many factors, many beyond the control of the individual driver. Traffic violations, on the other hand, reflect the individual's driving practices, and are a good measure of safety effects. The analysis of driver history records found safety benefits associated with the MCTS courses. There was a significant reduction in the rate of traffic violations while driving a truck for drivers with MTSC training. This effect was not found among the CDL drivers who did not participate in a MTSC course.

As part of the analysis of safety effects, the study compared the characteristics of truck crashes of drivers who had completed an MCTS training course with those of truck crashes involving a random set of CDL-holding drivers, matched by age and sex to the MCTS drivers. The crash records were from the Michigan Vehicle Crash Database. It was found that drivers with MCTS training were less likely to be assigned a hazardous action in a CMV crash than comparison drivers with no MCTS training. Hazardous actions coded in crash data are an indication of a driver's contribution to a crash. The largest difference between the MCTS and comparison drivers was among the youngest group drivers, those age 23-30, which are just starting their professional truck driving careers.

The perceptions of MCTS course participants were examined through the analysis of available course evaluations of the MCDD and DDC courses. Participants' evaluations were overwhelmingly positive for both courses. More than 80% of MCDD participants strongly agreed that the course was relevant and useful, that they learned much, would apply what they learned in their job, and that the instructors were effective and knowledgeable. Comments written on the evaluation forms suggested that the course handouts and visual aids could use some updating and that the trucks used for the skid training needed some maintenance. Several participants commented that the course was too short and should be expanded to multiple days. The

evaluations for the DDC were also very positive with regard to course content, effectiveness and knowledge of the instructors, and the relevancy and usefulness of the material covered. The evaluations also indicated that many course participants felt that the course was too short.

Structured interviews were conducted with a sample of representatives of trucking companies (safety managers), other organizations that employ drivers, and schools that train drivers to assess their perceptions of the courses, as well as the impact of the courses on the entities they represent. Structured telephone interviews were conducted with 11 individuals. Overall, the interviewees noted the usefulness of the MDCC and DDC. Few had experience with the other courses. Although none of the companies or organizations represented had tried to formally quantify the benefits of the courses, several interviewees mentioned that they observed fewer driver errors, crashes, and injuries among drivers following the course. Among the challenges mentioned with regard to participating in the MCTS training were difficulties in scheduling drivers due to the geographic dispersion of company drivers, as well as frequent changes to their driving schedules

## **Conclusions**

The MCDD course is the premier course of the MCTS—it has the largest attendance, it is well received by the course participants, and it is highly recommended by safety managers. Drivers and safety managers report that the hands-on experience on the skid pad is valuable. Among course participants who have taken more than one MTSC course, many have repeated the MCDD course. Many course participants comment that they would like the course to be longer and that they would like more experience on the skid pad.

The MCTS should continue offering this course and might consider expanding it. For example, more drivers could have an opportunity to go through the MCDD training if there was another facility. Consideration might also be given to the feasibility of developing a second MCDD course that builds on the first one, offering a review of the first course and perhaps offering some more advanced techniques.

The DDC course is also a successful course. It has the advantage of being able to travel around the state, thereby allowing participants to realize savings in travel time and costs. It is well received by those who have taken the course, and by safety managers whose drivers had taken it. However, the structured interviews indicated that many managers were not aware of the course. A marketing strategy targeting safety managers and others might be useful to bring their attention to this course.

The current DDC course is a four hour classroom course. Many of the course participants commented that this was too short. The DDC course was developed by NSC, who also offers an eight hour version of this course. Consideration should be given to the feasibility of offering the longer version of the course. Perhaps a pilot test of the longer course could be conducted to determine its feasibility.

The MTSP Simulator has great potential because it offers hands-on training and can travel around the state. Its fidelity is credible and it has reasonable scenarios that can simulate a variety of actual challenges that drivers may face in the real world. However, the simulator is underused and has not been in operation for some time. Efforts should be made to get the simulator program operational, so its full potential can be realized.

The FMC course is a web-based self-administered course on fatigue management. Web-based courses have great potential for the future in that they can reach a large audience, they are relatively cheap to administer, and they can be easily updated with new information. The material provided is useful, and an individual cannot move on to the next module until he/she has mastered the previous one. It would be useful if the last module included an evaluation, which could be used to assess how well the course is received or how it can be improved.

The PDC training serves the purpose of reviewing the driving practices of professional drivers and should be continued. Course records indicated steady participation over the last decade. The structured interviews indicated that the benefits to the trainee are related to the communication skills of the driving coaches. Thus, ways of refreshing the communication skills of the driving coaches could be considered.

One of the challenges faced in the evaluation had to do with identification of the course participants. The MCTS database used in the study was originally entered electronically by MCTS from forms filled out by the trainees. In many cases, the information on driver license numbers was not correct, either because the trainees did not enter the correct number or the number was incorrectly transcribed into the database. Ways of obtaining more accurate information about participants would benefit future evaluations and should be explored. There may be an opportunity to use current technology such as scanning the driver's license at registration or obtaining the electronic record from the employer. Some thought should also be given to developing or modifying the evaluation forms for the training sessions so that more useful feedback could be captured. Ways of conducting the evaluations on a website should be explored. This would reduce the work of entering the information into databases for analysis, and could be administered for all the training courses. These suggestions for improvements should not detract from the overall positive responses to the MCTS training program. Most of the suggestions related to making the program more widely accessible to professional truck drivers.

## References

1. Federal Motor Carrier Safety Administration. (2009, 12 14). *FY 2010 CDLPI – Supplemental Grants for High Priority and Emerging Issues*.

## **APPENDIX A: Structured Interview Guides**

### **Interview Guide for Safety Managers of Trucking Companies/Organizations**

Hi. My name is \_\_\_\_\_ and I am with the University of Michigan Transportation Research Institute. As part of a study funded by the Michigan Office of Highway Safety Planning and the Michigan Truck Safety Commission, we are talking with safety managers of trucking companies [OR organizations] such as yours whose drivers have participated in training courses offered by the Michigan Center for Truck Safety (MCTS). We hope to learn more about the training that your drivers have received from MCTS and the impact the training has had on your company/organization. We know that employees in your company/organization other than drivers may have participated in MCTS training but our study is focused only on drivers.

1. First, could you please confirm that DRIVERS from [name of company/organization] have participated in MCTS training courses in the past and/or currently participate in such courses?

If yes, continue. If no, thank and terminate.

2. How long has [name of company/organization] been sending drivers to these courses?

3. On average, how many drivers do you send to MCTS each year for training?

4. How many drivers in total do you have at your company?

5. At what point or points in their employment do you usually send them for training? (Multiple responses allowed)

6. Which courses have your drivers participated in? (list)

MCDD – Michigan Center Decision Driving (skid pad) (say full name as prompt if needed)

Day long course - professional truck drivers learn decision driving techniques both in the classroom and in actual hands-on activities utilizing the facilities' skid course.

Defensive Driving

4-hour course that covers core defensive driving concepts such as hazard recognition, preventable collisions, personal responsibility and driving to protect others.

Fatigue Management

Online interactive fatigue program that lays out the complexities of driver fatigue and provides countermeasures to use in combating and overcoming fatigue- consists of 7 lessons.

Simulator Training

4-hour course held at Centers Mobile simulator - offers training in basic hazard perception methods to specific collision avoidance techniques. (if they say they went to a facility ask "would you prefer if they came to you?")

Professional Driver Coaching

Instructor drives along with driver for one-hour. The program is designed to evaluate driver behaviors or responses compared to a standardized list of observable behaviors specific to location and traffic situation.

7. For each of the courses mentioned, could you tell me where it is generally offered - at MCTS or at a company site?
8. In general, how useful is each course?
9. What are the specific benefits of each course for your drivers and for your company overall?
10. What about benefits of MCTS as a whole?
11. Has your company/organization tried to quantify these benefits (both course specific and/or overall benefits)? What did you find?
12. Have you recommended or would you recommend MCTS to other truck company safety managers? Why or why not?
13. How could MCTS programs be improved?
14. Separate from the MCTS training, does your company/organization offer any in-house training for drivers? If so, could you describe the training?
15. Is there anything else you would like to discuss about MCTS training courses or MCTS as a whole?

## **Interview Guide for Truck Driver Training Schools**

Hi. My name is \_\_\_\_\_ and I am with the University of Michigan Transportation Research Institute. As part of a study funded by the Michigan Office of Highway Safety Planning and the Michigan Truck Safety Commission, we are talking with safety managers of trucking companies [OR organizations and schools] such as yours whose drivers have participated in training courses offered by the Michigan Center for Truck Safety (MCTS). We hope to learn more about the training that your drivers have received from MCTS and the impact the training has had on your company/organization/school. We know that employees in your company/organization/school other than drivers may have participated in MCTS training but our study is focused only on drivers.

1. First, could you please confirm that students from [name of school] have participated in MCTS training courses in the past and/or currently participate in such courses?

If yes, continue. If no, thank and terminate.

2. How long has [name of school] been sending students to these courses?

3. On average, how many students do you send to MCTS each year for training?

4. At what point in your training program do you send them to MCTS?

5. Have your students participated in any of the following courses?

### MCDD – Michigan Center Decision Driving (skid pad)

Day long course - professional truck drivers learn decision driving techniques both in the classroom and in actual hands-on activities utilizing the facilities' skid course.

### Defensive Driving

4-hour course that covers core defensive driving concepts such as hazard recognition, preventable collisions, personal responsibility and driving to protect others.

### Fatigue Management

Online interactive fatigue program that lays out the complexities of driver fatigue and provides countermeasures to use in combating and overcoming fatigue- consists of 7 lessons.

### Simulator Training

4-hour course held at Centers Mobile simulator - offers training in basic hazard perception methods to specific collision avoidance techniques.

### Professional Driver Coaching

Instructor drives along with driver for one-hour. The program is designed to evaluate driver behaviors or responses compared to a standardized list of observable behaviors specific to location and traffic situation.

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6. For each of the courses mentioned, could you tell me where it is generally offered - at MCTS or at a school site?
7. In general, how useful is each course?
- 7b. How does the MCTS course/courses fit into your overall program?
8. What are the specific benefits of each course for your students and for your school overall?
9. What about benefits of MCTS as a whole?
10. Has your school tried to quantify these benefits (course specific and/or overall benefits)?  
What did you find?
11. Have you recommended or would you recommend MCTS to other schools? Why or why not?
12. How could MCTS be improved?
13. Is there anything else you would like to discuss about MCTS training courses or MCTS as a whole?