

# Towards evidence-based road safety education in The Netherlands

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## Abstract

Road safety education (RSE) is an essential part of the integrated approach to traffic safety. It teaches and corrects behavior that is clearly related to traffic safety. In the field of road safety education in the Netherlands, a vast amount of more than 170 educational products and programs are available<sup>1</sup>. On a continuous basis, new educational initiatives are being developed and implemented. Since 1998 there has been a movement in the Netherlands to give more structure to the abundance of ongoing road safety activities within the framework known as Lifelong Road Safety Education (LRSE). As a last step in this process, in the years 2010 – 2013, a road safety education checklist was developed which provides a step-by-step plan for the design and assessment of RSE interventions. Since 2013 120 interventions have been assessed using this RSE checklist.

## Keywords

Road safety education, life-long learning, evidence-based interventions, process and outcome evaluation

## 1. Introduction

A big challenge is how to guarantee the quality of the road safety education (RSE) interventions that are being developed and implemented. This is why, in the years 2010 – 2013, in the Netherlands a road safety education checklist was developed which provides a step-by-step plan, inspired by the Intervention Mapping methodology (Bartholomew et al., 2011), for the design and assessment of RSE interventions. The Intervention Mapping methodology provides a framework for theory- and evidence-based health promotion program planning and addresses this challenge by providing a systematic and stepwise approach to planning interventions. This health promotion approach was translated to a road safety promotion approach. The RSE checklist should motivate intervention designers and funding organizations to develop evidence-based road safety programs and to spend more attention to quality assurance, evaluation and improvement. Important aim is that more RSE interventions are being developed according to the 10 steps of this checklist and more interventions are being evaluated and monitored on a regular basis. So that in the end, RSE interventions are increasingly evidence-based.

<sup>1</sup> See website: <https://www.crow.nl/kennis/tools-mobiliteit-en-gedrag/over-de-toolkit-permanente-verkeerseducatie-1>.

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## 2. Background of Road Safety Education in The Netherlands

RSE already has a long tradition in the Netherlands. One of the still existing milestones – a bicycle safety test for children in primary school – goes back more than 60 years in time. During these 60 years, a lot of educational activities and programs have been developed and implemented inside as well as outside schools. However, there was not much structure and coherence in the activities in the field of RSE. Since the beginning of this century this has changed. Since then, RSE in the Netherlands is based on the concept of ‘lifelong learning’ or ‘lifelong road safety education’ (LRSE; van Betuw & Vissers, 2002).

### 2.1 Target groups of road safety education

The main objective of LRSE is that every traffic participant receives know-how, skills and attitudes that are necessary for safe participation in traffic at important shifts in modes of traffic participation. This means that during a person’s life at important shifts people will have to receive the RSE that is necessary for participating in traffic in a safe and responsible way. Therefore, LRSE does not focus only on children, but includes traffic participants of all age groups “from the cradle to the grave”.

Within the LRSE concept, six target groups are distinguished (Betuw, van & Vissers, 2002):

- Preschool education (0 – 4 years)
- Primary school education (4 – 12 years)
- Secondary school education (12 – 16 years)
- Novice drivers (moped drivers as well as car drivers and motorcyclists; 16 – 25 years)
- License holders (25 – 60 years)
- Elderly traffic participants (60 years and older)

### 2.2 Educational goals

Specific educational goals have been developed for each target group (Vissers, 2004). As a development structure, the matrix with Goals for Driver Education (GDE) was used. The constructivist GDE is still considered theoretical best practice for driver education and describes knowledge and skills that are critical to the development of safe practices in traffic (Siegrist et al., 1999). The GDE consists of four hierarchical levels to be taught across three competencies. The first two levels are basic manoeuvring skills and mastery of traffic situations. Manoeuvring skills concern the interaction between the traffic participant and the mode of transport and requires basic skills that allow for control of the transport used. Mastery of traffic situations is the development of skills required to interact with other road users including the application of road rules. The top two levels (of the four hierarchical levels) are related to the development of higher-order skills: personal characteristics and aptitudes (e.g., self-regulation, peer-group norms) and trip-related context (e.g., driving goals, planning). The first of the three competencies that is taught for each of the four levels is knowledge and basic skills. The other, two competencies allow for the development of higher-order skills at each hierarchical level: namely, risk-awareness and self-evaluation.

After development of the LRSE concept and the definition of specific educational goals, the need for an overview of the state-of-the-art in Dutch road safety interventions grew. In 2008, the ‘toolkit road safety interventions’ was created: a web-based tool which could be used to select the best fitting interventions for the different age groups. Through the years the website has been further developed and today the website comprises the data of more than 170 RSE interventions.

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### 3. Development of Road Safety Education checklist

To guarantee the quality of the RSE interventions that are being developed and implemented, in the years 2010 – 2013, a road safety education checklist was developed which provides a step-by-step plan, inspired by the Intervention Mapping methodology (Bartholomew et al., 2011), for the design and assessment of RSE interventions. The RSE checklist consists of the following 10 steps:

1. Problem analysis
2. Target group specification
3. Educational goals
4. Didactical principles
5. Content and lay-out of teaching materials
6. Assessment and evaluation within the intervention
7. Intervention manual
8. Implementation of the intervention
9. Process evaluation
10. Outcome evaluation

Each step consists of several sub steps. For each step, the scores on the sub-steps are summed-up and converted into an average overall score which can range from 1 (step not substantiated) to 5 (step very well substantiated).

The purpose of the checklist is threefold:

1. To give support to intervention designers to develop their programs according to a step-by-step approach (see Figure 1). This means the intervention should be focused on problem behaviour that is related to road safety (step 1), should be targeting the group that displays the problem behaviour (step 2), should be based on well-defined and clear educational goals (step 3) and should apply the right didactical principles and methods to reach these goals (step 4). Furthermore, the intervention should have the right look (use the best fitting means of communication and have an attractive lay-out) and the information should be correct (step 5), should have clear instructions on how to carry out the intervention (step 7) and should have well-described recommendations for the implementation (step 8). With steps 6, 9 and 10 the evaluation of the intervention is covered: as an integral part of each individual intervention (step 6) and on an aggregated level in the form of a process evaluation (step 9) as well as an outcome evaluation (step 10).
2. To give funding organisations insight into the quality of RSE interventions, to justify their choices to subsidise a program or not.
3. To stimulate the assessment of the outcomes: for both developers and funding organisations, to measure effects, to link the efforts put into the interventions to road safety.

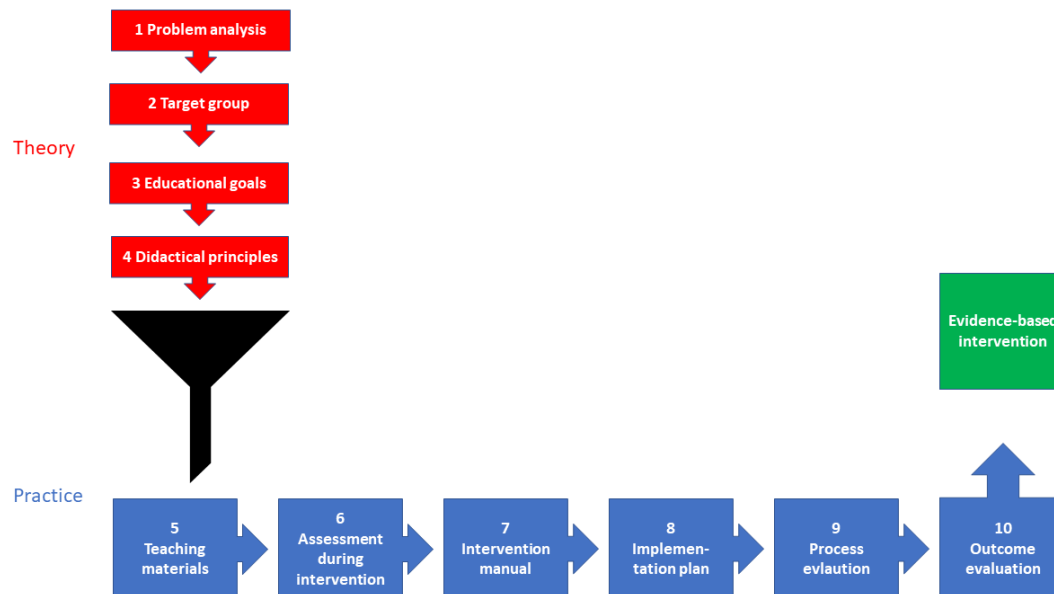


Figure 1 RSE checklist: step-by-step approach

## 4. Implementation

In 2013 the implementation of the checklist assessment process started. Through the years the process was further developed and, on a regular basis, small adjustments have been made in the process. In this way, the assessment procedure has been improved through the years. In the first years, it took much time to convince intervention designers to cooperate. But through the years they got more committed and the process got streamlined more and more. Essential within the assessment process is a personal interview with the designer(s) of the intervention. In this way scores on de 10 steps can be discussed and suggestions are given on how to improve the intervention.

## 5. Results

Since 2013 the RSE checklist is being applied in practice in the Netherlands. In the years 2013-2022 120 out of the 170 RSE interventions (70%) described in the RSE Toolkit have been evaluated.

As was expected, the quality of RSE interventions increased over the years in which the checklist was implemented. The overall score increased with 28%: from 3.6 in 2012 to 4.6 in 2021 (using a 5-point scale). See Table 1 for an overview of the average checklist scores per year.

*Table 1 Average checklist score from 2012 to 2021 (an average score was calculated based on the interventions assessed in the concerning year)*

Year	Average score
2012	3.6
2013	3.7
2014	3,7
2015	3.6
2016	3.9
2017	4.2
2018	4,7
2019	4,4
2020	4,3
2021	4,6

The first four steps of the checklist are crucial, because in these steps important choices have to be made about the traffic safety problem to be tackled (step 1), the specific target group that shows the problem behavior (step 2), the specific learning goals for behavioral change (step 3) and the methods and techniques to change the problem behavior (step 4). In 2022 most interventions score satisfactory on these first four steps, meaning that they have a score of 4 or 5 (see Table 2).

*Table 2 Assessment results on step 1 to 4 of the RSE Checklist*

Checklist step	Score 1 or 2 'not or badly substantiated'	Score 3 'intermediate'	Score 4 or 5 '(very) good substantiated'
Step 1: Problem analysis	5 (4,2%)	9 (7,5%)	106 (88,3%)
Step 2: Target group	0 (0%)	2 (1,7%)	118 (98,3%)
Step 3: Educational goals	7 (5,8%)	20 (16,7%)	93 (77,5%)
Step 4: Didactical principles	2 (1,7%)	7 (5,8%)	111 (92,5%)

In 2022 in 48 of the 120 interventions (40%) that have been assessed an evaluation study was carried out. Of the 48 interventions that have been evaluated in 35 cases step 10 received a score of 4 or 5. In most cases a (quasi-) experimental design was used (pre- and after measurement with involvement of an experimental and a control group). Although the percentage of interventions that have been properly evaluated has more than doubled (from 12% in 2017 to 29% in 2022), there still is a great number of interventions for which there is no evidence that these will have positive effects on traffic safety. There could even be negative effects. Without a sound evaluation, there is no insight into the actual safety changes in the behavior of road users.

### Standardized evaluation: computerized testing in primary schools

Standardized test batteries are essential tools for systematically monitoring and evaluating interventions for different target groups. In 2018 a standardized test battery was developed to measure the higher-order cycling skills of children 11 and 12 years of age at the end of primary school

(Twisk et al., 2018). The aim is to use this test battery to measure the effectiveness of road safety education programs in primary schools all over The Netherlands. In this way quality of RSE in primary school is monitored in a systematic way: possible shortcomings can be tracked down and necessary countermeasures can be taken.

## Discussion

Between 2012 and 2022 120 interventions have been gone through the assessment process. The results so far indicate that the checklist is a useful design and assessment tool. The checklist results give insight into the carefulness and the precision by which an intervention is designed and implemented.

The RSE checklist project showed that the assessment process did stimulate all parties involved in RSE to make more explicit choices on the important steps as described in the RSE checklist. The process evaluation showed that personal involvement of all RSE parties is important. The interview in which designers, governmental authorities and independent experts discuss the checklist steps is an essential part of the assessment process. In this way, especially designers gain confidence in the way their interventions are assessed and they get a better insight in how to improve their interventions. This eventually leads to the desired commitment of developers to the assessment process. Combination of theoretical and practical knowledge and expertise in the interview group is essential.

Through the years, designers have become acquainted with subject matter of the RSE checklist. They have experienced that by following the principles of the checklist it is easier to make well-founded choices about the goals, the contents and the methods of the interventions. In fact, a lot of designers use the RSE checklist when they are setting up new interventions.

The provincial road safety bodies are responsible for allocating funding for RSE in their regions. Most regional apply the RSE checklist or incorporate the checklist in their selection procedure to decide which RSE interventions will or will not be subsidized. This means that this decision process has become more transparent and is more based on objective criteria.

To conclude, the study suggests that the RSE checklist assessment process has led to an increase of the quality of RSE interventions in the Netherlands. All the important RSE parties are involved in the process and are committed to the principles of the RSE quality control procedures. Over the 10 years of implementing the RSE checklist, the overall quality score grew from 3.6 to 4.6 (5-point scale). The percentage of interventions that have been properly evaluated has more than doubled from 12% in 2017 to 29% in 2022. Improvement on this point is still needed. Evaluations should be an integral part of the development and implementation process.

In 2021 a process of re-assessment of interventions has started. Interventions should be monitored on a continuous basis. This means that, after a 5-year period, interventions will have to be re-evaluated.

Because of the Covid-19 pandemic, the face-to-face checklist interviews with designers have been replaced by online interviews (using Teams). This has proven to be an efficient and reliable way to conduct the interviews. At the moment, the online interviews are the standard way to do the assessments.

The document with educational goals for each target group was developed in 2004. This document is updated now. More attention will be given to higher-order skills. In stead of a paper document, a digital web-based version will be developed which will be more accessible for developers and designers of interventions.

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