

The role of the traffic teacher with increased use of digital technology in driver training

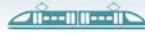
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The study aimed to understand the role of the traffic teacher in driver training with increasing use of digital technology, for example when part of driver training can be carried out in a driving simulator. The study explored how to create the best possible interaction among traffic teacher, learner driver, and technology. Findings from our literature review and interviews revealed the importance of traffic teachers in the context of increased use of digital technology, to facilitate, adapt, and explain the teaching process to the learner driver. The contribution of the traffic teachers lies in creating a comprehensive understanding of the learner drivers' situation and fostering reflection. Most interviewees believed that learning outcomes are contingent on learner driver's and teacher's attitudes towards, and experiences with, the technology.

The objectives of this study are to examine the role of traffic teachers in driver training as digital technology becomes more prevalent and to explore how to optimize the interaction between traffic teachers, learner drivers, and technology. To address these objectives, we have focused on five key questions:

- 1) What will be the role of traffic teachers in the context of technology, such as when parts of the training can be conducted in driving simulators and when cars become more autonomous?
- 2) What are the success criteria for effective interaction between technology and humans in driver training?
- 3) What is the traffic teacher's contribution to effective interaction?
- 4) How can technology measure learner drivers ability for reflection?
- 5) What opportunities and challenges does this pose for traffic safety?

We employed two methods for this study. Firstly, we conducted a review of research literature to provide a concise overview of technology-supported training in practical skills. This review identified three prominent approaches in recent literature: 1) Flipped learning, 2) simulation-based training, and 3) learning analytics. These approaches are not mutually exclusive but represent different perspectives and areas of focus. The second method involved qualitative research interviews (n=29) with experts from Norway and abroad to investigate the role of

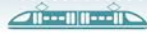


traffic teachers in driver training with increased digital technology and to explore strategies for optimizing the collaboration between traffic teachers, learner drivers, and technology.

Table S.1 summarizes the findings from the three approaches and the data obtained from the qualitative interviews regarding key questions addressed in this report.

Table S.1: Overview of what three research approaches and the data from qualitative interviews say about the five key questions we focus on in the study.

Question	Flipped Learning	Simulation-based Training	Learning Analysis	Qualitative Interviews
1) What will be the traffic teacher's role in relation to technology?	The traffic teacher's role will be to facilitate learning based on self-study. Individualized instruction is important.	The traffic teacher's role will be to facilitate the proper use of simulation-based technology.	Analyzing individualized data on driving behavior and technology usage together with the learner driver.	Facilitating and explaining the instruction to the learner driver. Understanding the learner drivers' challenges. Creating a dialogue to develop self-awareness at all levels of the GDE-framework.
2) What are the success criteria for effective interaction?	The traffic teacher facilitates self-study through recorded lectures, multimedia course materials, etc.	Ensuring that the traffic teacher and the learner driver use the simulator for situations and training that are suitable for it.	The traffic teacher and the learner driver interpreting data from the technology to understand how the learner driver learns.	The traffic teacher and the learner driver using the technology (e.g., simulator) for situations and training that are suitable for it. Knowledge and attitudes of the traffic teacher and the learner driver.
3) What is the traffic teacher's contribution to effective interaction?	The traffic teacher is important in adapting instruction and the use of technology.	The traffic teacher's understanding of what the simulator is suitable for and what it is not.	Interpreting the data and identifying patterns considering pedagogical approaches and creating individually tailored plans.	The traffic teacher's personal relationship with the learner driver enables them to adapt and explain the instruction.
4) How can technology measure the ability for reflection?	Technology does not directly measure it, but it facilitates it together with the traffic teacher and the learner driver.	Technology cannot measure the ability for reflection, but simulations can provide a basis for reflection, for example related to traffic culture. Technology can adapt driving scenarios to the learner drivers personal needs.	Technology cannot directly measure the ability for reflection, but it can provide indications of the level of reflection. Technology may potentially indicate the level of reflection in the future.	Uncertainty and disagreement. Generally, most interviewees think that technology can be used to develop skills on level 1 and 2 of the GDE-framework.
5) Opportunities and challenges for traffic safety?	The program facilitates a high degree of independence and reflexivity in the learner driver.	There is some uncertainty regarding which types of scenarios and levels in the GDE-framework the simulator is suitable for.	Analyzing data together, for example, the learner driver's driving style, can contribute to learning, improved driving style, and increased traffic safety.	It can provide volume training and training on specific scenarios. Behavioral adaptation possible risk; An interviewee from a country with extensive simulator use had negative experiences.



The Norwegian model for driver training was highlighted as an exemplary case. The five points in the table revolve around the role of traffic teachers. Interviewees regarded the Norwegian model as a strong international example because it facilitates the development of self-awareness and reflection in learner drivers. In contrast, interviewees from abroad described driver training systems that differ from the Norwegian approach. International interviewees primarily focused on developing skills at levels 1 and 2 of the GDE-framework² (e.g., vehicle maneuvering, traffic rules, and basic traffic skills), with less emphasis on fostering attitudes and behaviors corresponding to levels 3, 4, and 5 of the GDE-framework. Levels 3-5 encompass self-awareness and reflection regarding factors such as fatigue, stress, personal values, behavioral tendencies, and group norms related to traffic safety. Interviewees from abroad expressed their belief that the Norwegian model is commendable as it also includes comprehensive requirements for traffic teacher education and, unlike their respective countries, encompasses all levels of the GDE-framework. They expressed a desire for driver training that addresses all levels of the GDE-framework.

Both Norwegian and international interviewees agreed that the most important outcome of driver training is for learner drivers to develop self-awareness at all levels of the GDE-framework before taking the driving test. Interviewees emphasized that learning continues even after passing the driving test, and the ideal situation is for drivers to be self-directed, aware of their mistakes and shortcomings, and to recognize that the learning process as a driver is ongoing, even if training programs may not explicitly promote this idea. Norwegian interviewees mentioned that Norwegian driver training contributes to the achievement of the Vision Zero goal by fostering self-awareness at all levels of the GDE-framework. This is also emphasized in the Norwegian National Action Plan for Traffic Safety 2022-2025, where driver training is recognized as a crucial measure for improving traffic safety and realizing the Vision Zero goal.

² “Goals for Driver Education”, Hatakka et al., 2002.