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# Mandatory periodic training for professional drivers: A Norwegian study of implementation and effects

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## Introduction

Traffic accidents make up between 20 % and 40 % of work-related accidents in industrial countries (ETSC, 2010 and Fort et al., 2010). From 1988 to 1993 the accident risk of occupational drivers was 9.5 fatalities per 100 million person hours, as compared to three for other occupations (Elvik, 2005). In 2010 in the EU-27 4,603 fatalities occurred in accidents where a Heavy Goods Vehicle (HGV) was involved (Panteia, 2014), and 39 % of fatal occupational accidents in the EU are traffic accidents (ETSC, 2009). Between 22 % and 24 % of work-related deaths in the United States are caused by traffic accidents and in Australia and New Zealand, the shares are 31 % and 16 % respectively (Driscoll et al., 2005). This represents more than 15 % of the total number of fatalities.

There is thus a considerable potential for road safety improvement in enhancing the safety of professional drivers. In Europe, the training of lorry and bus drivers is regulated by EU-directive 2003/59/EC *Regulations relating to basic and periodic training for professional drivers*, which entered into force on 10. September 2003. The goal of the Directive is to:

“(...)enhance road safety in Europe by ensuring a common level of training, and the achievement of the necessary skills and competences for professional drivers to drive their vehicles. It establishes mandatory level of initial qualification and periodic training for professional drivers in the European Union. The training is organised by training centres approved by the Member States.”

As an EEA member, Norway is obliged to implement the necessary adjustments to national legislation, and the professional driver directive is implemented in Norwegian law pursuant to Road Traffic Act § 29, and came into force 10/9 2008 for passenger transport and 10/9 2009 for freight transport.

The directive covers compulsory basic training of 280/140 hours and periodic training of 35 hours in 5 years. Topics to be taught in periodic training are detailed in the Norwegian driver qualification regulations § 50. The training requirements are specified in the syllabus for the professional driver training developed by the Norwegian Public Roads Authority (NPRA). This syllabus is intended as a guide that

facilitates the students' achievement of the objectives set out in the regulations.

These objectives are:

“After completing the professional driver training, the student shall possess the necessary qualifications to work as a salaried professional driver for passenger or freight transport. The student will:

- a) drive optimally and safely
- b) demonstrate professionalism in the execution of the profession
- c) maintain their own and others' safety at work when the vehicle is stationary.”  
(Council Directive 2003/59/EC § 41)

This article reports an evaluation of the mandatory periodic training for professional drivers in Norway. We study how the periodic training is implemented in practice at the training centres, and what practices seem to provide the best effects for the driver and employer relative to the stated objectives of the periodic training.

The main objectives of this article are thus to:

- 1) Investigate how periodic training and teaching are implemented in practice at Norwegian training centres that organise periodic training courses.
- 2) Study which teaching practices that seem to provide the best effect for drivers and employers relative to the objectives of the periodic training.

To answer these questions, we have made use of a combination of qualitative and quantitative methods: a literature review of teaching plans, two online surveys, and four case studies.

### **Previous research on the periodic training directive and the safety outcomes of driver training**

There does not, to our knowledge, exist any prior evaluation of the periodic training specifically. The existing studies chiefly conclude that driver training in general has limited effect on accident rates. However, it is worth noting that two recent Scandinavian studies (Carstensen, 2002, Gregersen et al. 2000) both indicate a safety effect of new driver training models. The Danish study is particularly relevant, since the model evaluated has important similarities with the periodic training programme for professional drivers. In addition, targeted courses for professional drivers, especially in defensive driving, have been shown to have an effect on accident numbers.

Several studies from several countries have, however, demonstrated that training in defensive driving for professional drivers have significant effects on accident rates (Payne & Barmack, 1963; O'Day, 1970, Manders & Rennie, 1984, Downing, 1988; Lähdeniemi, 1995; King, 1996; Valset, 1996). A meta-analysis by Elvik, Høye, Vaa, and Sørensen (2009) showed that defensive driving courses reduce crash risk by about 20% for professional drivers. Previous evaluations of Directive 2003/59/EC have found that there are significant differences across the Member States with respect to implementation of the Directive (CIECA 2010; DEKRA, 2010; ETF/IRU 2012; European Commission, 2012). Widespread differences were also identified with regard to the distribution, costs, and validation of periodic training.

Panteia (2014) conducted a comprehensive ex-post evaluation of Directive 2003/59/EC. It concludes, among other things, that the defined scope in terms of training and testing provisions, and in terms of topics, duration, frequency etc. is only partially relevant and sufficient to ensure road safety, and that, given the late implementation in terms of deadlines for periodic training, it is too early to assess whether the Directive has contributed to improving road safety on the basis of road accident statistics.

### **Previous research on the quality of industrial training.**

Whereas the research on quality of teaching is fragmented, there is a large number of studies and meta-analyses that provides guidelines for instructional design in educational settings (Brown & Green, 2016). It is much harder to appeal to evidence-based practice in the field of industrial training (Greenberg, 2003). Criteria for high-quality programmes tend to draw on mainly four evidential sources; (1) principles of adult learning (Rubenson, 2010), (2) learning and instructional theory (Smith & DeFates-Dench, 2009), (3) organizational/occupational studies (Grossman & Salas, 2011) and (4) empirical research on employee training (Noe, 2013). In the following section we will review quality criteria of industrial and occupational training when these are related to a broad definition of learning outcomes synonymous with training outcomes. The latter draws on recent versions of Kirkpatrick's typology (Reio et al., 2017) that identified four levels of learning outcomes; reaction data/self-reports, learning, behavior and organizational results.

- Program evaluation of employee trainings is rare (Pineda, 2010), and if such activities are undertaken, they tend to rely on the reactions or self-reports of participants – usually the learners (Alvarez et al., 2004). Although this level is usually considered to be of low validity and unreliable as indicator of learning outcomes, Ford & Sinha (2008) have pointed out that participants' satisfaction is a highly relevant quality criterion in the sense that “customers” received a product that was enjoyable, inspiring and usable. Literature reviews have concluded that positive reactions of learners are supported by the following quality criteria: Training arrangements that meet the prior expectations of the participants (Alligar et al., 1997) and that specify realistic learning objectives (Noe & Colquitt, 2002).
- Active learning methods may be experienced as stimulating (Cannon & Witherspoon, 2005).
- Clearly structured and well-founded designs tend to generate satisfied learners (Salas et al., 2012).

The next “levels” in terms of learning and behavioural changes are not often rigorously assessed as it requires the design of a pre- and post-test (Giangreco, 2010). Factors that contribute to high scores for this type of learning outcome could be summarized as follows:

- Alignment of content and methods to the individual needs of learners is especially indicated when participants are adults and represent a broad range of skills and talents (Galbraith, 2004).

- The activation of learners in group discussions may facilitate changes in attitudes towards targeted issues, but productive communication is dependent on the guidance of competence moderator(s) (Kraiger et al., 1993; DEKRA, 2010).
- Provisions for technology-enhanced learning that enable adults to practice new skills and consolidate learning is generally beneficial (Bewell & Salas, 2010).
- Clear and relevant learning objectives coupled with feedback on performance during the training program enhance motivation and learning (Cannon & Witherspoon, 2005).
- Distributed learning in different situations is more effective than massed practice (Alvarez et al., 2004; Pashler et al., 2007) – especially for adults in occupational settings.

The outcome level in terms of organizational results is seldom measured since it would require a systematic follow-up study (Arthur et al., 20013). In our context it is relevant to ask what are the training factors that may facilitate a transfer of learning from the training context to the work place:

- A positive attitude from management and colleagues towards the training programme supports both employees' learning output and the potential for transfer to the work place context (Grossman & Salas,2011).
- In-house training programmes are more effective than alternatives located outside the work place of the learners and lead by external providers (Burke & Hutchins, 2007).
- Transfer of learning should be an explicit goal for effective training programmes (Chiaburu & Marinova, 2005).

The above quality criteria will be used in assessing the Norwegian training programme for professional drivers and our data from the case studies and surveys.

## **Driver training evaluations**

Although the research is too limited to provide a basis for conclusions, the studies indicate areas with a greater potential than others. Among these are:

- Managing time pressure
- Newer types of training
- Training in defensive driving for professional drivers
- Reward and motivation measures for professional drivers
- Fatigue management
- Extended practical driver training

## **Methods**

### **Document analysis**

The document analysis studied the variation between teaching plans from different training centres, and between different types of training centres. Curriculum theory

emphasizes consistency between objectives, content, organization of training, work and forms of documentation. The NPRA curriculum for periodic training is based on the content of the basic training, but regulations enable selections tailored to different groups of professional drivers, and flexibility in organization and training methods are emphasized. We studied 203 teaching plans made available by the NPRA, the majority of them from driving schools, the others from transport companies, training offices, high schools, etc. This constitutes about 2/3 of the institutions certified for training of professional drivers.

## **Case studies**

We also conducted four case studies of training courses; two internal courses, and two courses organised by an external supplier (driving school). The studies were conducted by an observer who was present during parts of the training, interviewed the head of teaching, and communicated with students and teaching staff during the course period. The observations were interpreted in the light of the curriculum and the training centre's teaching plan.

## **Training centre survey**

An online survey was distributed to all educational establishments certified to provide periodic driver training. The NPRA distributed a link to the online survey and an invitation to answer it, to all certified establishments. The survey was answered by 94 out of approximately 235 certified training centres, which represents a response rate of about 40. Although this is relatively high, there is a risk of self-selection, in that it is possible – despite the fact that the invitations stressed that the study was anonymous – that institutions that have less faith in their training programme failed to respond.

## **Student survey**

A second online questionnaire was distributed to a sample of 1,000 people who had completed the periodic training in the course of the past 12 months. Lists of students were obtained from the NPRA, but since these lists did not include contact information, subjects were identified using their registered address, and phone numbers obtained through open web-based directories. The invitation to participate in the survey was sent as a text message containing a link to the questionnaire, which could also be completed on smartphones. In addition, participants in the courses observed in the case studies were encouraged to complete the questionnaire.

The respondent group for this survey consisted of 168 people. The low response rate (16.8%) means that results must be treated with caution, since there may be systematic bias in the sample. Previous studies have shown, for instance, that a relatively high share of professional drivers have difficulties reading and writing, and, in addition, transport is an occupation attracting foreign language speakers. Problems with language and/or written language could lead these groups to opting out of surveys.

The student survey concerned the students' experiences, perceived learning outcomes and subsequent self-reported changes in driving practices. It also contained questions about perceived relevance to their work practices, satisfaction with the teaching programme and some key factual questions designed to measure learning outcomes.

We have performed regression analyses on the responses from the survey among drivers/students to assess what factors explain variation among respondents of different variables that measure respondents experienced effect of the courses.

We conducted multivariate regression analyses, to examine independent variables' isolated effects on the dependent variables, controlled for other independent variables. In these analyzes, we examine the factors that explain variation on the following variables: 1) Respondents' perceived learning outcomes (Index which consists of nine questions, with a minimum score of 9 points and maximum 45 points), 2) Respondents self-reported change in driving style after the course (Index measuring seven different possible changes in driving style, with a score of at least 7 points and maximum 35 points), and 3) Course influence in quality of work (One question with three possible answers: 1 = worse, 2 = no difference, 3 = better). The questions that the indexes are comprised of are presented in the multivariate analyses chapter. We used linear regression in the analysis, since the dependent variables are continuous.

## **Results**

### **Teaching plans and methods**

Like the basic training, the periodic training consists of six modules. Module 1, 2 and 3 are common to passenger and freight transport. Module 4, 5 and 6 is carried out for either passenger or freight transport. (Cf. Table 1). It is important to note that when referring to passenger transport in the present paper, we always refer to bus transport (and not taxi transport).

The review of teaching plans showed that there is relatively little variation in the design of teaching, but this may be partly explained by the fact that the syllabus allows for a limited degree of variability. The objectives formulated in the teaching plans are mostly derived from the regulations and NPRA handbooks, and this also applies to the content of the modules.

In the survey, most of the training centres agreed with the statement: "The NPRA syllabus for periodical training of professional drivers leaves considerable room for improvement", which may indicate that they would appreciate greater flexibility. This was corroborated by the responses to the open questions in the survey, where the most frequent feedback was that training centres wanted more flexibility when it came to the weight given to different topics and modules, the timing of courses, and opportunities for tailoring courses to individual groups. Most training centres in the survey, however, agreed that the actual teaching provided conformed to the syllabus, but some conceded that they emphasised practical teaching more than adherence to the syllabus.

Table 1. The six modules in the periodic training course.

<b>Periodic training course structure</b>	
Module 1	Road transport and society
Module 2	The professional driver's safety, health and working environment
Module 3	Vehicle technology and optimum use of heavy vehicles
Module 4	Framework conditions for freight transport/passenger transport
Module 5	Freight transport in practice /Passenger transport in practice
Module 6	Safe behaviour on the road

There were, however, clear differences between teaching plans when it comes to the descriptions of learning materials. Several training centres did not mention this aspect of the course, while others contained very detailed references to sources and supporting materials. This situation differs from some other countries that have implemented the EU directive and prepared a mandatory compendium or textbook for the periodic training.

There were no clear differences in the choice of content and methods between teaching plans created by external providers (such as driving schools) and those developed by transport companies. The choices were also quite similar for teaching plans for freight traffic, passenger traffic and combined plans. Transport companies tended to adapt the content of their teaching plans to the specific tasks and challenges of their own employees to a greater extent than others, however, and go into more detail when describing and justifying local content, so that the courses are more tailored to the needs of the company. This was reflected in the case studies, where we found that courses were actively used as a resource for companies to disseminate internal company information and improve the quality of work.

Driving schools put somewhat more emphasis on the educational platform in the design of teaching plans, and in accordance with this, used a somewhat wider range of educational methods and teaching forms. Generally, the teaching plans tended to emphasise two-way communication, student activity, the use of students' experiences, involvement and inclusion as well as teamwork and knowledge sharing. The survey among training centres also showed that "discussion and experience sharing" was the most prevalent form of teaching. PowerPoint teaching, teamwork, video, supervision and demonstrations are also very widely used in the teaching plans. The case studies confirmed that training centres focused on student activity, dialogue and reflection, and that students were thus able to influence the content of the course. The review of teaching plans found that training centres rarely justify their choice of pedagogical methods.

In summary, the same objectives, content and teaching methods recur in most of the plans. This limited variation means that differences in learning outcomes are unlikely to be caused by differences in teaching plans.

### **The practical organisation of courses**

In the training centre survey, 56% of the responses were from driving schools, while the rest came from transport companies providing internal courses. 83% of respondents offered courses in freight transport, 64% in passenger transport, and



67% offered combined courses. The institutions were asked to estimate the number of participants, and the average course had 13 participants. When excluding the practical driver training, an average of four people were involved in teaching a course.

On average, training centres spent more time preparing for courses (9 hrs 18 mins) than on work after courses (5 hrs 11 mins). Four out of five centres reported using ten or fewer hours preparing for courses. The difference between time spent preparing and time spent evaluating may be related to the tendency noted in the review of teaching plans that course evaluations primarily focus on students' experiences, rather than on assessing learning outcomes. In the student survey, a majority (52.4 %) "completely agreed" that they had been given an opportunity evaluate the course, while a further 16.7% "partly agreed" with this statement. Only a minority of students (11.3 %), however, agreed they would have benefitted more from the course if it had been followed by a test. In the case studies, some students pointed out that it is possible to follow the course without benefitting.

The average number of hours spent teaching each module is shown in figure 1. As we can see, relatively less time was spent teaching "road transport and society" and "vehicle technology and optimum use of heavy vehicles", whereas the highest average number of hours was spent teaching "freight/passenger transport in practice", "the professional driver's safety, health and working environment", and the practical training module "safe behaviour on the road".

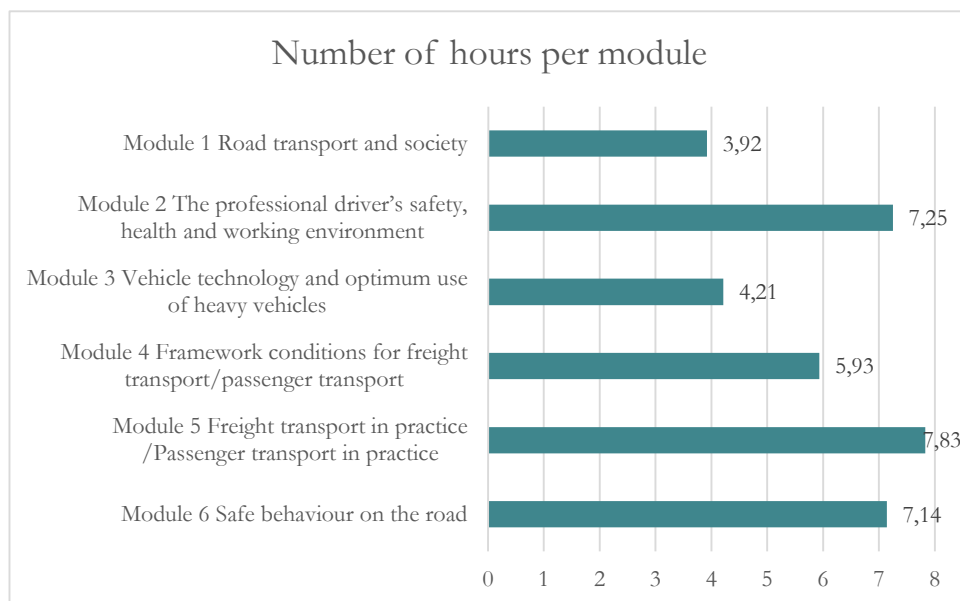


Figure 1. Number of hours per module, per training centres.

The survey also asked which modules the training centres would like to see expanded. Figure 2 compares the results for driving schools and transport companies, and shows that there are significant differences between the two types of institutions: while the highest share of driving schools would like to see the module

“road transport and society” expanded, the highest share of transport companies would like to see the module on “the professional driver’s safety, health and working environment” expanded. This might be explained by the fact that transport companies could probably use this module to train their drivers in the companies’ own regulations and policies.

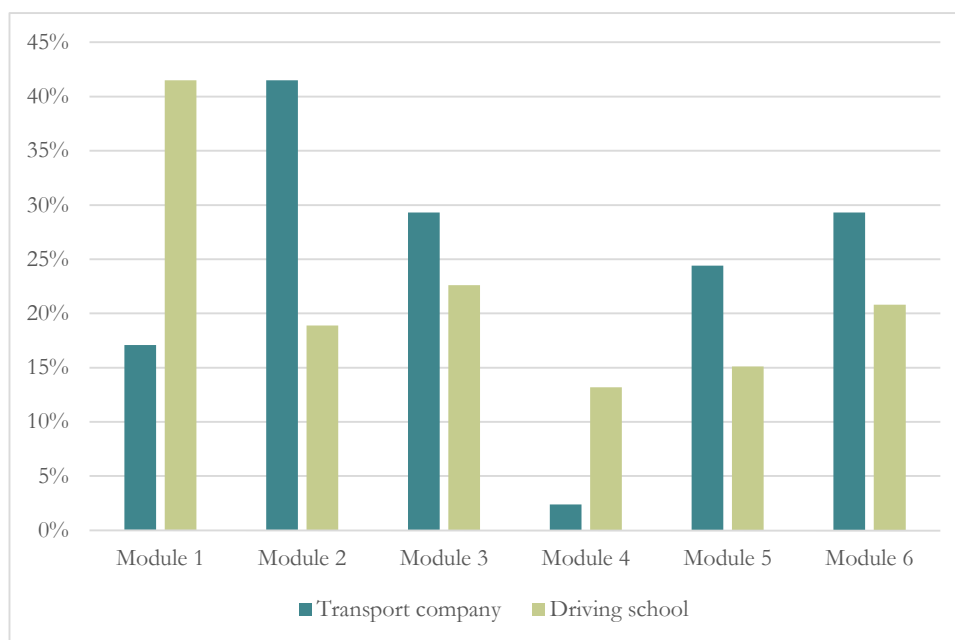


Figure 2. Modules where training centres would like to have more time for teaching, transport companies (N=41) and driving schools (N=53).

## Students’ experiences and learning outcomes

### Respondents

Students’ experiences and learning outcomes were measured through the student survey. The majority of respondents had completed the periodic training more than five months ago, and only 4.8% had completed the course less than one month before answering the survey. 95.8% of respondents were male and 98.2% were Norwegian. Since the comparison groups are so small, we chose to ignore these variables (gender and nationality) in the further analysis.

Respondents were distributed unevenly across age groups. Only a very small group was under 26 years, while nearly a third were over 55 years old. The largest group was between 46 and 55 years. This to some extent reflects the age structure of the industry, but could also partly be the result of self-selection. In keeping with the age distribution, the largest group had more than 20 years’ experience as professional drivers, while only 10% had less than five years’ experience.

A great majority (78 %) of respondents were employed in companies, while 14,9 % were self-employed, and 7,1 % “other”. Among those employed in businesses, the largest group worked in small companies (1-50 employees), but almost a fifth worked

in large companies with more than 250 employees. 33,3 % of respondents had attended an internal course, organized by their employer. About half had attended a combined course, for freight and passenger transport, while 37.7% and 15.6% had attended courses for freight or passenger transport respectively.

### Expectations and experiences

More than half the students agreed they had expected the course to be a waste of time (cf. fig. 3), and 41,1 % that they had “no expectations”. On the other hand, between 45 and 60% agreed that they had expected to improve their knowledge about each of the topics fuel effective driving, loading and unloading, and HSE.

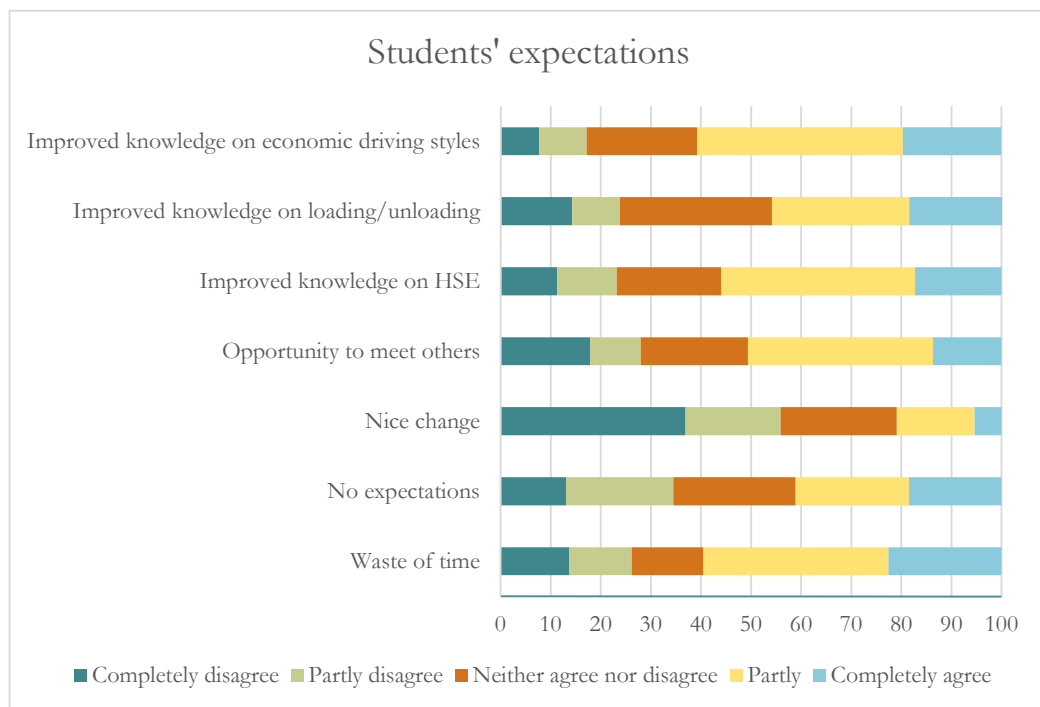


Figure 3. Students' expectations of periodic training course. Percent. N=168.

Table 2. Questions used to measure students' experience with the course.

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The course was well organized, so we always knew what would happen next.
It was clear which parts of the course were important.
I would have learned more from the course if there was an exam or test.
We had the opportunity to fill in an evaluation after the course.
The other participants had fairly similar working days as me.
The other participants did not seem very interested in the course.
The instructors were competent.
The course was interesting.
The course was difficult.
The instructors were unable to make the course relevant to my everyday work.
There was much repetition of things I already knew.

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When it comes to the organisation of the course, an overwhelming majority (82.7 %), indicated that the course they had attended was well organised, while only 8.9 % of the participants completely or partly disagreed. About half (47.6 %) agreed that the other participants had fairly similar everyday work as themselves, while 21.4 % disagreed, which may indicate that in many cases, it may be a challenge to tailor courses to the individual students' work.

A majority (56 %) were in complete agreement with the statement that those teaching the course were competent, and another 23.2 % partly agreed. It is still worth noting that 11.9 % completely or partly disagreed with this statement, since it is unlikely that this group have good training outcomes.

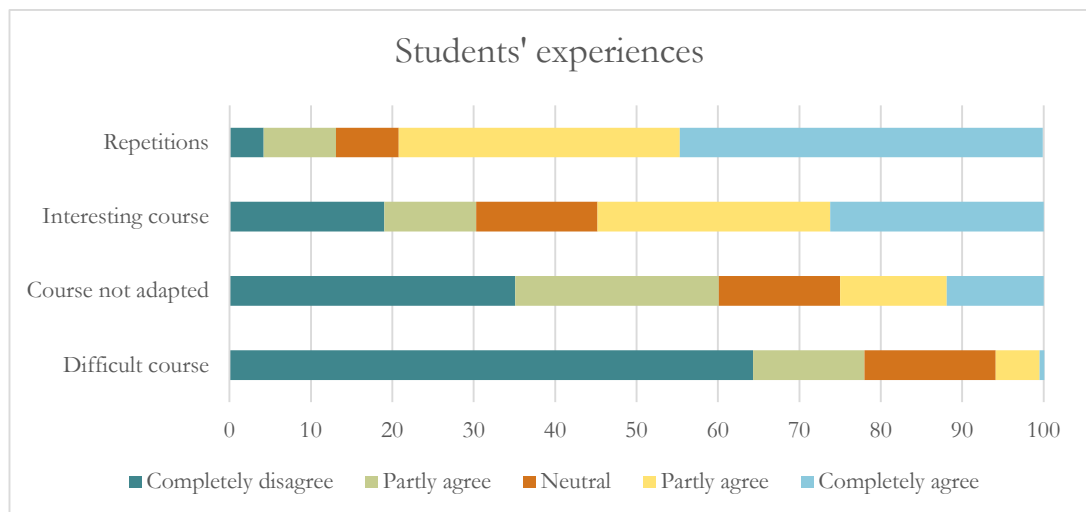


Figure 4. Students' experiences with periodic training course. Percent. N=168.

The questions used to measure students' experience with the course are listed in Table 2. Their general assessments of the course are shown in Figure 4. Respondents were divided on whether the course had been interesting: 26.2 % were in complete agreement, while 19 % completely disagreed. The majority also disagreed with the statement "The course was not adapted to my daily work". A large majority disagreed that the course was difficult, while only 0.6 % totally agreed with this. In line with this, most agreed the course contained a lot of repetition of things they already knew.

Questions used to measure students' views on teaching methods are listed in Table 3. 22 % completely agreed that there were too many lectures, and another 22 % partly agreed. In accordance with this, many wanted more use of pictures and video in the course; 41.1 % agreed with this.

The statement with which most people disagreed, was that there was too little feedback on the practical driving. 40.5 % completely disagreed with the statement, while 22.6 % slightly disagreed, and only 4.2 % completely agreed that this was the case. 32.1 % disagreed that there were too few practical exercises, and 53.6 % disagreed that there was too much sharing of experiences.

Respondents were asked to rank their closest supervisor's interest in the course, before and after the course took place. As shown in Figure 5, in both periods, the largest share of supervisors showed limited interest.

Table 3. Questions used to measure students' views on teaching methods.

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Questions used to measure students' views on teaching methods. Answer alternatives: 1= Completely agree, 2=Partly agree, 3= Neither agree not disagree, 4= Partly disagree, 5=Completely disagree

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There should have been more use of video and illustrations.

There were too many lectures.

There should have been more time for group work and discussions

There was too much exchange of experiences between participants.

There were not enough practical exercises.

We received too little feedback on the practical driving.

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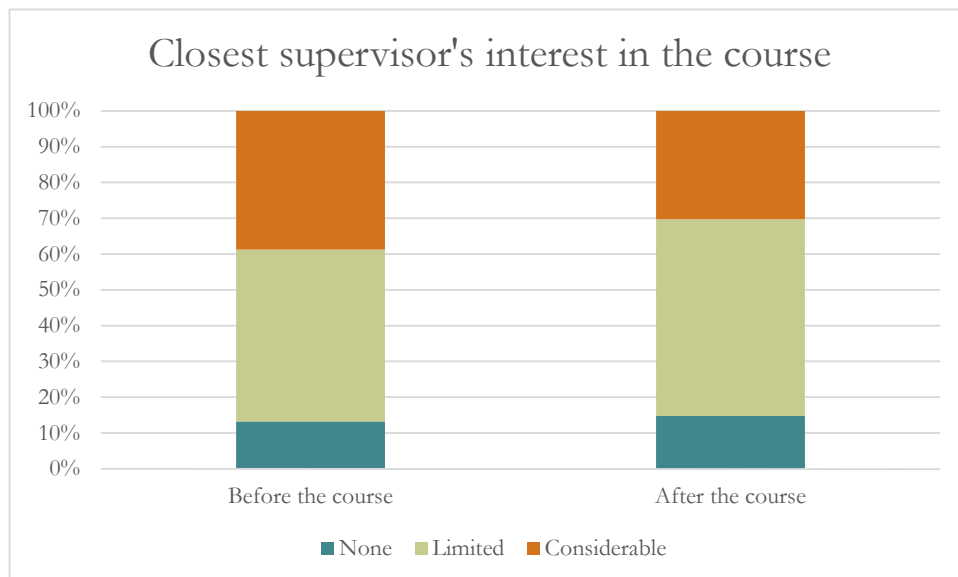


Figure 5. Students' closest supervisor's interest in periodic training, before and after course. Percent. N= 168.

### Learning outcomes and goal achievement

Students' perceived learning outcomes were measured using the questions listed in Table 5. The results are summarized in Figure 6. Most of the students reported that they remembered what they had learned during the course, and a majority agreed they had learned things that were useful in their daily work. However, it is worth noting that a large group (21.4 %) completely disagreed with this. Approximately half reported that the course had been more practically useful than they had had believed. For this statement as well, a relatively large group totally disagreed.

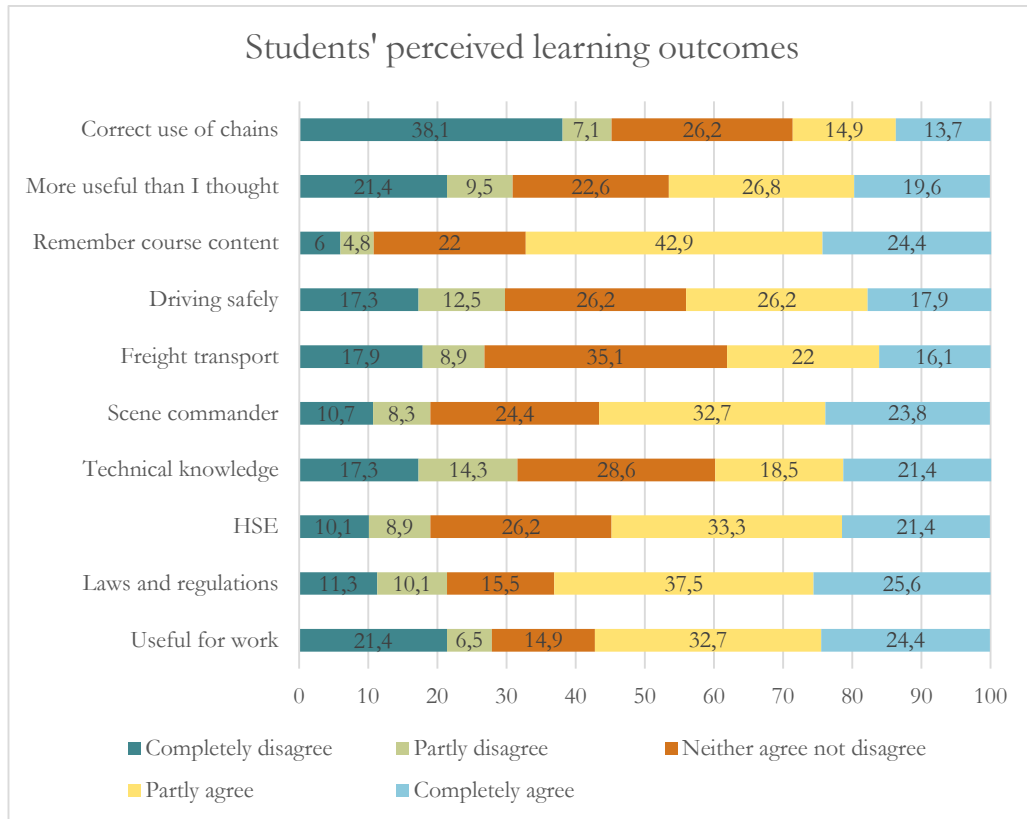
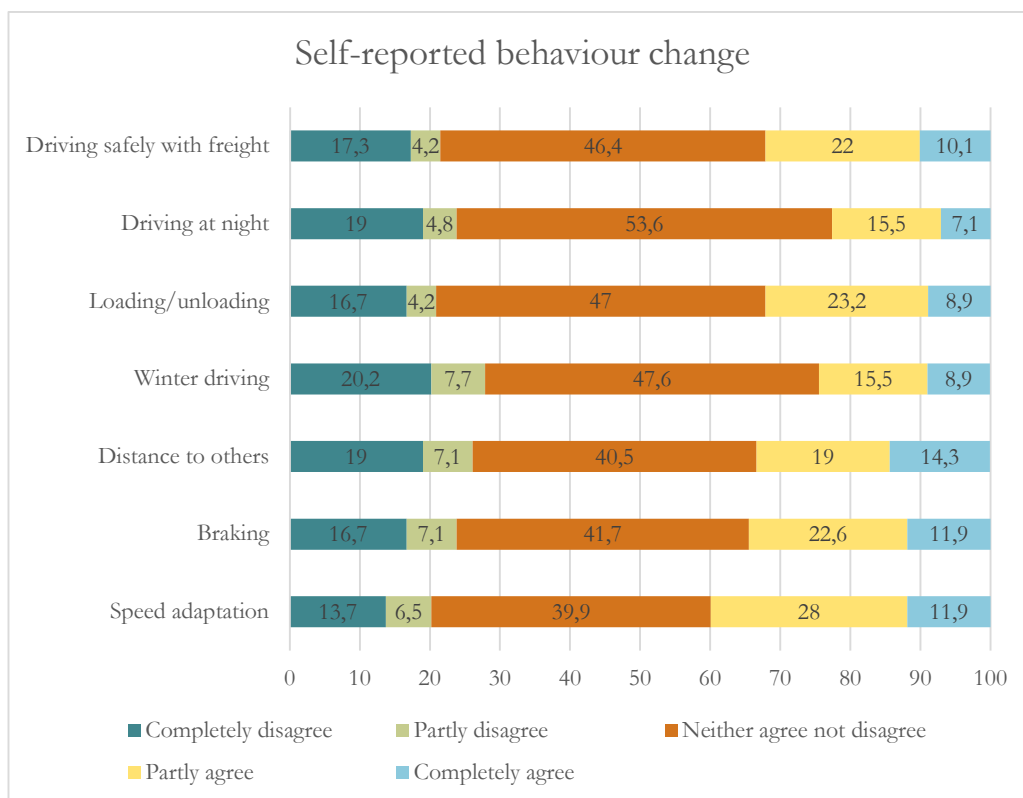


Figure 6. Students' perceived learning outcomes of periodic training course. Percent. N=168.

When it comes to specific learning outcomes, there was greatest consensus that the course had given them more knowledge about laws and regulations. More than half of the respondents also agreed that they had gained better knowledge of HSE, and that they thought they would do a better job as scene commanders after the course.

Somewhat fewer respondents, but still a significant proportion, completely agreed they had improved their skills in defensive driving and that they had improved their technical knowledge of heavy vehicles. For all these topics, however, relatively large subgroups completely disagreed. Respondents most disagreed that they had improved their knowledge about the proper use of chains.

Self-reported behavioural change was measured with the questions listed in Table 4.



*Table 4. Questions used to measure students' self-reported behaviour change after the course.*

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Questions used to measure students' self-reported behaviour change after the course. Answer alternatives: 1= Completely agree, 2=Partly agree, 3= Neither agree not disagree, 4= Partly disagree, 5=Completely disagree

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I have changed my way of driving following the course when it comes to:  
 adapting speed and driving style.  
 braking.  
 distance to other cars.  
 winter driving.  
 loading and unloading.  
 driving at night.  
 driving safely with load.

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*Table 5. Students' perceived learning outcomes.*

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Questions used to measure students' perceived learning outcomes. Answer alternatives: 1= Completely agree, 2=Partly agree, 3= Neither agree not disagree, 4= Partly disagree, 5=Completely disagree

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I learned things that are useful in my daily work.  
 I have learned more about laws and regulations.  
 I have learned more about health, safety and environment.  
 I have improved my technical knowledge of heavy vehicles.  
 I think I am better equipped to act as on-scene commander.  
 I have learned more about the planning and execution of freight transport.  
 I have become better at driving safely.  
 I remember what I learned in the course.

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The course was more practically useful than I thought it would be.  
I know more about the correct use of chains.

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When it came to changes in driving behaviour, the largest share agreed that they had changed speed adaptation and driving style, i.e. the topics of the practical driving in module 6. The lowest proportion agreed for driving in the dark and winter driving. Yet there are significant proportions – over a fifth – who agree that they have changed their behaviour. These numbers are self-reported, and it is not possible, based on this material, to say whether this reflects actual changes in behaviour, or whether this has resulted in improved safety. However, for all the topics, a majority (i.e. over 50 %) reported that they had not changed their driving. 40.5 % stated that the course had improved the quality of their work, while 25.6 % had experienced improved self-esteem at work.

The survey also contained four factual questions (in the form of yes/no/do not know) about cargo securing, but without a control group, it is not possible to determine whether knowledge is a result of completing the course. Overall, between 37.5 % and 76 % who gave the correct answers to the factual questions.

### **Multivariate analyses**

There are statistically significant differences between different groups of students in terms of experienced training outcomes of the course. This was measured through a composite index for perceived training outcome. Drivers in passenger transport have by far the highest score on the index (34.9), while drivers from the distribution sector have the lowest score (25.6). The differences between the groups is significant at the 1 % level. Salaried workers have higher scores (30.4) than self-employed (26,56). The differences between the groups is significant at the 5% level. Drivers in medium-sized companies (51-250 employees) have the highest score (33.12), while those who work in the smallest businesses (1-10) has the lowest (26.75). Drivers who have attended courses for passenger transport have significantly higher scores on the training outcome index than those who have attended courses for freight transport (35.08 and 29.25 respectively). In addition, drivers who have attended internal courses score higher (32.59) than those who have attended external courses (28.41).

We conducted regression analyses to examine what factors influence perceived learning outcomes, changes in driving styles and improved quality of work. We found that hat perceived learning outcomes could best be explained by the index for well-organised courses. In addition, positive expectations of learning outcomes lead to higher perceived learning outcomes.

### ***What explains perceived learning outcomes?***

We constructed an index of perceived learning outcomes quality by putting together the scores of the following statements in the questionnaire:

- o I learned things that are useful in my daily work
- o I know more about laws/provisions
- o I have learned more about health, safety and environment



- o I know more about technical stuff about vehicle
- o I think that I have become better to act as on-scene commander
- o I have learned more about the planning and execution of freight transport
- o I have improved in safe driving
- o I remember what I learned on the course
- o The course was more practically useful than I thought beforehand

Table 6 shows the results of nine regression models with respondents' perceived learning outcomes as the dependent variable. Scores on the index varies between 9 and 45. A high value indicates good professional benefit.

Table 6. Linear regression. Dependent variable: respondents perceived learning outcomes. Standardized beta coefficients.

Variabel	Mod. 1	Mod. 2	Mod. 3	Mod. 4	Mod. 5	Mod. 6	Mod. 7	Mod. 8	Mod. 9
Age	,123	,065	,042	-,021	-,088	-,094	-,011	-,017	-,065
Seniority		,118	,123	,118	,130	,109	,019	,007	,067
Time of course			-,108	-,142	-,083	-,151	,014	,030	-,019
Internal/external (external=2)				<b>-,226*</b>	-,095	-,039	,119	,112	,081
Goods/passenger (passenger=2)					<b>,274*</b>	<b>,285**</b>	<b>,239**</b>	<b>,259**</b>	<b>,263**</b>
Manager's interest						<b>,372***</b>	<b>,196**</b>	<b>,184*</b>	<b>,175*</b>
Organisation of course							<b>,601***</b>	<b>,629***</b>	<b>,537***</b>
Quality of course								,074	,115
Good expectations									<b>,307***</b>
Adjusted R <sup>2</sup>	.000	-.005	-.009	.024	.059	.186	.474	.470	.553

\* p < 0,1 \*\* p < 0,05 \*\*\* p < 0,01

In model 1-3, we see that respondents' age, seniority and training does not contribute to explaining variation in the dependent variable which may indicate that the programme was well aligned with variation in age and work-experience (Noe & Cotquitt, 2002). Neither does "time of course" contribute significantly. This variable measures how long time it is since respondents took the course. The lowest value of the variable is less than a month ago, while the highest value is for more than five months ago. In model 4 the variable describing whether the course was externally or internally contributes significantly and negatively, indicating that respondents who participated in internal courses report better learning outcomes than those who participated in external courses. This variable stops, however, to contribute significantly in model 5, where we take into account whether respondents participated in courses for goods or passenger transport. The effect is positive, indicating that respondents who took courses for passenger report better professional benefit than those participating in courses for goods transport. Internal/external ceases to contribute significantly in model 5 and indicates that there is a correlation between internal courses and passenger transport. In model 6, we see that manager contributes significantly to the respondents experienced effect of the courses.

In model 7, we include the variable which seems to be of greatest significance for respondents' perceived professional benefit: respondents' positive experiences with the organization of the courses. This index consists mentioned four statements:

- a. Those who taught the course was competent,

- b. The course was interesting,
- c. It was clear which parts of the course that was important, or less important
- d. The course was well organized, so we always knew what was going to happen,

We also see, in Model 9, that respondents who had positive expectations for the courses, more often reported that the training provides academic quality.

The adjusted R2 value, which indicates the proportion of the variation in the dependent variable which is explained by the independent variables are close to zero in the first models, but it rises to 47 % in model 7, when we include the index describing the organization of the courses. This means that this index has a considerable explanatory power.

### *What explains changes in driving style after the courses?*

We constructed an index measuring self-reported changes in driving style, on the basis of answers to seven questions:

- o Braking
- o Proximity to other cars
- o Winter Driving
- o Loading and unloading
- o Night driving
- o Driving with and without load

Table 7 shows the results of nine regression models with the index of self-reported changes in driving style as the dependent variable. Scores on the index ranges between 7 and 35. A high value indicates large change in driving style.

*Table 7. Linear regression. Dependent variable: respondents' self-reports about changing driving style after the courses. Standardized beta coefficients.*

Variabel	Mod. 1	Mod. 2	Mod. 3	Mod. 4	Mod. 5	Mod. 6	Mod. 7	Mod. 8	Mod. 9
Age	,023	,023	,028	,004	-,073	-,077	-,020	-,013	-,045
Seniority		-,001	-,002	-,004	,010	-,005	-,066	-,051	-,012
Time of course			,022	,009	,076	,027	,140	,119	,087
Internal/external (external=2)				-,088	,060	,101	,209	,217	,197
Goods/passenger (passenger=2)					,313*	,320**	,289**	,265*	,268*
Manager's interest						,270**	,149	,163	,157
Organisation of course							,411***	,375***	,315**
Quality of course								-,093	-,067
Good expectations									,199
Adjusted R <sup>2</sup>	-,015	-,031	-,047	-,056	-,008	,050	,176	,169	,193

\* p < 0,1 \*\* p < 0,05 \*\*\* p < 0,01

First we see that respondents' age, seniority, when they took the course and internal/external does not contribute significantly to explaining variation in the dependent variable In model 5 goods/passenger contributes significantly. The effect is positive, and it indicates that respondents who have taken courses for passenger

transport are reporting significantly greater change of driving style after courses than those who have taken courses for goods transport. In model 6, we see that manager's interest also contribute significantly to changes in driving style, but the effect of passenger transport is strongest.

In model 7, we include the variable which seems to be of greatest significance for respondents 'self-reported change of driving style after the courses: respondents' positive experiences with the organization of the courses. Unlike what we saw above, positive expectations to the courses does not contribute significantly to changes in driving style.

We see that the adjusted R2 value, which indicates the proportion of the variation in the dependent variable which is explained by the independent variables is negative in the first models but rises to 19.3% in the latest model. We can therefore conclude that it is more difficult to explain respondents self-report changes in driving style than their professional benefit of the courses.

### *What explains students' assessments of quality in their work?*

Table 8 shows the results of nine regression models with respondents 'assessment of the courses' impact on the quality of the work. The scores on the index ranges between 1 and 3, where 1 is worse, two no change, and 3 are better.

*Table 8. Linear regression. Dependent variable: respondents 'self-reports about the courses' impact on the quality of the work. Standardized beta coefficients.*

Variabel	Mod. 1	Mod. 2	Mod. 3	Mod. 4	Mod. 5	Mod. 6	Mod. 7	Mod. 8	Mod. 9
<b>Age</b>	,107	,039	-,029	-,073	-,175	-,179	-,122	-,116	-,163
<b>Seniority</b>		,141	,154	,150	,169	,156	,095	,108	,166
<b>Time of course</b>			-,309**	-,333***	-,244**	-,287**	-,175	-,192	-,240**
<b>Internal/external (external=2)</b>				-,159	,038	,074	,180	,187	,157
<b>Goods/passenger (passenger=2)</b>					,414***	,421***	,390***	,369***	,374***
<b>Manager's interest</b>						,236**	,116	,128	,119
<b>Organisation of course</b>							,406***	,376***	,287**
<b>Quality of course</b>								-,078	-,039
<b>Good expectations</b>									,296***
<b>Adjusted R<sup>2</sup></b>	-,004	-,004	,076	,086	,186	,230	,355	,349	,424

\* p < 0,1 \*\* p < 0,05 \*\*\* p < 0,01

First we see that respondents' age and seniority do not contribute significantly. In model 3 time of the course contributes significantly and negatively, indicating that the shorter the time it is since the respondents took the course, the higher the effect they report that it has on the quality of their work. The lowest value of the variable is less than a month ago, while the highest value is for more than five months ago. Thus, it seems that those who have recently taken a course remember well what they have learned in the course and how it affects their everyday work, but that the memory of this deteriorate with time. It does not seem plausible that the more recent courses are better than those that respondents participated in more than five months ago. Research on transfer of training (Grossman & Salas, 2011) clearly indicates that rapid deterioration of learning after formal training can be traced back to inadequate

after-course support in organizations. This theme needs to be further researched in a systematic (longitudinal) way.

We also note that passenger transport and manager interest contributes significantly and positively as in the analyzes of the model 4 and 5. Passenger transport contributes strongly, indicating that those who have taken courses for passenger transport report higher impact of the courses on quality in their own work, when we control for the other variables in the analysis.

As in the analysis above, we also see that the respondents' positive experiences with the organization of courses contribute significantly and positively to self-reported effect of the courses. The same applies to respondents' positive expectations of learning outcomes of the courses. In the present analysis, where we look at the courses' impact on the quality of respondents' work, however, passenger transport contributes stronger than both good course organization and positive expectations of course participants. This should be investigated further in future research: are the passenger transport courses made more relevant for the participants, and are there more internal courses in passenger transport, which are better adapted to the individual work days of the drivers? It is probably less variation in the work activities of drivers in passenger transport than in goods transport, and this may explain why drivers in passenger transport report of better effect of the courses.

We see that the adjusted R<sup>2</sup> value, which indicates the proportion of the variation in them dependent variable explained by the independent variables are close to zero in the first models, but that it is 42.4% in the last model. This is particularly thanks to the indexes measuring positive experiences with the organization of courses and positive expectations to the learning outcomes of the courses.

## **Discussion and Conclusions**

The findings above show that the periodic training is in many ways a success, in that considerable numbers of students report that they have acquired new knowledge and changed their driving practices. One should note, however, that the number of respondents was limited, and that the response rate to the survey was low, which increases the risk of self-selection. Nevertheless, there are still large groups among students who reported negative expectations and poor learning outcomes. Our evaluation of the Norwegian periodic professional driver training draws on elements from four types of programme evaluation models; the implementation of the EU-directive and national, theory-based evaluation, stakeholder analysis (restricted to the providers of training) and outcome-evaluation.

We have not systematically compared the Norwegian programme with the other countries implementing the EU-directive, but based on cross-national reports the Norwegian version was characterized by (ETF/IRU, 2013; Panteia, 2014):

- Compressed 5-day course (35 hours) instead of distributed 1-day courses over a 5-year period.

- A national syllabus and guidelines for the structuring and pedagogical design of the training programme. These schemes may have reduced the flexibility along several dimensions as pointed out by our informants.
- Limited use of blended learning (e-learning, mobile learning, face to face,) and simulator training.
- Little emphasis on course evaluation. In the other partner countries about half wanted to institutionalize a test of output (Panteia, 2014).

From the position of a theory-based evaluation model, the Norwegian implementation is in line with some basic principles of effective training for adults, such as emphasis on participant activation (Cannon & Witherspoon, 2005), discussions in groups and practical training of new driving skills (DEKRA, 2010). Also, the provision of internal programmes should increase the likelihood of transfer of learning outcome to daily work (Burke & Hutchins, 2007). Compared with research evidence on other aspects of effective employee training (Salas et al., 2012), the design of the Norwegian national programme falls short on several criteria;

- A more distributed training with several shorter courses, for example 1 day, would have strengthened the individual learning process and follow-up measures in participating companies (Alvarez et al., 2004; Pashler et al., 2007).
- Given that the majority of participants (students) were middle-aged (above 50 years), more emphasis should have put on the customization of content and instructional methods (Noe & Cotquitt, 2002), although our data indicate that this variable did not explain much variance in reported satisfaction and learning outcome. More rigorous measures are needed to eliminate the effects of age-specific response preferences.
- The national guidelines prescribed various methods to be used in the programmes, but surprisingly few examples of e-learning, simulator training etc. were reported. EU-financed projects have demonstrated that updated educational technology may be an asset in the periodic training of professional drivers (Battisti, 2016). Again, flexible tools may support learning and the transfer of competence to realistic situations (Bedwell & Salas, 2010).
- The course providers invested a rather modest amount of time in preparations and systematic evaluations of the local programmes which is not surprising given the low priority attached to such activities in employee training (Pineda, 2010). According to our data and in line with much research (Noe, 2013), a clarification of objectives and expectations is correlated with a higher reported learning outcome. The Norwegian programme provided little support in terms of specific objectives and feed-back to the learners.

These points suggest that there is space for considerable improvement in the Norwegian implementation of the EU-directive. It should be added that international reviewers of professional driving training have concluded that the sector is slow in applying good principles of training design (Brock et al., 2007).

Our outcome-oriented study consisted mainly of self-reports from participants and are difficult to assess since we do not have a reference material, but some of the

differences should be considered when reviewing the international experiences with the implementation of the EU-directive.

Our first main conclusion is that participants' perception of a well-structured programme, measured by means of the variable "organisation of the course" had the strongest contribution to participants' perceived learning outcomes and self-reported behavioural changes after the course. It also had a considerable influence on respondents' reports on the courses' impact on the quality of their work.

A second main conclusion is that respondents who had positive expectations for the courses, more often reported that the training provided academic quality and they reported of better learning outcomes. Such an interaction between expectations and learning is in line with previous research (Alligar et al, 1997), but should be the object of further studies in different sectors. Future studies should clarify these relationships.

A third main conclusion is that respondents who attended passenger transport courses reported of better learning outcomes, behavioural changes after the course and they more often reported that the training provided academic quality. This variable contributes significantly in all the three regression analyses. It is difficult to explain this in light of previous research, but it seems that this could to some extent be related to the finding in previous research that in-house training programs are more effective than alternatives located outside the work place of the learners and lead by external providers (Burke & Hutchins, 2007). In Table 1, describing the regression analysis where learning outcomes is the dependent variable, the variable "Internal/external" ceased to contribute significantly when "Goods/passenger" was included in the analyses. Thus, we see may perhaps conclude that these are strongly related. This is in accordance with our experience that internal courses are more common in passenger transport. However, we do not see that "Internal/external" ceased to contribute significantly when "Goods/passenger" was included in the two other regression analyses. This may indicate that there also are more differences between the quality of passenger versus goods transport courses that we have been unable to measure in our study. More research is needed to examine this.

A fourth main conclusion concerns the importance of management support ("Manager's interest"), especially for learning outcomes. This has strong backing in the literature on organizational training effectiveness and should be given more attention (Grossman & Salas, 2011). In this respect the need for local evaluations is accentuated since such activities would strengthen the long-term effects of the training (Chiaburu et al., 2010).

Our analyses show that having attended courses for drivers in passenger transport and having experienced a well-organised course, is strongly associated with perceived learning outcomes and self-reported behavioural changes after the course. These are the two variables contributing significantly in all the analyses, and they should therefore be studied to improve future courses. Based on our analyses, we would therefore recommend the following measures to be taken to improve the periodic driving training:

- *Investigate differences between sectors and between internal and external courses in terms of course outcomes*

Future research should study why students are more satisfied with courses for drivers in passenger transport and with internal courses – are they made more relevant to students? Could their practices be copied?

- *Build relationships with transport companies*  
Managers' attitudes to the course influence experienced outcomes. One possible approach would therefore be to increase managers' understanding of the importance of the course. Positive expectations are also associated with improved learning outcomes, and these expectations can be influenced by managers.
- *Introduce measures directed towards instructors/teachers*  
While most of the students reported that the instructors were competent, a minority disagreed, which may suggest that training or guidance of instructors may be considered. Another possibility is to develop common teaching resources, such as compendiums on key topics, which could act as a form of "benchmarking" for students and instructors alike in terms of expected outcomes and practical goal achievement.
- *Focus on self-employed drivers*  
Self-employed drivers have more negative attitudes towards the course and report less learning outcomes than other groups. This may partly be due to the fact that attending the course is associated with a greater financial loss for this group. This can be dealt with by, for example, allowing more flexible implementation of the course, as discussed above. Another approach to the problem may be to develop targeted courses for this group (e.g. for different sectors).
- *More focus on topics perceived by students to be relevant*  
The topics "first aid and crisis management" and "cargo security" were highlighted as useful in both surveys and case studies. Increased focus on these topics in the courses and the information disseminated about the courses could contribute to higher expectations and better outcomes. However, from a curriculum point of view the important topics may not be the most popular which should be considered when doing evaluations on reported data.
- *Specify assessment of learning outcomes*  
Given that a relatively large proportion of students' experience training outcomes as limited, assessment of learning outcomes should probably be specified, especially for external courses. Since learning outcomes are usually not assessed, it can also be difficult to create a basis for improvements of the course. Also the use of methods (possibly technology-supported) for individual (formative) feedback would enhance learning and generate data about measures for differentiation of content and teaching methods.
- *Study outcomes for foreign-language drivers*  
We received too few questionnaires from foreign drivers to study this group specifically in the quantitative survey. The case studies, however, suggested that one should investigate how the periodic training works for foreign-language drivers. The interactive teaching methods may contribute to worsening learning outcomes for drivers with language problems.
- *Designing for transfer of learning.*

Our data indicate that learning in the course context does not generalize to everyday job practice, and the programme would be more effective if transfer of learning is an important component. Likewise, company-involvement in the training should be stimulated.

- *Review opportunities for improving follow-up courses*  
Professional drivers are required to undergo periodic training every five years, and already participants have been through their second round. There seems to be a need for discussing to what extent the training cycles should take into account a progression of learning outcomes.

Although our results show that several respondents reported of positive learning outcomes, improved driving styles and increased quality of work, we have not assessed the effects of the courses on the accident involvement of the drivers. This is a shortcoming of our study. Previous studies find that driver training may reduce professional drivers' accident risk (Payne & Barmack, 1963; O'Day, 1970, Manders & Rennie, 1984, Downing, 1988; Lähdeniemi, 1995; King, 1996; Vaset, 1996). Future research should take the results reported in the current study further, to examine the relationship between driver training courses, factors influencing learning outcomes and accident risk.

Finally, in the introduction, we saw that 39 % of fatal occupational accidents in the EU are traffic accidents (ETSC, 2009), but that the shares vary substantially between countries. Although it is important to note that this to some extent could be due to differences in data collection methods and classification, previous research indicates that the heavy goods vehicle (HGV) accident risk varies by a factor of up to ten in European countries (Nævestad et al 2014). Comparing the number of fatalities involved in HGV incidents per billion HGV km driven in each of the European countries, AECOM (2014) concludes that the average risk of all EU member states is 31.5 fatalities involved in a HGV incident per billion HGV km. Romania had the highest HGV fatality risk, with 177.3 fatalities per billion HGV km driven. Poland had the second highest fatality risk (59.9), followed by Belgium, Greece, Finland, Austria, Denmark, Portugal and the Czech Republic. These differences may be related to several different country-specific challenges, e.g. infrastructure, road characteristics and quality, national safety culture, competence training, technology and equipment, framework conditions and organization of the sector (cf. Nævestad et al 2014; 2017). An important goal of the EU-directive 2003/59/EC Regulations relating to basic and periodic training for professional drivers is to enhance road safety in Europe by ensuring a common and mandatory level of training, skills and competences for professional drivers in the EU. Thus, future research should look further into the mechanisms generating such national differences in the accident risk of professional drivers, and not the least examine if, and how the basic and periodic training for professional drivers in the EU can be adapted to compensate for these challenges. We have also seen that there are significant differences across the Member States with respect to implementation of the Directive (CIECA 2010; DEKRA, 2010; ETF/IRU 2012; European Commission, 2012). The relationship between heavy vehicle accident risk and implementation of the directive could also be examined in future research.



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