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Manual and curriculum driver training

The Load Reduction method

Driving simulator ST Software BV

Contents

Preface

In this document the set of lessons that make part of the Load Reduction Method are discussed. The illustrations are from the Dutch version, as are the road signs and rules of the road. It must be noted, however, that there are a number of different versions available for different countries and languages. For these versions, the road signs, rules of the road, speech messages and graphical popups and language deviate from the examples given here as they are adapted to that specific county. Also, not all lessons are available for all countries yet.

The Load Reduction method

It is an established fact that driving simulators, during novice driver training, may greatly enhance safe driving: a large scale study, performed in the US, (R. Wade Allen, George D. Park, Marcia L. Cook, Dary Fiorentino, 2007), has shown that:

- When a good simulator is used, accident rate during the two year period after getting the licence, is reduced to 34% of the national average accident rate of novice drivers: simulators can definitely improve driver training and result in safer drivers. Since teen accident rates are about 5 times higher than mature drivers, the application of simulators in driver training should be seriously considered as a means to reduce young driver fatalities.
- The effects are largest when a wide field-of-view simulator is used with real-word image sizing, as in our ST Software Jentig 50 systems.

The curriculum in the ST Software simulators is even richer in content compared to the simulators used in that study, so the benefits may be even larger. The added value of a simulator depends on both:

- the level of driver training in the respective country: the simulator is a convenient instruction tool for improving the level of training when the training infrastructure in a specific country is less developed.
- the quality of the simulator and the curriculum. The better the simulator and especially the curriculum, the larger the benefits.

The simulator is a very suitable teaching method for driver training. Car driving involves a large number of behaviour- and traffic rules, but in addition it requires a number of 'psychomotor' skills. Examples of these are steering, estimating and controlling your own speed and that of others, gear shifting, etc. Typically during a normal car drive, a number of these skills are required, while at the same time relevant situations must be recognized (road signs, road types, other traffic) and related to traffic rules. For an inexperienced (novice) driver this can be very demanding. Because of the high task demands, learning progresses slowly. In a simulator, the required skills can be learned one at a time resulting in faster automatization of skills. When skills become automatic, controlled processing requiring controlled attention is typically lower, and different tasks can be done simultaneously. When skills are more automatized, more tasks can be performed simultaneously (such as steering, scanning, applying the traffic rules, and gear shifting), and the quality of driving increases. Especially for this reason, the simulator can be an excellent aid during driver training. However, the quality of the didactics and the software is the determining factor here. In the Load Reduction Method of ST Software, applied in the simulator, this results in a high quality of driver training because:
- Structured training of separate skills and tasks (such as steering, shifting, scanning, traffic- and behavioural rules) without having to perform complex tasks at the same time (as is the case in driving on public roads).
- First training via instruction lessons and then practicing situations in realistic traffic environments, followed by tests.
- Structured lessons from simple to complex.
- Direct and consistent feedback on driver errors

- Clear report after each lesson. During any moment during the simulator training the weak points are clear and the instructor/operator can focus on these.
- Realistic traffic and well structured traffic environments (roads, signs, traffic and environment) during the lessons, which facilitates fast recognition of relevant traffic situations and automatization of skills.
- The autonomous 'intelligent' traffic (with their own perception, decision making and actions) allows a high traffic density in which all traffic interacts in a realistic way. Because of this, the level of realism of this simulator is very high and the step to the real traffic participation on public roads is only small. The transfer of training from the simulator to the road is high because of this: that means that what is learned in the simulator is applied immediately on the public roads. A high transfer of training is a requirement for a high training value.
- Because there are a lot of learning situations each lesson, driving experience increases faster on these aspects compared to driving on the road. For example, in the lesson on the highway (P-Highway), which lasts 17 minutes in total, the trainee enters and leaves the highway 6 times. In the lesson of 17 minutes in a town (P-Town) there are a lot of different right-of-way situations in a short period of time. So, a practice lesson in the simulator brings more driving experience compared to a lesson on the road of the same duration.
- Also, on the road you never know which training situations will be encountered. In the simulator these situations are guaranteed to occur. The trainee drives a fixed route where relevant learning situations are triggered while driving the route.

The simulator training encompasses a large part of the total driver training curriculum. It is a standard method for learning to drive, a kind of 'training in a box'. Each trainee gets a quaranteed level of quality if the training is performed in the right way. The automatic observation of behaviour by the simulator results in an analysis of the strong and weak points of the trainee and of how fast learning progresses. This allows zooming in on the level of the individual trainee and it gives all information needed to provide the student with additional support and extra lessons, if needed.

Because of the complete and structured contents and didactics, the simulator contributes to a training of high quality. Ofcourse, the simulator is a training aid, and the quality of training is determined by the way the simulator is used during the full driver training curriculum. It is strongly recommended that:
- The lessons should not be too long. One hour in a simulator is already quite a long period of time.
- The available time must not be stuffed with too much lesson content.
- The order of the lessons is important: make sure the trainee doesn't have to perform too many tasks at the same time. For example: teach gear shifting after a number of other instruction lessons, because otherwise the trainee is too much involved in vehicle control making it hard to absorb other information.
- Make sure there's always an operator who can motivate the trainee and give extra support.
- Make computer printout after each lesson (especially after the P-lessons and the T-lessons). Store the prints so you can examine these afterwards. It can be motivating to you give the student a printout as well.
- Discuss the printed results with the trainee and 'replay' the lessons if needed. This increases the student's awareness of his/her driving behaviour.

- Make sure there's a good transfer from the simulator training part to the instructor who is responsible for the on-road training. Tell the instructor the strong and the weak points.
- Let the trainee start with the on-road training (on public roads) when he/she is able to drive well in the simulator. The lesson grades are not the only criterion. Use your own impression as well and also take into account whether driving is fluently. Give additional support and repeat lessons depending on the needs of the trainee.

The method discussed here, offers a structured training that consists of three phases:

- <u>Instruction</u>: All lessons in the Instruction phase start with an I, as in I-StartStop. During the instruction lessons the Virtual Instructor (VI) explains the procedures and traffic rules, while the trainee is sitting or driving in the simulator.
- <u>Practice</u>: The trainee drives a fixed route and encounters all kinds of traffic situations. The things that have been learned during the instruction phase are practiced in a structured way. During these simulations, behaviour of the trainee is 'observed' by the VI who gives feedback and instructions if needed.
- <u>Test</u>: There are a number of tests during which no feedback is given.

In all phases, behaviour is monitored. The results are stored in the Student Assessment System (SAS). The operator can print a report after each lesson to examine the weak points and see what interventions are required.

Student Assessment System (SAS)

The SAS is the central part of the simulator training. Every student has a spreadsheet (Excel spreadsheet) with the results stored. The opensource software package 'OpenOffice' is installed on the simulator computer. This is used for opening the spreadsheets and for printing reports.

Adding a new student

On the desktop, there's an icon 'NewStudentHD. You must follow the indicated steps:
- Double click the icon 'New Student'
- Typ in the name of the new student as, for example, John Miller, then press the button 'Add'.
- check if the new spreadsheet with that name has been created by pressing the 'Show students' button.
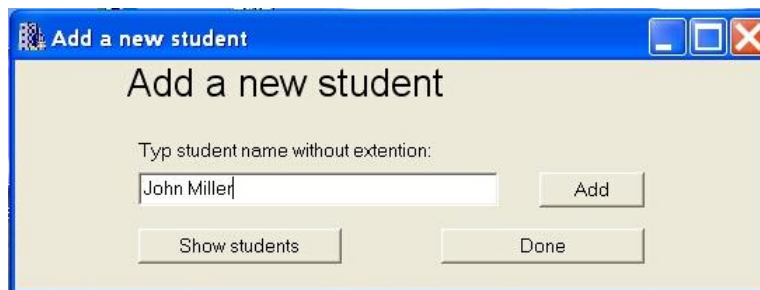
Select a student

When the simulator is started, a lesson (or simulation) can be started in two ways: either without student data or with student data. We assume here, that a lesson is started from the SAS. For the general control of the simulator the reader is referred to the document 'Manual Simulator'.
First a student must be selected. When the simulator has been started, the button 'Student data' can be used. This button is on the top of the user interface. Press this button.
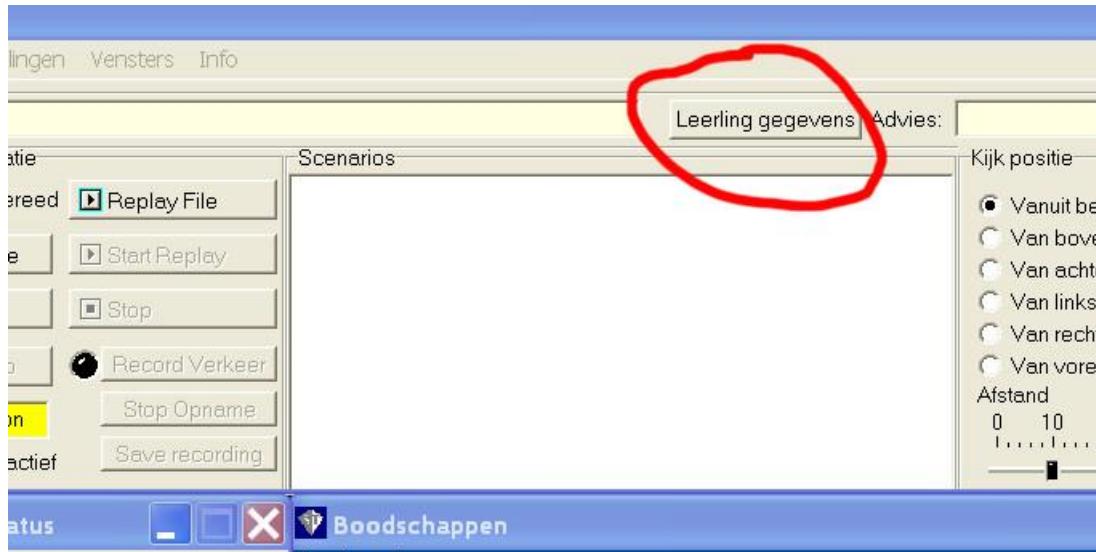
The SAS panel is then opened, see next illustration. On the left side of the panel there are a number of buttons:

Control simulator:
- **Select student**. With this button a file of an existing student can be opened. To create a new file for a new student, the reader is referred to the program 'NewStudent'.
- **Start Lesson**. This button starts a selected lesson for the selected student.

Navigate in SAS: these buttons can be used to navigate to a certain tabsheet in the spreadsheet.
- **To selected lesson**. In the 'Overview' tabsheet there's an overview of all lessons. A lesson can be selected by clicking on the row with the name of the lesson.
- **To overview**. Navigate to the 'Overview' tab.
- **To report**. Navigate to the report tab (print page) to print the report.

Report: After each lesson is finished, the results of the lesson are filed in the tabsheet of the respective lesson: each lesson has it's own tab. But the system also makes a report of a single page which gives the results in summarized form. There are two possibilities: after each lesson is finished, the SAS creates a report. This can be printed by the operator. Another option is to make a report of another lesson that has been driven before (and thus was not the latest lesson). For that purpose the 'Make report' function can be used.
- **Make report**. To make a new report (apart from the automatically generated report of the latest lesson), do the following. First go to the 'Overview' tab and select a lesson by clicking on the name of the lesson. Then jump to the tab of that lesson by clicking on the 'To selected lesson' tab. This shown the tab of that lesson. When that lesson has been driven at least one time, a report can be generated of the last time this lessen was done (by the present student). To do so, click on the 'Make report' button. This can take a few seconds, and then the SAS jumps automatically to the 'Report' tabsheet. This then gives a summary of the results of that lesson. Some fields are empty, like fuelconsumption, because that data is only available if the lesson has just been finished: it is not stored in the SAS.
- **Print via OpenOffice**. This is to print the report, by calling the program 'OpenOffice'.
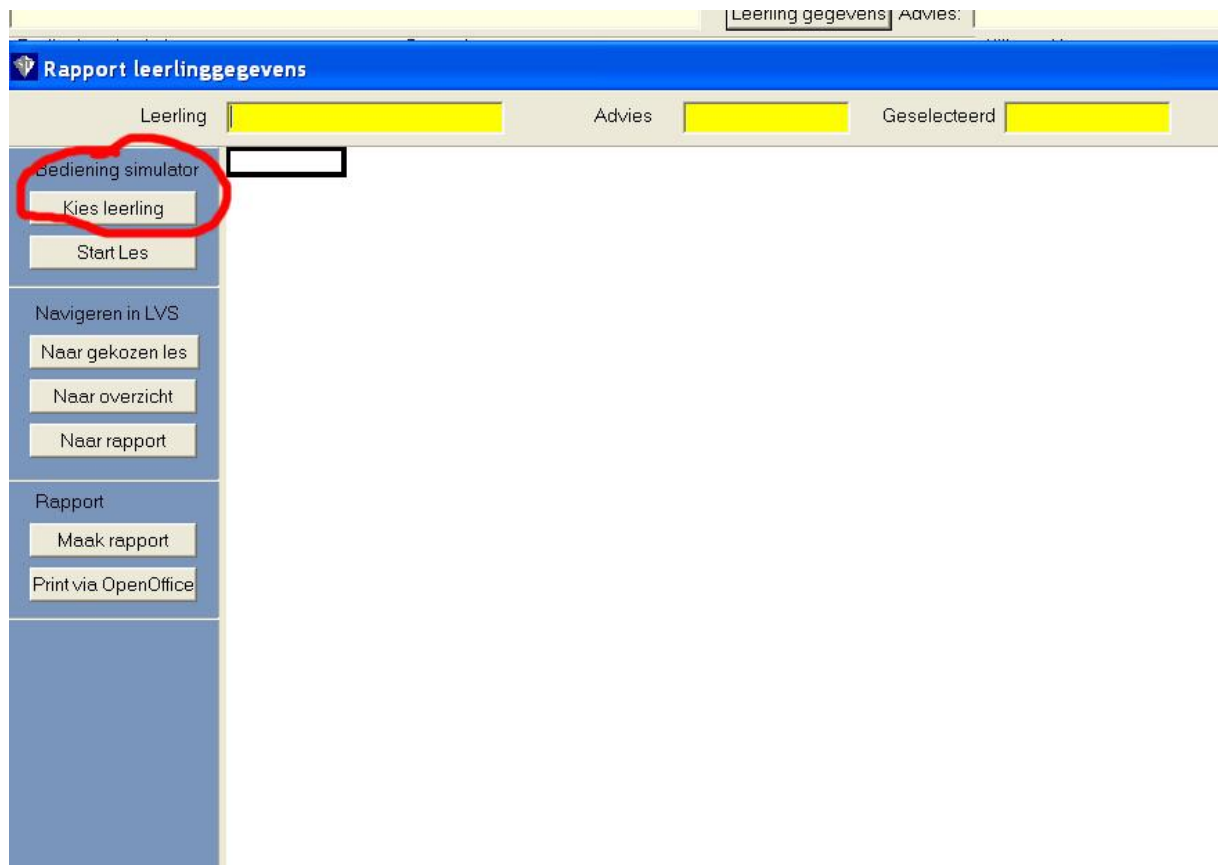
Select a student by clicking on the 'Select student' button. A file selection dialog opens and a student can be selected by clicking on the name. When the button 'Open' is pressed, the student data is loaded, see next illustration. This may take some time because of the large excel spreadsheets.
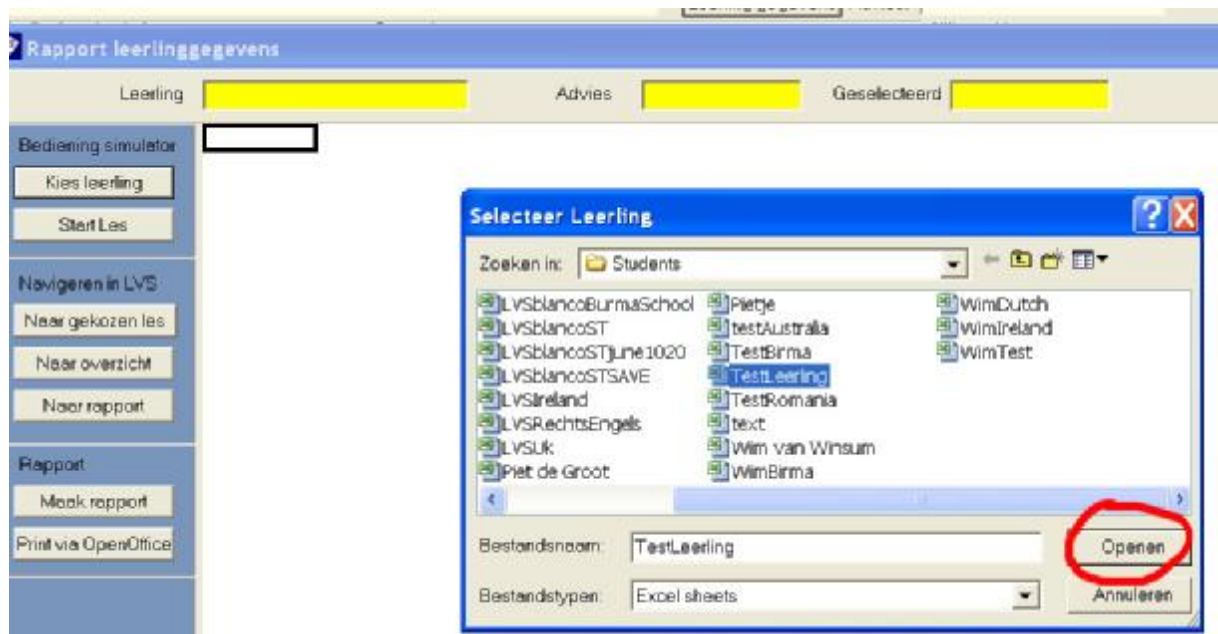
Start lesson

When the student data are loaded, a number of things happen, see next figure:

- The system gives an advise on the lesson to be selected. In this case, this concerns the first lesson and the system advises the lesson I-StartStop (see on top in the 'Advise' field).
- The name of the student is shown in the 'Student' field (TestLeerling).
- The system opens the tab 'Overview' (LesOverzicht in the figure). This is the central part of the SAS. It gives an overview of all lessons, with a name and a short description. When the lesson has not been done yet, the background colour is gray. The column 'Number' shows the number of times the lesson has been done by the present student. In this case this value is 0 for all lessons. If the value is larger than 0, the column 'Highest' shows the highest grade for that lesson. This means that, for example, when the lesson has been done twice with a 6.0 for the first time and a 5.0 for the second time, the column 'Highest' shows a 6.0. The column 'Criterion' contains the pass/fail criterion. In this case this is a 6.0 for all lessons, on a scale from 0 (lowest grade) to 10 (highest grade). This means that a grade of 6 or higher must be obtained in order to pass for the lesson. When a lower grade is obtained, the SAS advises to do the lesson again. When the student is passed for the lesson, the background colour is green. When the student has failed, the background colour is red.

After this, a lesson can be started. When the operator has not selected a lesson, the advised lesson is started. However, the operator may also choose another lesson, by clicking on the name of another lesson. The field 'Selected' then shows the name of the selected lesson. The lesson starts after the button 'Start Lesson' has been clicked.

In this illustration, the lesson I-Steer1 has been selected. When the button 'Start Lesson' is pressed, a file selection dialog appears with the name of the selected lesson filled out, see next illustration. By pressing the button "Open" the lesson is started. The SAS disappears from the screen and the control panel of the simulator is put on the foreground.

When the lesson is started, the lessonfile and accompanying database are loaded. The program then stops in Pause mode and waits until the operator presses the 'Pause' button. See next illustration.
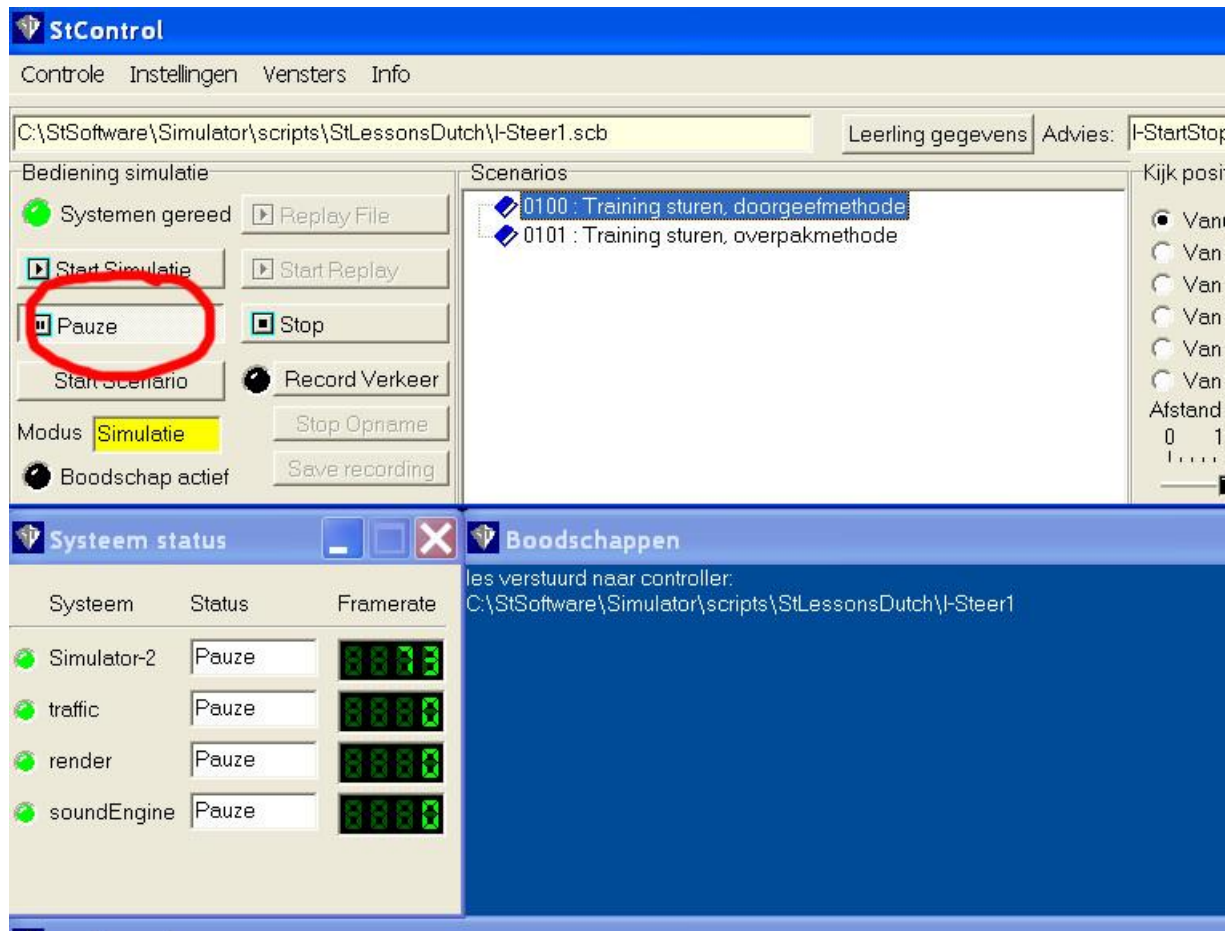
In the illustration it can be seen that the lesson I-Steer1 has been started. It contains two scenarios:
- 0100: Training steering, pass-on method
- 0101: Training steering, cross-over method

First the pass-on method is learned followed by the cross-over method. When the operator wants to do the cross-over method first, click on the line with 0101 and then press the button 'Start Scenario'.

End of lesson

A lesson can be ended in two ways:
- When the lesson is finished, this is detected by the simulator software en the VI indicates that the student has to stop the car. The student then has to follow these instructions (stop the car and turn off the engine). Then the simulator closes the lesson en sends all performance data to the control program. This stores the data in the SAS of the selected student.
- The operator may finish the lesson by pressing the 'Stop' button. The lesson then stops and all data are sent to the control program. This stores the data in the SAS of the selected student.

The SAS creates a report (Report tabsheet) and the Report tab is shown. When the lesson has been started from a lesson package, the simulator continues with the next lesson in the package without showing the report after a lesson has been finished. A lesson package consists of a sequence of lessons that are executed sequentially.

When a lesson has been started from the SAS, the report is shown after the lesson has been finished, see next figure. This shows hat the lesson was P-Rural, together with the date, time, distance driven and fuel consumption. The grade was a 7 and the students passed. There have been a couple of errors:
- On the task 'Speed control' speed was too high. This did not occur often, resulting in a 7.0 for that task.
- On the task 'Steering' the student drove too much to the right. The grade on that task was a 8.5.
- A number of tasks have not been measured and have no grade (NA = Not Applicable).

When the button 'To selected lesson' is pressed, the SAS navigates to the P-Rural tab. This gives a lot more detailed information for each driving task. For example, the driver error 'Speed to high' has been registered twice and the driver error 'you drove too much to the right' has been detected once.

When the 'To Overview' button is pressed, the Overview tab is shown, see next illustration. It shows that the lesson P-Rural has been done once and the grade was a 7.0. That is sufficient to pass and the colour is then green.

When the 'To Report' button is pressed, the report can be printed and the printout can be filed It is recommended to make 2 prints: one for the file and one for the student.
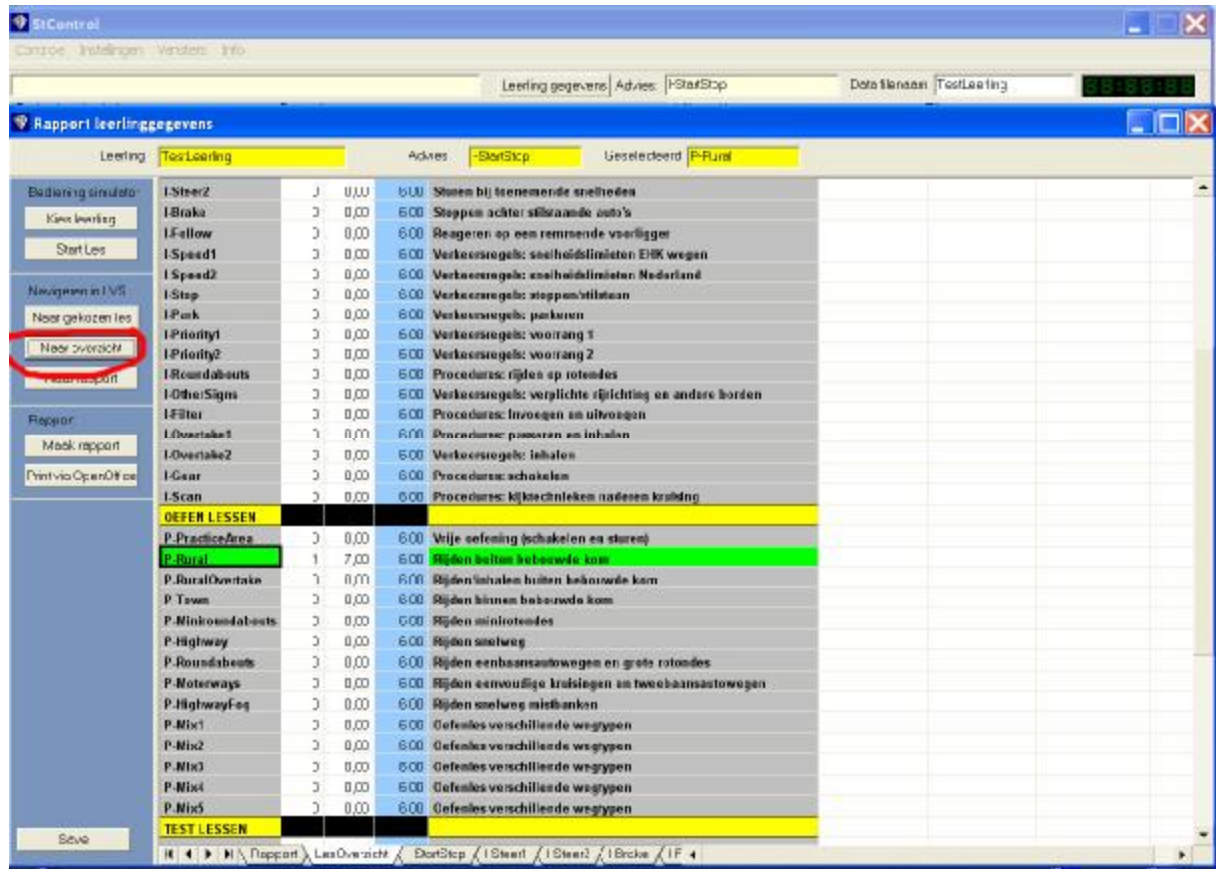
Lesson packages

Lesson packages can be created with the "LessonConfig" program. The reader is referred to the manual of that program. A package is a sequence of lessons that are executed sequentially, without intervention of the operator. Between lessons, the StControl program does not wait in Pause mode. Packages have the extention 'pac'. Suppose there's a package called speed.pac, that consists of 2 instruction lessons:

- I-Steer1
- I-Steer2

See the next illustration with an overview of the LessonConfig program.
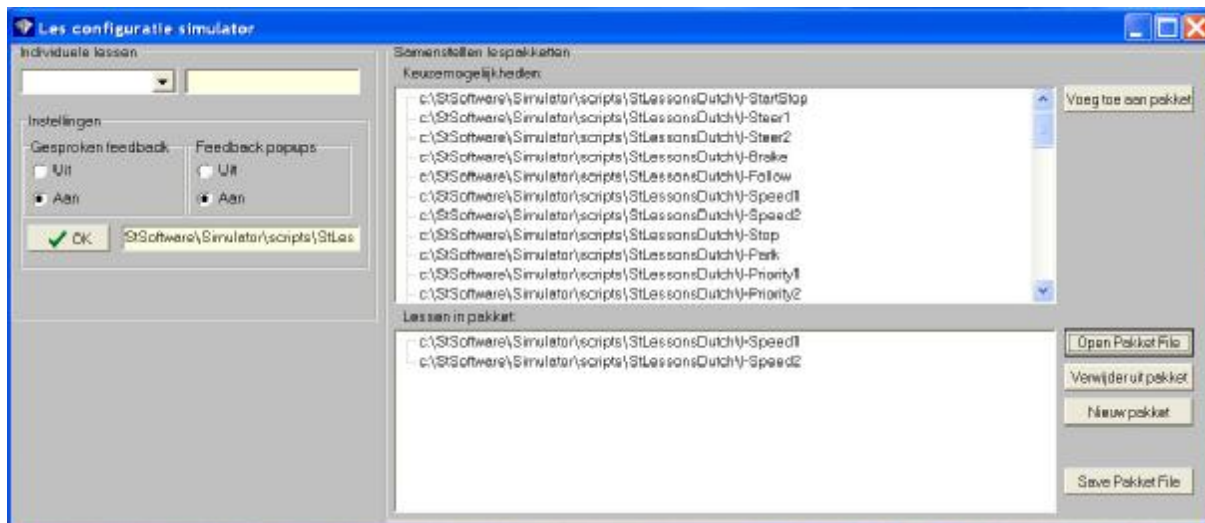
When this package is started, these two lessons are executed sequentially without the simulator reverting to Pause mode.

Starting a package works as follows:
- First, select a student, as described earlier.
- Then, don't choose a lesson from the tabsheet 'Overview', but simply press the button 'Start Lesson'.
- In the file selection dialog that follows, click on the folder 'teachingmodules' and open the package you want. Packages end with the .pác extention, as in speed.pac.
- Then press the 'Open' button and all lessons will start one at a time in the order listed in the package file.

See next illustration.
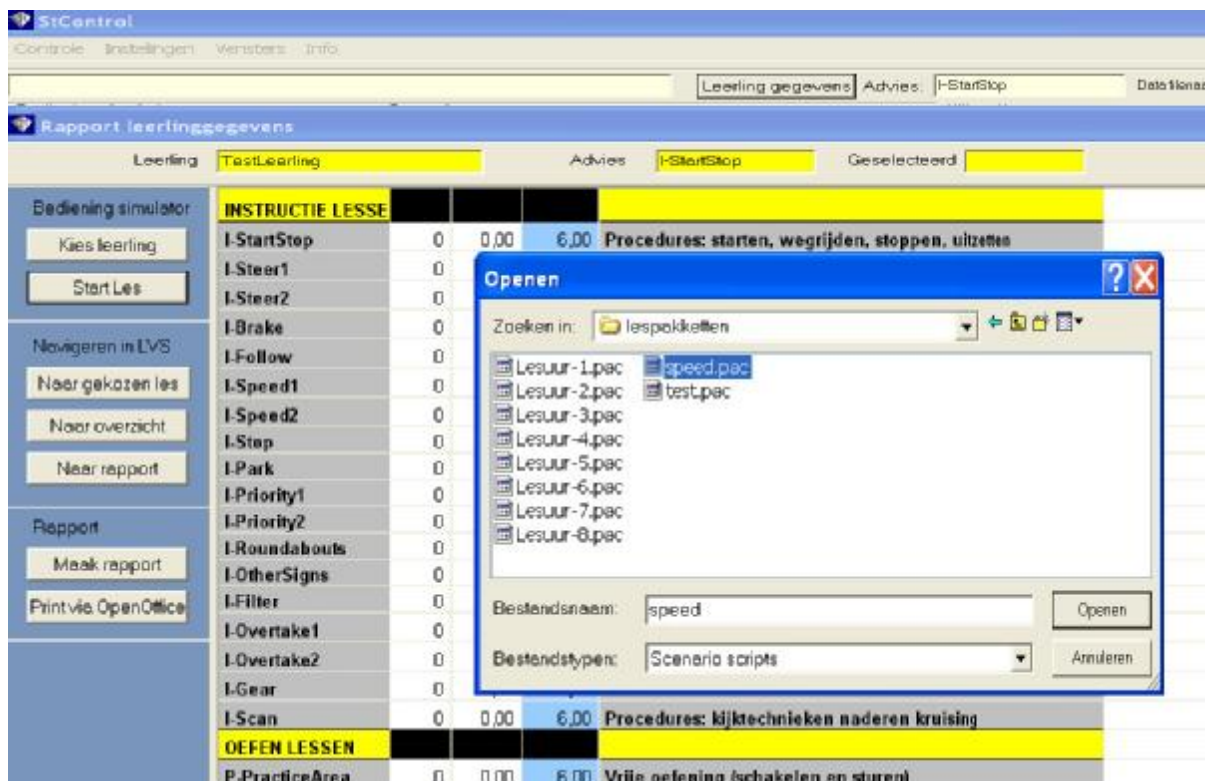
When all lessons are finished, the SAS shows the report of the last lesson. That's I-Speed2 in this case. This report can then be printed. But there are no reports of the previous lessons. To generate a report on the other lessons, I-Speed1 in this case, take the following steps:

- Go to the 'Overview' tab.
- Click on the lesson I-Speed1.
- Click on the 'To Selected lesson' button. The tab of I-Speed1 is displayed.
- Click the 'Make report' button. The SAS makes a report of the latest I-Speed1 lesson and then navigates to the 'Report' tab.
- Then print the report: OpenOffice opens with the present spreadsheet and you can print with the OpenOffice print function.

Control of the simulator during a lesson

During the lesson the simulation can be controlled via the user interface, see next figure.

Control of simulation
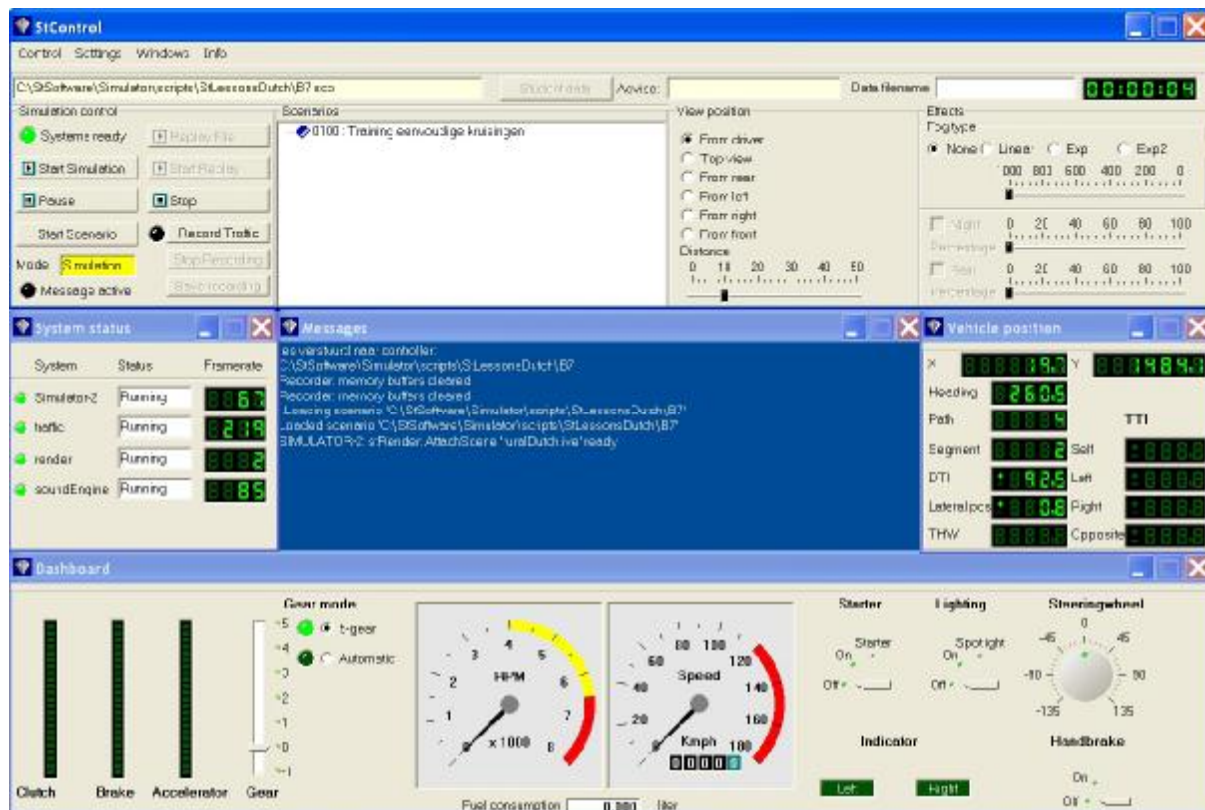
Userinterface during a lesson

- The lesson can be paused by pressing the button 'Pause'. The lesson can then be resumed by pressing the 'Pause' button again.
- The lesson can be stopped by pressing the 'Stop' button. When the button 'Start Simulation' is pressed while a lesson is still running, the system asks if the current lesson must be stopped.
- IMPORTANT ! When a lesson is stopped by the operator before the lesson was ended, the student data are stored on the SAS as well. After the lesson is ended, the lesson is stopped automatically by the system. The norms of the lesson are based on a complete lesson. When the lesson has been terminated by the operator by pressing the 'Stop' button, the student data are stored (when more than 100 meters have been driven), but the grades must be viewed with caution, because for example, 2 speed errors in a drive of 1 minute have a different meaning compared to 2 speed errors in a drive of 20 minutes
- A scenario can be selected from the list in the screen 'Scenarios', and this selection will be activated by pressing the button 'Start Scenario'.
- The lessons are recorded

- The current recording can be played by pressing the 'Start Replay' button (only after the lesson has been stopped).
- A previously recorded lesson can be played by pressing the 'Replay File' button, followed by a file selection dialog.
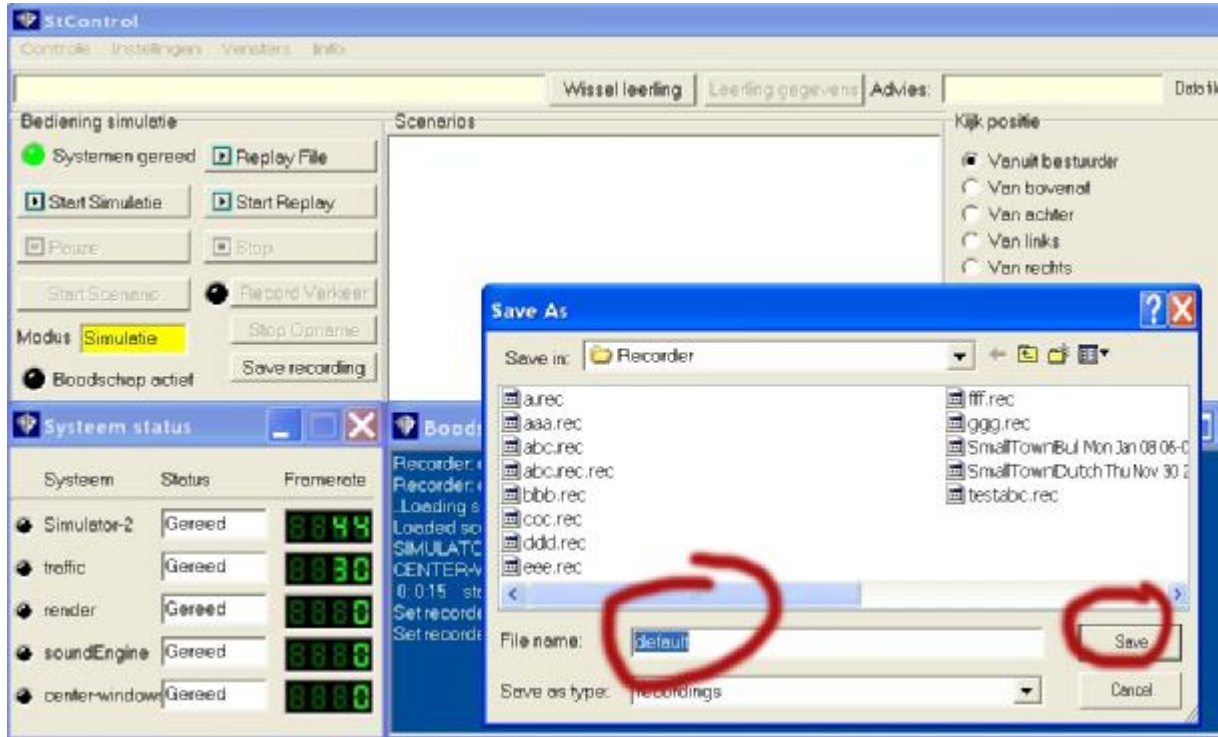
Storing a recording of (part of) a lesson

System status

The status of the different sub-systems can be monitored in the System status window. During a lesson, all accompanying leds must be green. The 'Frame rate' fields show the number of cycli per second (updates per second). For the two rendering processes these values should preferably be in the range of 30 to 60 Hz.

Viewing position

The viewing position allows the operator to look from different point of views. The viewing distance can be controlled by sliders. Changing the viewing position can especially be of interest during a playback of a recording.

Effects

Only fog can be adjusted as a special effect. With a linear fog, the precise sight distance can be adjusted via a slider. The Exp and Exp2 types of fog are more realistic but don't allow the precise setting of sight distance.

Messages

In the 'Messages' window, system messages are displayed, but also the texts of the speech messages that are administered to the trainee. This allows the operator to monitor what has been happening, and to see a history of speed messages by scrolling through the list.

Vehicle position

The 'Vehicle position' window provides information on the path where the simulator car is located (this is like a road number), the number of the segment (a piece of the road), the distance to the intersection in meters (DTI), the lateral position (distance from the right road edge) and time headway (THW) to the lead vehicle in seconds. Also, time to intersection (TTI) in seconds is displayed for the simulator car and the first other vehicle that approaches the next intersection from a certain direction.

Dashboard

The 'Dashboard' window shows information on the status of the actuators (steer, clutch, brake etc.).

Automatic vs manual gear (Gear mode)

The operator can choose between manual and automatic gear by clicking on the appropriate item at "Gear mode". To drive in automatic gear the gearbox has to be in second gear (the "drive" position).

Turn off the simulator

The simulator is turned off by clicking on 'Stop Simulator' from the main menu. After giving a confirmation all systems are stopped.
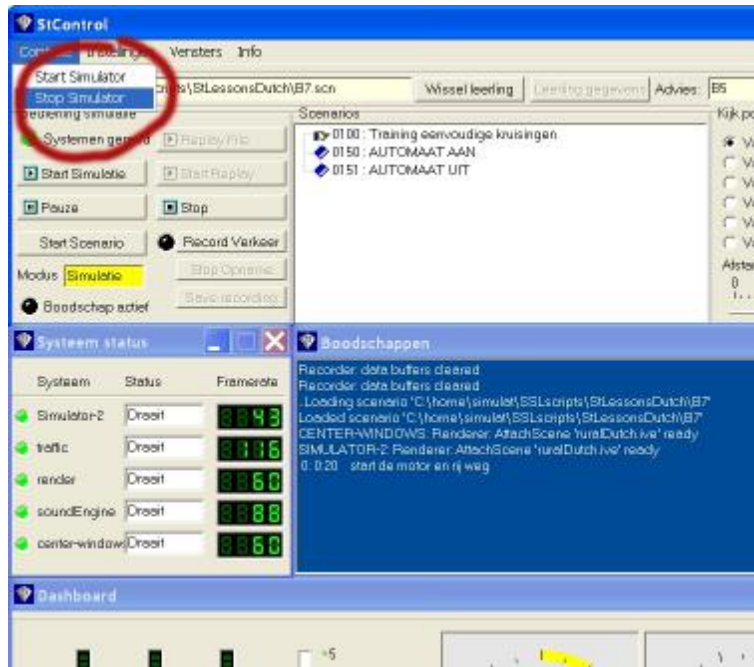
Tuning off the simulator

After all programs have terminated, the computers can be shut down by pressing the on/off buttons on the front of the computers.

Adjusting the mirrors

Each display/channel has it's own rearview mirror. The mirrors can be moved via the dialog that pops up by clicking in the main menu on <Settings> followed by <Mirrors>.

Select Mirrors to adjust the rearview mirrors

For changing the positions of the mirrors, see the next figure.
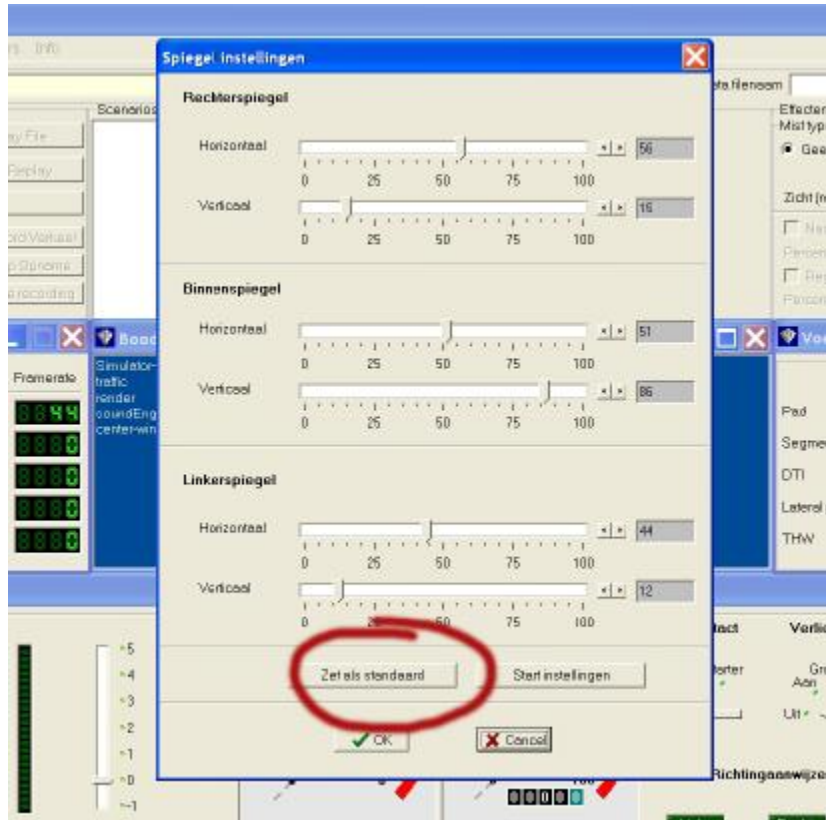
Changing the positions of the mirrors

The horizontal and vertical positions of the 3 mirrors can be modified by the sliders. If the new positions can be used for all other students, press the button 'Set as default'. When the button 'Ok' is pressed, the new mirror settings are displayed.

Analogue signals

During a lesson, various types of analogue signals can be displayed allowing the operator to get a better overview of student behaviour. For example, a time history of vehicle speed can be displayed or clutch and gear can be displayed the one above the other. This shown in an instant whether the student uses the clutch correctly when changing gears. At maximum, 6 different signals can be displayed simultaneously.
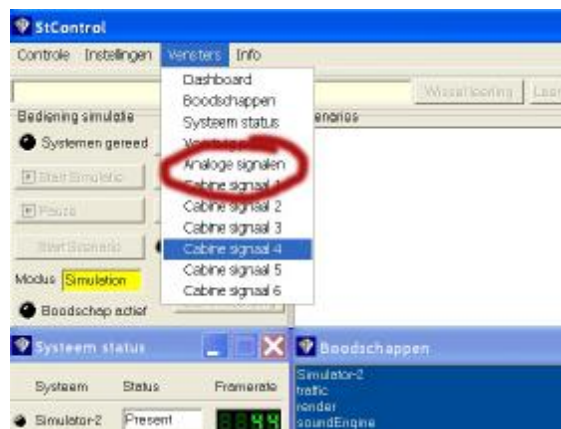
Selection of analogue signals

In the main menu, by clicking on 'Windows', a group of 6 analogue signals can be activated by clicking on 'Analogue signals'. It is also possible to select one signal at a time (for example, Cabin signal 4). When 'Analogue signals' are selected, 6 new windows pop up with the selected signals running during the lesson. By clicking the mouse in a window, and pressing the right mouse button, a signal (variable) can be selected and the vertical axis can be scaled, see next figure.
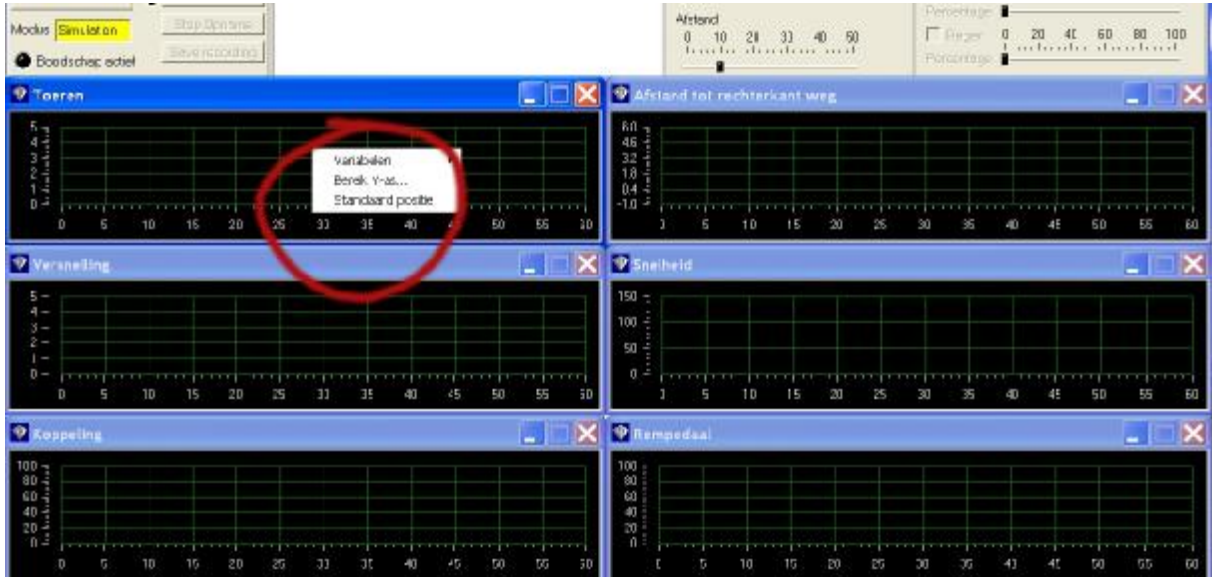
Analogue signals, like RPM, gear, clutch etc.

General characteristics of the lessons

All lessons have a number of common characteristics:
-   Instructions or additional explanations are often delivered by means of 'graphical popups'. These are transparent blue panels with a grey border with extra information or instructions. More than one popup may be seen at the central display at the same time. For example, a traffic sign that must be given attention to, a reminder concerning a traffic rule, an explanation of the order in which certain actions must be taken, etc. Each lesson starts with an opening popup that indicates which lesson has been started and what the lesson is about, see next figure.

-   Voice messages (from the Virtual Instructor or VI) are used for instructions and feedback. For example an instruction about the direction to be taken at the next intersection, or feedback that the clutch was not pressed fully while changing gears. The VI watches a large number of things simultaneously, but takes care that the messages are scheduled according to importance and order, such that the messages are delivered sequentially. Sometimes the trainee commits a number of errors almost at the same time, and in that case only feedback on the most important errors is given. During the lesson, the VI sometimes gives a reminder using a popup. These popups are usually at the bottom right of the central display and must be seen as additional instructions, see next figure. When training is more progressed, during the P-Mix lessons, these extra popups are no longer shown.

- Driver errors are <u>stored in the Student Assessment System (SAS)</u> after each lesson (if a student has been selected, otherwise nothing is stored). Progress during the complete training is stored for each student in this way.
- <u>Each lesson is fully recorded automatically</u>. This enables playback, after the lesson has been completed, from different viewing positions. This offers an additional aid for debriefing in which the trainee can be made aware on what occurred preceding an accident, the position on the road, etc.
- In most lessons (except the T or test lessons) the <u>current gear position</u> is displayed, which gives information to the trainee about the current gear. This is displayed in a small popup near the navigation display on the dashboard, see next illustration.

- During the lessons verbal <u>route instructions</u> are given by the VI (for example, 'turn left at the next intersection') and this is accompanied by a direction on the navigation display. When there's a oneway road and/or no-entry sign, and there's really no choice but to enter one road after the junction, no route instruction is given. All students MUST follow the fixed route. When the student deviates from the route he/she is put back to a point before the last intersection. The car has to be started again and the student has to proceed according to the proper route.
- In most lessons '<u>feedback popups</u>' are displayed on the dashboard. These are two vertical bars, one for the basic tasks (for example, gear shifting and steering) and one for traffic tasks (for example, giving right of way). These give an indication about performance up to the present point in time. As long as the trainee stays 'in the green zone' the trainee does well. This can be extra motivating. In the program 'LessonConfig' these feedback popups can be switched off for individual lessons.
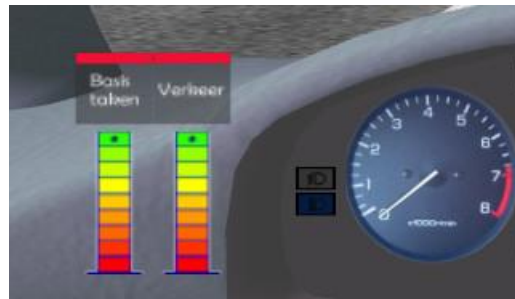
- Each lesson is driven in one of three modalities: Automatic, Manual or Auto drive. Automatic is in automatic gear: the gear MUST be set in second ('drive'). Manual is manual gear (5 or 6 gears + reverse). In Auto drive the simulator controls the speed completely (although the trainee can brake if he feels speed is too high), but the student has to steer (or control the pedals if needed). During the first instruction lessons the student drives in Automatic (gear) (except the first lesson I-StartStop). However, from the lesson I-Gear (gear shifting) the lessons are in Manual. However, the operator can switch from Manual to Automatic or the other way around at any time. This enables the students to learn to drive in an Automatic car or to train longer in Automatic before the student starts using the gear. During the lesson a popup is shown (near the central mirror) that indicates the current driving mode. See next illustration.

Order of lessons

Total lesson material, when all lessons are performed once, is around 10 clock hours. Lessons differ in length: durations may vary from a few minutes to 30 minutes per lesson. The instruction lessons, used during the first few hours of simulator training, are generally between 5 and 10 minutes. The operator may concatenate lessons into packages with the program 'LessonConfig'. This is a package configurator for sequentially running lessons in a fixed order. You may make a package of 15 minutes or half an hour or whatever duration, depending on the requirements.

The lessons have a certain logical order. For example, before the trainee starts to drive in a town (lesson P-Town) the priority rules have to be learned first and these rules have to be connected to the various situations involving right of way (the lessons I-Priority1 and I-Priority2). Also, it's best to first learn the procedures for starting the engine and driving off (I-StartStop) and then to learn steering (I-Steer1 and I-Steer2). The best thing to do then is to first learn the traffic rules, traffic signs and to learn other basic skills before learning to change gear. Because of that, most instruction (I) lessons are done in Automatic gear. The recommended order of learning driving related skills then is:

1) Learn to start the engine, drive off, stop the car and switch of the engine.
2) Learn to steer using the pass-on method and the cross-over method .
3) Learn the basic skills concerning traffic rules and infrastructure (road types and signs) by connecting these to what is perceived while driving.
4) Learn to change gears in a lesson that teaches the procedures for gear changing, followed by a lesson that allows the student to train this further.
5) Learn the scanning procedures preceding a junction (for turning right, left and crossing the junction) and learning the actions to be taken preceding turning left or right (reducing speed, scanning, changing gears, use of indicator, etc).
6) Practice in a number of P-lessons what has been learned, starting with a lesson in a quiet rural environment.
7) Then it's best to repeat a number of I lessons (priority rules, parking and stopping) before the P-lessons in the urban environments are done.
8) Then it's recommended to repeat a I lessons on roundabouts followed by a P lesson on miniroundabouts in town.
9) Repeat the I lessons on entering and leaving the highway, speedlimits and overtaking before the P lessons on highways, motorways and large roundabouts are done.
10) After that, the trainee can do a few rehearsal lessons with different types of roads: the P-Mix lessons.
11) And finally, a few tests can be done (the T lessons). When the results in the SAS indicate so, the trainee may practice a little bit further or the operator may select specific instruction lessons.

For most students it will not be necessary to do all lessons, while it may be sensible to repeat some other lessons a few times.

The special manouvres are not trained in the simulator because the sense of movement is very important in these manoeuvres. It's better to train things like reversing and reverse parking in a real car. Also, driving backwards is generally experienced as unpleasant because it may induce feelings of simulator sickness.

No all lessons are available yet for all languages. Lessons that may not be available are printed in *italic*. The recommended order of lessons then is as follows:

INSTRUCTION phase

Lesson	Short description	Mode	Duration (mins)
I-StartStop	Procedures Starting the engine, driving off, stopping the car and turning off the engine	Manual	5
I-Steer1	Procedures pass-on and cross-over method of steering	Automatic	10
I-Steer2	Training steering with increasing speed	Auto drive	8
I-Brake	Training braking/braking distance	Auto drive	5
I-Follow	Training car following/gentle braking	Auto drive	5
I-Speed1	Speedlimits Dutch EHK roads	Automatic	5
I-Speed2	Speedlimits depending on road type	Automatic	6
I-Stop	Rules for stopping	Automatic	6
I-Park	Rules for parking	Automatic	3.5
I-Priority1	Rules right of way 1	Automatic	8
I-Priority2	Rules right of way 2	Automatic	8.5
I-Roundabouts	Procedures driving on roundabouts	Automatic	4
I-Othersigns	Rules obligatory driving direction and other signs	Automatic	7
I-Filter	Procedures entering and leaving the highway	Automatic	8
I-Overtake1	Procedures passing by and overtaking	Automatic	6
I-Overtake2	Rules overtaking	Automatic	8
I-Gear	Procedures gear shifting	Manual	5
P-PracticeArea	Practicing gear shifting on a secluded practice area for a fixed amount of time	Manual	5
I-Scan	Procedures scanning (viewing techniques) and preparatory actions while approaching junctions	Manual	16

The duration of the lessons is an estimation based on measurements with a fast learning student. In addition, some time must be planned for starting and closing the lessons. Total estimated time for the recommended lessons in the instruction phase: **3.5 hours**.

PRACTICE phase (independent driving on a fixed route)

Lesson	Short description	Mode	Duration (mins)
P-Rural	Practice lesson outside built-up area	Manual	13
P-RuralOvertake	Practice lesson outside built-up area with passing-by and overtaking	Manual	14
I-Priority1	REHEARSAL right-of-way rules preceding Town driving	Automatic	8
I-Priority2	REHEARSAL right-of-way rules preceding Town driving	Automatic	8.5
I-Stop	REHEARSAL rules for stopping preceding Town driving	Automatic	6
I-Park	REHEARSAL rules for parking preceding Town driving	Automatic	3.5
I-OtherSigns	REHEARSAL other signs preceding Town driving	Automatic	7
I-Scan	REHEARSAL scanning techniques for approaching junctions	Manual	16

P-Town	Practice lesson in built-up area	Manual	17
S-TownB	Practice lesson in built-up area with bicyclists	Manual	17
I-Roundabouts	REHEARSAL procedures roundabouts preceding practice lesson	Automatic	4
P-Miniroundabouts	Practice lesson mini-roundabouts in built-up area	Manual	25
S-MiniroundaboutsB	Practice lesson mini-roundabouts in built-up area with bicyclists	Manual	25
I-Speed1	REHEARSAL speedlimits 1	Automatic	5
I-Speed2	REHEARSAL speedlimits 2	Automatic	6
I-Filter	REHEARSAL entering and leaving the highway	Automatic	8
I-Overtake1	REHEARSAL Overtaking 1	Automatic	6
I-Overtake2	REHEARSAL Overtaking 2	Automatic	8
P-Highway	Practice lesson highway	Manual	17
P-Roundabouts	Practice lesson large roundabouts and single carriageways	Manual	25
P-Motorways	Practice lesson dual carriageways and multi-way intersections	Manual	27
P-HighwayFog	Practice lesson highway with fog banks	Manual	17
T-2 (or other T test)	Test (exam) to evaluate whether the student needs more simulator lessons	Manual	10

The duration of the lessons is an estimation based on measurements with a fast learning student. In addition, some time must be planned for starting and closing the lessons. Total estimated time for the recommended lessons in the Practice fase: **5.5 hours**.

It is recommended to do a test at the end of the practice phase. This is to evaluate whether the student is ready for continuing the training in a real car on the road. When the operator thinks that student is passed (based on the grade and own impressions) the student can continue training on the road. When the student fails the test, training may continue with specific I lessons or with additional P-Mix lessons to gain driving experience.

If required, additional lessons can be given on a mix of different road types, the P-Mix lessons, see next table. The P-Mix lessons are especially useful for the student to get more driving experience. However, the student should not train in the simulator longer than necessary.

Additional practice lessons

Lesson	Short description	Mode	Duration (mins)
P-Mix1	Practice lesson Mix	Manual	20
P-Mix2	Practice lesson Mix	Manual	20
P-Mix3	Practice lesson Mix	Manual	20
P-Mix4	Practice lesson Mix	Manual	20
P-Mix5	Practice lesson Mix	Manual	20

The maximum duration of the additional practice lessons is about 2 hours.

TEST Phase

Usually, a single T test will be sufficient. When the operator thinks the student has passed the test (based on the grade and own impression) the student proceeds with the on-the-road part of the training. However, the T tests can also be used to increase driving experience.

Lesson	Short description	Mode	Duration (mins)
T-1	Test	Manual	20
T-2	Test	Manual	20
T-3	Test	Manual	20
T-4	Test	Manual	20
T-5	Test	Manual	20

Description of lessons

There may be variations in the lessons for different countries and languages. Not all of these lessons have been implemented for all countries for which lessons are available.

Instruction lessons

During the instruction lessons, the proper order of actions is trained in a number of cases. These are *procedure training* lessons. The Virtual Instructor (VI) then 'tells' the trainee what to do, and the trainee is expected to perform these actions. Simultaneously, there's often a popup on the centre display that lists the complete order of actions.

I-StartStop: Start engine, drive off, stop the car, turn of engine

Previous name	Modus	Duration (minutes)	Feedback
B1	Manual	5	yes

I-StartStop is the first lesson in the curriculum. It is a procedure training lesson in which the following procedures are trained:
- Starting the engine
- Driving off
- Stopping the car
- Turning off the engine

Because this is a procedure training in which the order of actions matters, it is important that the trainee listens well to the instructions of the VI, and does not start to take actions independently. The training has two levels:
- Follow my steps: Step by step explanation of all actions in the correct order: the VI tells which actions have to be performed and the trainee then performs the actions, one at a time. The trainee thus follows the VI and does not start doing actions on his own. For example, the VI may tell the student: "We are going to start the car. Listen to me and wait after each action".
- Do by yourself: Perform the complete procedure by yourself from beginning to the end in the correct order. During this, a popup is displayed as a reminder, with the proper order of actions. As an example, the VI may tell the student: "Start the engine".

The order of the training scenarios in the lesson I-StartStop is:
- Follow my steps: Start the engine
- Follow my steps : Turn off the engine

- Do by yourself: Start the engine
- Do by yourself: Turn off the engine

- Do by yourself: Start the engine
- Follow my steps: Drive off
- Follow my steps: Stop the car
- Do by yourself: Turn off the engine

- Do by yourself: Start the engine
- Do by yourself: Drive off
- Do by yourself: Stop the car
- Do by yourself: Turn off the engine

The proper order of actions:

Task	Order of actions
Start the engine	Check if the hand brake is pulled
	Check if the gear is in neutral position
	Check if the lights are off
	Press the clutch
	Switch on the power (contact)
	Start the engine
	Switch the lights on
Drive off	Check around the car if it's safe to drive off
	Press the clutch
	Switch to first gear
	Release hand brake
	Look around the car
	Switch the indicator on
	Release the clutch and press accelerator simultaneously
	(switch off indicator after driving off)
Stop the car	Look ahead to see where you are going to stop
	Look in interior mirror
	Switch the indicator on
	Press clutch and brake
	Look in interior mirror
	Reduce brake pressure just before you stop
	When stopped, switch into first gear
	Switch off indicator
Turn off the engine	Pull hand brake
	Switch gear in neutral position
	Switch lights off
	Switch off engine and power
	Release clutch and brake pedals

I-Steer1:   Steering: pass-on and cross-over methods

Previous name	Modus	Duration (minutes)	Feedback
B2Instruction	Automatic	10	yes

I-Steer1 is a procedure training lesson in which the following procedures are trained:
- Steering with the pass-on method
- Steering with the cross-over method

During the lesson, popups are displayed with the order of actions. Training occurs on a simulated special practice area with a number of curves to left and to right and intersections where the trainee has to turn left or right.

First, a number of complete instructions are given for the pass-on method for curves to left and to right, followed by the 'do by yourself' method.

Then, the full instructions for the cross-over method are given a number of times, followed by the 'do by yourself' method.

For some students it may be helpful if the operator shows both methods.

I-Steer2:   Steering at higher speed

Previous name	Modus	Duration (minutes)	Feedback
B2	Auto drive	8	yes

In I-Steer2, the simulator starts to drive slowly, but then speeds up to higher speeds. People who have difficulties with steering accurately, often compensate for that by driving slowly. However, in this method, the trainee is forced to learn to steer when driving at higher speed. When speed is too high for the student, he may press the brake to slow down.

The training is in a rural area with a speed limit of 80 km/h. There are a large number of oncoming vehicles which force the trainee to steer accurately. The car drives in auto drive so speed is controlled by the simulator instead of the trainee, to ensure a fixed speed. When the simulator turns left or right at an intersection, speed is reduced by the system in a quiet manner, allowing the student to steer quietly to turn left or right. The student is supposed to use the pass-on method and to use the indicator before turning left or right on the intersections. During the lesson the VI gives feedback if steering is not accurately or when the curve on the intersection is taken too narrow or too wide.

When, after this lesson, the trainee still is not able to steer accurately (has failed the lesson) the lesson should definitely be repeated, because adequate steering ability is a prerequisite for the next lessons.

I-Brake: Precision braking for stationary objects

Previous name	Modus	Duration (minutes)	Feedback
B3	Auto drive	5	yes

In this lesson the student learns the right moment to start braking and to brake accurately (not too hard) for stationary vehicles. The lesson is on a rural road where vehicles are blocking both lanes. The simulator drives in auto drive with a fixed speed of either 50 km/h or 80 km/h. The student has to steer and start to brake on the right moment, such that the car is stopped precisely behind the stationary vehicle in the correct lane. Braking should be done with a comfortable deceleration. First, there are a number of braking manoeuvres at 50 km/h, and this is followed by a number of braking manoeuvres at 80 km/h. Ofcourse, at 80 km/h braking distance is longer and the student should start braking sooner. The VI evaluates whether:
- The deceleration is gentle.
- The simulator car stops right behind the stationary vehicle (not too far and not too close).

I-Follow: Car following and controlled braking for a decelerating vehicle in front

Previous name	Modus	Duration (minutes)	Feedback
B4	Auto drive	5	yes

In this lesson the student learns to react appropriately to a vehicle in front that varies it's speed. The lesson is on a rural area with a lot of oncoming vehicles to force the student to stay in the proper lane. There's a vehicle in front and the simulator car follows in auto drive. As soon as the vehicle in front brakes, auto drive is switched off by the system and the student has to apply controlled braking in order to avoid a collision. The objective is to maintain sufficient headway and to brake in a controlled manner such that a collision is avoided. There are a lot of oncoming vehicles, so steering is important as well. Monitoring the vehicle in front introduces an additional task load for the student: steering is then trained in more difficult circumstances as well, as a secondary objective.

I-Speed1:   Speed limits and EHK roads

NOT AVAILABLE IN ALL LANGUAGES

EHK roads (or 'self-explaining roads') are a typical Dutch phenomenon, so this lesson in this form, is only available in the Dutch version.

Previous name	Modus	Duration (minutes)	Feedback
new	Automatic	5	yes

This is the first of two lessons that cover the speed limits. I-Speed1 handles two subjects:
- The general country specific speed limits
- Speed limits on EHK roads (only in Dutch version)

The EHK roads form a category of new road types in which the speed limits depend on the road markings (types of lines on the road). This concerns the 60 km/h roads outside built-up areas, the 80 km/h roads and the 100 km/h roads. The student drives by himself in automatic gear (because gear shifting is learned in a later lesson)..

The structure of the lesson is:
- General speed limits (depending on country): 50, 80, 100 and 120 km/h depending on road category (in Dutch version)
- General explanation EHK roads
- Verbal explanation 60 km/h roads and with instruction popups
- Driving with 60 km/h on different 60 km/h roads
- Verbal explanation 80 km/h roads and with instruction popups
- Driving with 80 km/h on different 80 km/h roads
- Verbal explanation 100 km/h roads and with instruction popups
- Driving with 100 km/h on different 100 km/h roads

The student starts the car and stops the car in-between the different sections. The engine must not be switched off. The student switches off the engine at the end of the lesson.

The following traffic signs are covered in this lesson:

I-Speed2:   Speed limits and road types

NOT AVAILABLE IN ALL LANGUAGES

Previous name	Modus	Duration (minutes)	Feedback
new	Automatic	6	yes

This is the second of two lessons that cover the speed limits. In I-Speed2, the following subjects are covered:
- Built-up area (50 km/h)
- Local limits within built-up areas (70 km/h and 50 km/h)
- Residential/shopping areas (drive slowly, 30 km/h)
- Trunk roads (100 km/h)
- Motorways (120 km/h)

The student drives on the various road types and receives instruction concerning the speed limit and roadtype while driving. The various road signs and the recognition of these, play an important part in this. Recognition of road types and road signs and connecting these to the speed limits is an important objective in this lesson.

The following traffic signs are covered in this lesson:

I-Stop: **Traffic rules for stopping**

NOT AVAILABLE IN ALL LANGUAGES

Previous name	Modus	Duration (minutes)	Feedback
new	Automatic	6	yes

This lesson covers the traffic rules for stopping the car voluntarily. This is defined as stopping voluntarily for a short period of time, for example for letting a passenger get in or out. So this excluded a traffic-necessary stop. The following subjects are covered:
- <u>Intersections/junctions</u>: prohibited to stop on an intersection or railroad crossing.
- <u>Parts of the road for other road users</u>: prohibited to stop on a part of the road that is intended for other road users, such as a pavement for pedestrians or bicycle track.
- <u>Bicycle lane</u>: prohibited to stop on, or next to, a bicycle lane.
- <u>Zebra crossing</u>: prohibited to stop on a zebra crossing, or 5 meter before or after a zebra crossing.
- <u>Bus stop</u>: prohibited to stop 12 meters before or after a bus stop.
- <u>Yellow solid line</u>: prohibited to stop next to a yellow solid road line.
- <u>Sign E2</u>: prohibited to stop after the traffic sign E2 on the side of the road where the sign is placed.

The student is shown the respective situations while driving and then has to stop somewhere where stopping is allowed.

The following traffic signs are covered in this lesson:

I-Park: **Traffic rules for parking**

NOT AVAILABLE IN ALL LANGUAGES

Previous name	Modus	Duration (minutes)	Feedback
new	Automatic	3.5	yes

In this lesson the traffic rules for parking are treated. Parking is defined as: making a voluntary stop for a longer period of time. Usually the car then is stopped in a parking place and left behind. However, stopping in front of a shop to buy things is regarded as parking as well. The following subjects are covered:
- Intersections/junctions: prohibited to park the car within 5 meters of an intersection.
- Entry/exit: prohibited to park the car in front of an entry or exit.
- Major road outside built-up area: prohibited to park the car on a driving lane of a major road outside a built-up area. It is allowed to park the car on the roadside.
- Yellow broken line: prohibited to park the car next to a yellow closed road line.
- Sign E1: prohibited to park after the traffic sign E1 on the side of the road where the sign is placed.

The student is shown the respective situations while driving and then has to park the car somewhere where parking is allowed.

The following traffic signs are covered in this lesson:
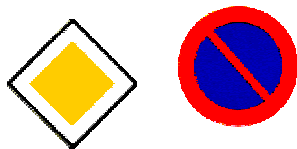
I-Priority1:   Traffic rules for priority and turning off

NOT AVAILABLE IN ALL LANGUAGES

Previous name	Modus	Duration (minutes)	Feedback
new	Automatic	8	yes

This is the first of two lessons that deals with the traffic rules for priority and turning off. In the lesson, the following subjects are covered:
- General remarks concerning priority.
- Junction of roads of equal importance: drivers from right have priority.
- Junction of major road: sign B6 and B7 (priority sign and stop sign).
- Major road: you have priority over all traffic.
- Priority junction: you have priority over all traffic.

In this lesson, the student drives in the respective traffic environments, with the traffic signs along the road and traffic coming from various directions. The rule is explained to the student and he must then decide to stop or drive on. Because these rules are often quite abstract on paper, it is illuminating for the student to experience the situations from the perspective of the driver. The students learn the rules in relation to the position of other traffic and signs and road markings.

The following traffic signs are covered in this lesson:

I-Priority2:   Traffic rules for priority and turning off

NOT AVAILABLE IN ALL LANGUAGES

Previous name	Modus	Duration (minutes)	Feedback
new	Automatic	8.5	yes

This is the second of two lessons that deals with the traffic rules for priority and turning off. In the lesson, the following subjects are covered:

- Straight through has priority: when you turn left or right at the junction, oncoming traffic that goes straight through on the same road has priority. This rule is demonstrated from the perspective of a car that proceeds straight through and from the perspective of a car that turns left and has to deal with an oncoming car going straight through.
- Bending main road: when you approach a junction with a main road that bends left or right, you have to give priority to all vehicles on the bending main road. This is an exception to the rule that traffic going straight through a junction has priority. This rule is demonstrated from different perspectives as well.
- Turning right before turning left: the 'shortest curve' has priority. This rule is demonstrated for the case in which the student turns left and when he turns right.
- Exits: when you leave an exit or residential low speed area with pavement stretched over the road, all drivers and pedestrians have right of way. Demonstrated from different perspectives.
- Traffic lights: stop for a red traffic light and stop for yellow if possible and safe.
- Other rules: emergency vehicles etc.

The following traffic signs are covered in this lesson:

I-Roundabouts: Approaching and driving on roundabouts

NOT AVAILABLE IN ALL LANGUAGES

Previous name	Modus	Duration (minutes)	Feedback
new	Automatic	4	yes

This lesson covers the procedures for taking the first, second and third exit on roundabouts. The following subjects are treated:
- Roundabouts general.
- Roundabouts first exit (turn right)
- Roundabout second exit (straight ahead)
- Roundabout third exit (turn left)

The student approaches the roundabout and receives instruction on the proper timing of actions concerning observation, use of indicator and lane position.

The following traffic signs are covered in this lesson:

I-OtherSigns: **Mandatory driving direction and other signs**

NOT AVAILABLE IN ALL LANGUAGES

Previous name	Modus	Duration (minutes)	Feedback
new	Automatic	7	yes

In this lesson, one-way roads and mandatory driving direction are discussed, together with getting-in-lane on one-way roads. In addition, a number of other traffic signs are demonstrated.

The lesson consists of the following subjects:
- One-way roads: the meaning of the traffic signs is explained and the student drives on one-way roads while choosing the proper lane position when turning left.
- Mandatory driving direction.
- Road closed for certain categories.
- Other signs giving orders.
- Warning signs road narrowing.
- Warning signs curves and bends.
- Warning signs other road users.
- Warning signs other dangers.

The following traffic signs are covered in this lesson:
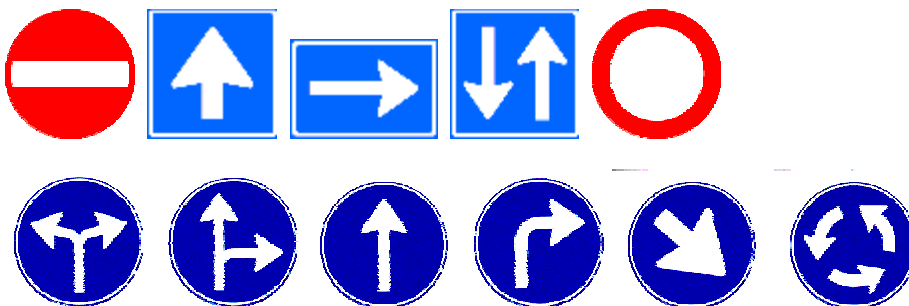
I-Filter: Merging and leaving the motorway

NOT AVAILABLE IN ALL LANGUAGES

Previous name	Modus	Duration (minutes)	Feedback
new	Automatic	8	yes

This lesson concerns procedures for merging and leaving the motorway. The following subjects are covered:
- Merging and leaving the motorway general.
- Merging on a motorway with no traffic. Explanation order of actions while entering a motorway.
- Leaving a motorway with no traffic. Explanation order of actions while leaving a motorway.
- Merging on a motorway with traffic. Explanation order of actions while entering a motorway.
- Leaving a motorway with traffic. Explanation order of actions while leaving a motorway.
- Merging in a traffic-jam. Explanation order of actions while merging into a traffic-jam on a motorway.

The proper order of actions:

Task	Order of actions
Merging	Look ahead where to merge: observe traffic on the motorway.
	Use the acceleration lane to increase speed and adapt your speed to the traffic stream.
	Check the mirrors, left and look over left shoulder to see if it's safe to enter the motorway.
	Switch indicator on, wait a few seconds and merge.
	Switch the indicator off.
Leaving the motorway	Make sure you drive on the right lane in time.
	Switch indicator on at 300 meter sign.
	Check the interior mirror and right outside mirror.
	Change to the exit lane at the start of that lane and reduce speed.
	Switch off the indicator at the 'exit' sign.
Merging in a traffic-jam	Use indicator in time.
	Drive to the end of the acceleration lane.
	Communicate with eye contact with other drivers for an opportunity to merge.
	Leave indicator on and merge.
	Switch the indicator off.

I-Overtake1:   **Passing and overtaking**

Previous name	Modus	Duration (minutes)	Feedback
B8	Automatic	6	yes

This is the first of two lessons concerning overtaking. In this lesson the procedures for passing stationary vehicles and overtaking driving vehicles are trained. In the second lesson, the traffic rules concerning overtaking are trained.

This lesson consists of the following subjects:
- Passing a number of stationary vehicles is trained 3 times. The proper order of actions is explained during execution of the passing manoeuvre.
- Overtaking a driving vehicle is trained 3 times. The proper order of actions is explained during execution over the overtaking manoeuvre. The student performs these actions at the right moment in time during passing and overtaking.

The proper order of actions:

Task	Order of actions
Passing	Look ahead to see if you can pass safely (oncoming vehicle etc.)
	Look in the mirrors and over the left shoulder to see if you are being overtaken.
	Signal to left.
	Change to the left lane.
	Pass the stationary car(s).
	Check the mirrors if you see the passed vehicle(s) and look over your right shoulder.
	Signal to right.
	Change to the right lane.
Overtaking	Check if overtaking is allowed here (signs, road markings).
	Look ahead to see if you can overtake safely.
	Keep sufficient headway to the lead vehicle.
	Look in the mirrors and over the left shoulder to see if you are being overtaken.
	Signal to left.
	Change to the left lane.
	Overtake quickly.
	Check the mirrors if you see the overtaken vehicle(s) and look over your right shoulder.
	Signal to right.
	Change to the right lane.

I-Overtake2:   Traffic rules for overtaking

NOT AVAILABLE IN ALL LANGUAGES

Previous name	Modus	Duration (minutes)	Feedback
new	Automatic	8	yes

This is the second of two lessons about overtaking. This lesson handles the rules concerning overtaking.

The lessons consists of the following subjects:
- Overtaking general: as a rule, overtaking is on the left, but there are situations in which it is allowed or even mandatory to overtake on the right, or where it is prohibited to overtake.
- General rule: overtake on the left. Explanation and practice of this rule.
- Vehicle in frony turns left: you have to overtake on the right if the vehicle in front turns left at a junction and gets in lane to the left.
- Before or on a roundabout: you are allowed to overtake on the right just before or on a roundabout.
- Block marking: you are allowed to overtake to the right of a block marking.
- Traffic-jam: you are allowed to overtake when you are driving to the right of a traffic-jam.
- Zebra crossing: it is prohibited to overtake just before or on a zebra crossing.
- Closed centre line: it is prohibited to overtake when there's a continuous centre line.
- Traffic sign F1: it is prohibited to overtake after a sign 'overtake prohibition' F1.

These rules are explained while the student drives in the relevant traffic environments where these situations apply.

The following fraffic signs are covered in this lesson:

I-Gear: Change gears

Previous name	Modus	Duration (minutes)	Feedback
B5	Manual	5	yes

In this lesson the student learns to change gears according to fixed procedures. First, a few general reminders are given:
- Always change one gear up.
- When stopped, gear down to first or second gear.
- Always press the clutch when changing gears and just before you make a stop.
- But never press the clutch without a good reason.

The first time the student gears up, the 'follow my steps' method is used: the VI tells the student what to do, and the student then performs this action. After that, the students gears up by himself, while the proper order of actions is displayed on a popup. In the same way, when the student gears down for the first time, the follow my steps method is used, followed by the 'do by yourself' method. The student pulls up to 2200 rpm's and then shifts up, from first, to second, third, fourth and fifth gear. The order of the procedures is:

Gear up: Start engine à Drive off à 2nd à 3th à 4th à 5th à
Gear down: 5th à 4th à 3th à 2nd à
Gear up :   2nd à 3th à 4th à
Gear down: 4th à 3th à 2nd à Stop the car à Turn off engine

The proper order of actions:

Task	Order of actions
Gear up	Pull up to 2200 rpm (eco-driving)
	Release accelerator and press clutch
	Hand to the gear stick
	Shift up to next gear
	Hand to the steering wheel
	Release clutch gently and press accelerator
	Check the mirrors
Gear down	Check the mirrors
	Release accelerator and reduce to 1200 rpm (eco-driving)
	Press the clutch
	Hand to the gear stick
	Shift down (eco-driving allows more than 1 gear down at a time)
	Hand to the steering wheel
	Release clutch gently and press accelerator
	Check the mirrors

I-Scan:
Scanning (viewing techniques) and preparatory actions while approaching junctions

Previous name	Modus	Duration (minutes)	Feedback
B6	Manual	16	yes

This is an extensive, and for learning to drive safely, very important lesson that trains scanning while approaching an intersection. In addition, all actions preceding a junction are trained. The objective is to teach the student to complete all actions in time before reaching the intersection. Turning left, turning right and going straight through are trained separately. There are bicyclists in the simulations as well, because these are important for training to turn right at an intersection. In some cases, the student has to stop before entering the intersection to give way to traffic.

The lesson consists of the following subjects:
- Scanning, turn right, low speed: the student approaches an intersection 3 times and turns right. The scanning is explained with the 'follow my steps' method.
- Scanning, turn left, low speed: the student approaches an intersection 3 times and turns left. The scanning is explained with the 'follow my steps' method.
- Scanning, going straight through, low speed: the student approaches an intersection 3 times and goes straight through. The scanning is explained with the 'follow my steps' method.
- Actions approaching intersection, turn right, higher speed: 3x with gearing down and reducing speed before the intersection.
- Actions approaching intersection, turn left, higher speed: 3x with gearing down and reducing speed before the intersection.

Concerning the actions while approaching the intersection, the VI remarks:
"Decide by yourself whether to stop or drive on. When you stop, put it into first gear. When you drive on, reduce speed to 20 km/h before the intersection and switch down to second gear".

In addition to the scanning techniques, the VI checks the correct use of indicator, whether speed is reduced in time before the junction, the timely shifting down to second gear when turning left or right and the proper application of the priority rules..

For each subject, the order of procedures is:

Start engine à Drive off à approach intersection and turn off (or straight through) à approach intersection and turn off (or straight through) à approach intersection and turn off (or straight through) à Stop car à Switch off engine

When turning right and going straight through there are, besides other cars, also bicyclists that must be attended.

The proper order of actions:

Task	Order of actions
Scanning, turning right	Interior mirror
	Look ahead
	Right mirror, right shoulder
	Indicator on
	Look ahead
	Look left
	Look right
	Right shoulder
Scanning, turning left	Interior mirror
	Look ahead
	Left mirror, left shoulder
	Indicator on
	Look ahead
	Look left
	Look right
	Left mirror, left shoulder
Scanning, going straight through	Interior mirror
	Look ahead
	Look left
	Look ahead
	Look right

Practice lessons

In the practice lessons, the student drives independently according to a fixed route. When he deviates from the route, he is automatically stopped with the engine turned off and put back in the database, somewhere before the junction where the route error was made. He then starts the car again and proceeds according to the prescribed route. The VI gives route instructions and feedback on behaviour. There are often popups on the middle display that act as a reminder for the current driving task. For example, when the student approaches a roundabout, the required actions are displayed in a popup. This type of reminder feedback is given in all P-lessons, except the P-Mix lessons. In the P-Mix lessons, only route instructions are given and verbal feedback on errors. For a number of specific P-lessons, it is best to rehearse a specific Instruction lesson preceding the respective practice lesson, see the chapter 'Order of lessons'

P-PracticeArea: Practice area

Previous name	Modus	Duration (minutes)	Feedback
PracticeArea	Manual	5	yes

This is a lesson of free driving of which the duration is limited to 5 minutes. During that time, the student is free to practice skills such as gear shifting, steering, use of clutch etc. There's no prescribed route, and the student is free to choose a route. Other things can be practiced as well, such as driving backwards in a curve, reverse parking, or turning on the road. However, it is not recommended to practice these special manouevres in a simulator, because sense of movement and looking backwards over the shoulder are important aspects in these tasks.

P-Rural: Practice lesson outside built-up area

Previous name	Modus	Duration (minutes)	Feedback
B7	Manual	13	yes

In this lesson outside built-up area the following aspects are trained:
- 80 km/h roads with zones where there's a 60 km/h limit.
- The student encounters 10 intersections, of which there are 4 right turns, 4 straight throughs, and 2 left turns. Most intersections are of equal importance and often there's traffic from right that has priority.
- Car following and maintaining a safe headway to vehicles in front.
- When turning left, there's oncoming traffic going straight through, or oncoming traffic turning right, that has to be given the right of way.
- When turning right, there are sometimes bicycle strips where the student has to get in lane to the right as far as possible.
- There's an approach to a major road with a stop sign where there's traffic from left that has priority.
- There are roads with a no-entry sign.
- There's a major road where the student has priority over traffic from right.
- In addition, a number of signs indicate:
    o Curved road
    o Dangerous crossing
    o Overtake prohibition
    o Mandatory driving direction
    o Major road, priority junction, stop sign

This lesson offers a pleasant training in driving in a relatively quiet environment. On each stretch of road there are oncoming vehicles, and there's traffic at each intersection. However, because of the rural environment and the long stretches of road this lesson is a good lesson to start practicing what has been learned before.

P-RuralOvertake: Practice lesson outside built-up area with passing-by and overtaking

Previous name	Modus	Duration (minutes)	Feedback
B9	Manual	14	yes

In this lesson in a non bult-up area, the student drives on the same fixed route as in P-Rural. In addition, there are a number of other situations:
- Passing a number of stationary vehicles.
- Overtaking a number of slower driving vehicles.

During the first phase of the lesson, there are no oncoming vehicles while passing or overtaking, but later during the drive, there are oncoming vehicles. Therefore, overtaking requires the proper attention for oncoming vehicles as well. This is a lesson to train the skills that have been learned during the lessons I-Overtake1 and I-Overtake.

P-Town: **Practice lesson in built-up area**

Previous name	Modus	Duration (minutes)	Feedback
C10	Manual	17	yes

In this lesson the student drives in a town environment with a fixed route. The following aspects are covered:
- 50 km/h roads with zones with a local speed limit of 70 km/h.
- 29 intersections, with 7 right turns, 18 straight on and 4 left turns. Most intersections are of equal importance and often there's traffic from right that has priority.
- When turning left, there are situations where oncoming traffic goes straight through or where there's oncoming right-turning traffic that has priority.
- When turning left there are situations where the student is on a one-way road and has to get in lane to the left lane.
- Major roads are approached with a stop sign where a full stop has to be made and priority has to be given to traffic from left.
- Major roads are approached with a priority sign where priority has to be given to traffic from left.
- The student drives on major roads and approaches priority junctions where he has the right of way.
- The student has to stop for a red traffic light and for a traffic light that turns on yellow when the student approaches. There's also a traffic light that's out of order while traffic approaches the junction.
- There are roads with a no-entry sign.
- There's a bending major road.
- The student drives on a residential/shopping area low speed area.
- When leaving the residential low speed area the student has to stop for traffic from left.
- Zebra crossings before an intersection that must be taken into account when stopping..
- When the student follows a vehicle in front with a headway that is too small, the lead vehicle brakes unexpectedly occasionally.
- Parked car that sometimes drives off when the student approaches the car.
- Parked cars right after an intersection when turning right.
- Manoeuevering between parked cars parked on the left and the right side of the road.
- Sharp corners where speed must be reduced.

P-Miniroundabouts: **Practice lesson mini roundabouts in built-up area**

Previous name	Modus	Duration (minutes)	Feedback
C11	Manual	25	yes

In this lesson, with a lot of traffic, mini roundabouts are trained in an urban environment.

The main issues during this lesson:
- First the student has to take the first exit on two different types of mini roundabouts
- Then the student takes the second exit on both types of mini roundabouts
- And finally the student takes the third exit on both types of mini roundabouts

So, the student drives 6 times on a roundabout with traffic.
In addition there are other situations such as:
- The student encounters 32 other (non-roundabout) intersections, of which 13 are straight through, 8 are right turns, and 11 left turns.
- These can be of equal priority, or on major roads with priority or stop signs, T-junctions with traffic from right, etc.
- One-way roads and no-entry signs.
- Cars from left that drive on (in contrast to traffic rules).
- Stopping for traffic lights (red or yellow).
- Obscure intersections.

Al in all this is a difficult lesson because a lot of complex traffic situations must be negotiated. In a number of cases, it will be required to do this lesson twice.
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P-Highway: **Practice lesson highway**

Previous name	Modus	Duration (minutes)	Feedback
D12	Manual	17	yes

This is a lesson on a motorway with a high traffic intensity, and with driving at high speed. Especially merging and leaving the motorway, together with the proper use of the indicator and position on the road are important aspects in this lesson.

The most important situations trained are:
- 6 x merging on a motorway.
- 6 x leaving the motorway.
- 2 x driving straight through with merging traffic that enters the motorway.This traffic must be given the opportunity to enter the motorway.
- 1 x traffic-jam on the motorway where the student has to make a full stop.
- 1 x traffic-jam while entering the motorway.
- There are a few merging situations where there's a large truck that drives on the motorway and arrives at the acceleration lane at the same time as the student, resulting in a conflict that has to be resolved by the student.
- The student is overtaken frequently and has a lot of opportunities to overtake himself.
- There can be large speed differences between the left and right lanes.
- Student has to take care of vehicles in front that greatly vary in speed and keep a safe headway.

P-Roundabouts: **Practice lesson large roundabouts and trunk roads**

Previous name	Modus	Duration (minutes)	Feedback
D13	Manual	25	yes

This lesson takes place outside built-up areas in situations of high traffic density where speed is high. It concerns driving on large roundabouts, single carriageways, a dual carriageway and a motorway.

The most important situations in this lesson are:
- 1 x large roundabout first exit
- 2 x large roundabout second exit
- 2 x large roundabout third exit
- Single carriageway with oncoming vehicles
- 2 x turn right on single carriageway
- 1 x turn left on single carriageway
- 1 x entering dual carriageway
- 1 x entering motorway and 1 x leaving the motorway.
- Speed limits on motorways, trunk roads, roads outside built-up areas and local speed limits.

P-Motorways: **Practice lesson dual carriageways and multi-way intersections**

Previous name	Modus	Duration (minutes)	Feedback
D14	Manual	27	yes

This lesson concerns driving on dual carriageways (trunk roads) and crossing and turning left/right on multi-way intersections. On some intersections the central reserve (median) is large enough to position the car while on other intersections this is not the case. When the central reserve is not large enough, the student has to wait until traffic from both left and right is clear before he crosses the intersection or turns left. When the central reserve is large enough, crossing the intersection proceeds in two steps:
- When left is clear, drive to the central reserve and wait.
- When right is clear, cross the intersection or turn left.

The most important situations in this lesson are:
- Crossing dual carriageways with high traffic density with narrow central reserve.
- Crossing single carriageway with high traffic density.
- Entering motorway.
- Leaving motorway.
- Large roundabout second exit.
- Turn right on dual carriageway via deceleration lane (choose correct lane position).
- Crossing dual carriageways with high traffic density with wide central reserve.
- Entering dual carriageway with high traffic density and narrow central reserve via left turn.
- Leaving dual carriageway by turning left on a deceleration lane (choose correct lane position).

When leaving the dual carriageway by turning left, it is important to mind traffic from rear and choosing the proper lane position in time.

P-HighwayFog: **Practice lesson motorway with fog banks**

Previous name	Modus	Duration (minutes)	Feedback
D15	Manual	17	yes

This lesson is comparable with P-Highway: the student follows the same route and the lesson contains comparable situations. The student drives in fog and fog banks in which speed and headway must be adapted to the local circumstances and sight distance. Because adapting behaviour to varying circumstances is important in this lessons, it must be regarded as a more advanced lesson.

The P-Mix lessons

There are 5 P-Mix lessons of approximately 20 minutes each. Every P-Mix lesson consists of a part in a built-up area, a part outside a built-up area and sometimes a piece of motorway or trunk road. The purpose of these lessons is to increase driving experience on different types of road. During the P-Mix lessons, there's no instruction anymore, although the VI does give feedback when the student commits an error.

P-Mix1:   Practice lesson Mix

Previous name	Modus	Duration (minutes)	Feedback
E16	Manual	20	yes

The lesson proceeds as follows:
- Start in a town
- One-way roads town square
- Mini roundabout third exit
- Mini roundabout second exit
- Leave built-up area
- Large roundabout third exit
- Enter motorway
- Leave motorway
- 80 km/h road
- Cross single carriageway (trunk road)
- Enter dual carriageway (turn left)
- Leave dual carriageway (turn left) via deceleration lane

P-Mix2:   Practice lesson Mix

Previous name	Modus	Duration (minutes)	Feedback
E17	Manual	20	yes

The lesson proceeds as follows:
- Enter motorway
- Leave motorway
- Enter motorway
- Leave motorway
- Large roundbout first exit
- 80 km/h road
- Enter built-up area
- Drive through town
- Leave built-up area
- Large roundbout first exit
- Dual carriageway
- Leave dual carriageway (turn left)

P-Mix3:   Practice lesson Mix

Previous name	Modus	Duration (minutes)	Feedback
E18	Manual	20	yes

The lesson proceeds as follows:
- Start in a town
- Residential/shopping area low speed
- Drive through town

- Leave built-up area
- Large roundabout second exit
- Single carriageway
- Leave single carriageway by turning left
- Enter motorway
- Leave motorway
- Large roundabout second exit
- Dual carriageway
- Leave dual carriageway (turn left)
- Approach en enter dual carriageway (turn left) with wide central reserve
- Leave dual carriageway (turn right) via deceleration lane

P-Mix4:   **Practice lesson Mix**

Previous name	Modus	Duration (minutes)	Feedback
E19	Manual	20	yes

The lesson proceeds as follows:
- Start in a town
- Bending major road
- Mini roundabout second exit
- Mini roundabout second exit
- Leave built-up area
- Large roundabout third exit
- Enter motorway
- Leave motorway
- Enter motorway
- Leave motorway
- Enter motorway
- Merging vehicles on motorway
- Leave motorway

P-Mix5:   **Practice lesson Mix**

Previous name	Modus	Duration (minutes)	Feedback
E20	Manual	20	yes

The lesson proceeds as follows:
- Enter motorway
- Leave motorway
- Large roundabout first exit
- Enter built-up area
- Drive through town
- Traffic lights
- Leave built-up area
- Large roundabout first exit
- Dual carriageway
- Leave dual carriageway (turn left)
- Enter single carriageway
- Leave single carriageway (turn right)

Test lessons

There's a total of 10 test lessons that vary between 5 and 10 minutes. Some tests emphasize driving in town, while others emphasize driving on a motorway or roundabout. Each test can contain different road categories, just as in the P-Mix lessons. A characteristic feature of all T lessons is that there's no feedback of the VI. The VI only gives route instructions and instructions for driving off (at the start of the test) and stopping (at the end of the test). However, behaviour is observed by the VI and results are sent to the Student Assessment System while at the end of the lessons, a grade between 0 (lowest) and 10 (highest) is given.

T-1:   Test

Previous name	Modus	Duration (minutes)	Feedback
Ex21a	Manual	5	no

The test proceeds as follows:
- Start in a town
- One-way roads town square
- Mini roundabout third exit
- Mini roundabout second exit

T-2:   Test

Previous name	Modus	Duration (minutes)	Feedback
Ex21b	Manual	10	no

The test proceeds as follows:
- Leave built-up area
- Large roundabout third exit
- Enter motorway
- Leave motorway
- 80 km/h road
- Cross single carriageway
- Enter dual carriageway (turn left)
- Leave dual carriageway (turn left)

T-3:   Test

Previous name	Modus	Duration (minutes)	Feedback
Ex22a	Manual	9	no

The test proceeds as follows:
- Enter motorway
- Leave motorway
- Enter motorway
- Leave motorway
- Large roundabout first exit
- 80 km/h road

T-4:   **Test**

Previous name	Modus	Duration (minutes)	Feedback
Ex22b	Manual	10	no

The test proceeds as follows:
- Enter built-up area
- Drive through town
- Leave built-up area
- Large roundabout first exit
- Dual carriageway
- Leave dual carriageway (turn left)

T-5:   **Test**

Previous name	Modus	Duration (minutes)	Feedback
Ex23a	Manual	10	no

The test proceeds as follows:
- Start in a town
- Residential/shopping area low speed
- Drive through town
- Leave built-up area
- Large roundabout second exit
- Single carriageway
- Leave single carriageway (turn left)

T-6:   **Test**

Previous name	Modus	Duration (minutes)	Feedback
Ex23b	Manual	9	no

The test proceeds as follows:
- Enter motorway
- Leave motorway
- Large roundabout second exit
- Dual carriageway
- Leave dual carriageway (turn left)
- Approach and enter dual carriageway (turn left) with wide central reserve
- Leave dual carriageway (turn right) via deceleration lane

T-7:   **Test**

Previous name	Modus	Duration (minutes)	Feedback
Ex24a	Manual	6	no

The test proceeds as follows:
- Start in a town
- Bending major road
- Mini roundabout second exit
- Mini roundabout second exit

T-8:   Test

Previous name	Modus	Duration (minutes)	Feedback
Ex24b	Manual	11	no

The test proceeds as follows:
- Leave built-up area
- Large roundabout third exit
- Enter motorway
- Leave motorway
- Enter motorway
- Leave motorway
- Enter motorway
- Merging vehicles on motorway
- Leave motorway

T-9:   Test

Previous name	Modus	Duration (minutes)	Feedback
Ex25a	Manual	11	no

The test proceeds as follows:
- Enter motorway
- Leave motorway
- Large roundabout first exit
- Enter built-up area
- Drive through town
- Traffic lights

T-10:   Test

Previous name	Modus	Duration (minutes)	Feedback
Ex25b	Manual	10	no

The test proceeds as follows:
- Traffic lights
- Leave built-up area
- Large roundabout first exit
- Dual carriageway
- Leave dual carriageway (turn left)
- Enter single carriageway
- Leave single carriageway (turn right)

Special lessons

NOT AVAILABLE IN ALL LANGUAGES

S-TownB: Special lesson in built-up area with bicyclists

NOT AVAILABLE IN ALL LANGUAGES

Previous name	Modus	Duration (minutes)	Feedback
new	Manual	17	yes

This is a lesson in a town environment with high traffic density that uses the same route as P-Town. In addition to the traffic interactions with vehicles, this lesson contains a lot of interactions with bicyclists. The bicyclists don't always drive according to the proper traffic rules. Because, in addition to other cars, attention must be given to bicyclists who often display unpredictable behaviour, this lessons has a larger task load compared to P-Town. Because of that, this lesson should be done at the end of the simulator training period or after the lesson P-Town.

The following bicycle scenarios occur:
- Bicyclists from right that pass cars from right on the right side and are thus difficult to see.
- Oncoming bicyclists that are being overtaken by cars that swerve to the left while overtaking. This requires the student to drive more to the right.
- Bicyclist from right who has to stop for a priority sign but drives on anyway.
- Bicyclist who swerves to left if student wants to overtake.
- Bicyclists from left who don't give right of way, forcing a vehicle in front to stop unexpectedly.
- Oncoming bicyclists who turn right while the student turns left.
- Bicyclists in the same direction as student who drive straight on while student turns right: he has to give them the right of way.
- Three bicyclists blocking the road by driving next to each other.
- Bicyclists from right driving next to each other (have priority).
- Bicyclists from left ignores red traffic light while student drives on for green light.
- When turning right and while stopping for stop sign, bicyclist passes on the right and turns left in front of the student.
- Bicyclists leaving from an exit.
- Bicyclists from left on a major road.

S-MiniroundaboutsB: **Special lesson mini roundabouts in built-up area with bicyclists**

NOT AVAILABLE IN ALL LANGUAGES

Previous name	Modus	Duration (minutes)	Feedback
new	Manual	25	yes

This lesson follows the same route as P-Miniroundabouts, but in addition to the traffic interactions with cars, this lesson contains a lot of interactions with bicyclists. Especially during driving on mini roundabouts, it is important to pay attention to bicyclists because sometimes they must be given priority while in other occasions this is not the case. Because, in addition to other cars, attention must be given to bicyclists who often display unpredictable behaviour, this lessons has a larger task load compared P-Miniroundabouts. Because of that, this lesson should be done at the end of the simulator training period or after the lesson P-Miniroundabouts.

The following bicycle scenarios occur:
- Bicyclists on a bicycle track while student enters the roundabout.
- Bicyclists on a bicycle track while student leaves the roundabout.
- In some case, the bicyclists have the right of way, and in some cases (depending on traffic signs and road markings) they don't have the right of way.

S-HP1:   **Special lesson Bicyclists Hazard Perception 1**

NOT AVAILABLE IN ALL LANGUAGES

Previous name	Modus	Duration (minutes)	Feedback
new	Manual	20	yes

This lesson is in a town and there are a large number of situations in which bicyclists behave unexpectedly. The student learns to react appropriately to bicyclists and to be prepared for unexpected behaviour of bicyclists.

The following bicycle scenarios occur:
- Bicyclists from right.
- Oncoming bicyclists with swerving vehicles that overtake the bicyclists.
- Bicyclist who swerves to left if student wants to overtake.
- Oncoming right tuning bicyclists while student turns left.
- Bicyclists from left take priority.
- Oncoming bicyclist on one-way road forcing student to perform an evasive action.
- Bicyclists in the same direction as student who drive straight on while student turns right: he has to give them the right of way.
- Bicyclists driving next to each other forcing the student to stay behind them.
- Bicyclists driving next to each other from opposite direction.
- Bicyclists driving next to each other from right.
- Bicyclists ignore red light.
- Bicyclists from left on major road.
- Bicyclists when leaving roundabout, student has priority.
- Bicyclists when leaving roundabout, student has no priority.
- Bicyclist from right takes priority and passes parked car. This car drives off and as soon as it has overtaken bicyclist, the bicyclist stops in front of the student.
- Oncoming bicyclists on bicycle lane.
- Bicyclists emerge suddenly from between parked cars.
- Bicyclists driving in front of student, drive straight on while student turns right.
- Bicyclists from left and right on major road.
- Bicyclists from exit does not give priority.

- Oncoming bicyclists are being overtaken in a road curve by a car, forcing the student to perform an evasive action.
- Bicyclists from right turn to left.