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**Driver training  
and Traffic safety education**

**A Consultation Paper**

*Presented by the unit responsible for road safety policy  
of the Directorate-General for Energy and Transport*

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# 1. INTRODUCTION

This document deals with a major area of road safety: driver training and traffic safety education.

The paper is based on the assumption that the road user is a main participant in the road traffic system. The road traffic system has three main components which must all work together to reach a high level of road safety. There must be a balance between:

- the road design (including the speed limit),
- the safety performance of the vehicle (including active and passive safety) and
- the choices and behaviour of the road user.

All road users need to have the knowledge, attitudes and ability to make choices and take decisions in order to drive and reach their destination safely without harming themselves and those around them.

The aim is to concentrate on novice drivers, while also encouraging drivers to continue formal life-long learning after they have passed their test. Young novice drivers are the group most at risk and for whom investment is most worthwhile.

Research in recent decades has provided much new information about the reasons for accident involvement and injury severity. One of the most prominent findings of the research on young novice drivers is that there are two main issues putting them at higher risk than other drivers.

The first issue is their lack of experience and insight into the risks of driving. The acquisition of experience is a crucial ingredient in driver education and training. Without experience, reaction times are longer, visual search patterns are poorly developed, mental workload is high and drivers are more easily distracted. The lack of automated behaviour is also a major risk factor for drivers. As behaviour becomes more automatic, these abilities will gradually improve and mental resources will be freed up for safety-related tasks such as hazard detection.

The second issue relates to external factors, not directly linked to driving itself, that influence their ability and motivation to perform safely when they drive. These are lifestyle factors related to different psychological and physiological parameters such as parents' education, family income, gender, school or job performance, social activities and criminal record. Consequently it is important, particularly for young drivers, to be aware while driving of factors related to the driver's context and lifestyle, and not focus solely on driving technique and the use of the vehicle.

## **Why the need for this document?**

This document, which is offered for public consultation, aims to analyse and summarise the results of various projects in this domain co-financed by the EU or run by the Member States. Its objective is to provide a framework to help further define guidelines and recommendations for efficient driver training and traffic safety education in the European Union.

Since the 2<sup>nd</sup> Driving Licence Directive adopted in 1991<sup>1</sup>, there has been mutual recognition of driving licences throughout the European Union. The 3<sup>rd</sup> Driving Licence Directive<sup>2</sup> adopted in 2006, enforceable from 2013 onwards, will impose further harmonisation of the driving test within the European Union. The standards required to obtain a driving licence still vary between the Member States. This affects road safety because drivers from one Member State may not have been trained and tested to the same level as those from other Member States. This means that, should they drive elsewhere in the EU, they will pose a greater risk to themselves and others by not being fully prepared to drive in a safe and responsible manner.

In addition, a general objective for the Commission is to ‘facilitate the free movement of persons, while ensuring safety and security of their peoples’<sup>3</sup>. This can be achieved through more harmonisation of driver training and road user behaviour.

It follows that we need to develop a common culture of road safety and traffic behaviour. We need to emphasise the wider responsibility of drivers to show respect for the environment and respect for other citizens as road users. It is up to the Commission to contribute to building a common culture focused on citizens as responsible road users.

## 2. FACTS AND FIGURES

Since 2001, the aim of EU road safety policy has been to halve the number of road fatalities by the year 2010. In 2001, 54 000 people died on the roads in the 27 countries which are now Member States of the European Union, and many measures have been taken since then to meet the target of a 50% reduction in fatalities. In 2007, for the first time since 2001, no progress was made in reducing deaths on the roads in the EU. Before that, the annual reduction in fatalities was 6% in 2004, 5% in 2006 and 0% in 2007. In 2007, the number of deaths was still 43 000, equivalent to five medium-sized passenger planes crashing in the EU every week. Over the period from 2001 to 2007, the number of fatalities has decreased by 20%, but a 37% reduction would have been necessary to meet the target of halving the number of road fatalities.

Statistics for 2008 show an improvement. With 9% reduction in road fatalities, the number of persons killed on the roads was cut to around 39 000 at the end of 2008.

### Young drivers and road users

At present young persons aged 18 to 25 account for **19%** of road deaths in the European Union, while they represent 10% of the population. Similarly, young car drivers aged 18 to 25 account for **27%** of the total number of car drivers killed. These figures demonstrate the significance of youth in road fatalities, highlighting the need for road safety action targeted particularly at this population.

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<sup>1</sup> Council Directive 91/439/EEC of 29 July 1991 on driving licences, OJ L 237, 24.8.1991.

<sup>2</sup> Directive 2006/126/EC of the European Parliament and of the Council of 20 December 2006 on driving licences, OJ L 403/18, 30.12.2006.

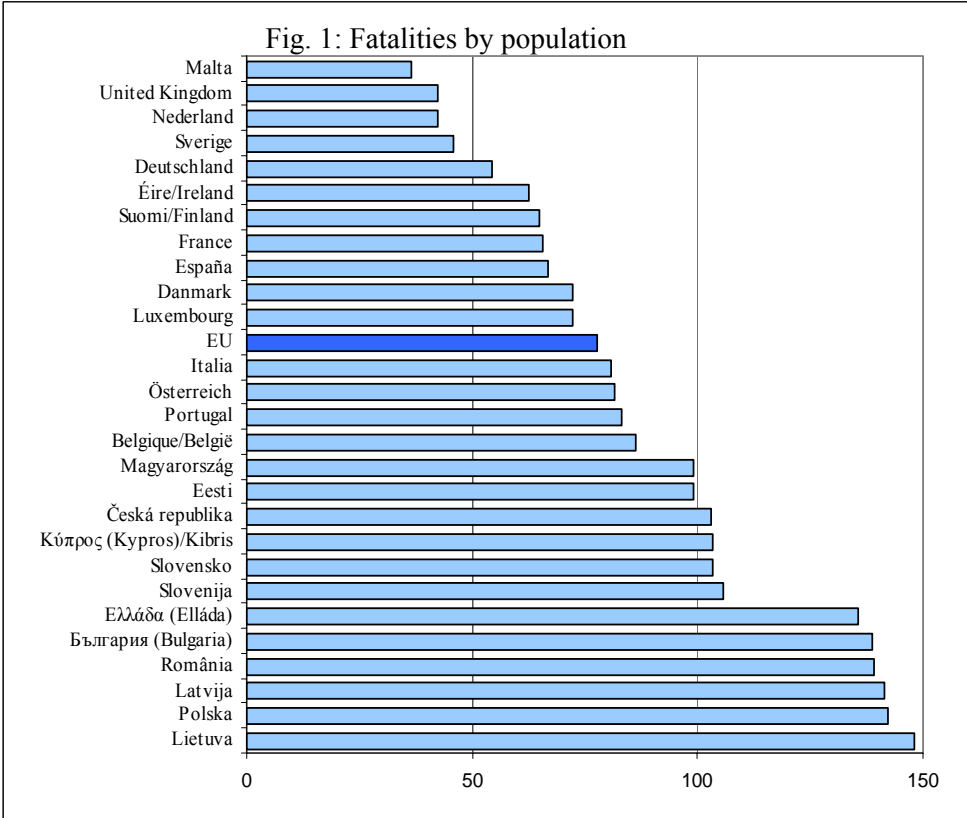
<sup>3</sup> Preamble of the Treaty on European Union.

Young persons aged 18 to 25 account for a high proportion of road deaths. They are over-represented compared to other age groups. However, statistics on the number of deaths since 1991 show a gradual decrease of the share of young people. This trend is partly due to the introduction and improvement of training programmes.

Driver training is an important way to influence the behaviour of young drivers, given that young people have more access to cars in EU countries, and are increasingly likely to pass the driving test.

It is not easy to isolate the impact of training on a country’s road safety performance. Indeed, as new measures are often implemented together, their effects are combined and it is difficult to analyse their impact independently. In addition, training has a long-term impact, which makes assessment difficult, unlike other types of action such as enforcement action.

Nevertheless, statistics on the number of deaths per million inhabitants in the various Member States shows that the countries with the best results in the EU are those that also have a wide-spread road safety culture and a long experience in training. This is especially true for UK, the Netherlands, Sweden, Germany, Finland, France, Spain, Denmark and Luxembourg. Most of these countries have set up structured detailed training programmes (Fig. 1: Fatalities by population in 2008). There is also evidence that some of these countries accomplished this 15 years ago, and still maintain the best results within the EU. Conversely the countries whose systems are the least effective are those in which the number of deaths per million inhabitants is higher than the European average.



Another way to identify the impact of training on road safety is to compare the number of car drivers killed. The comparison of results shows that in the past a far higher number of young

persons aged 18-25 were killed on the roads than in 2007 (Fig. 2). There was an improvement in the behaviour of the younger population between 1991 and 2007. However, this improvement is not found in older users. Car drivers over the age 45 in 2007 do not perform better than those who were over 45 in 1991.

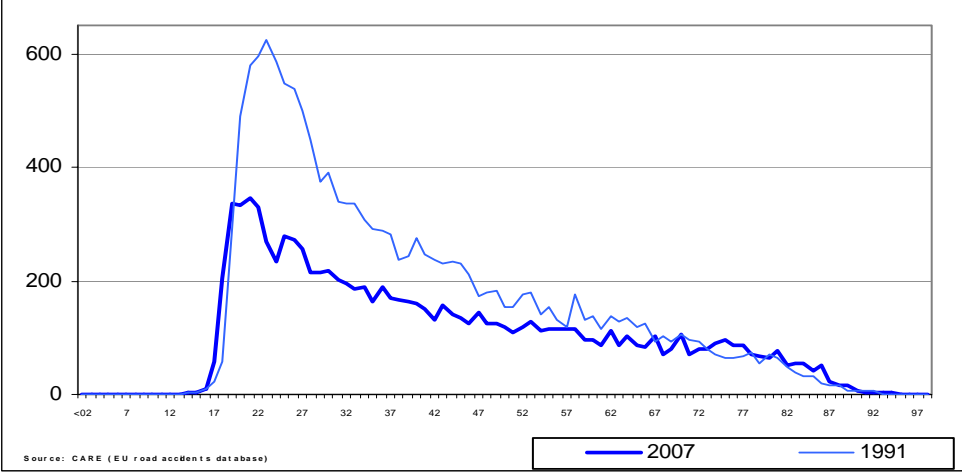


Fig. 2: Car driver fatalities by age

One possible explanation is that drivers over 45 followed pre-test training courses that were much less detailed than they are today. This limited training is manifesting itself today in the dangerous driving of this age group.

The same analysis of motorcycle drivers shows a deteriorating situation (Fig. 3.). While the number of young drivers (18-24 years) killed in 2007 in traffic accidents is lower than it was in 1991, the number of older drivers, particularly in the 35-45 age group, is significantly higher. Not only has no improvement been recorded, but this age group’s road safety has fallen since 1991.

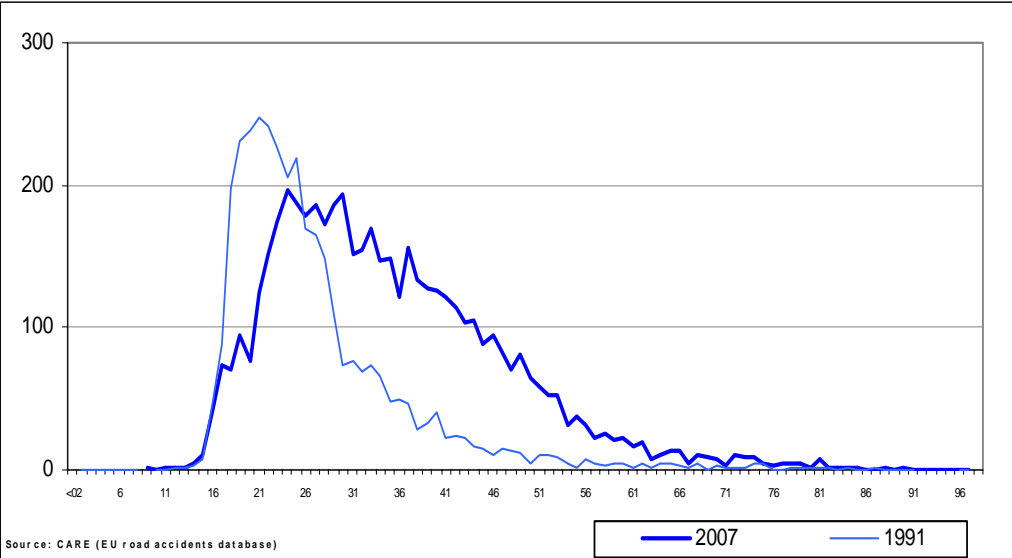


Fig. 3: Motorcycle driver fatalities by age

### 3. EXISTING DRIVER TRAINING SYSTEMS IN THE MEMBER STATES

In the EU there are many different types of licensing systems. They can be divided into three main categories. As can be seen, they differ in many respects. The **traditional models** offer the simplest approach to driver training; they include the test-only model, or driving school + test. The **pre-test learning period models** put more emphasis on building up experience before the test; they include the accompanied driving model and the graduated driver licensing model. The **post-test practical experience models** place emphasis on developing good habits and building up experience after the test; they include the post-test accompanied driving model and the two-phase model.

#### 3.1. Traditional Models

##### 3.1.1 Test only

The traditional test model is based on the idea that if the content and criteria of a test (skills, knowledge) are known, the learning will be based on the same criteria and there is no need for any curriculum. It relies on the validity and reliability of the examination and on the professional skills of examiners. This model prevails in the UK.

##### 3.1.2 Test + driving school

The test + driving school model relies on professional, usually instructor-centred, structured teaching, where the idea is that the instructor transfers their knowledge and skills to the student. The learning time is often short and the effectiveness depends on the knowledge and skills of the instructor and how they use them to show the right way to behave in traffic. Learning is based on clear goals and prescriptive feedback. Traditional training has concentrated heavily on manoeuvring skills as well as driving in traffic situations, which are both easy to measure in an examination. This model has been implemented in most of the EU Member States.

#### 3.2. Pre-test learning period

##### 3.2.1 Accompanied driving model

The 'driving school + accompanied driving model' is a combination of a minimum training obligation in driving school and a minimum mileage obligation. This model is based on the idea that learning is most effective when the goals are clear (driving school training) and when the learner gains a lot of experience (minimum mileage obligation). The learner receives structured and intentional feedback from the instructor in addition to the feedback received during practice. The minimum mileage obligation tries to provide enough experience to automate the perceptual-motor aspects of driving, making driving an everyday task and diminishing the effects of emotions connected to independent driving. Large amounts of practice make automated skills possible, and planning skills may also be developed when driving is part of everyday activities. However it is also possible to learn unsafe driving habits from the environment and perhaps from the accompanying person. Accompanied driving

could be made more effective if combined with a structured initial period and professional feedback.

#### **Case Study: France**

The first trials of accompanied driving took place in 1984 and led to a generalisation of this system by 1988. This training can start at the age of 16, subject to passing the theory test and after 20 hours of lessons in a driving school. The lay instructor must be at least 28 years old, have been a licensed driver for the last 3 years and have no previous convictions for serious offences (e.g. drink driving). The learner has to drive a minimum of 3 000 km, recorded in a logbook, to be completed within a one- to three-year period. New drivers are subject to maximum speed restrictions for the first three years; this restriction is reduced to two years if they choose accompanied driving. The success rate for category B driving licences is 70% instead of 50% for those who choose the traditional system. In 2009, it was decided to develop accompanied driving to include new requirements: the lay instructor will need to have been a licensed driver for the past five years without suspension, and the obligation to drive 3 000 km is replaced by the obligation to drive under various conditions.

### 3.2.2 Graduated driver licensing

Graduated driver licensing also relies on practice and experience but tries to make this independent practising period as safe as possible by prohibiting driving in risky environments or conditions. The usual restrictions are on carrying passengers, driving at night, and combining driving with the use of alcohol. The restrictions help the new driver in decision making, but do not give any other support for learning apart from making the practising period safer.

#### **Case Study: Ireland**

In 2007 Ireland introduced a minimum learning period of 6 months for all category B learner drivers, following the example of graduated licensing models used in other Anglo-Saxon countries around the world. Learners must apply for a provisional licence to start on-road practice, and cannot take the practical driving test until 6 months have elapsed since the issue of the provisional licence. This measure is designed to encourage learners to practise more, and over a longer period of time, than before.

### 3.3. Post-test practical experience models

#### 3.3.1 Post-test accompanied driving

#### **Case Study: Germany**

There is a voluntary programme now available to learner drivers in all federal states of Germany which includes a post-test accompanied driving period. This programme involves the normal driving-school-only approach to passing the theory and practical tests, but up to one year earlier than normal (taking the test from 17 years old rather than 18 years old). Learners following the accompanied driving model must, once they have passed the test, only drive accompanied by a designated person (at least 30 years old) until they reach the age of 18. Thereafter, the normal probationary period for novice drivers applies.

Post-test accompanied driving combines structured learning with accompanied driving and allows candidates to start learning and practising at 17 years of age instead of 18. It makes driving as much of an automated everyday task as possible and ensures that, when solo driving starts, there will be fewer emotions and dangerous motives at play than there might be after a short period of driving school training. The accompanying person helps the driver to follow the rules and to control their own behaviour.

### 3.3.2 Two-phase models

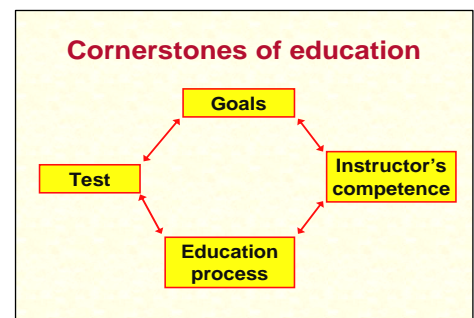
Two-phase models allow the learner to first get some independent driving experience and then to come back to driving school to assess this experience and get feedback from the instructor and other students. The learning potential depends on the instructor's ability to handle the group and to initiate reflection and discussion. Feedback driving enables learners to check how valid their own evaluation is of their skills in traffic, and how they could improve them. Dealing with risks and ecological driving habits are often also tackled in the second phase.

#### Case Study: Austria

Youngsters in Austria can apply for a category B driving licence at the age of 17. Training can begin at 16, accompanied by a lay instructor. First they must undergo theoretical and practical driving school training (12 hours) and then the learner has to drive at least 3 000 km, with 3 on-road + discussion sessions in a driving school. The 3 000 km covered must be recorded in a logbook and should take at least 2 weeks to complete. The total package provides for a minimum 6-week training timeframe before taking the driving test at age 17 minimum and then driving solo on passing the test.

## 4. LEARNING TO DRIVE: The four cornerstones of education

It is clear that driver education is a complicated activity where the goals are much wider than knowledge of rules and car manoeuvring skills. Achieving these goals calls for a good education programme and well-trained professionals such as instructors and examiners. We also need a good test that can select those who have achieved the goals and exclude those who have not.



In order to support the candidates in becoming safe drivers these cornerstones must be in harmony. Goals must be based on safe driving skills and knowledge. These goals must be attained by teaching and learning strategies that are adapted to the candidates and use appropriate modern methods. The instructors (professional driving instructors, parents or other lay supervisors) must be qualified for their respective tasks in the education process and have the necessary skills and knowledge. They must also possess teaching and instruction skills with a variety of effective strategies to help learner drivers incorporate the competencies they need into their attitudes, knowledge, skills and actual behaviour.

Another important element of the teaching and learning process is the possibility for candidates to learn from other teaching sources such as theory books, computer-based learning aids, professional and accompanied education and training etc.

The final evaluation is commonly carried out by a driving and a written test. This calls for competent examiners, with the ability to evaluate the tests.

Without harmony between all four cornerstones, there is a high probability that the education programme will fail, leading to high failure rates or qualified dangerous drivers.

#### **4.1 GOALS FOR DRIVER EDUCATION — THE GDE MATRIX**

The objective of the GDE matrix is to provide a framework for defining the detailed competencies needed to be a safe driver. It can be used to define educational goals and content in driver training. An efficient training programme should cover as much as possible of the matrix and not focus only on the lowest levels, as traditional programmes used to do (See Annex I).

##### **4.1.1 The ‘highest’ levels**

The highest level in the hierarchy, ‘goals for life and skills for living’, refers to a driver’s overall personal motives, emotions and life goals, broadly speaking the driver’s self. It includes the driver’s perceptions, true or imagined, of how to behave in the world so as to please not only him or herself but others and society as well. It is closely connected to the person’s age, mental and physical health, gender and developmental maturity. The contents of this level can override the contents of the other levels.

On the second highest level, ‘goals and context of driving’, strategic choices are made: the why, what, where and when of driving. These choices include choice of transport mode (bus, car etc.), day or night-time driving, rush hours or not, driving under the influence of alcohol or fatigue.

The importance of these higher levels becomes evident for example if we consider the fact that young people often engage in driving for leisure purposes and in the company of friends or just for the thrill of it, most often because it meets some developmental or social needs, such as the need to feel accepted by one’s peers.

##### **4.1.2 The ‘lowest’ levels**

The second lowest level, ‘mastering traffic situations’, includes what has traditionally been the central component of driver education, such as speed, knowledge of traffic rules, and interaction with other road users.

The lowest level, ‘skills for vehicle manoeuvring’, includes the skills needed to control and operate the vehicle, understanding its properties and the effect certain operations induce.

Driver training traditionally focuses on these lowest levels. The acquisition of these skills remains crucial for safe driving.

##### **4.1.3 Connecting the levels to driver training**

At each level, three categories of skills are being developed: basic skills and knowledge, knowledge and skills concerning risk-increasing factors, and self-evaluation skills.

Traditional driver training starts with vehicle manoeuvring, i.e. the lowest level of the GDE matrix. However, accident research shows that the majority of car crashes are not caused by lack of vehicle manoeuvring skills but by human risk factors such as inattention, fatigue,

alcohol, sensation seeking, risk-taking attitudes etc., i.e. the higher levels of the GDE matrix. Most serious car crashes of novice drivers are single-vehicle accidents, occurring in easy driving situations such as an empty rural road during the day. Consequently, the traditional approach of starting driver training with pure car handling should be changed. Instead, car driving should start with learning about typical risk factors in the form of seminars followed by practical skill training. Driver education should make it clear that it is about ‘how we make our decisions’ when driving a car and not only ‘what we should decide’.

## **4.2 COMPETENCE OF EDUCATORS**

The driving instructor is the key person in transmitting safety. Guidelines and recommendations have been established in the MERIT project<sup>4</sup>. The following section builds on the results on of this project.

### **4.2.1 Selection and training of driving instructors**

Driving instructors should be able to plan, implement and evaluate driver training effectively and meaningfully: they should be aware of the official curriculum and also of the GDE matrix. They should have good communication skills, evaluation skills, defensive and social driving skills.

Applicant driving instructors should have sufficient schooling to meet the demands of training and working in the profession; possess the driving licence of the category they intend to teach in; have a minimum of three years’ driving experience with the relevant category of vehicle; complete a screening process, in order to gain access to training and pass the test to become a driving instructor; undergo a medical test — including an eyesight test — commensurate to the safe execution of the profession; and undergo a background check with regard to prior criminal offences and/or traffic offences, to ensure that the applicant is a fit and proper person. Applicants should undergo initial professional training prior to the test.

Such training should be carried out in accredited driving instructor training centres which are subject to regulation by a recognised and appointed body. The programme should at least include training on the teaching methods and skills required to teach all levels of the GDE matrix.

Experience with teaching real learner drivers is needed prior to the trainee instructor gaining full qualification. This experience should be subject to supervision by a qualified supervisor, during both practical and theoretical driving lessons. Applicants should undergo testing, according to the competencies required with regard to: theoretical knowledge, teaching ability and driving ability. Persons responsible for training and testing applicant driving instructors should possess sufficient knowledge and skills to train and test in the specific area in question.

### **4.2.2 Compulsory further training**

Driving instructors should continue their training. The MERIT project recommends five days’ periodic training every five years. It also encourages driving instructors to undergo an evaluation, by an appropriately qualified and accredited observer, every five years. Driving

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<sup>4</sup> MERIT project (2005), see Annex 2.

instructors found to be seriously under-performing during such observations should be required to obtain specific training to correct the shortcomings observed.

### **4.3 THE EDUCATION PROCESS**

Driver training and education is a life-long undertaking. It should start at school. Traffic education should be understood not only as learning the rules but as a part of the process of becoming a responsible person. Traffic education in this sense would have a double impact: first, people would become safer traffic participants and second, young people would generally take more responsibility for their decisions and their effects on their life. Already focussing on self-responsibility in traffic education at school might help with all the other potentially risky aspects of life for young people. In particular, it might have an impact on teenage moped accidents as young people tend to lack emotional maturity and a sense of responsibility.

#### **4.3.1 Driving school training**

Driving school training is a crucial part of the driver education process. Driver training curricula must lay down the content and possible methods for reaching the educational goals. Examples of such programmes can be found in step-by-step training modules, such as RIS (Driver Training Stepwise) in the Netherlands, the Danish driver training curriculum alternating theory and practice<sup>5</sup> and the German driver training curriculum. Importance is attached to all the levels of the GDE matrix. Coaching techniques should include questioning and integrating the learner's prior experience and knowledge into the driver training process, thus bringing in the higher levels of the GDE matrix. A driver training regime should also encourage training spread over time, rather than just a few days.

#### **4.3.2 Coaching**

While traditional driver training is instructor-oriented, coaching is learner-oriented. Coaching is recognised as a highly beneficial method of training, which covers all segments of the GDE matrix. The coach aims to raise the learner driver's awareness (feel, input, information, self-feedback), thus more than doubling the quality and quantity of information received, and this 'information' is in many conditions acted upon instantly, automatically and often sub-consciously. This trains the learner to naturally operate at a higher level of awareness, leading to a faster, more accurate and safer response. Telling and instructing, on the other hand, creates dependence. Coaching also builds a sense of self-responsibility by inviting the learner to make their own choices about their actions in the car, to the highest degree possible. Coaching exercises which use the imagination can address emotional issues, such as how one would address dangers and react to incidents, by asking the learner to describe such instances and to evaluate themselves. Coaching enhances the natural learning process by encouraging learners to think for themselves, thus speeding up the learning process and resulting in a dramatically reduced accident rate.

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<sup>5</sup> SUPREME project.

### 4.3.3 Accompanied driving

One of the primary factors explaining the high crash risk of novice drivers is their lack of driving experience. Safe driving requires considerable practice. Driving is a complex task, involving constant decision-making, and the necessary skills and experience cannot be acquired in just a few hours. Currently in Europe, the average amount of on-road, pre-solo driving practice for category B learner drivers stands at around 30 hours. Meanwhile, research from Sweden and Norway<sup>6</sup> has concluded that between 5 000 and 7 000 km or around 120 hours of on-road practice can substantially reduce the crash risk of novice drivers. Whilst driving school training is the normal approach to preparing novice drivers in most European countries, such training cannot be relied upon to provide such a high number of hours of driving practice. Accompanied driving is the only real tool available at this stage to assume this role. Accompanied driving as a means to practise driving is currently permitted in over half of the EU-27, but its potential has yet to be fully exploited in most of these countries. Attempts to combine accompanied driving with formal driver training, as in France, Austria and Norway, have not yet led to a reduction in the novice driver crash risk. This is possibly due to a lack of sufficient mileage in a variety of driving situations and conditions.

There are a number of ways to encourage or even oblige learner drivers to accumulate a lot of accompanied driving practice, before they drive solo. The minimum age for starting to learn to drive can be lowered (as in Sweden and Norway), at the same time as maintaining the normal licensing age (18 years old, as in most European countries). This measure serves to encourage parents and learner drivers to practise over a longer period of time before the learner drives solo. Another measure is to introduce a minimum pre-test learning period, for example 6 months (e.g. Ireland), during which the learner again has more time to practise. Some countries have introduced a minimum number of hours of pre-test on-road practice, e.g. 120 hours in various states in Australia, and these hours have to be clearly recorded in a logbook and signed off by the accompanying person. A more recent approach has been to introduce post-test accompanied driving. A voluntary programme in Germany allows learner drivers to follow the normal driving school approach to the driving test, albeit a year earlier than normal. After passing the test, the novice driver must then drive with an officially designated accompanying person until his/her 18<sup>th</sup> birthday. All novice drivers in Israel currently have a compulsory period of accompanied driving after passing the test.

Various principles should be followed with regard to accompanied driving. Accompanied driving should not just be seen as a means to practice to pass the driving test, but as a way to reduce the accident risk through high-volume training in a variety of circumstances. There should be as few barriers as possible to facilitate the take-up of accompanied driving.

Various concerns regarding accompanied driving have not materialised in practice. For instance, research in Sweden suggests that a learner who has accumulated high amounts of accompanied practice does not appear to be more dependent on cars subsequently, instead of other (safer, more environmentally-conscious) modes of transport. The crash risk during accompanied practice is negligible, especially when compared to the solo crash risk for novice drivers. Questions do remain, however, regarding the availability of accompanying persons in countries where high amounts of accompanied practice are required by law. Furthermore, it may not be easy in practice to ensure that a minimum number of hours of accompanied practice is actually carried out.

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<sup>6</sup> Gregersen et al. (2000); Sagberg (2002).

#### **4.3.4 Second-phase training after licensing**

Further training in the form of ‘second-phase’ education after licensing has shown successful results recently in Austria<sup>7</sup>. The main characteristics are:

- The further educational steps take place soon after licensing (for a period of a few months) as the accident probability of a novice driver decreases continuously from the beginning of independent driving (a further educational step after one or two years would have no impact.)
- Pure skills training (e.g. skid control on roads) is avoided, since it may cause overconfidence in certain individuals. Instead, training aims to demonstrate how to avoid risks rather than how to cope with them, to encourage defensive driving.
- Feedback in traffic is conducted by specifically trained driving instructors and self-evaluation is improved.
- ‘Halls of consequences’ (exhibition and demonstrations of accident risks) are promoted as long as the novice drivers are accompanied by a driving instructor trained to lead a discussion on the goals.

Second-phase education is not usually connected with a test. It is based on participation, so a quality control system with audits and evaluation needs to be established by the authority responsible.

#### **4.3.5 Zero blood alcohol limits for novice drivers**

Scientific findings on the disproportionate increase in the accident risk with higher blood alcohol concentrations are based on two roadside surveys<sup>8</sup>. It has been shown that the accident risk increases significantly more steeply for inexperienced young drivers. Even with a blood alcohol concentration of 0.3 percent, young drivers’ risk is double that of older drivers. When the legal alcohol limit for novice drivers in Austria was lowered from 0.8 to 0.1 percent, a significantly stronger decrease in alcohol-related accidents was found for novice drivers compared to other drivers<sup>9</sup>. Consequently, a zero alcohol limit for novice drivers should be introduced.

#### **4.3.6 Driving simulators**

Driving simulators have been shown to be a highly useful element of driver training, with the potential to substantially reduce the incidence of accidents in the post-test period. Originally prohibitively expensive, simulators have become much more popular and accessible due to the increasing affordability of the computer elements required.

There are, however, discrepancies across the range of simulators available. The highest end simulators are highly realistic in terms of view, vehicle behaviour, motion, behaviour of other vehicles, and scenarios. The lowest-end simulators are much less complex and thus offer a poor imitation of real-life situations, reducing their effectiveness in driver training.

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<sup>7</sup> Gatscha & Brandstaetter (2007).

<sup>8</sup> Borkenstein et al. (1964), Borkenstein et al. (1974) and Krueger (1995).

<sup>9</sup> Bartl (2000).

Research by Wheeler and Trigs in 1996, which compared driving simulators with flight simulators, demonstrated the effectiveness of driving simulators in certain areas. They identify four different types of task for which the simulator user may prepare: procedural tasks ('in this situation, first do this and then do that'), tracking tasks (keeping speed and course), tasks in emergency situations and higher-order tasks (situational awareness, risk perception). Driving simulators were found to be more suited to higher-order and procedural skills. The driver may master basic situations and learn hazard perception and situational awareness skills without the potential dangers resulting from them 'getting it wrong', and through the repetition and diverse scenarios which a simulator allows.

There are also numerous disadvantages to simulator use, namely the problems of poor transfer of competencies if the learning environment is even slightly removed from reality, and the retention of skills (skills may be retained better when learned through spontaneous situations). Driving simulators may therefore prove a highly useful tool in educating drivers to deal with situations which, if attempted on-road, would either pose an elevated risk to the learner driver and other road users, or would require specific, random, real-world conditions such as weather and traffic behaviour.

#### **4.3.7 E-learning**

The positive impact of e-learning in road safety education has not yet been evaluated. E-learning appears potentially able to supplement road safety education, especially in areas requiring not just rote learning but learning about risks such as fatigue, inattention, alcohol impairment etc. E-learning programmes should therefore be interactive to improve efficiency. E-learning tools also offer opportunities when it comes to testing. Simple rote learning with a computer to pass the driving test must be avoided.

#### **4.3.8 Environmental awareness and eco-driving**

In the current global context, 'good' driving is not only safe and considerate to other road users, but also environmentally-aware. There are three levels of environmental awareness that may be integrated into effective driver training and testing:

- general principles related to the environment and transport (e.g. using alternative, less polluting transport modes, avoiding unnecessary travel),
- pre-driving decision-making (e.g. choice of car, trip-planning, regular checking of tyre pressure),
- practical environmentally-aware driving techniques.

Such driving techniques as anticipating traffic flow, thus avoiding unnecessary and sudden braking, and early release of the accelerator when slowing down are not only environmentally friendly but also make driving more controlled and therefore safer. Such techniques are easier to teach to learner drivers than to experienced drivers who have developed deeply ingrained driving styles and habits. Moreover, modern cars (i.e. any new car since the early 1990s) are designed to be driven in this way.

Whilst the environment should play an integral part in driver training and education, learner drivers must be made to understand that safety concerns override environmental ones in specific situations. In this regard, techniques such as avoiding unnecessary braking should not be taken literally where safety issues are involved.

#### 4.4 THE TEST

The driving test is a cornerstone of the driver licensing system within the European Union. The mutual recognition of Member State driving licences depends on minimum standards for the theoretical and practical test, as laid down in Annex II of the European Driving Licence Directive. The test not only plays a role in setting basic standards for safe driving, it can also have a guiding influence on the content of driver training, education and practice ('what is tested must be trained').

Driving tests should have both reliability and validity<sup>10</sup>. The testing system is reliable if candidates can expect similar treatment, conditions and assessment at tests across the whole country. New EU-level requirements for driving examiners<sup>11</sup> are designed with this purpose in mind. A valid test is one which claims to be a comprehensive assessment of the competencies required for safe driving. With respect to validity, the driving test has its limitations. Whereas the practical and theoretical tests go some way to assessing a learner driver's knowledge and skills in vehicle control and interacting in traffic, other competencies for safe driving, such as attitudes and motivations, are not evaluated. It is with these limitations in mind that some countries have introduced obligatory driver training modules or road safety education in schools, such as group work and discussion, to address what cannot easily be tested.

Both the practical and theory test can be improved, however. For example, in an effort to make the practical test as realistic as possible, and to positively influence driver training, some countries have introduced 'independent driving' tasks in the practical test. Independent driving tasks include driving to a particular destination, or following a series of instructions, without further directions from the examiner.

Computer-based testing also offers a number of benefits, similar to those offered by e-learning. Traditional theory tests aim simply to assess a person's knowledge. A more valid form of assessment is to test a person's application of knowledge in concrete traffic situations. Computer-based testing allows the use of images and real-life scenes, both static and moving, to achieve this goal. In this sense, the traditional boundaries between theory and practical testing, and indeed testing and training, are being blurred. Elsewhere, the potential of computer-based testing for attitude-testing and self-assessment is currently being explored.

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<sup>10</sup> TEST (2006), see Annex 2.

<sup>11</sup> Annex IV, 3<sup>rd</sup> Driving Licence Directive.

## **5. CONCLUSIONS**

### **Recommendations for efficient driver training and traffic safety education**

#### **1. Additional controlled practice**

More practice is needed. This can be achieved by more pre-test or post-licence accompanied driving, more practical sessions and use of simulators. Practice should take place under conditions which allow acquisition and improvement of driving skills. Both self-evaluation and peer-evaluation should be developed.

#### **2. Alternate theory and practical training**

Training programmes should alternate theory and practice. Returning to theory after practical training should not mean following a new package of theoretical courses. Instead, training should take place through the learner's self-evaluation or by assessing driving experiences together with the instructor. Coaching, as a learner-oriented method, should be encouraged.

#### **3. Standards for driving instructors**

An important way to improve the quality of training is to raise the standards for driving instructors.

The profession of instructor should be defined and developed under similar principles in all Member States.

#### **4. Driving test**

Driving tests should be better designed with a view to influencing the content of the training.

The driving test should not only focus on establishing the driver's knowledge, but should also evaluate the driver's understanding of driving challenges and their responsibility towards themselves, their passengers and all road users, and towards environmental issues.

New forms of driving test should include activities such as independent driving, situation-awareness questioning, self-evaluation and hazard-perception testing.

#### **5. Emphasising high risk scenarios**

High risk scenarios should be primarily classroom-based. Under safe circumstances, track and in-car scenarios could take place. Such modules could be introduced in pre-licensing education, pre-test training or post-test training.

Pure skills training (e.g. skid control on roads) may cause overconfidence in learner drivers. Instead, training should focus on how to avoid risks rather than how to cope with them, thereby encouraging defensive driving.

## **6. Reducing high risk exposure**

Young novice drivers are vulnerable. Through licensing and enforcement, the negative impact of their behaviour can be reduced. This includes such specific measures as zero alcohol tolerance, lower speed limit, passenger bans, higher licensing age and night-time driving bans.

These measures should not be presented as discriminatory measures.