Graduated development training for driving license acquisition (Category B)

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Abstract. Directive 2006/126/EC of the European Parliament and of the Council of the European Union details the minimum requirements for driving examiners and the test that needs to be taken before the issue of a driving license in member countries. However, there in no directive concerning the training of learner drivers or of driver trainers/instructors. Consequently, there are different systems of training carried out in every EU country and there is no scientific evidence to show that one training system is more effective than another. This means that training systems are judged depending on the number of lessons students need to pass their driving test in each country and the pass rate for tests in that country. A research project was devised in Italy involving 272 driving instructors. These instructors were provided with a bespoke training course aimed at reducing the pressure on their students and on themselves. The research demonstrated that the adoption of the specially designed training program was more effective in facilitating the learning of practical driving skills and was also less stressful for the driver trainer and the learner driver. The report below details this new and innovative training procedure and the results of this exercise.

Keywords: workload, simulators, driving school, driving training, progressive access training

1. Introduction

Car driving is considered a very complex activity, consisting of different concomitant tasks and subtasks that require a very high mental and physical coordination [1], [2] and moreover the surrounding environment is very unpredictable and out of control [3]. Within human factors research, a distinction has been made between *driver performance*, which reflects what a driver can do, based on his or her physical and mental capabilities, and *driver behavior*, which involves what a driver actually does and is influenced by social factors and self-motivations [4]. Despite the conceptual difference, it is often hard to distinguish driver behavior and performance, because of a strong inter-relation.

This conflict is already present while learning to drive. Most people who register for a driving school do so in order to obtain a driving license, not to learn how to drive properly and safely. The resulting situation, aiming exclusively at achieving that

goal, generates a very high level of performance stress, because of a mismatching between students expectation and real actions.

The first hours of driving are, in my experience and according to anecdotal evidence, often the most complicated and frustrating for the students who are not used to the length of time required to learn a discipline as complex as driving. People could feel anxious before their driving lesson and sometimes they could also fail in their performance. This feeling people have before a trial is called “performance anxiety”, and it's a state of tension and fear felt when someone has to face an assessment situation of his capacity as a driving lesson or a driving test [5]. Starting from the hypothesis that emotions could impact cognitive processes [6] anxiety can have negative effects on people’s behavior during a demanding task, for instance profoundly affect the cognitive performance and so the learning process. This is the reason why performance anxiety is demonstrated to affect the driving behavior [7].

A progressive access training system used in the first few driving lessons should allow students to focus on each step of learning the different skills required individually, as often happens in many sports where motor coordination is required.

The first driving lessons are stressful for the driving instructors who have to manage the anxieties and sudden movements of the students. Thanks to the active use of the dual controls (in Italy clutch, brake and accelerator), the instructor manages the driving of the vehicle in a smoother way and focuses the attention on the dynamics of the traffic from the first few lessons. However, it is hard to check at the same time the quality of each movement performed by the students over the car commands. At the same time, the student has to learn and perform different movements and actions simultaneously, at a cost of a high workload, even resulting in a poor training. Experimental studies already highlighted how the execution of multiple instructional sequences appears to be much more complex and multilayered than what is suggested by the traditional description of instruction in terms of Initiation–Response–Evaluation (IRE) sequences [8].

In this context, the study aimed to evaluate how an innovative method of training based on a progressive access training protocol would improve driving training effectiveness reducing at the same time the cognitive workload level requested to the students and the instructors.

2. Materials and Methods

With the aim of reducing the cognitive workload, in accordance with experience gained in driver training in Switzerland [9], it was decided to use a progressive approach teaching method with the following characteristics

1. Create and consolidate the basic motor schemes;
2. Create and consolidate the coordination skills necessary for training
3. Optimize the ministerial time available to the candidate for training
4. Check the actual learning times of the exercises proposed in the individual driving lessons
5. Create a team of specialized instructors able to carry out specific lessons

6. Help the driving instructors to create the necessary skills for the students to be autonomous in the shortest possible time, without generating further workload.

2.1 The proposed method

The method used during the first few driving lessons consists of four separate training units. The application of the individual training units simplifies the workload for each student, since the student will face separately each single fundamental movement, i.e. observation and steering wheel control, right foot use for accelerator and brake pedals, right foot use for the gearbox.

The first training unit consists in learning the correct use of the steering wheel and the importance of all-round observation and control (Figure 1), considering the 70 % to be allocated for car direction, 15 % for infrastructure observation and the remaining 15 % for local scanning (check).

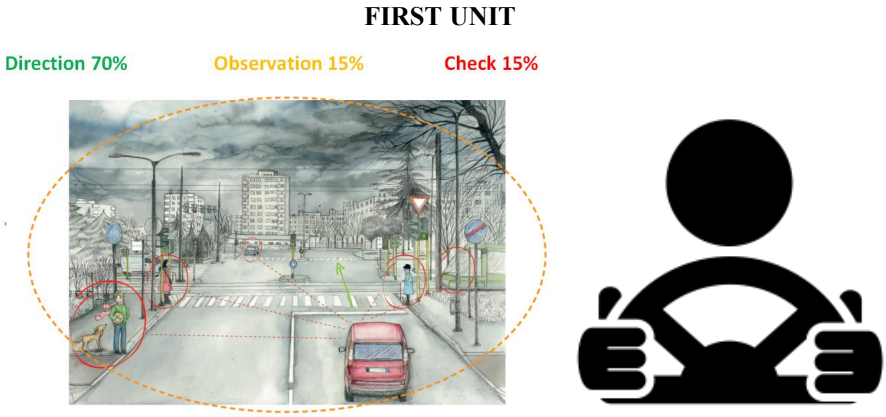

Figure 1. On the left, a graphical representation regarding how to distribute the all-round observation while driving. On the right, the symbol of the steering wheel, representing the fundamental control practiced during the first session.

In the second unit (Figure 2) the student, while putting into practice what they learned in the first unit, learns to use the right foot in the management of the accelerator and the brake.

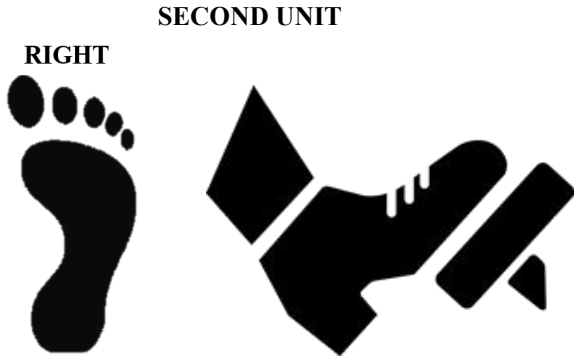

Figure 2. The symbol of the pedals managing through the right foot, representing the fundamental control practiced during the second session.

The third unit (Figure 3) introduces the use of the left foot and the right hand (gear lever) in addition to the commands previously learned.

Figure 3. The symbol of the gear lever and the involved limbs, representing the fundamental control practiced during the third session.

In the last unit (Figure 4), the total coordination of the student is managed, and the commands are completely passed to him.

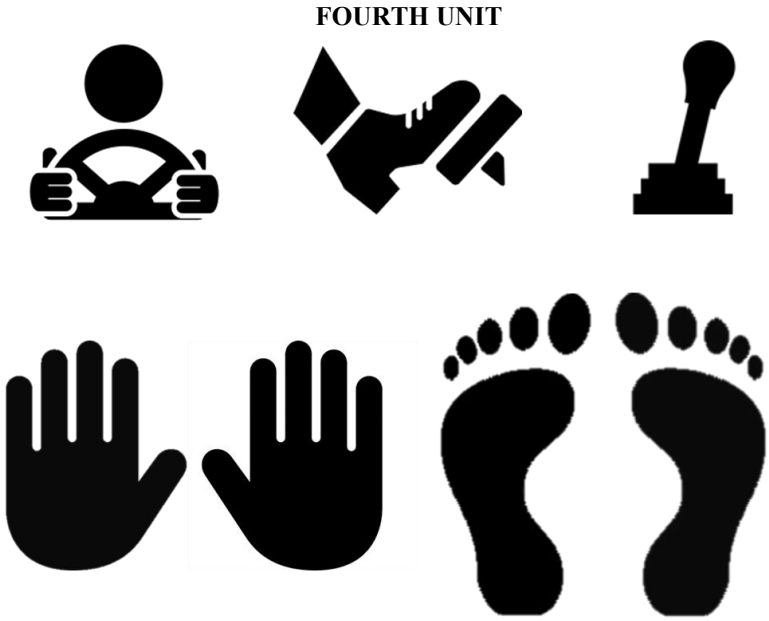

Figure 4. During the fourth session the student will have the full control of the car.

2.2 The study

From 2015 to 2017, voluntary training courses were held for about 300 driving instructors between 30 and 55 years of age, lasting 40 hours. In June 2019 the course participants were asked to answer a short questionnaire on the effectiveness of the progressive access training methodology during the first driving lessons.

The aim of the questionnaire was to understand the real effectiveness of the system in carrying out daily training activities, or if the application of the progressive access instruction methodology had:

- Reduced the cognitive workload of the students through the separation of the commands given by the Instructor;
- Reduced the time needed to assimilate the driving skills of the students, thus being able to dedicate more resources to focusing on the problems associated with circulation;
- Decreased the level of workload by the Instructor in the management of the first driving lessons.

In particular, the subjects were asked to indicate their level of agreement (Not at all – full disagreement -, Little, Enough, High) with the following 6 items by means of a 4-way Likert Scale [10]:

Question 1: Did the gradual explanation of the controls reduce the workload of the students during the first driving lessons?

Question 2: Did the gradual explanation of the commands speed up the learning of automatisms by the students during the first driving lessons?

Question 3: Has the gradual distribution of the controls contributed to raising awareness among students of road traffic issues since the first driving lessons?

Question 4: Do you apply the progressive access instruction methodology during the first driving lessons of your students?

Question 5: Has the use of the techniques provided by the progressive method reduced its workload as an Instructor during the first driving lessons?

Question 6: Overall, the use of the progressive methodology during the first driving lessons has changed the quality of your work?

3. Results

Below are the results obtained for each item:

Question 1: Did the gradual explanation of the controls reduce the workload of the students during the first driving lessons?

Not at all	0.4
Little	0.7
Enough	9.6
High	89.3

Question 2: Did the gradual explanation of the commands speed up the learning of automatisms by the students during the first driving lessons?

Not at all	0.4
Little	0.4
Enough	13.2
High	86

Question 3: Has the gradual distribution of the controls contributed to raising awareness among students of road traffic issues since the first driving lessons?

Not at all	0.7
Little	3.3
Enough	16.2
High	79.8

Question 4: Do you apply the progressive access instruction methodology during the first driving lessons of your students?

Not at all	0.7
Little	0.7
Enough	5.5
High	93

Question 5: Has the use of the techniques provided by the progressive method reduced its workload as an Instructor during the first driving lessons?

Not at all	0.4
Little	1.8
Enough	11.8
High	86

Question 6: Overall, the use of the progressive methodology during the first driving lessons has changed the quality of your work?

Not at all	1.1
Little	0.4
Enough	11.4
High	87.1

4. Discussions & Conclusion

In Europe, initial and periodic training for driver trainers is fragmented, in many cases un-regulated and is not always mandatory. A survey was carried out in 22 countries. Only in 14 there is an initial training course which can vary from 2 months to 2 years of attendance. For example, in Italy the course is mandatory and consists in 120 hours of theoretical and practical lesson [11].

The situation of periodic training is much more serious, in fact across 22 countries, only in 9 of them a periodic training course aimed to maintain skills is taken into consideration. The mandatory introduction of a progressive access training methodology through an EU Directive would be well received in the world of driving training. The results of the questionnaire show a very high approval rating for those who have voluntarily submitted to the course for improving their skills.

The professional driving training activity has undergone profound changes in recent years. The significant increase in the level of traffic in European metropolises [12], associated with a lower motivation of the population residing in large urban areas to obtain a driving licence [13], has led to greater difficulty in providing driving training. The introduction of a system that can reduce the cognitive workload for students, guaranteeing them less time and less effort to generate the motor coordination automatisms necessary to be able to drive safely, was highlighted by the results obtained from the proposed questionnaire.

The result associated with the reduction in the workload achieved by the students during the driving lessons is significant (89.3%), as is the result obtained in reducing the time required to complete the automation process of the basic controls, associated to motor coordination (86%). Although still exceptional, despite being lower than the other results obtained, the figure associated with raising awareness of the other problems associated with road traffic (79.8%). The results associated with the daily application frequency of the training system (93%) are also very interesting, undoubtedly due to the considerable reduction in workload for the driving instructor

(86%). Overall the use of a progressive approach methodology is judged more than positively (87%) by the driving instructors who participated in the study.

The result obtained from this work highlights the need for new research in the field of driving training, taking advantage of the theme of progressive learning to drive, so that further applicable solutions can be found, globally, able to further reduce the load of work for the people involved in the delicate educational path in question.

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