

Scientific research proves the benefit of a simulator

Training in driving simulator leads to increased safety on the road

A Viewing registration training in a simulator contributes to greater safety on the road. People who have completed this training are less frequently involved in accidents. Furthermore, this training contributes to a reduction in the number of driving lessons. Scientific research, initiated by Green Dino, proves this. Read the conclusions below.

In November 2013, Rij-instructie reported that 10 years after the introduction of driving simulators in the Netherlands, it could be concluded that the promises had been fulfilled. Driving simulator creator and builder Green Dino in Wageningen asked Delft University of Technology to conduct research into the dependability of its driving simulators.

In the period between 2005 and 2013, PhD students Joost de Winter and Stefan de Groot conducted a series of studies. They found irrefutably evidence that driving simulation students require an equal amount of learning hours to pass, and have a higher chance of passing, on the first driving exam compared to regular students. In addition, we reported exclusively that

driving simulation students pay less for their driver training and driving schools earn more from driving simulation students compared to students who are only taught on the road. A question that was not yet answered, concerning the involvement of driving simulator students in accidents

after obtaining the driving license. Is it bigger, smaller or doesn't it make a difference? That question is answered below.

REPLACING DRIVING LESSONS

In the early years of development, Green Dino primarily focused on the replacement of driving lessons on the road and automation of driving instructions.



DRIVING SIMULATOR



The most important reason for this was the shortage of driving instructors and the enormous waiting lists around the turn of the century. When it became clear that driving lessons can indeed be replaced by driving simulators and automated instruction, the question arose on which points the driving simulator could be improved. Following the PhD studies by Joost and Stefan, it became clear that young drivers are four to six times more likely to be involved in an accident after obtaining their driving license compared to more experienced drivers.

NO SECRET

Moreover, it is no public secret that one only truly learns how to drive after obtaining their license. An interesting detail is the fact that the risk of being involved in an accident is greater for drivers who pass their exam the first time compared to drivers who fail their first driving exams. This is true all around the world. For Green Dino, this posed a dilemma. Increasing the passing rate automatically means increasing the chance of involvement in accidents. This stands contrary to Green Dino's mission to make a positive contribution to social well-being: cheaper driving education and less accidents among young drivers.

PHD RESEARCH

For owner Jorrit Kuipers, this was the reason to start a PhD research at Delft University of Technology. He believes that the underlying cause for the high involvement in accidents should be found in the working of the brain. For example, he noticed that driving simulation students who learned how to use their mirrors, quickly forgot how to carry out the procedure properly when the automatic instruction on this ended. This was the case when the simulator did not yet have the ability to judge the viewing behaviour of the students.

The student learns how to approach and cross an intersection, including the procedure for mirroring. If the student performs the task well (automated), he or she receives fewer instructions. However, errors in the viewing procedure could not be identified. The result was that students got sloppy when viewing, but didn't receive any feedback on it. The brain needs this feedback to solidify the knowledge that is being processed. When this feedback isn't there and knowledge is insufficiently solidified, this knowledge is lost again.

AUTOMATIC FACIAL RECOGNITION

In 2009, Green Dino solved the problem of the viewing behaviour with automatic facial recognition in the driving simulator. By showing the student a red field in the area where he/she should have looked, the student receives necessary feedback to solidify his/her knowledge. This is literally 'gaining experience'. The mechanism in which knowledge is lost due to

insufficient feedback also applies to the first months after obtaining one's driving license. The feedback from the driving instructor is completely removed. This feedback was present up to the point of obtaining the driving license and ensured that the student could maintain the knowledge required to drive safely. Upon obtaining one's driving license, this feedback from the instructor suddenly disappears, causing the student to unconsciously lose part of his/her knowledge. As a consequence, procedures are no longer applied correctly, resulting in a greater risk of accidents.

PILOTS

It is remarkable that pilots also experienced a drop in knowledge after the introduction of the automatic pilot. For example, they received less feedback from the aircraft and therefore became less skilled over time. By training in flight simulators, pilots now ensure that their skills are maintained (incidentally, Dutch Formula 1 driver Max Verstappen does the same). Jorrit is convinced that the intensity of the feedback from the driving instructor causes the drop in knowledge for the student after obtaining the driving license. The more the student is drilled during his/her education, the larger the drop will be after obtaining the driving license. By making mistakes, the student restores this lost knowledge over time (he/she gains experience).

3,500 people participated

In total, more than 3,500 former students filled out the online survey. Of these, 2,439 surveys were completely and correctly filled out and thus included in the research. This amount is more than sufficient to judge the results as "reliable" or "coincidental".

The survey was not randomly held among all former students in the Netherlands. Only former students from driving schools using a driving simulator from Green Dino were approached. It is of course possible that these driving schools attract another type of student or teach differently compared to other driving schools in the Netherlands. This may mean that the results are not representative for all driving schools in the Netherlands. To exclude this effect, the researcher only looked at the differences between the students that registered for the driving simulator. By dividing the driving simulation students into groups, it was possible to determine whether the hypothesis was correct. The group of simulation students was split up into two groups that followed the Vehicle Control module or the modules Vehicle Control and Crossing. In addition, a distinction was made between former students who had or had not received feedback from the viewing registration. Another distinction was made in whether or not Danger Recognition training was followed.



FATAL

Sadly, for some students these mistakes are fatal. Based on the new insights, Green Dino has decided to make some improvements in terms of instruction and assessment, aimed at reducing the drop in knowledge after obtaining one's driving license. The viewing registration is the most remarkable example, but the introduction of the training Danger Recognition by the Scientific Research Foundation for Road Safety (SWOV) is also aimed at this. An additional advantage is that these measures also support knowledge development. New skills are learned quicker and remembered better. This should result in an increase in the chance of passing the first exam and a decrease in involvement in accidents in the first months after obtaining one's driving license. An explicit decision was made not to decrease the amount of driving lessons. After all, fewer driving lessons means less experience, which increases the chance of being involved in accidents. For the student, it is best to take as many driving lessons as possible. In case of a driving simulator, it will not cost them more money and it will only increase the driving school's profit levels. So it was said, so it was done.

DESIGN FOR RESEARCH

In September of 2015, Jorrit asked psychologist Tessa Termorshuizen to determine whether the chosen course was the correct one. She designed a survey and sent this to former driving simulator students. She approached 23,000 former students in total. These former students obtained their driving license between 2007 and 2015. Jorrit is currently using the results for the completion of his doctoral research. He will be awarded a PhD at the end of the year, on the subject of 'Automated training and assessment of car drivers'. For this reason, Tessa's research had to meet the criteria of scientific research. In short, this meant examining whether a hypothesis was correct or wrong. It was important that the results were reliable and not incidental.

VALID

In addition, the results must be valid. This means that the results can not be influenced by matters that are not accounted for in the research. The hypothesis that Jorrit wanted Tessa to examine, was geared towards the processing of information in the brain. He expected that when brain function is taken more into account, the relapse in knowledge during and after driving instructions will be less significant.

This should result in a higher chance at passing the first exam and a decrease in accidents immediately after obtaining the license. The reliability of the research is partly determined by the size of the driver group contributing to the research.

RESULTS

On the basis of the research into accidents, Tessa concluded that viewing registration has a reliable effect on the involvement in accidents. The former students who used viewing registration are less frequently involved in accidents. Of this group that took the Vehicle Control and Crossing modules with viewing registration in the driving simulator, 5.1 percent was involved in accidents in the first year after obtaining their driving license. Of the group who did not receive feedback on viewing registration in the driving simulator, 13.8 percent was involved in accidents. A difference of 8,7, a reduction of 63 percent!

DANGER RECOGNITION

There is no data available on involvement in accidents for the students that completed the Danger Recognition module. This is because the training was added to the driving simulator in 2014 and there were only a few former students who followed this training and had 12 months of

Objective

Given that the initiator of the scientific research was Green Dino - developer and manufacturer of simulators - one may quickly think: 'of course, the butcher who approves his own meat'.

It is therefore important to stress that one can only be rewarded a PhD at a University if your supervisor believes you can judge a certain situation or topic objectively and independently.

For Green Dino owner Jorrit Kuipers, this was the reason to enter a request to do his PhD research at the Man-machine Systems faculty. Prof. dr. Peter Wieringa believed Jorrit demonstrated the ability to work objectively and independently as a researcher. According to Wieringa, there was no question of a conflict of interest and he honoured the promotion request.

driving experience. Nationwide, the average for involvement in accidents in the first year after obtaining one's driving license was 7.5 percent, for 2toDrive students the average was even higher: 8.8 percent (source: SWOV).

RELIABLE CONNECTIONS

Former driving simulation students who drove with viewing registration are less frequently involved in accidents compared to students who didn't drive with viewing registration. Furthermore, Tessa found reliable connections between the number of unilateral accidents, economical driving and avoiding risks during driving simulation training and the involvement in accidents in the first year after obtaining one's driving license. Her conclusion is that the risk of being involved in accidents decreases in the event more lessons were taken in the driving simulator with feedback of the viewing registration.

NUMBER OF DRIVING LESSONS

The survey also inquired about the number of driving lessons that the former student followed on the road and his/her result in the first driving exam. For the group of students who drove with viewing registration, a reliable positive effect. 3.7 hours fewer driving lessons was identified, compared to students who drove without viewing registration. In total, the average duration of lessons on the road was 41.5 hours for former students who drove with viewing registration and 45.2 hours for the group who drove without viewing registration.

Former students who took the Danger Recognition course, drove a total of 38.9 hours on the road in order to pass, 6.3 fewer hours than students who drove without viewing registration and didn't take the Danger Recognition course. The nationwide average for obtaining one's driving license is about 43 hours of driving lessons (source: SWOV). The chance of passing the first exam for the group students who drove with viewing registration was also proven to differentiate from the chance of passing for students who drove without viewing registration. This was 59.6 percent to 51.8 percent for the group who drove without viewing registration.

VIEWING REGISTRATION

For students who drove on the driving simulator with viewing registration and who also took the Danger Recognition course, the chance of passing the first exam was no less than 81.8 percent. The nationwide average for obtaining the driving license at the first exam was 48.0 percent between 2008 and 2015 (source: CBR), a difference of 11.6 percent compared to students who drove with viewing registration and 33.8 percent to students who also took the Danger Recognition course.

FEWER DRIVING LESSONS

Former students who took driving lessons in the driving simulator with viewing registration on average required fewer driving lessons to pass



and had a higher chance at passing the first exam compared to students who didn't take driving lessons with viewing registration. The Danger Recognition training amplified this effect. Tessa also found that students who had taken more driving simulation lessons needed fewer exam attempts to succeed.

CONCLUSIONS

The research conducted by Tessa shows that Jorrit's hypothesis is correct. When during driving lessons, the information processing functions of the brain are increasingly taken into account, this has positive effects on the retention of knowledge during and after driver training. This has been proven for (former) students who received feedback on viewing registration during driving lessons and who took the Danger Recognition course in a Green Dino driving simulator. Moreover, the involvement in accidents and the total number of driving lessons on the road also decreased. The chance of passing the first driving exam increases as the amount of driving lessons on the simulator increase. In addition, the costs of the completed driving training decrease for the student and the profit per student increases for the driving school. Based on these results and the results from previous (PhD) studies, Jorrit Kuipers, PhD candidate at the Delft University of Technology, recommends driving schools to allow their students to take basic driving training with automated viewing registration and the Danger Recognition module. This can be done in a driving simulator, for example.