

# The use of driving simulator for training learner drivers belonging to a high-risk group.

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Immigrant drivers are considered a high-risk group in traffic, especially drivers from Middle East, and Africa are represented more than other groups in road accident statistics. There are several factors why this group are at a higher risk than others. First of all, this group often consist of people with another cultural understanding of risk and road safety and a significant different driver training than the Norwegian driver culture and training. In addition, the language and terminology used in driving is different from what they are familiar with. For this reason, the group is specified in the Norwegian national transport plan (NTP) as a group where research-based measures for increasing safety are in demand. Thus, our research question was: *Can driving simulator be a beneficial measure for safety for the high-risk group migration driver trainers?* Method: Five interviews with driver instructors who used driving simulators to train migration driver trainers were conducted in addition to observations of teaching situations. Grounded theory was used for analysis. Results: The core category was “The simulator could increase safety training” This was based on the 2 main categories “The simulator is used like a car” and “Re-creating knowledge”. The conclusion was that simulator, in addition to real life training, could be a good tool for teaching immigrants to drive according to Norwegian standards.

*Keywords:* Road traffic safety, driver training, high-risk road users, simulator, experiential learning, simulation learning.

## 1. Introduction

Due to statistical road accident number, migration drivers, especially from Middle East and Africa, are specified as a high-risk group in traffic by the White paper 33, the Norwegian National Transport Plan ((Nordbakke & Assum, 2008; NTP, 2018-2029). This is even though this group hold a Norwegian driving license. Additionally, the driver training for this group is not specified in the Norwegian driver curriculum (NPRA, 2017) nor is driver training a part of the general national adult learning programme for immigrants in Norway. When exploring other high-risk industries, simulation is commonly used for training purposes. Based on this, an immigrant learner driver programme for immigrants not holding a Norwegian licence but did have a licence from their original country, was implemented as a part of the driver instructor education, using a simulator as a central factor Nord University in Norway. Thus, our research question was: *Can driving simulator be beneficial for safety for the high-risk group migration driver trainers?*

Next, we will present simulation in Norwegian driver training in Norway, experiential learning theory, and the aspect of traffic risk and cultural differences

before the method and result sections are provided. Last a discussion and conclusion based on the findings round off the paper.

### 1.1. Simulation in driver training in Norway

Simulation in driver training has for the past few years had an increasingly interest in general in the driver training industry in Norway (Sætren et al., 2018; Sætren et al., 2019a; Sætren et al., 2019b; Sætren et al., 2020; Sætren et al., 2021). Research findings shows that simulator driver training is beneficial for pedagogical aspects, learning new elements from every part of the Norwegian driver training four-level education, improves theoretical understanding of night driving, and so forth. However, in addition to these benefits, there are challenges in this regard. Challenges has for instance been linked to the technological aspects, as novice trainers seem to have some difficulties with the transformation of learning process from a simulator that does not look and feel like a car. However, training on using the simulator is shown to be beneficial in order to obtain a more pedagogical understanding of the simulator in a learning process (Sætren et al, 2021). Another challenge that is commonly reported, is the element of simulator

sickness (de Winter et al., 2012). However, simulator sickness was not reported in any of the more recent Norwegian studies, which implies that how it is used and the type of simulator is relevant for this aspect (de Winter et al., 2012; Sætren et al., 2018).

### 1.2. *Experiential learning*

In learning by simulation, the theory of Kolb (1984, 2014), experiential learning theory, is often referred to. Here, the practical experience is viewed as a central factor for learning which is viewed as a cycle. The theory is based on cognitive development theories and consists of the four different abilities: concrete experience, reflective observations, abstract conceptualisation, and active experimentation. The cycle is then based on understanding the experience and transforming the experience into new knowledge. Understanding the experience is done through concrete experience and abstract conceptualisation. Transformation of the experience into learning is done through reflective observations and active experimentation.

Further, the theory is built on the six propositions; “1) learning is best conceived as a process, not in terms of outcomes. 2) All learning is re-learning. 3) Learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world. 4) Learning is a holistic process of adaptation to the world. 5) Learning results from synergetic transactions between the person and the environment. 6) Learning is the process of creating knowledge” (Kolb et al., 2014, p. 212).

### 1.3. *Road traffic and cultural aspects*

Migration drivers are considered a high-risk group in traffic, especially drivers from Middle East, and Africa are represented more than other groups in road accident statistics. There are several factors why this group are at a higher risk than others. First of all, this group often consist of people with another cultural understanding of risk and road safety and second, they hold a significant different driver training than the Norwegian driver culture and training (Haldorsen, 2011). The Norwegian road traffic culture has for the last decades been influenced by a focus of safety and is today considered the safest nation in the world in regard to road safety regarding number of road deaths (IRTAD, 2020; WHO, 2018) This includes a historical low number of 95 people dead from road accidents in 2020 (NPRA, 2021). For this reason, it is of importance to transfer the knowledge immigrants have of road traffic behaviour to Norwegian standards.

## 2. Method

Due to the explorative nature of the topic, and lack of previous research on the theme, a qualitative approach was chosen for this research on immigrants' driver training. Further, this paper is

based on data from an early phase of the immigrant learner programme that was implemented at Nord University. It is expected to conduct more research on this programme on a later occasion.

### 2.1. *The researchers*

The researchers are all three experienced in use of simulation in higher education and have published scientific research on this topic. Regarding their experience with the methodology, two of them have lectured qualitative methods for several years in different universities in Norway. Their experience is based on lecturing for all student levels up to master level. Additionally, one of the researchers is a former driver instructor with experience of teaching immigrant learner drivers.

### 2.2. *The interviews*

Five semi-structured individual interviews (Kvale, 1997) with driver instructor students who used driving simulators to train migration learner drivers were conducted, in addition to participative observations. The immigrant driver training programme did include a restrictive number of driver instructor students who taught this group of learner drivers, and thus the number of informants were restricted. The interviews lasted for approximately one hour and were transcribed for analysis.

### 2.3. *The simulator*

The simulator used in this study was equipped with a seat including seatbelt, pedals equivalent as in a car, three screens, a steering wheel and a dashboard that resembled a normal car (see figure 1).



Fig. 1. This is the simulator used for training purpose of immigrant learner drivers in this study.

### 2.4. *Analysis*

The analysis was conducted based on grounded theory and the post-positivistic guidelines of Strauss and Corbin (1990). Grounded theory, which is an inductive qualitative method of analysis, consists of open, axial, and selective coding. Open coding refers to breaking down the raw data of the transcribed

interviews by comparing and conceptualizing the data into categories. Axial coding is the process of categorizing the categories from the open coding and making connections between the categories. In other words, axial coding is to make the coding more abstract and the main categories are found in this stage. Selective coding, the final step, involves comparing the categories and selecting the central phenomenon, referred to as the core category. This is the final abstraction step of the process of analysis.

**3. Results**

The core category was “The simulator could increase safety training” which was based on the two main categories “The simulator is used like a car” and “Re-creating knowledge” (see Table 1 and Figure 2).

Table 1. This is the table illustrating the categories including illustrative explanations and quotes.

Categories related to safety and training	Illustrative explanation and “quotes”
The simulator could increase safety	The core category is the result of the practical and pedagogical aspects combined. By thorough preparations based on learning theory, the simulator training could increase safety for both the driver trainer and the driver instructor.
1 the simulator is used like a car	1: Relates to the practical preparation for the training session and the practical use during training.  “...a good way to do it when you are teaching in the same way as in the car. It will probably be most targeted when you are involved, because then you can control more what they are doing.”
2 re-creating knowledge	2: Relates to how the educator (the student) worked on transforming the knowledge of the immigrant learner driver.  “(…) to discuss and reflect with the learner driver in such a way that the learner driver understands that here he drove in such a way that something arose. If you drove too fast, too close, include questions that both affect self-insight but also create attitudes and thoughts about the driving process (...) why you do things, and why you should not do things.”

**3.1 Core category: The simulator could increase safety training.**

The core category was found to be that the simulator could increase safety in training by the use of the practical preparations as well as how the educators (driver instructor students) helped creating new knowledge for the learner drivers. As the core category was an abstract interpretation of the two main categories, quotes are not available for this category.

**3.2. Main category 1: The simulator is used like a car**

This category was a practical aspect of the driver training programme. Here the category of using the simulator like a car was related to how the students prepared for the lecture and how it was conducted. When the simulator was used like a car, the students taught in the simulator first prior to moving to a real-life car. This transfer from the simulator to the car was perceived as smooth as the preparation and training was conducted the same way in the simulator as it would have been if they had done the same in a real-life car. This includes the mental preparation for the instructor students, the documents prepared, as well as the actual tasks that is trained and how these are trained. One example is level 2 where the tasks for instance are starting and stopping and adjusting mirrors.

**3.3 Main category 2: Re-creating knowledge**

The category of re-creating knowledge relates to how they worked with the learner drivers in the learning process to re-create the immigrants understanding of safe driving. This was a pedagogical aspect of the driver training programme. By using the simulator, they had the opportunity to run the same programme several times. They had the possibility to let the learner driver make mistakes and experience the consequences without danger. Additionally, they had the possibility to stop the session, and reflect at the very time it occurred and try again if they saw that relevant. As for their own situation, the educators stated that they could focus more on the learner driver instead of surrounding real life road traffic aspects. All these factors were commented as more difficult to do when teaching in a real-life car in real life traffic.

**4. Discussion**

Because Norwegian road traffic is considered the safest in the world, it is of importance to teach the cultural cues to learner drivers. As immigrants especially from Middle East and Africa are overrepresented on accident statistics even though

they have obtained a Norwegian driver's license, teaching this high-risk group might need some innovation. For this reason, Nord University developed an immigrant learner driver programme as a part of the driver instructor education, using a simulator as a central tool for teaching. Based on this, the research question was: *Can driving simulator be beneficial for safety for the high-risk group migration driver trainers?*

The results are illustrated in figure 2 and show that a driving simulator can increase safety training for this particular high-risk group. This was based on how the simulator was used in practice as a tool through the category of "the simulator is used like a car" and how the learning process was taken in consideration in the simulator session through the category "re-creating knowledge".

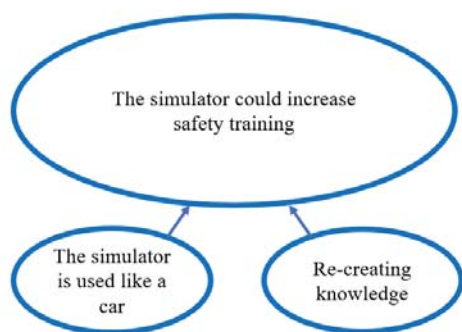


Fig. 2. The relation of the categories found in the study of how use of simulator could increase safety training.

By integrating a learning theory perspective to the driver training in accordance to experiential learning theory (Kolb, 1984; Kolb et al., 2014), learning by experimenting seem to be beneficial for this group of high risk road users. A systematic pedagogical plan will benefit how the educators provide guidance in recreating knowledge for the immigrant learner drivers. This group already have a licence when arriving in Norway, and thus their cultural behaviour and understanding of road traffic culture must be recreated. This was shown in the results through how the educators (instructor students) focused on certain elements from the curricula and were able to let the learner drivers experience for themselves what the consequences could be from the driving behaviour they were used to. By integrating theory from the vision 0 for instance, with the risk related to their driving, a integration of theory and praxis was made possible in a safe matter.

Additionally, by using their previous knowledge on how to teach in a real-life car, the educators were able to enter the teaching context with confidence in

that what they were doing was relevant. Simulator training is not intuitive (McGaghie et al., 2010), and to take advantage of the way teaching is conducted in a real-life car is a benefit. Here, preparation for the lessons are of importance, and should be done with the same accuracy as if it was a lesson in a real life scenario the educator was preparing for. By doing this, the objectives for the lessons are easily measured and can be reflected upon prior to and after the session.

### 5. Conclusion

The conclusion was that the use of a simulator in migration driver training is a tool that could be considered to increase safety during driver training. Further, it can give the migration learner driver a more thorough understanding of how to drive safely according to Norwegian cultural standards by actively experiencing driving in a safe and calm learning environment.

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