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## **EFFECTIVE REMOTE TEACHING AND LEARNING**

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What works in education

## How effective is remote teaching and learning?

With school buildings fully or partially closed and many teaching staff absent, delivery of education has to a large extent shifted to remote and in particular digital forms. Not only in the Netherlands, but in all countries.

Various review studies have shown that remote teaching and learning can be effective.<sup>1,2</sup> In most sectors it is less effective, however, than in-person education. Higher education seems to be the one exception, where some forms of remote teaching and learning appear more effective than in-person education.<sup>2,3</sup> The research literature further shows this effectiveness varies widely with the form in which it is offered and between pupils or groups of pupils. Pupils who experience difficulty in regular education are more likely to fall behind or drop out with remote teaching and learning.

This review article describes how to design effective remote teaching and learning. First, it describes six risks of remote teaching and learning. Next, it looks at the components of effective remote lessons and effective approaches at school level. It also describes how schools can involve parents in remote teaching and learning. Research insights set out in this article hold true for all sectors, from primary to higher education. For the sake of readability, this article uses the terms 'pupil', 'teacher' and 'school' to refer equally to students, lecturers and educational programmes.

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# **1 Risks of remote teaching and learning**

The massive surge in remote teaching and learning as a result of the COVID-19 pandemic has shed further light on the risks of remote education. The research literature defines six risks of remote teaching and learning.<sup>2</sup> Three risks pertain to pupils and three to schools and educational programmes.

## **1.1 Risks for pupils**

Remote teaching and learning poses three risks to pupils: (1) learning loss, (2) diminished well-being and (3) limited education participation.<sup>1,2</sup> The latter risk partly impacts the first two.

### *1.1.1 Learning losses*

With the major shift in 2020 and 2021 from in-person to remote teaching and learning, research in the Netherlands and elsewhere once again shows learning losses in pupils. Among Dutch primary school pupils, this amounted to an average loss of 6 to 8 weeks in the first half of 2020.<sup>4,5,6</sup> Pupil test scores before the summer of 2020 were consequently lower relative to 2018 and 2019.<sup>7</sup> Comparable learning losses have been seen in Flanders<sup>8</sup> and the UK.<sup>9</sup> Large disparities exist between pupils, with losses most prevalent among vulnerable children and those who have difficulty keeping up with the curriculum.<sup>4,5,6,8,9</sup> The extent of learning loss furthermore varies widely among primary schools; some actually show increased progress.<sup>5</sup>

### *1.1.2 Diminished pupil well-being*

Remote teaching and learning can lead to reduced well-being in some pupils. This is less of an issue where schools actively contribute to pupil well-being. Dutch education professionals indicate pupil well-being is now among the main concerns at their schools.<sup>13</sup> Social isolation, loneliness and personal safety are bigger problems than when pupils attend school in person. The risk is even greater for pupils whose well-being was already poor before the advent of remote teaching and learning.<sup>10</sup>

### 1.1.3 *Less active participation in learning*

Another risk is that of less active or non-participation in remote teaching and learning. This risk applies to three distinct groups of pupils:

- Pupils with no access to digital resources or space  
Pupils who have no access to digital resources, spaces and/or study materials at home are impeded in their participation in remote teaching and learning. Research in the Netherlands shows some pupils are unable to take part in remote teaching and learning due to a lack of digital resources and space.<sup>12</sup>
- Pupils who stay home or disconnect  
Schools have lost contact with some pupils during the COVID-19 crisis and others are still not attending school for fear of contagion. These pupils tend to take limited or no part in remote teaching and learning.<sup>11</sup>
- Unmotivated pupils  
Keeping pupils motivated is a bigger challenge in remote learning contexts. If pupils feel unmotivated they are at risk of disengaging.<sup>11</sup> An exception here is a small group of pupils for whom remote teaching and learning in a safe home setting seems to boost motivation.

## 1.2 **Risks for schools and educational programmes**

At the school level, remote teaching and learning also entails three risks: (1) poor continuity, (2) a high workload and safety issues for teachers and (3) suboptimal delivery of subjects with a large practical component.

### 1.2.1 *Poor teaching continuity*

The physical closure of schools has necessitated a switch to remote teaching and learning. For schools and educational programmes, the consequent lack of in-person contact with teachers and in many cases abbreviated and modified lessons are making it tough to preserve learning continuity.<sup>11</sup>

### 1.2.2 *High workload and safety issues for staff*

Many teachers are currently having to design and create remote teaching and learning content alongside or in addition to their regular teaching tasks. This extra work is coming at a time when teachers already face more challenges due to the COVID-19 crisis and schools are dealing with higher than average teacher absences.<sup>10,11</sup> Studies show remote teaching and learning has increased workloads for not only teachers but school leaders as well.<sup>11,12</sup> Teachers also report diminished well-being and fears about safety.<sup>12</sup>

*1.2.3 Suboptimal delivery and quality of applied and practical subjects, work placements and associated assessments*

Remote teaching and learning poses a particular challenge for applied subjects (learning to write and fine motor skills development in primary education), practical subjects (Dutch VMBO and MBO-level education), work placements (Dutch VMBO, HBO and WO-level education) and the testing and examination of applied and practical subjects.<sup>11</sup> Some practical assignments simply cannot be done remotely. Finding work placements has become immensely difficult in some sectors and the testing/examination of practical subjects is tricky at best, impossible at worst.

## **2 Features of effective remote lessons**

Remote teaching and learning can be effective. The key is a combination of good remote lessons and targeted school-level measures. A review study<sup>2</sup> by the Education Endowment Foundation (EEF) concluded four factors are critical for remote teaching and learning: (1) teaching quality, (2) peer interaction, (3) supporting pupils to work independently and (4) additional guidance for disadvantaged pupils.

### **2.1 Teaching quality is essential**

Teaching quality is even more important in remote teaching and learning than it is in the physical classroom.<sup>13</sup> The mechanisms of good teaching are in themselves no different from those used in in-person classes, only they matter more in the digital context.<sup>2</sup> This constitutes a combination of:

- clear explanations attuned to pupils' knowledge and skills level;
- organization of structure, clarity and calm;
- pupil involvement in learning;
- provision of exercises;
- provision of feedback.

The presence of these elements of effective teaching is more important than how or when classes are taught. Clear explanations can be provided live or by video (pre-recorded or already available). What matters is that they clearly follow on from what pupils have already learnt. Certain features of effective teaching are more complicated to realize in a remote context versus in-person, such as encouraging pupils to think aloud and volunteer answers, and also the provision of feedback.<sup>13</sup> Feedback can consist of: (1) stating when answers are correct/incorrect, (2) providing correct answers, (3) explaining correct answers and (4) explaining why particular answers are incorrect. Explaining correct answers is especially effective.<sup>31</sup>

### **2.2 Organize peer and teacher-pupil interactions to boost pupil motivation**

The online environment is more distracting and less cohesive for pupils and that can reduce their motivation.<sup>11</sup> Interactions with fellow pupils as well as their teacher can help boost motivation and improve learning performance.<sup>26,29</sup> Research studies show that communication and collaborative applications foster pupils' interactions with their peers and teacher.<sup>17</sup> In both instances the interactions can be synchronous, through video calls or chats, or asynchronous, via email, Google Drive or polling systems.

Interactions can take place both during digital lessons or outside them (before, after or at other times). Class-time interactions designed and implemented by the teacher for that purpose have the greatest effect on learning performance.<sup>26</sup> This entails actively soliciting pupils' involvement in the lesson, posing frequent questions and asking pupils to respond to their peers. Outside class, peer tutoring can be used. This method has pupils work in pairs or small groups to assist each other.

To design effective collaborative activities, whether for regular in-person or digital classes, four distinct elements are needed: (1) positive mutual reliance between pupils, (2) individual responsibility, (3) peer interactions and (4) giving and receiving detailed explanations. A good example incorporating all four elements is described in a study where pupils had to create a visual representation of the concept of 'photosynthesis' as part of a biology lesson.<sup>27</sup> First, each pupil made a drawing on their own (e.g. using the Paint application). Next, each pupil used their drawing to explain the concept of 'photosynthesis' to the rest of the 'group'. They then reviewed similarities and differences between their drawings and finally made one collective drawing. Overall, this collaboration had a positive effect on learning performance.

In addition to interactions related to lesson content, social interaction between pupils is crucial as well. Social interactions enhance pupil well-being.<sup>44,45</sup> They also enhance motivation to learn.<sup>29</sup>

### **2.3 Have pupils work independently**

During normal in-person classes, pupils routinely do independent work. The teacher is in the classroom and can provide structure and support. Independent work is an effective part of remote teaching and learning as well. But compared to the classroom setting, there's a larger responsibility on pupils to create structure and apply the correct learning strategies themselves.<sup>18</sup>

In remote teaching and learning contexts, teachers have various options to support pupils to work independently. This includes simplifying tasks, breaking them down into subtasks and/or modifying them to require fewer complex steps, knowledge and tools.<sup>28</sup> The same modes of instruction can be used as for in-person lessons, such as text outlines or fraction cards. Teachers can also offer specific learning strategies to help pupils carry on with tasks on their own, such as explaining the learning material to someone else at home or to a classmate, or drawing a mind map to help organize given concepts or ideas.<sup>18</sup> Many online programmes also offer aids for independent work.<sup>21</sup> These include instruction videos providing more detailed explanations, pop-up hints while doing assignments and pop-up questions after completing them. Online programmes that implement some form of support have a significant positive impact



on pupils' learning performance.<sup>20,21,29,30,39</sup> Also important is that pupils regularly experience successes and get feedback on their work.<sup>31</sup>

Tip:

**What do pupils need to know to do online assignments?**

When pupils do assignments online, it's crucial they understand:

- what they're supposed to do;
- how to get help from the teacher;
- how to get feedback on their completed work and exercises.

To help pupils who may get stuck, it's a good idea to set fixed times when they'll know they can get help. It can be useful to have them submit their additional questions beforehand so the teacher can prepare. And also to record their questions and the explanations, so others can benefit as well.

As a further stimulus for independent work, teachers can use digital applications that let pupils get extra practice and apply what they know. As well as getting them to do more exercises, this can boost the quality of their work. A simple example of apps that encourage pupils to practise more and remember key information are polling systems (quiz apps) for mobile phones and tablets like Kahoot, Quizlet, Nearpod and LessenUp.

Alongside added opportunities to learn, some digital tools offer built-in assessments and tailor the content of exercises to give pupils more of a challenge or additional support. The main advantage of these adaptive programmes is that they allow support to be personalized.<sup>21</sup> They can assess pupils' knowledge and comprehension with a good degree of accuracy and can adjust the content of exercises to ensure pupils are working at the appropriate level. While apps like these provide extra learning opportunities for pupils at risk of falling behind, as with any form of technology their impact depends on a teacher's ability to implement them effectively and how well they match with traditional modes of instruction.<sup>41</sup> Most such programmes were of course designed to provide supplementary support – as replacements for other interventions to help pupils catch up, but not to replace traditional instruction. Examples of adaptive online programmes include Rekentuin, Taalzee, Words & Birds, Muiswerk and Snappet.

## **2.4 Additional guidance for disadvantaged pupils**

Some pupils do just as well in online learning as in the classroom, a few may even do slightly better, but on the whole pupils' performance is poorer in the online environment, and that's especially true if they already have a learning disadvantage.<sup>11</sup>

Teachers consequently have to be extra attentive to these pupils' needs and to how to keep them engaged. They can pay extra attention to:

- Charting and monitoring cognitive results and social and emotional well-being.
- Intensifying contact with the pupils (e.g. offering extra help).
- Providing more support for independent work in the form of checklists, daily plans etc.
- Intensifying contact with parents (see §4.5).

### **3 Effective organization of remote teaching and learning at the school level**

For many schools, the organization of remote teaching and learning is a challenge. Studies show schools can do five things to be more effective: (1) ensure access to remote teaching and learning, (2) professionalize teachers, (3) monitor well-being, (4) organize compensation programmes and (5) involve parents (primary and secondary education).

#### **3.1 Access: organize access to remote education for all pupils**

Good access to technology is essential as poor access means pupils will not be able to take part in remote learning fully, or perhaps at all. The availability of digital resources is an absolute precondition: without a laptop or internet connection it's usually impossible to take digital lessons. Schools and educational programmes should ensure all their pupils have a laptop/tablet, internet connection and access to digital learning resources. It cannot be taken for granted that these resources are available, especially in underprivileged families. This is why these pupils tend to benefit less from remote teaching and learning than their privileged peers.<sup>11</sup>

Schools apply different strategies to create access to remote teaching and learning, particularly with regard to disadvantaged groups of pupils. They may arrange equipment for pupils, use some other resource that is available (e.g. e-learning by mobile phone) or let disadvantaged children come to school for instruction.

#### **3.2 Professionalization: help teachers build remote teaching skills**

As teachers and their teaching practices are the main factor determining whether remote education is effective, it pays off to support them and help them build their remote teaching skills. Many teachers have quickly gotten to grips with remote teaching and learning but are by no means experts yet. Support and professionalization can help them get better at it.

Teacher professionalization is among the most effective interventions in education, with both short and long-term effects.<sup>15</sup> Many schools are now making additional investments in teacher professionalization, particularly with a view to remote teaching and learning. This includes extra guidance and support for the use of new hardware and software applications (such as TEAMS, Google classrooms and Wikiwijs) and exploring ways to combine synchronous and asynchronous communication tools, or

in-person and remote education.<sup>14</sup> It also extends to professionalization activities like peer learning, sharing good practices and targeted training activities.

### **3.3 Well-being: monitor well-being of pupils, teachers and school leaders**

Now more than ever, schools and educational programmes need to closely monitor the well-being of pupils, teachers and school leaders to guard against the risk of diminished well-being associated with remote teaching and learning. With school leaders and teachers now facing additional challenges, it's vital that they can focus on things that really matter and have impact. What is urgent, and what can wait? Important tasks for school leaders are to provide clarity for their team, keep a finger on the pulse and encourage and support their teachers. Teachers, in turn, need to monitor what's going on with their pupils by for instance checking their homework and regularly asking how they are. If a pupil's situation becomes unstable or unsafe, being able to act quickly is key, whether that means letting them come to school after all or arranging some other safe location from which they can participate remotely.<sup>10</sup>

### **3.4 Compensation: organize additional support or compensation programmes for pupils who fall behind**

There are some pupils who do not thrive in remote education and wind up falling behind.<sup>3,4,5,6</sup> These pupils benefit from additional support and programmes designed to help them catch up. Schools can organize this by investing in additional teacher or parental help for these pupils<sup>18</sup> (mainly primary and special education), in compensation schemes<sup>19</sup> and in tutoring and summer schools,<sup>40</sup> alongside other forms of extra support. To be effective (rather than stigmatizing), the programmes have to target pupils' actual learning losses. Most schools have requested funds for additional support programmes,<sup>11,24</sup> mainly to address such gaps in school achievement.

In England, initial findings from a study among more than 2,500 primary and secondary school pupils shows online tutoring can be a powerful aid to help children impacted by school shutdowns.<sup>43</sup> This online tutoring programme mainly targets pupils from disadvantaged socioeconomic backgrounds. They receive online tutoring before, during or after school (approximately 60-90 minutes) from volunteer tutors who stay in regular contact with the school.

### **3.5 Parental involvement: involve parents in remote teaching and learning (primary and secondary education)**

A big issue for primary and secondary schools is how to engage with parents to help pupils during remote teaching and learning. This is a challenge particularly with

families that are ordinarily also less involved in their child's learning and/or don't have sufficient access to digital resources. Studies show there are several effective ways to involve and support parents.

One approach that works is to communicate about lessons, assignments and learning material in a way that's simple and straightforward. This means making assignments and learning materials as easy as possible for parents to access, whether through a clear, user-friendly digital portal or in writing. The less complex, the better. Using only one channel keeps it clear for parents where to find information.<sup>32</sup> Schools can communicate with parents through their own portal or by email, text message or a mobile messaging service (e.g. WhatsApp, Signal or via online communication platforms like Klasbord, Schoolpoort, Parro or Social Schools). Texts and WhatsApp messages may be easier than email or a digital portal for some parents. Sending messages is a very effective and inexpensive way to give parents tips and instructions. The messages can let them know how their child is doing on at-home exercises, for example, or offer pointers for working on reading, maths etc. with their child.<sup>33,34,35,42</sup> Messages should be as personalized as possible, brief and positive.<sup>36,37</sup> They shouldn't go into details about the curriculum. The language used should be plain and not exceed [level B1](#). This [website](#) can be used to check if words fit level B1.

Tip:

**Communicating with parents via texts or online messages is very effective!**

Messaging is a highly effective as well as inexpensive way to further support pupils' development in remote learning contexts.

Messages can focus on providing general tips to support reading or maths skills, but can also provide tips for activities parents can do with their child. Below are some examples:<sup>33,36</sup>

'When reading, the sounds words start with is very important. Saying the first letter of a word, like the "ttt" in taco or tomato, helps your child to learn to read it. Have your child repeat the "ttt" sound, too.'

'When reading with your child, draw on your own experiences. *The dog went outside*: "Remember we saw a dog out yesterday?"'

'Learning to do maths at home can be hard. It helps if your child can take the time to practise what they already know, such as going through multiplication tables.'

A second approach that works is to give parents simple, practical techniques based on methods used in class to support their child's learning at home. Parents are not

teachers. Let them know they're not expected to fill the teacher's shoes. The best way parents can support their child is to create a fixed structure for each day, with set times to work on assignments and their own space to work. Set up a daily planner that parents and kids can use to schedule their day, including time for schoolwork.<sup>32,38</sup> Parents of younger children can support them by doing short activities together, like reading. Parents can also create a learning environment for their child at home with materials like books, puzzles and toys. With older kids, parents should mainly encourage them to learn, rather than get directly involved in assignments.<sup>37,38</sup>

Also give parents information and pointers on how to help their child with reading and maths using methods the school itself applies.<sup>23</sup> For example, add a short explanation to assignments for them, where relevant. Set a learning objective for each assignment, such as: read 5 pages in the book *The Jolly Bear*; do problems 1 to 10 on page 50. That way, parents also know exactly what work their child has to do. Finally, parents can practise simple time-management strategies with their child,<sup>32</sup> such as talking with their child about how to do a specific task and then asking afterwards how it worked.

To get parents involved, schools also need to consider their respective backgrounds and capabilities (education, income, culture). Not everyone has digital resources like laptops or tablets at home, or enough for the whole family to use. Working with a variety of formats can address this.<sup>32</sup> Offer learning materials in both digital and hard copies so all parents can use them. Knowing what resources children have at home is the first step. They may have connected devices, but no craft supplies. Also factor in the needs of children who require additional support and the capabilities of parents who aren't fluent in Dutch. How should assignments and communication be adapted to accommodate this? Be mindful as well of sensitive learning materials that may be less suited to the home setting.

## **4 In conclusion**

This report maps out the risks of remote teaching and learning and examines the most promising interventions. We have focused on those for which there is 'hard' and convincing evidence, or else confine our discussion to studies that meet the very highest standards of scientific research. See the annex for a technical discussion.

It should be noted that for remote teaching and learning to be genuinely effective, it is not enough to implement only one or two of these interventions. The focus has to encompass every level – from the overall organization to individual lessons – to look at what's working, what can be improved and where gaps are. This report can serve as a guide.

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## 6 Remote teaching and learning: technical annex

**Definition:** Remote teaching and learning refers to education in which instruction is delivered remotely, mainly in digital form, rather than in person.

**Search terms:** distance learning, remote learning, digital learning, blended learning, COVID-19 impact on students/schools.

### How can we judge the effectiveness of different approaches?

This publication is part of a series entitled 'What Works?' produced by Education Lab NL (see: <https://education-lab.nl/geen-onderdeel-van-een-categorie/education-lab-nl-gaat-samenwerken-met-martin-bootsma-en-eva-naaijkens/>) in association with the Dutch Inspectorate of Education and the education field. The series presents a systematic review of the literature on approaches (interventions) proven to close learning gaps and provide guidelines for the education field. The purpose of the present study is to help schools and school governing bodies make informed choices about how to deliver remote education.

### Selection criteria

Our systematic review looks at international review studies (meta-studies) and individual scientific research studies on effective remote teaching and learning. The publications included in this study constitute well-executed, randomized experiments<sup>1</sup> and quasi-experimental studies. The latter use econometric methods such as regression discontinuity (RD) and Difference-in-Differences analysis (DiD), which are considered to provide the 'hardest possible proof' of an intervention's impact on a desired outcome. Without such a research design there would be no way to evaluate the effectiveness of individual interventions.

These meta-analyses and reviews enable us to form an overall picture of the impact of interventions. To avoid bias, we look at both interventions that have been proved effective and those that have not. We also try to draw conclusions about the effective mechanisms of different interventions, documenting those that have no impact as well. From these we distil individual studies that describe the *most promising interventions*. These are interventions that could potentially be highly effective but often have not yet been studied in the Dutch context. Promising interventions are selected using the following criteria:

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<sup>1</sup> Experiments are done using two comparable groups of pupils, applying the approach in one group and not in the other. Participants are randomly assigned to one of the two groups (e.g. by drawing lots). Differences that manifest between the two groups over time are deemed to be effects of the intervention.

- The intervention has a significant impact on pupils' cognitive and/or non-cognitive performance.
- The size of the interventions' effects (the benefits; see below) relative to the costs. Ideally, a cost-benefit analysis should be done for each intervention. Some interventions are very expensive (e.g. one-on-one tutoring) but also highly effective (often, for a particular group). Interventions with a lower effect size can also be worthwhile if the costs are very low (e.g. sending messages to parents). These considerations are assumed in this publication.
- An intervention's design and implementation are deemed promising by Dutch teachers and school leaders (see again: <https://education-lab.nl/geen-onderdeel-van-een-categorie/education-lab-nl-gaat-samenwerken-met-martin-bootsma-en-eva-naaijken/>).

### **Interpreting the effect size of interventions**

According to the accepted guidelines for education research, the effect of an intervention (Cohen's *d*) is expressed as the difference between the standardized outcome measure of an intervention group and a control group. This effect measure shows how many standard deviations children have moved up or down on an outcome (e.g. reading skills) as a result of an intervention. The convention in education research is that effects with a value of 0.2 or higher are found to be significant. We therefore use the following criteria to indicate the effect sizes of the compiled studies:

- Small effect:  $d < 0.20$
- Medium effect:  $d = 0.20 < > 0.40$
- Large effect:  $d = > 0.40$

### **How have we interpreted differences in standard deviations?**

A standard deviation is a measure of dispersion that enables comparison between a spread of test scores. According to a recent report by the CPB Netherlands Bureau for Economic Policy Analysis (2020), an effect size of one-half of one standard deviation (0.5 SD) on the CITO test corresponds to a difference of approximately one secondary school education level. Thus, if an intervention achieves an effect size of 0.5 SD on the CITO test, this translates into an average increase of one whole education level for the group in which the intervention is applied.

It should be noted that this is a mean effect and that interventions tend to have different outcomes for different groups. Because of this, it's crucial to always investigate further and ascertain who within the experimental group experienced the largest and smallest effects of the intervention.

### **Do interventions that are effective in other countries also work in the Netherlands?**

Though we used strict criteria to select studies for inclusion in our research, this does not automatically guarantee approaches proved to be effective in other contexts will also work in the Dutch context. When implementing these approaches, the foreign literature must be transposed to education practice in the Netherlands. To do this, we are collaborating with teachers and school leaders in the Netherlands (see: <https://education-lab.nl/geen-onderdeel-van-een-categorie/education-lab-nl-gaat-samenwerken-met-martin-bootsma-en-eva-naaijkens/>). Finally, schools that adopt recommended approaches are advised to monitor the results carefully and, if possible, conduct impact studies to evaluate them.

### **Sources**

Principal sources are the Education Endowment Foundation's (EEF) teaching and learning toolkits and guidance reports. Other sources include the What Works Clearinghouse, NBER, Google Scholar and ERIC database. The EEF toolkits and guidance reports contain meta-analyses and reviews covering various topics. Also used where possible (based on our selection criteria) are Dutch studies and publications such as the guidelines and literature reviews produced by the Netherlands Initiative for Education Research (NRO) and CPB Netherlands Bureau for Economic Policy Analysis.

### **How strong is the evidence?**

Most current studies on the opportunities and threats of remote teaching and learning during the COVID-19 crisis are not (or not yet) causal; therefore the evidence is not as strong. Our review centres on international studies, supplemented by studies on schools in the Netherlands, where they exist. We have no indications that lessons learned outside the Netherlands are not also relevant to the Dutch context. Also worth noting is that the studies are from all sectors but that a relatively large share of this research is concerned with impacts in higher education. Smaller studies have been done on impacts in primary education, special education and senior secondary vocational education.

For a more detailed description of these studies, send a request to Bas Aarts (B.Aarts@maastrichtuniversity.nl).

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