Four in Balance Monitor 2015

Use and benefits of ICT in education
The education sector has discovered the potential of ICT in recent years. That is noticeable at virtually every Dutch school. Discussions no longer concern whether we should use ICT but rather how we can use it to improve the quality of education.

By now, research has shown that ICT can make a vital contribution to educational output. Nonetheless, we can give many examples of situations in which ICT did not produce the targeted result. In some cases, those who introduced it did not take all the basic elements of the Four in Balance model into account. But in other cases, the problem lay in the quality of the ICT application or a mismatch between the chosen solution and the school’s actual needs or its culture.

ICT also proves disappointing when it fails to live up (immediately) to expectations. Innovation takes time and requires careful consideration. It also requires commitment and effort on the part of teachers, school managers and school boards as well as private parties such as publishers and ICT providers.

In February 2015, I&O Research conducted a survey among Dutch schools. More than a thousand teachers and almost four hundred school managers filled in an online questionnaire. As you will read in Chapter 2, the use of ICT has increased dramatically. There are more devices available, and the share of digital learning materials has increased. ICT is often used in instruction, in pupil exercises, and to track pupil progress.

“You won’t change education just by digitizing it. You first have to know what you want, and what you need. How can you motivate pupils to learn? Only then should you introduce ICT.”

Translation of quote from “De Nieuwste school” in Scholen om van te leren (Schouwenburg, 2015)
What we now know about the benefits of ICT for education is described in Chapter 3. For example, research shows that ICT has considerable potential when it comes to knowledge transfer activities. Teachers can generally differentiate no more than two or three levels of pupil knowledge and skill. Smart applications can differentiate far more, creating more opportunities for teachers to supervise individual pupils, and freeing up time for cooperative learning activities. The chapter concludes with our most important conclusions.

Chapter 1 describes the context. Why does the education sector want to use ICT, and why is that necessary? What changes are happening in our lives that education must take into account? How is our way of working changing? What issues is the education sector facing?

ICT makes it possible to automate certain routine activities and to support others, potentially optimizing the relationship between pupils and teachers. The desire to learn more effectively and efficiently using ICT starts by having a realistic idea of what ICT can do. It also requires us to make thoughtful choices that will lead to successful implementation. Kennisnet will continue to do its part in the years ahead. Success requires the commitment of many others, however, both within and outside education.

Let’s tackle this challenge together and get ICT working for education.

“Help us come up with recommendations for education based on the concepts described in the Four in Balance Monitor”

Toine Maes, CEO of Kennisnet
1. Education today

Education prepares pupils to live, learn and work in the 21st century. This chapter looks at the impact of ICT on this process.
1. Education today

*The connection between education and ICT*

A good education helps people get the best out of themselves. By now, ICT has been broadly accepted by the education sector. There is growing awareness of what ICT can mean for organizational matters and for teaching. Its use has become a strategic choice in education. The question is no longer *whether* ICT will be used, but *how* it can contribute to better, smarter teaching and learning. Schools are seeking out ICT applications that suit their aims and their culture.

ICT is used for many different purposes and takes a variety of different forms. The term “ICT” covers practice software, videos, apps, games, tablets, interactive whiteboards, and social media. The purposes and aims for which we use ICT are equally varied, ranging from practice and cooperation to planning, sharing or creating. This Four in Balance Monitor links our use of ICT to the functions of education. For example, we wish to show that questions about ICT use must always be answered by considering the aim we have set for ourselves in the distinct contexts of learning, living and working.

**Learning** - The point of learning is for individual pupils to develop their talents to the best of their ability. The question is how ICT can help pupils learn faster, better or more enjoyably. Consider, for example, the use of interactive whiteboards to liven up lessons, or explaining complex concepts using video.

**Living** - This involves preparing pupils to function in a society in which ICT plays a major role. It may, for example, touch on ethical issues concerning safety and security in a digital society, or media literacy.

**Working** - The main question in the context of working is to what extent education prepares pupils sufficiently for a labor market in which ICT plays a role in every occupational field, whether that be nursing, teaching, automotive or architecture.
1.1 Learning to live in a digital world

Over the past few decades, our society has become a digital knowledge society. Anyone who wants to function as a citizen must increasingly use digital means to pay bills, book a trip, shop for groceries, arrange medical assistance, apply for a job, or look up government information. This transformation is making new demands on schools. They have to teach their pupils how to deal with ICT. It is a new type of literacy that every member of society must master. Those who do not have digital skills may very well be left behind.

Media is an important part of our lives

The Dutch are engaged with media seven out 24 hours a day (SCP, 2015). That is slightly less than half their waking hours.¹ That figure is even higher among children and adolescents, who spend more than nine hours a day using media. People spend most of that time watching and listening, followed by communicating and reading. They use a combination of more traditional media and the internet.

What is digital literacy?

Digital literacy means using ICT to collect, create and share digital information so that we can participate effectively at home, at school, at work and in society as a whole (Fraillon, et al., 2014; Meelissen, et al., 2014; SLO, 2014). The point is to make responsible and critical use of ICT and more traditional media. It also means understanding the ethical and legal aspects, and being capable of reading and comprehending texts online. The latter requires special attention, given ICT’s impact on literacy in the 21st century. The skills needed to read and write in a digital world have changed: texts look very different than they used to (blogs, tweets, websites), are organized differently than before (connected by hyperlinks), and offer other options (animation, video, audio).

Time spent on media-activities

<table>
<thead>
<tr>
<th>Media activity</th>
<th>Percentage (%) of participants</th>
<th>Avg. time</th>
<th>Time by participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watching</td>
<td>86%</td>
<td>3:00</td>
<td>3:30</td>
</tr>
<tr>
<td>Listening</td>
<td>65%</td>
<td>2:48</td>
<td>4:19</td>
</tr>
<tr>
<td>Reading</td>
<td>50%</td>
<td>0:42</td>
<td>1:25</td>
</tr>
<tr>
<td>Communicating</td>
<td>53%</td>
<td>1:05</td>
<td>2:04</td>
</tr>
<tr>
<td>Gaming</td>
<td>17%</td>
<td>0:18</td>
<td>1:51</td>
</tr>
<tr>
<td>Finding information online</td>
<td>9%</td>
<td>0:04</td>
<td>0:46</td>
</tr>
<tr>
<td>Other internet use</td>
<td>41%</td>
<td>0:30</td>
<td>1:14</td>
</tr>
<tr>
<td>Other computer use</td>
<td>6%</td>
<td>0:08</td>
<td>2:31</td>
</tr>
<tr>
<td>Total media time</td>
<td>99%</td>
<td>8:40</td>
<td>8:48</td>
</tr>
</tbody>
</table>

Dutch population aged 15 and above, in hours and minutes

Source: SCP (2015)

¹ The Tijd in beeld study defines media as everything from reading the newspaper to using social media.
The internet, social media, and “being connected” are now essential features of our society and we start our fascination with them at a very young age (Mediawijzer.net, 2015). In particular, children today spend a lot of time watching television and using tablets. Much of the lives of 10 to 18 year olds is defined by their media use. They are intensive users of digital media (SCP, 2015; Kennisnet, 2015).

### Did you know?

Ninety-two percent of Dutch people visit websites. We bank online, file forms and submit questions to government online, and look up the latest news or the weather forecast on the internet. We also make frequent use of social media. Approximately 54% of the Dutch population do so regularly, and 15% occasionally (SCP, 2015).

#### Time children spend using various media devices

- **Television**
- **Tablet**
- **Desktop**
- **Laptop**
- **Gaming computer**
- **Handheld games computer**
- **Smartphone**
- **Mobile telephone**
- **E-reader**

**Source:** Mediawijzer.net, 2015
Media use by 10 to 18 year olds

Digital literacy children and adolescents? An international comparative study (ICILS) measured the digital literacy of children and adolescents by administering a practical test (Meelissen, et al., 2014). Subjects were rated at one of four levels of skill. In most countries (including the Netherlands), upwards of two-thirds of 14 and 15 year olds score no higher than the basic skill level. Eight percent of pupils in the Netherlands do not even qualify for the lowest level of skill. Only 4% performed at the most advanced level, with most of these being pre-university pupils.

Skill level ICILS test

Levels
- a few basic skills
- basic
- proficient
- advanced

Percentage of pupils who have achieved this level of skill. Source: Houtkoop et al. 2012
There are huge differences in digital literacy between pupils in the various educational tracks in our country. Pupils enrolled in the practical education track have an average score of 407, well below the international average of 500; pre-university pupils score well above that figure at 595. The average for the Netherlands is 535.

**Higher educated, more digitally literate**
Higher educated people clearly have better computer and internet skills than lower educated people (*CBS, 2014*). The differences between educational levels are not only quantitative. The two groups also differ in how they use computers and the internet. People with lower-level skills tend to use computers mainly for consumption and entertainment purposes (e.g. gaming, sharing music and films, or chatting) (*Houtkoop, et al., 2012; Dijk, 2008*). They do use e-mail, look up information on the internet and do their banking online, but less so than people with more digital skills (*Buisman, et al., 2013*).
Issues for education

Research shows that many young people have trouble looking up and evaluating information in online texts (Deursen, 2010; Clemens, 2014; Walraven, 2011). These are not skills that children and adolescents develop spontaneously. There is therefore a growing need to prepare future generations to use ICT (responsibly), and society is increasingly looking to education to take on this task (Allen, et al., 2011).

Children and adolescents also have expectations when it comes to their education. More than four out of ten want their schools to show them how to protect their privacy or security online, how the internet works, and how they can use the internet more handily or creatively, or conduct more efficient online searches. About one out of five pupils does not want to learn these things (Kennisnet, 2015). Approximately a third would like to learn to programming or game design at school.

### 1.2 Learning to work with ICT

The rapid advances in ICT have also had an impact on the labor market. ICT skills are required in almost every job these days, whether that be in a garage (onboard computer technology), in education, or in journalism. The rise of ICT has also led to new occupations, for example...
data security specialists and smartphone app developers.

According to the Netherlands Working Conditions Survey (Nationale Enquête Arbeidsomstandigheden) 2014, 23% of all employees feel they lack new knowledge or skills needed to do their job properly, such as technical and organizational expertise and skills. Employees who report feeling this way call in sick and suffer from burnout more often than those who do not (CBS, 2015). Research indicates that pupils who lack sufficient (basic) skills run a greater risk of losing out on the job market and of not contributing to economic growth (OECD, 2010).

That is why pupils should also be taught to work with ICT as they prepare for their working lives. Without ICT skills, pupils are not qualified to compete in the labor market. That realization has influenced every curriculum in vocational education. In other words, ICT is a vital part of young people’s vocational training and makes an important contribution to job creation. This debate about the importance of programming offers a good illustration.
**Automation is changing the labor market**

ICT is changing how the labor force works and the demands placed on the labor market (*Allen, et al., 2011*). Automated systems are taking over routine tasks, and machines and intelligent robots are performing routine work (*UWV, 2014*). That has been the case in industry for quite some time now. The pace of digitization is expected to increase in the years ahead in financial/ administrative and secretarial occupations (*UWV, 2015*).

The labor market is changing dramatically as a result. Automation is having a huge impact specifically on those occupations requiring VET or lower-level qualifications (*Deloitte, 2014*). Routine activities (for example clerical or assembly work) can be replaced by ICT applications in many occupations:

- Clerical workers
- Bookkeeping staff
- Assembly workers
- Operators of immovable machinery and systems
- Drivers of vehicles
- Metalworking industry workers, mechanics
- Salespersons
- Skilled trades workers
- Horticulture workers, crop farmers, livestock farmers
- Construction workers, except for electricians
- Domestic servants and cleaners
- Electricians and electronics repairpersons
- Health care workers
- Security workers

### Extent to which occupations can be automated/digitized

Source: *Deloitte, 2014*
occupational groups. That is otherwise in such fields as communications and complex problem-solving (WRR, 2013). In fact, there are more jobs now for experts in complex communications. In addition, the need for non-routine manual labor remains.

Occupations require new skills
To cope with these changes, the Scientific Council for Government Policy (WRR) says that the Netherlands must become a “learning economy” in which knowledge and skills can circulate. “The

Did you know?
The Dutch make plentiful use of computers and the internet at work. Whereas an average of 47% of EU workers use the internet at work, in the Netherlands that figure is 58%. The level of use differs from one sector to the next, however (CBS, 2014).
‘learning economy’ concentrates on the need to investigate which types of knowledge may develop, how that knowledge is shared, and how learning can take place in the broader sense (learning from consumers, analytical learning, technical learning, skills learning, learning in organizations, institutional learning, policy learning, and so on)” (WRR, 2013).

It is the job of education – and specifically vocational education – to furnish good quality training programs that keep pace with these developments in occupational practice. Because ICT is changing occupational practice, the educational content that prepares pupils for the working world is changing as well.

1.3 Learning more and learning smarter

ICT offers new opportunities to make learning more effective, efficient, and fun. Research shows that it can do this, but it also shows that people often have unrealistic expectations of ICT because they are unfamiliar with the results of research into its actual benefits. At the same time, expectations are riding high as to what ICT can offer education in the future. Fortunately, we are making better use all the time of our knowledge of what does and does not work. The available applications are also improving, so is their utilization, increasing our insights into the effective use of ICT.

“A serious investment is needed in the quality of primary and secondary education. Much of that investment can be achieved by means of innovation and the use of ICT, by re-evaluating the existing inflexible system of classroom hours, and by turning teacher training into a university-level program” (WRR, 2013)
**Doing more with talent**

Dutch education is good and continues to improve, the aim being to get the best out of every pupil. It pays particular attention to outstanding pupils and pupils who require extra supervision, without this being at the expense of the other pupils. Schools aim to offer every pupil the opportunity to develop his or her talents, and they also want to keep up with trends in society and on the labor market. At the same time, testing dominates education: what counts is not (or not only) what pupils have learned, but their scores on various tests (especially the national examinations).

The Education Report [Onderwijsverslag] for 2013/14 shows that many teachers still find it very challenging to differentiate properly between pupils ([Inspectie van het Onderwijs, 2015](#)). Teachers indicate that they have trouble allowing for differences between pupils in their teaching. When schools do succeed in differentiating properly, pupils are motivated, less likely to fall behind, and learn more. In particular, many secondary school teachers lack the skills needed to differentiate properly.

**What do pupils think?**

Pupils report that the traditional blackboard has been replaced at virtually every school by the interactive whiteboard. Forty-seven per cent say that they learn more easily when the subject matter is also presented to them in a video. Thirty-nine per cent say that they have more trouble learning if they are only given “text”. That percentage is somewhat

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**Percentage of teachers who have general didactic and differentiation skills**

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>All general didactic skills inadequate</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Does not have all general didactic skills</td>
<td>9%</td>
<td>10%</td>
<td>19%</td>
<td>20%</td>
</tr>
<tr>
<td>Has general didactic but not differentiation skills</td>
<td>32%</td>
<td>26%</td>
<td>47%</td>
<td>44%</td>
</tr>
<tr>
<td>Does not have all general didactic but does have differentiation skills</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Has both all general didactic and differentiation skills</td>
<td>52%</td>
<td>57%</td>
<td>27%</td>
<td>29%</td>
</tr>
</tbody>
</table>

*Source: Inspectie van het Onderwijs, 2015*
higher in pre-vocational secondary education and VET, and somewhat lower in primary education. Thirty-one per cent would rather watch a film than have a teacher explain, 29% are convinced that they learn more easily on a computer or tablet than from a book, and 25% would rather search the internet for help or explanations than look through their schoolbooks if they have questions about a subject. Pupils not only use computers, tablets and laptops but also make frequent use of their smartphones for school purposes (especially in secondary education and VET). (Kennisnet, 2015).

1.4 Education and ICT

Schools are searching for ways to deal successfully with the challenges facing education. They regard ICT as an important tool within the domains of learning, living and working. Whether ICT is considered an effective and efficient tool for education depends on the aims.

Some of the issues are:

Learning - Does ICT contribute to the effectiveness/efficiency of learning? Does it help you “learn to learn”?

Living - Does using a particular ICT application help you understand how you use ICT as a member of society? Are you media literate? Do you understand the impact that ICT can have on you as a person? Do you use ICT safely?

Working - Are you prepared to use ICT applications in your future occupation (including the occupation of teacher)?

The aim should therefore play a defining role in implementation issues in education. To bring about successful change, we also need to ask ourselves how things stand at the start. How is teaching organized at the moment, and what role does ICT play in that context?

The following chapter describes the current state of affairs based on the Four in Balance model.
2. ICT in education in 2015

This chapter describes the current state of affairs in education based on the basic elements of the Four in Balance model.
2. ICT in education in 2015

How education uses ICT today

In essence, the successful introduction of ICT in education involves striking the right balance between four basic elements: vision, expertise, content and applications, and infrastructure. Having better technical facilities does not automatically lead to more computer use. Considering the human elements (for example making a vision explicit in a policy plan or receiving training) will not lead to the long-term use of ICT if the necessary technical facilities are not available at the same time. It is possible to strike the right balance between the human and technical elements if the stakeholders – teachers, school managers and school boards – work together.

The presence of ICT is growing in education across the board. For example, more frequent use is being made of digital educational resources, and the number of devices has grown. At the same time, we see that there are still teachers who feel they are not adequately equipped to use ICT.

Unless stated otherwise, all the data in the dataset was collected by I&O Research. More than a thousand teachers and almost four hundred school managers in primary and secondary education and VET assisted in the data collection process.2

2.1 The Four in Balance model
Kennisnet’s Four in Balance model shows how schools can get the most out of ICT. This model summarizes everything that we know about using ICT in education (Stichting Ict op School, 2001; Stichting Ict op School, 2004; Kennisnet, 2012). It describes the basic elements – the building blocks – that must be in balance with one another before we can use ICT effectively and derive the benefits that we want.

2 See Appendix 2 for more information on the study.
### The Four in Balance model

<table>
<thead>
<tr>
<th>Human elements</th>
<th>technical elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>vision</td>
<td>content and applications</td>
</tr>
<tr>
<td>expertise</td>
<td>infrastructure</td>
</tr>
</tbody>
</table>

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### Vision

How an educational institution envisages qualitatively sound and efficient education and what ICT’s role is in achieving it. “Vision” encompasses the institution’s basic aims and addresses the conditions necessary to achieve these aims.

### Expertise

The competencies that staff must have to make satisfactory use of ICT:
- Teachers’ ICT skills: their knowledge of and attitudes towards ICT in both their pedagogical-didactic actions, their work within the school, and their own professional development
- the expertise of school managers and school boards members in using ICT to achieve the educational institution’s aims and to help staff become ICT-skilled
- the expertise of support staff (for example ICT specialists, administrative staff and librarians) in getting ICT to work for pupils, teachers and management

### Content and applications

The information, educational content and software used in an educational institution, such as:
- digital learning materials produced especially for educational purposes and general sources of knowledge
- educational software packages and ICT systems, such as an electronic learning environment, pupil records, and pupil information management systems
- general office software and apps, timetabling software, and HRM tools.

### Infrastructure

The availability and quality of hardware, networks and connectivity within the institution’s education system. This encompasses interactive whiteboards, desktops, laptops, tablets, fixed and wireless connections, internet connections, servers, and cloud services. It also covers how these facilities are managed.
**Use and benefits**
If the four basic elements are in balance, then our use of ICT will be effectual, targeted, and controlled. Utilizing ICT in a way that complements didactic methods allows pupils to learn more effectively. In terms of the secondary (i.e. organizational) process, ICT is used as a tool to ensure that schools have the information they need to structure processes more efficiently and to improve transparency for parents and society.

The benefits will be discussed in detail in Chapter 3. In the remainder of the present chapter, we will look at how things stand for each basic element of the model and how ICT is actually being used.

2.2 Vision
The key question in the structuring process is “how do teachers and pupils interact?” In the latest Four in Balance survey, we examined how teachers structure their teaching in actual practice. Teachers and school managers were asked to consider a number of statements. The aim was to examine didactic methods and the structuring of learning situations.

### How teachers structure their teaching

**Pupil-driven**
- I coach my pupils’ individual learning process
- I consider cooperation and initiative when assessing pupil performance
- I encourage pupils to set their own goals
- I let pupils give each other feedback on their work
- Pupils have the freedom to choose their own learning content

**Teacher-driven**
- I check whether pupils have mastered the assigned subject matter
- I have pupils do exercises
- I ask questions about the assigned subject matter during lessons
- I summarize the subject matter during lessons
- I decide what my pupils learn and when

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**very frequently**  |  **frequently**  |  **fairly frequently**  |  **occasionally**  |  **never or hardly ever**
Didactic methods
How teachers teach. Does the teacher decide what a pupil is to learn and when, or is it largely up to the pupil?

Structuring learning situations
How pupils learn. What dominates, knowledge transfer by means of instruction and practice, or knowledge construction?

The way in which teachers teach and the learning situations that arise at a school are both important for selecting the right ICT applications.

Didactics: lessons are often teacher-driven
The survey asked teachers how they structure their lessons in actual practice. Teachers take a varied approach in every sector. On average, they use approximately seven different teaching methods. Teachers indicate that their lessons tend to be teacher-driven. They decide what pupils learn and when, check that pupils have mastered the subject matter, and ask numerous questions about it. Many teachers also use pupil-driven instruction, but there is much more variation here. For example, teachers rarely allow pupils to choose the lesson content themselves or give one another feedback.

Structuring lessons – teachers with (relatively) little variation in their lessons (no more than four activities, n=53)

- I ask questions about the assigned subject matter during lessons
- I have pupils do exercises
- I check whether pupils have mastered the subject matter
- I decide what my pupils learn and when
- I coach my pupils’ individual learning process
- I summarize the subject matter during lessons
- Pupils have the freedom to choose their own learning content
- I consider cooperation and initiative when assessing pupil performance
- I encourage pupils to set their own goals
- I let pupils give each other feedback on their work

- teacher-driven
- pupil-driven
Structuring lessons – teachers with average variation in their lessons (five to seven activities, n=497)

I check whether pupils have mastered the subject matter
I ask questions about the assigned subject matter during lessons
I summarize the subject matter during lessons
I decide what my pupils learn and when
I coach my pupils’ individual learning process
I consider cooperation and initiative when assessing pupil performance
I encourage pupils to set their own goals
I let pupils give each other feedback on their work
Pupils have the freedom to choose their own learning content

Structuring lessons – teachers with a highly varied repertoire (eight activities or more, n=484)

I check whether pupils have mastered the subject matter
I coach my pupils’ individual learning process
I have pupils do exercises
I ask questions about the assigned subject matter during lessons
I summarize the subject matter during lessons
I decide what my pupils learn and when
I encourage pupils to set their own goals
I consider cooperation and initiative when assessing pupil performance
I let pupils give each other feedback on their work
Pupils have the freedom to choose their own learning content
Learning situation: emphasis on knowledge transfer

The key question concerning the learning situation is: what types of learning situations are there? Are there situations in which pupils listen to explanations, do exercises, work together to master the content, or apply what they have learned in problem-solving?

Based on the data collected, we divided the learning situations into two categories according to how they are structured. Knowledge transfer involves learning situations in which pupils listen to instructions, read texts on their own, do exercises and discuss the subject matter with the teacher. Knowledge construction involves situations in which pupils apply their knowledge and skills in solving problems or writing essays.

Learning activities are still geared mainly toward knowledge transfer in every sector, which corresponds to our analysis of how teachers teach.

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In-depth analysis

Appendices
School managers were asked to describe their institution's aims. The majority said that their school's aim was to gradually change and improve their teaching. Approximately a quarter plan to use ICT within the present teaching concept; the others planned to alter the teaching concept significantly using ICT.

There was a notable shift in primary education, where many more respondents are seeking to make (significant) changes to their vision of education than in 2013/14. In VET, the trend has reverted to a more gradual process of change.

2.3 Expertise
ICT will only work if it is deployed by a skilled teacher who knows when, how, and why it is being used. The effective use of ICT depends almost entirely on the expertise of those who work with it. In that regard, we distinguish between ICT skills and didactic ICT skills.
Basic and didactic ICT skills

Ninety percent of teachers consider themselves proficient in such basic ICT skills as word processing and searching the internet. This percentage has been relatively stable for many years. However, school managers are somewhat more critical of teachers’ skills.

Didactic ICT skills according to teachers

Teachers indicate that they are less skilled at using ICT as a didactic tool. Approximately half consider themselves proficient in that regard, while a quarter say they are highly proficient. Virtually all teachers who indicate that they have sufficient didactic skills also say that they have mastered the basic skills. This is a positive development, given
the relationship between didactic ICT skills, the use of ICT, and how teachers assess its benefits.

2.4 Content and applications
The availability of digital learning materials is a prerequisite for using ICT. Quantity is not the whole story, however; the materials must also be of good quality. We have seen the role that digital materials play in lessons increase gradually over the past few years (Kennisnet, 2013; Blockhuis, et al., 2014), a trend that has continued.3

Digital learning materials on the rise
Teachers have made growing use of digital materials in recent years. In 2007-2008, 15% of the materials they used were digital (primary and secondary education); today, that is about 25% (primary) and 35% (secondary). The same increase has taken place in VET, from 35% seven years ago to more than 55% this year.

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3 Digital learning materials are learning materials that require an electronic device (PC, Tablet or another device). The definition of digital learning materials has changed compared to previous years.
Almost all teachers now use digital learning materials. A majority (58%) say that no more than 30% of their learning materials are digital (maximum); in 2013/14, that was 64%. More and more teachers say that they use a lot of digital learning materials (i.e. that 70% or more of the material they use is digital).

Relationship with course books
Dutch teachers often use course books developed by publishers. That is also the case when it comes to digital learning materials. In terms of which digital learning materials are used most, there is little difference between primary education, secondary education, and VET. Teachers in all three sectors make considerable use of interactive exercises, video, text files and courseware.
Primary and secondary school teachers tend to use the digital learning materials that are provided along with (or as part of) a particular course book (75%). They also make a lot of use of Google (more than 40%), digital video banks (more than 35%) and special educational websites (more than 30%). Thirty per cent of teachers produce their own materials at times, and more than 25% use materials that a colleague has given them.

Teachers say that they would make more use of digital learning materials if there were more computers available, if they had more time, and if the quality of the materials improved.
Organizing teaching

ICT has also become commonplace in organizational matters related to teaching. All of the sectors make plentiful use of pupil information management systems (indeed, primary schools are required to do so), pupil registration systems, and systems for recording attendance.

Did you know?

ICT makes it possible to collect and sort management information without requiring any extra effort. ICT also helps educational institutions account for their efforts by making the results actually achieved comprehensible, transparent and comparable. This also facilitates benchmarking between educational institutions (Trendrapport Kennisnet, 2014).

Systems used for organizational matters according to school managers

- Pupil information management system
- Attendance registration system
- Pupil registration system
- Electronic learning environment
- Timetabling system
- Testing systems
- Quality tools
- Curriculum design system

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The use of digital learning materials and more complex ICT applications is growing. This increase also affects the collection and utilization of pupil data, requiring firm agreements regarding pupil privacy. Studies carried out by the Dutch Ministry of Education show that schools use basic “common sense” in their approach to pupils’ personal data, with relatively good results. However, they are unfamiliar with the precise privacy legislation and the applicable security standards. For example, a large number of primary schools say that they have data-processing agreements (DPAs) with suppliers, while parents are often not aware of this.

Data-processing agreement with suppliers

<table>
<thead>
<tr>
<th></th>
<th>prim</th>
<th>sec</th>
<th>vet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>yes, and parents/guardians are aware of this</td>
<td>yes, and parents/guardians are aware of this</td>
<td>yes, and parents/guardians are aware of this</td>
</tr>
<tr>
<td></td>
<td>yes, but parents/guardians are not aware of this</td>
<td>yes, but parents/guardians are not aware of this</td>
<td>yes, but parents/guardians are not aware of this</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
</tbody>
</table>

Would you like to know more?

In our in-depth section, you will find:
• more analyses about the use of digital learning materials in primary and secondary education and vet
• information about privacy
2.5 Infrastructure

A suitable infrastructure is necessary to be able to use ICT. Schools make differing choices in that regard. The choices concern devices and networks, and whether to purchase computers themselves or expect pupils (and their parents) to do so. This year has seen an increase in the infrastructure present at schools. In particular, the number of devices has risen, as did the presence of Wi-Fi. Schools are using a growing number of mobile devices such as laptops and tablets.

Growing number of devices
For years, the average school had one device (computer, laptop or tablet) for every five pupils. This year, we have noted an increase to one device for every four pupils in primary and secondary education, and one device for every three pupils in VET.

<table>
<thead>
<tr>
<th>Year</th>
<th>Prim</th>
<th>Sec</th>
<th>Vet</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-2008</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008-2009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009-2010</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010-2011</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2011-2012</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012-2013</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013-2014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014-2015</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Did you know?
A relatively large number of pupils (40%), with girls slightly in the majority, say that their mobile phone is important for their schoolwork. However, they consider it even more important for their private lives (more than 80%) (Kennisnet, 2015).

* There were outliers in the VET results. The trend is therefore weaker and shown here as a dotted line.
Most of these devices are desktop computers, which account for about half of all devices in all three sectors. There has been a shift in all three sectors towards mobile devices, such as laptops and tablets. Tablets and laptops are becoming more popular in primary education. In 2013 they accounted for 1% of the stock of devices, but that has increased to 16% now. Tablets are purchased to supplement existing devices (Kennisnet, 2014), whereas laptops and desktops are often purchased to replace older models. The expectation is that tablets will eventually play an even bigger role in primary education. Secondary education and VET make less use of tablets. Laptops are still preferred in these sectors. They are more suitable for the kinds of assignment secondary school and VET pupils are given, for example working with data files (text, images and video) or running subject-specific software.

### Devices used

<table>
<thead>
<tr>
<th></th>
<th>prim</th>
<th>sec</th>
<th>vet</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-2013</td>
<td>tablet</td>
<td>laptop</td>
<td>desktop</td>
</tr>
<tr>
<td>2014-2015</td>
<td>tablet</td>
<td>laptop</td>
<td>desktop</td>
</tr>
<tr>
<td>2012-2013</td>
<td>tablet</td>
<td>laptop</td>
<td>desktop</td>
</tr>
<tr>
<td>2014-2015</td>
<td>tablet</td>
<td>laptop</td>
<td>desktop</td>
</tr>
<tr>
<td>2012-2013</td>
<td>tablet</td>
<td>laptop</td>
<td>desktop</td>
</tr>
<tr>
<td>2014-2015</td>
<td>tablet</td>
<td>laptop</td>
<td>desktop</td>
</tr>
</tbody>
</table>
**Wi-Fi almost ubiquitous**

Almost every school in the Netherlands has Wi-Fi. In VET, the percentage of schools with Wi-Fi had already reached (almost) 100% in 2013-2014. The percentage has also risen sharply in primary and secondary education. Thirty-four per cent of primary schools, 30% of secondary schools, and 24% of VET schools indicate that access is restricted in some areas. Scarcely any schools limit Wi-Fi access to staff only.

**Wi-Fi access at school according to managers**

<table>
<thead>
<tr>
<th></th>
<th>yes, everywhere</th>
<th>yes, in most places</th>
<th>yes, in some places</th>
<th>yes, but not for pupils</th>
<th>no, no wifi</th>
</tr>
</thead>
<tbody>
<tr>
<td>prim</td>
<td>59%</td>
<td>21%</td>
<td>13%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>sec</td>
<td>65%</td>
<td>27%</td>
<td>2%</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>vet</td>
<td>72%</td>
<td>15%</td>
<td>9%</td>
<td>1%</td>
<td>3%</td>
</tr>
</tbody>
</table>

Would you like to know more?

In our in-depth section, you will find more analyses about the design of the ICT infrastructure.
2.6 Learning with (and from) ICT

Things are clearly changing when it comes to the basic elements of the Four in Balance Model, but not only there. The use of ICT in schools also continues to rise, with specifically secondary schools and VET institutions making more use of ICT now than in 2013.

More use of ICT on average

Slightly more than half of primary and secondary school teachers now spend more than ten hours a week using computers. In VET, that is almost 70%. The average number of hours that a teacher uses ICT has risen since 2013, especially in secondary education and VET. In secondary education, the average rose from more than six and a half hours to almost eleven hours. In VET, the average rose from more than ten hours and three quarters to more than 15 hours.

There has been a sharp decline in the number of teachers who use ICT less than five hours a week. In addition, there is a growing group of teachers who use ICT at least fifteen hours a week.

<table>
<thead>
<tr>
<th>Number of hours of ICT use</th>
<th>2012-2013</th>
<th>2014-2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>prim</td>
<td>9.3</td>
<td>10.5</td>
</tr>
<tr>
<td>sec</td>
<td>6.6</td>
<td>10.9</td>
</tr>
<tr>
<td>vet</td>
<td>10.8</td>
<td>15.1</td>
</tr>
</tbody>
</table>

Number of hours of computer use
Computers used in teaching for more than 10 hours per week

Purpose of ICT use

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**Teachers use ICT frequently themselves**
Teachers use ICT mainly to track pupil progress, to prepare lessons, to give instructions, and to communicate. We see that the sectors differ in this regard, however. For example, primary school teachers use ICT more frequently for practice and exercises. In VET, they use ICT more often to get pupils to look up, use, and organize information.

**Agreements made**
School managers, especially those in primary education, indicate that agreements have been made about using ICT in teaching. These agreements do not encompass all of the lessons, however. Compared with 2013/14, the number of school managers indicating that no agreements have been made has declined in all three sectors.

---

**Agreements regarding the didactic use of ICT and digital learning materials**

**prim**
- agreements have been made to this effect for all lessons
- some agreements have been made
- no agreements have been made

**sec**
- agreements have been made to this effect for all lessons
- some agreements have been made
- no agreements have been made

**vet**
- agreements have been made to this effect for all lessons
- some agreements have been made
- no agreements have been made
**ICT in secondary processes**

The majority of school managers believe that ICT is necessary to run a more efficient organization. They also believe that ICT promotes transparency in education and leads to greater understanding. ICT is also used a great deal in organizational matters, for transparency purposes for school managers and school boards, and to deliver data to the Ministry of Education and the Education Inspectorate. The data is also used in communications with parents and to discuss pupils (or groups of pupils) internally.

Did you know?

According to secondary school principals, digital systems have shown themselves most useful at bringing together data and providing an overview (administration and support) and at making pupil results visible (record-keeping and supervision) (Lockhorst et al., 2014).

**Would you like to know more?**

You will find more information about ICT and secondary processes in our in-depth section.
ICT in secondary processes

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This chapter describes what we know about the benefits of using ICT. The challenge is to use that knowledge when making strategic choices.
3. From more use to better education

How ICT can help us attain our educational aims

The education sector is making ample use of ICT. There is considerable willingness to implement ICT. Research has shown what works and what does not. These insights help schools make choices compatible with their aims. The effective use of ICT requires targeted choices and realistic expectations.

What works and why?
Research is providing growing evidence that ICT – when its use is effectual, targeted, and controlled – contributes to more appealing, effective and efficient education. At the same time, research results show that ICT use is seldom effective in the same way for all pupils. That means that a particular application may help some groups of pupils improve their results, but may have no or even a detrimental impact on other pupils. There are also applications that only help pupils with memorization tasks, whereas others support “exploratory learning”. In more and more cases, evidence regarding the effectiveness (or ineffectiveness) of the underlying mechanisms is mounting.

The number of new applications continues to grow while our knowledge of their desirable (or undesirable) effects remains inadequate in many areas (Lane, et al., 2013). To make effective choices concerning the use of ICT in their teaching, schools need to know which pupils will benefit from an application and in what circumstances. That is what this chapter is about.
We start by considering the benefits that teachers and school managers have noted themselves. We then look at the latest research concerning the benefits of ICT for the three domains of learning, living, and working.

### 3.1 How does ICT support learning?

**What teachers and school managers say**

ICT can have a positive effect on pupil motivation and academic performance and can streamline the learning process. Teachers and school managers have noted this in their everyday work. Primary school teachers and school managers are more positive about the benefits of ICT than...
their counterparts in secondary education. Almost nine out of ten teachers think that pupils are more motivated when they work with ICT. Many teachers are satisfied with the impact that ICT has on the efficiency of the learning process. A comfortable majority of primary school teachers believe that using ICT improves academic performance.

Secondary school teachers are less positive. Almost half of teachers note an obvious positive effect on pupil learning process and motivation. More than a third are positive about the impact on academic performance. In VET, more than half of teachers are positive about using ICT to improve pupil motivation and the learning process. Compared with secondary education, more teachers (more than 40%) believe that ICT also has a positive impact on academic performance.

School managers are generally more critical than teachers about the benefits. This is specifically the case in VET for both learning benefits and motivation. Most school managers believe that ICT will not cut the cost of teaching. They are a bit more positive about the time that ICT can save teachers and the money it can save school boards.

### Relationship between learning situations and pedagogical methods
How does interaction between teachers and pupils come about, and how does that translate into a learning situation? That is the main question when structuring teaching. The answer to this question is decisive if the idea is to get more out of education using ICT. Two pedagogical methods give us an idea of the benefits of ICT: teacher-driven knowledge transfer and pupil-driven knowledge construction. Teacher-driven teaching focuses on knowledge transfer. The teacher decides what the pupil learns and the focus is on instruction and practice. In pupil-driven knowledge construction, the pupil is largely responsible for his or her own learning (content and organization). Pupils are afforded the leeway to construct their knowledge by actively searching for solutions. Effective teaching combines the two methods.

This division corresponds to the insights presented in the previous chapter. We see that there is a relationship between teacher-driven methods and learning situations focusing on knowledge transfer on the one hand, and pupil-driven methods and situations focusing on knowledge construction on the other.

### Relationship between type of approach and activities

<table>
<thead>
<tr>
<th></th>
<th>Knowledge transfer</th>
<th>Knowledge construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher-driven</td>
<td>0.458*</td>
<td>0.180*</td>
</tr>
<tr>
<td>Pupil-driven</td>
<td>0.200*</td>
<td>0.646*</td>
</tr>
</tbody>
</table>

*Correlation is significant at a significance level of 0.01 (Pearson, two-tailed)
Teacher-driven knowledge transfer
Teacher-driven knowledge transfer (otherwise known as direct instruction) involves presentation and explanation by the teacher, precise and structured practicing of subject matter, and immediate corrective feedback. In learning situations, a system of questions and answers makes clear whether a pupil has mastered the subject matter. This method of teaching and learning has a long tradition. We know quite a lot about the strength and limitations of teacher-driven teaching (Ebbens, 2009; OECD, 2010; OECD, 2013).

Direct instruction is effective if the teacher adapts the content and direct feedback to pupils’ characteristics and progress. In the real world, teachers do manage to provide effective, customized teaching to small groups (two or three pupils) (Faber, 2014), but it is impossible for them to constantly adapt their instruction, exercises and direct feedback to suit every pupil. ICT can help teachers make more allowance for individual differences.

Computer software makes it possible to offer a pupil content and exercises that follow up on his or her previous answers. Software based on the principles of direct instruction analyze pupil responses using embedded analytics. Combined with other pupil information, these programs use algorithms to provide pupils with the most effective method of instruction and feedback. The software takes over from teacher when it comes to what and how a pupil learns. These programs are getting better and better at replacing teachers in situations requiring routine instruction. Specifically, we know a great deal about how we can best allow for individual differences between pupils in such learning situations (Brandsford, 2000; Darling-Hammond, 2005; Scheerens, 2008; OECD, 2009). That knowledge helps designers pick the best methods of instruction for knowledge transfer in adaptive software (Reints, et al., 2014), especially when combined with our growing insights into effective digital educational resources (Reints, et al., 2012; Kester, et al., 2013; Spanjers, et al., 2014).

Research into serious gaming
One good example is serious gaming. This consists of a standardized game in which players (pupils) only gain access to learning situations that give them appropriate feedback on their previous actions or responses (Hulst, 2014). Every pupil learns the content at a computer at his or her own pace, with that content and the form in which it is presented being customized to suit him or her.
Research on computer-assisted instruction and exercises of this kind show that educational resources that use optimized mathematical algorithms can provide every pupil with an appropriate learning plan.

The SlimStampen ["Clever Cramming"] program, for example, uses memory models to help pupils memorize facts ([Rijn, et al., 2012]). It adapts how often content is repeated to how quickly a pupil recalls a particular fact. Based on the pupil’s reaction time and the number of mistakes made, the software decides when it would be best to repeat the content so that pupils take less time to memorize more material. The Rekentuin ["Math Garden"] program uses a similar mechanism to allow pupils to practice their basic math skills. Pupils in the upper years of primary school did better on math tests after working with this program than a control group using a course...
Research has also revealed, however, that some pupils benefit more from such software than others. If the match is poor, there is no effect or pupils do not perform as well as they do when attending the customary lessons (Plak, et al., 2014).

Pupils can learn faster and better when they use adaptive software and apps meant specifically for instruction and for practice. That is in contrast to situations in which the teacher adapts the content to the pupils’ needs. This does make demands on the learning environment, for example the availability of enough devices.

Pupil-driven knowledge construction
Pupil-driven learning allows pupils to adapt choices made during the learning process to their personal preferences. These are learning situations in which pupils construct knowledge by consistently setting their own attainment aims, choosing tools that will help them achieve those aims, and then checking themselves whether they have in fact achieved them. Through planning, implementation and monitoring, pupils can adjust their learning approach or attainment aims themselves (Zimmerman, 2001). In practice, we see that there is a relationship between teachers promoting pupil-driven learning and the software

Digitized structured knowledge transfer can therefore be more effective than the average teacher, with more pupils having an opportunity to develop their talents as a result.
designed to support pupils in discovering things for themselves, self-reflection, self-evaluation, cooperative learning, and the use of social media (Dabbagh, et al., 2012; Matzat, et al., 2014). These types of learning are expected to contribute to the acquisition of 21st-century skills (e.g. problem-solving, cooperation, critical thinking and creativity) (Molenaar, 2013; Voogt, et al., 2010; SLO, 2014).

One of the characteristics of knowledge construction is that pupils are given the leeway to give open answers and responses. There is a broad spectrum of ICT tools that support this, for example by offering pupils assistance in writing texts, brainstorming, project work, problem-solving, and thinking creatively, with essays, mindmaps and self-reflections as the final result. Such results cannot be evaluated properly by a computer system (at least not yet). That means that a teacher’s proximity is essential in learning situations involving knowledge construction (Dede, et al., 2012).

Another prerequisite is that pupils must know what they want and possess self-management skills. Pupils are also expected to maintain their concentration and stay motivated. In other words, working and organizing learning on their own makes strict demands on pupils’ metacognitive skills (Devolder, 2014; Pintrich, 2004; Zimmerman, 2001).

Pupils who have well-developed self-management and self-regulatory skills have no trouble finding their own way when it comes to learning. That has been shown in studies in which pupils create their own learning situation. Pupils who have not yet acquired these skills are more likely to make inefficient choices. Pupils differ considerably in their ability and desire to self-manage (Veenman, et al., 2006), with those in the lower levels of education being more likely to run into difficulties (Purcell, et al., 2012; Matzat, et al., 2014).

Pupil-driven learning is not equally suitable for all pupils

In summary: independent and self-organized learning by means of pupil-driven knowledge construction makes specific demands on pupils’ self-regulating abilities, teachers’ coaching skills, and the support provided by a digital learning environment. That is why the digital and other prerequisites for teacher-driven knowledge transfer differ from the prerequisites that support pupil-driven knowledge construction.
Combining pupil-driven and teacher-driven learning

Effective teaching combines teacher-driven knowledge transfer and pupil-driven knowledge construction. The functions, effects and benefits of ICT in teacher-driven knowledge transfer differ considerably from those in pupil-driven knowledge construction. Together, they constitute what are in essence the active ingredients of teaching. Combined, these two basic approaches determine how effective learning situations are. Is ICT part of this mixture? If so, then we refer to “blended learning” (Spanjers, et al., 2014).

The figure above shows the extent to which teachers combine knowledge transfer and pupil-driven approaches. Teachers who have a limited didactic repertoire (score on x axis < 5) tend to favor teacher-driven knowledge transfer. This is 16% of teachers. Teachers who are more broadly acquainted with different learning situations add different pupil-driven activities to their repertoire. Those who favor teacher-driven learning tend to focus on knowledge transfer, whereas those who favor pupil-driven methods also become more interested in knowledge construction.
This shows that the way teaching is structured does not mean having to choose between teacher-driven or pupil-driven learning. It is the combination that is important, with teacher-driven knowledge transfer being most prominent at the present time. The broader a teacher’s didactic repertoire, the more he or she will add activities supporting pupil-driven knowledge construction to his or her teacher-driven knowledge transfer activities.

Teachers with an extensive didactic repertoire are also often more inclined to use ICT, and are somewhat more satisfied with its effects.

3.2 Living and learning in the 21st century

There has been much discussion in recent years about digital literacy as preparation for life in the 21st century. But how digitally literate are today’s children and adolescents? And what is the education sector doing to help them?

Digital literacy
Research shows that the vast majority of pupils have taught themselves how to communicate and search for information online. Pupils say that school scarcely plays a role. Dutch teachers pay very little attention to digital literacy during lessons (compared with teachers in other countries). The Netherlands is also one of the few countries where “learning to work with ICT” is not an explicit part of the curriculum. Nevertheless, Dutch pupils perform above average when it comes to digital literacy. Only in the Czech Republic is pupils’ digital literacy significantly better (Meelissen et al., 2014).

The idea that education contributes little to pupils’ digital literacy is confirmed by analyses concerning the factors that influence their skills score. The analyses show that there is almost no correlation between a school’s characteristics (for example its use of ICT in teaching) and digital literacy. Neither does the extent to which pupils use ICT (at home or at school) have much impact on their digital literacy. Even if pupils indicate that they have been taught digital literacy skills at school, there is no correlation. A pupil’s educational level and home situation (socio-economic status) are the most important predictors of digital literacy (Meelissen et al., 2014; Fraillon et al., 2014). This pattern resembles other findings by the Netherlands.
Institute for Social Research (SCP), which also revealed that pupils are “digital natives” (SCP, 2002).

**Digital inequality**

Education has so far not succeeded in narrowing the digital literacy gap between differing groups of pupils. At the moment, pupils’ home situation (socio-economic status) has more impact on whether they are prepared for life in a digital society than the school curriculum.

This means that we have not yet managed to structure the process of preparing them for life in the 21st century in a way that ensures that the school curriculum makes a vital contribution to their digital literacy. For people to be able to participate in 21st-century society, they must have digital skills (see Chapter 1). Unless we make changes, we are heading towards a growing level of digital inequality. Our challenge is to ensure that education helps children and adolescents who are not “digital natives” to become digitally literate.
Working with ICT

Labor market participation requires a satisfactory level of knowledge and sufficient skills. It is good for every Dutch person to have mastered a satisfactory repertoire of skills, and it is good for the Netherlands as a whole because it contributes to economic growth (Buisman, et al., 2013). VET focuses on developing the right knowledge, attitudes and skills for a particular occupation. That means that for the most part, young people acquire the core skills that they need to find a job in initial (vocational) education. In addition, it appears that ICT applications (e.g. simulations and games) can help pupils prepare better and more rapidly for their occupational practice (Hulst, 2014; Jong, 2012; Oomens, et al., 2011). Another feature of VET is that it uses ICT applications to support communication with the teacher during pupils’ work placement and practical vocational training. Using ICT applications during on-the-job learning can support closer supervision and help pupils function in occupational practice (Nieuwenhuis, et al., 2012).

Compared with primary and secondary education, much less research has been conducted into the effects of ICT applications in VET. The risk is that innovativeness will decline as a result, and the potential of ICT to improve the quality of occupational training programs will go underutilized.

The 21st-century teacher

ICT already plays a significant role in education, and that role will grow even more crucial in the future. To keep up with this trend, schools can purchase all sorts of ICT applications. That does not automatically lead to improvements in teaching and learning, however. In fact, it is more likely to lead to resistance by the teaching staff. Schools that want to use ICT for new aims and approaches to teaching and learning should first invest in the people who are going to work with it.
It is striking that – unlike in many other occupations – no standards of ICT competence have been established for teachers. This means that every teacher can use ICT in their teaching, regardless of their level of knowledge or skills. Research has shown, however, that teachers often do not use ICT purposefully in their teaching, meaning that they reflect too little about the correlation between the use and the benefits of ICT. Teachers who can explain why it is appropriate to use ICT for certain content or with a certain didactic method often have trouble doing so in actual practice (Voogt, et al., 2014). Another notable observation is that very little routine work has been automated in education, for example the annual repeat lessons, or practice material and revision work. This takes up a lot of teachers’ time.

By having teachers hone their professional expertise and by preparing them to use ICT in their work, schools can get more out of their investment in digital educational resources and infrastructure. This means that the professional expertise that teachers ought to possess includes a knowledge of what works with ICT in the 21st century. And on the labor market, it is professional expertise that separates good employees from weaker ones (Humburg, et al., 2013).
3.3 Conclusions: ICT for better education

This Four in Balance Monitor combines our knowledge of the current state of affairs in education with research insights. The evidence points to a trend towards more use of ICT, and a quest to get more out of that use. The main conclusions are:

1. The education sector is making more use of ICT

The education sector is making more and more use of ICT. The infrastructure is improving, the percentage of digital educational resources is rising, and a growing number of teachers are discovering that they are ICT-competent. Although these are necessary prerequisites for using ICT, they are not enough to make effective use of ICT in education. One key factor is that these prerequisites must be attuned to the school’s vision of education. For example, a teacher-driven approach makes different demands on ICT than a pupil-driven one. When developing and selecting digital learning materials, schools must allow for the features of the learning situation in which ICT will be used.

2. Automation/digitization can benefit education

Adaptive instruction and practice software can improve pupil performance. These programs take the job of knowledge transfer over from the teacher. They can save both teachers and pupils time, time that can, for example, be used to supervise pupils more closely as they engage in knowledge construction and cooperative learning activities. This, in turn, offers teachers extra opportunities to structure challenging and didactically varied learning situations, leading to more motivated pupils who perform better.

3. Pupil-driven learning is not equally suitable for all pupils

Pupils who get high marks for self-regulating skills benefit the most from a digital environment based on pupil-driven knowledge construction. Pupils who have lower scores on these skills often perform less well academically in that kind of digital environment. This means that using ICT for pupil-driven learning makes specific demands on both the pupils’ abilities and the teachers’ coaching skills.
Schools play a minor role in digital literacy

A pupil’s level of digital literacy is determined mainly by his or her home situation (socio-economic status). Schools play only a minor role in children’s acquisition of digital literacy. Unless we change this, we are heading towards a growing level of digital inequality. And those who are not digitally literate enough will be left behind in 21st-century society.

Teachers need to know what works with ICT

To get the most out of the available ICT facilities, teachers must be capable of effectual, targeted and controlled use. That means that as professionals, teachers in the 21st century should “know what works with ICT”.

Four in Balance Monitor 2015

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In-depth analysis

This in-depth analysis provides more information and insight in the themes: Content and applications, Infrastructure, Legal aspects and ICT in the secondary processes. The analyses are based on the data from the Four in balance research.
The design and use of educational resources play a crucial role in good teaching. If ICT is to be used effectively, then schools need to have a satisfactory number of effective digital teaching materials. The role that digital materials play in lessons has increased gradually over the past few years (Kennisnet, 2013; Blockhuis, et al., 2014), a trend that continued this year as well.

Teachers have made growing use of digital materials in recent years. In 2007-2008, about 15% of the materials used in primary and secondary education were digital. That figure now stands at approximately 25% (primary) and 35% (secondary). The same trend can be seen in VET, rising from 35% seven years ago to more than 55% this year.4

---

### Percentage of digital learning materials according to teachers

<table>
<thead>
<tr>
<th>Year</th>
<th>Prim</th>
<th>Sec</th>
<th>Vet</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-2008</td>
<td>10%</td>
<td>15%</td>
<td>35%</td>
</tr>
<tr>
<td>2008-2009</td>
<td>15%</td>
<td>20%</td>
<td>40%</td>
</tr>
<tr>
<td>2009-2010</td>
<td>20%</td>
<td>25%</td>
<td>45%</td>
</tr>
<tr>
<td>2010-2011</td>
<td>25%</td>
<td>30%</td>
<td>50%</td>
</tr>
<tr>
<td>2011-2012</td>
<td>30%</td>
<td>35%</td>
<td>55%</td>
</tr>
<tr>
<td>2012-2013</td>
<td>35%</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>2013-2014</td>
<td>40%</td>
<td>45%</td>
<td>65%</td>
</tr>
<tr>
<td>2014-2015</td>
<td>45%</td>
<td>50%</td>
<td>70%</td>
</tr>
</tbody>
</table>

---

4 VET was not covered in the 2014 Educational Resources Monitor (ERM)
Almost all teachers use digital learning materials. Only 1% does not. On the other hand, there are no Dutch teachers who only use digital materials. For the majority, digital materials comprise up to 30% of the materials used. Only 20% of teachers use material of which more than half is digitized, although this represents a slight shift compared with 2013.

More and more teachers say that they use a lot of digital learning materials (i.e. 70% or more of the materials they use). There was also a decline in the percentage of teachers who make little use of digital materials.
Use of various types of digital learning materials

<table>
<thead>
<tr>
<th>no. of educational resources</th>
<th>prim</th>
<th>sec</th>
<th>vet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>1%</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td>3-4</td>
<td>4%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>5-8</td>
<td>53%</td>
<td>51%</td>
<td>55%</td>
</tr>
<tr>
<td>&gt; 8</td>
<td>43%</td>
<td>43%</td>
<td>40%</td>
</tr>
</tbody>
</table>

**Categories of digital learning material**

Most teachers (in primary and secondary education and VET) use multiple categories of digital material. The vast majority use five categories or more. The three sectors scarcely differ in that respect. While the use of digital materials is widespread in teaching, primary and secondary school teachers tend to use courses or course books developed by publishers. In addition, they favor learning materials that supplement these courses, such as videos, printed text files, and interactive exercises.

The three sectors differ very little when it comes to the category of digital material used. The top categories in all three sectors are interactive exercises, videos, and printed and digital text files. In primary and secondary education, courseware rounds off the top five, while in VET, tests are more popular. In primary and secondary education, tests are in sixth place.

Primary education makes ample use of courseware and videos. This fits in with our perception of teachers who base their teaching on specific courses or course books, supplemented by material that they have tracked down themselves. Another increasingly popular category consists of interactive exercises. Teachers use them in addition to the course book to give pupils more opportunity to practice. Primary school teachers make less use of games, websites, simulations, tests or e-books.

Teachers in secondary education and VET also make little use of games, websites, simulations, tests or e-books. They tend to use text files most, supplemented by videos. Secondary education makes less use of the courseware and interactive exercises that are so popular in primary education. That is because general knowledge materials are unsuitable for the subject-specific lessons that predominate in secondary education and VET. In addition, VET teachers are less inclined to use course books when planning their lessons. They tend to make more use of their own material.
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Use of digital educational resources in vet

- Digital text files
- Printed text files
- Video/film clips
- Courseware
- Interactive exercises
- Tests
- Simulations
- Interactive websites
- E-books
- Games

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Obtaining digital materials

Primary and secondary school teachers favor courseware, videos and printed text files. We also see that when we look at the source of their materials. Teachers usually receive learning materials along with the course book that they are using. Alternatively, they may track down materials by Googling or searching online video banks. Almost 90% of primary school teachers receive their digital materials along with the chosen course book. In secondary education, that is more than 60%. These are digital materials developed by the publisher and they refer to the printed materials (textbooks). Primary school teachers add film clips that they have found online, for example on Teleblik, as well as other materials that they have tracked down with Google or on an educational website.

Source of digital learning materials

- Digital learning materials supplied with course book
- Google
- Digital video banks like Schooltv or Teleblik
- Educational websites like Kennisnet or DigiSchool
- Own, original materials
- Colleagues
- Adaptions of existing digital teaching materials
- Other websites
- Wikiwijs-Leermiddelenplein, online platform for sharing educational resources
- Social media (Facebook, Twitter, etc.)

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This approach is also popular in secondary education, although teachers in this sector also produce many of their own materials. Few teachers adapt existing material or obtain it through their social media networks.

**Added value of digital learning materials**
The way teachers use digital materials corresponds to how they assess its added value. They find that digital materials appeal to pupils more, and they feel it helps them vary their lessons and differentiate between pupils. The latter became more important in the past year. Compared to the previous year, teachers did not find the appeal of the materials or combining them with printed resources as important. What is also notable is that teachers are more positive about the amount of time that they can save using digital materials.

### Added value of digital learning materials according to teachers

- Digital educational resources appeal to pupils more
- I can make more differentiation between pupils using digital educational resources
- Digital educational resources are better at conveying learning content
- Digital educational resources offer more variety in learning activities
- Digital educational resources cut down on marking time
- I can have pupils work independently more using digital educational resources
- I think digital and printed educational resources make a powerful combination
- I do not see any added value compared with printed educational resources

**2013-2014**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>vet</td>
<td>2014-2015</td>
<td></td>
</tr>
</tbody>
</table>
Reasons for using digital learning materials

According to teachers (primary, secondary and VET combined), about 35% of all the materials that they use are digital. When asked what needed to happen for them to use more digital materials, the teachers’ responses varied. They mainly said that they needed more devices and more top quality materials. Managers thought that the main barriers to more use were the teachers’ skills and the quality of the material.

Primary school teachers said that the biggest problem is the lack of devices (56%). Very few have trouble tracking down learning materials (15%). Other reasons were cited about the same number of times. The distribution of responses
differs in secondary education. Here too, device availability is a point of concern (42%), but even more striking is that teachers want more time to develop their own materials (49%). This corresponds with other data showing that original materials play a major role in secondary education. The cost is also less of an issue in secondary education than in primary (15% vs. 25%). Devices are not the biggest problem in VET (23%). Once again, VET teachers want more time to develop their own materials (42%), but they also noted technical problems (38%) and quality (26%). As in secondary education, VET teachers do not see costs or traceability as issues.

Primary, secondary and VET school managers believe teacher training is one of the keys to more ICT use (PRIM: 50%, SEC: 59%, VET: 58%). Primary school managers also considered teacher satisfaction as a prerequisite for more use (66%). VET school managers frequently mentioned technical problems as a barrier (54%), echoing their teaching staff.

References:
Effective use of ICT requires an infrastructure that is compatible with the school’s ICT “vision”. Schools can make very different choices in this regard, depending on why they are using ICT and where they are using it. These choices concern devices and networks, and whether to purchase computers themselves or expect pupils (and their parents) to do so. This year has seen an increase in the infrastructure present at schools.

In particular, the number of devices has risen, as has the presence of Wi-Fi. The type of device is also changing, with the number of mobile devices on the increase. For years, schools had one device (computer, laptop or tablet) for every five pupils. This year, according to school managers, that has increased to one device for every four pupils (in primary and secondary education) and one device for every three pupils (in VET).6

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6 The trend for VET is shown as a dotted line to make the interruption in 2012-2013 visible. From 2009 to 2012, the ratio in VET was one computer for every five pupils. In 2012-2013, that was one for every six. In 2014-2015, it is one for every three. The reason is unclear.
Device types
Most of these devices are desktop computers, which still account for about half of all devices in all three sectors. There has been a shift in all three sectors towards mobile devices, such as laptops and tablets. Tablets have become particularly popular in primary education. In 2013, they accounted for 1% of all devices, but that is now 16%. The tablets have been purchased to supplement existing devices (Kennisnet, 2014), whereas laptops and desktops are more often purchased to replace older models. The expectation is that tablets will eventually play an even bigger role in primary education. Secondary education and VET make less use of tablets. Laptops are the device of preference in these sectors. As yet, they are more suitable for the kinds of assignment secondary school and VET pupils are given, for example working with data files (text, images and video) or running subject-specific software.

Devices used

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>tablet</td>
<td>light blue</td>
<td>light blue</td>
<td>light blue</td>
<td>light blue</td>
<td>light blue</td>
<td>light blue</td>
</tr>
<tr>
<td>laptop</td>
<td>dark blue</td>
<td>dark blue</td>
<td>dark blue</td>
<td>dark blue</td>
<td>dark blue</td>
<td>dark blue</td>
</tr>
<tr>
<td>desktop</td>
<td>light grey</td>
<td>light grey</td>
<td>light grey</td>
<td>light grey</td>
<td>light grey</td>
<td>light grey</td>
</tr>
</tbody>
</table>

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Wi-Fi access at school, according to managers

<table>
<thead>
<tr>
<th></th>
<th>Yes, everywhere</th>
<th>Yes, in most places</th>
<th>Yes, in some places</th>
<th>Yes, but not for pupils</th>
<th>No, no Wi-Fi</th>
</tr>
</thead>
<tbody>
<tr>
<td>prim</td>
<td>59%</td>
<td>21%</td>
<td>13%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>sec</td>
<td>65%</td>
<td>27%</td>
<td>2%</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>vet</td>
<td>72%</td>
<td>15%</td>
<td>9%</td>
<td>1%</td>
<td>3%</td>
</tr>
</tbody>
</table>

Wi-Fi almost ubiquitous
Almost every school in the Netherlands has Wi-Fi. In VET, the percentage of schools with Wi-Fi had already reached (almost) 100% in 2013/14. The percentage has also risen sharply in primary and secondary education, from 61% to 93% in primary and from 85% to 95% in secondary. Wi-Fi can be accessed by pupils at most schools (PRIM: 59%, SEC: 65%, VET: 72%). Scarcely any schools limit Wi-Fi access to staff only. Wi-Fi is not available everywhere at every school, however. Thirty-four per cent of primary schools, 30% of secondary schools, and 24% of VET schools indicate that access is restricted in some areas. The presence of Wi-Fi says nothing about its quality or speed, however. That depends on the type of access point, the connectivity, and the building features.

Personal device
Schools are seeing more and more pupils turn up for classes with their own personal device. This one-to-one ratio is most common in VET, where slightly more than half of pupils have their own device (55%). In secondary education, about a fifth of pupils have a personal device (21%). In primary education, not even a tenth of pupils do (7%). The number of pupils with their own device increased in all three sectors (by about 5% in primary and secondary education and 10% in VET).
Legal aspects

This an in-depth analysis supplementing the Four in Balance Monitor 2015 report. Both are based on the same data set and therefore overlap to some extent.

The use of digital learning materials and more complex ICT applications is growing. This increase also affects the collection and utilization of pupil data, requiring firm agreements regarding pupil privacy. Studies carried out by the Dutch Ministry of Education show that schools use basic “common sense” in their approach to pupils’ personal data, with relatively good results. However, they are unfamiliar with the precise privacy legislation and the applicable security standards (PWC, 2014).

The schools surveyed make broad use of digital educational resources in order to allow pupils to practice applying their skills and knowledge, and to test them. The increasing level of digitization and the use of innovative internet applications are producing a growing volume of pupil data. That data not only concerns a pupil’s performance (mark on a test or homework assignment), but also his or her level of learning. To ensure that this data is used correctly and effectively in teaching, measures are needed to protect the privacy of both pupils and teachers (Kennisnet, 2014). Personalized learning is only possible if the privacy of the teacher, the pupil, and other users can be guaranteed (Doorbraakproject Onderwijs & ICT, 2014).

Legal agreements

One of the first key steps toward guaranteeing privacy at an educational institution is to inform and make everyone aware of privacy. Once everyone is aware of the need to deal scrupulously with pupil data (and that such data must be properly secured), it is easier to focus on this issue and support educational institutions in doing so (PWC, 2014).
A recent study commissioned by the Dutch Ministry of Education shows that 59% of primary school organizations have a policy on data security and privacy. In secondary education that was 70% and in VET 50%. By way of comparison, this figure is 89% in higher education. Many VET institutions are aware of the official frameworks (for example legislation or ISO standards) for data security and privacy; 80% are familiar with the legislative frameworks, and 70% with ISO 27001 and ISO 27002 standards. In secondary education, that is 14% and 26%, while in primary education only 8% are familiar with the legislative framework and 13% with the relevant ISO standards (OiG, 2015).

Many institutions have made agreements about the use of the internet and social media. In addition, the vast majority of institutions now have privacy regulations.
**Agreements with suppliers**

It is crucial for schools to make and document agreements that guarantee user privacy. Schools must also strike the right balance between systems that comply with privacy standards and systems that facilitate the teaching-learning process. Each educational institution is responsible for making proper arrangements with suppliers. Those arrangements are documented in data-processing agreements (DPA). A large percentage of those surveyed do not know whether their own educational institution has concluded agreements with suppliers. Only a small percentage indicate that there are no agreements. Nonetheless, 20% of institutions have made agreements with suppliers and are transparent about those agreements with parents.
Transparency

It is not only important for schools to make firm data-processing agreements with suppliers; they must also let parents know that such agreements have been made. Regulations and protocols help in that respect, but schools can draw attention to privacy in other ways as well. The course or school catalog is the most customary way of communicating with parents about privacy. In primary education and VET, websites are a much-used channel of communication, whereas primary schools tend to discuss privacy matters during the enrolment procedure.

Transparency of privacy agreements

- **prim**:
  - Stated on school website: 60%
  - Letter/information sent: 40%
  - Discussed during information evening: 20%
  - Mentioned during enrollment: 10%
  - Don’t know: 0%

- **sec**:
  - Stated on school website: 80%
  - Letter/information sent: 60%
  - Discussed during information evening: 40%
  - Mentioned during enrollment: 20%
  - Don’t know: 0%

- **vet**:
  - Stated on school website: 70%
  - Letter/information sent: 50%
  - Discussed during information evening: 30%
  - Mentioned during enrollment: 10%
  - Don’t know: 0%

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Data security

Schools that aim to deal scrupulously with personal data also need to have a sound data security system in place. A state-of-the-art, properly secured ICT infrastructure is an important requirement for schools wanting to make the most of ICT.

The survey responses show that the VET sector makes agreements about many different matters, although these agreements are often general in nature, with a great deal being left to the staff’s discretion. Very few primary schools have made agreements about data security. The agreements made in secondary education tend to cover only the basics.

References:

- PWC. (2014). *Nulmeting Privacy & Beveiliging Primair en Voortgezet Onderwijs*. Amsterdam: Ministerie van OCW.
ICT in secondary processes

This an in-depth analysis supplementing the Four in Balance Monitor 2015 report. Both are based on the same data set and therefore overlap to some extent.

ICT is not only used to optimize learning; it has also become commonplace in organizational matters related to teaching. The majority of school managers believe that ICT is necessary to run an efficient organization. They also believe that ICT promotes transparency in education.

Applications used
All of the sectors make plentiful use of pupil information management systems, pupil registration systems, and systems for recording pupil attendance. We see more differences between sectors when it comes to other applications, however. For example, electronic learning environments and timetabling systems are common in secondary education and VET.

Use of data taken from information systems

<table>
<thead>
<tr>
<th>Application</th>
<th>Prim (%)</th>
<th>Sec (%)</th>
<th>Vet (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupil information management system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attendance registration system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pupil registration system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronic learning environment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timetabling system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality tool</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curriculum design system</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**ICT in secondary processes**

- To discuss pupils or groups of pupils internally
- To communicate with parents/guardians
- To communicate with teachers (e.g. a performance review or progress report)
- For external communication (e.g. website, school catalog or advertising campaigns)
- To provide data to the Ministry and the Inspectorate (more than Word or Excel alone)
- To supply information to managers or school boards

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Data taken from administrative systems is used for a variety of purposes. For example, ICT is used to supply information to managers, school boards and the Ministry of Education. It is also used to kick off discussions with teachers and parents/guardians. The latter happens least frequently in VET. That is only logical, since parents play a different role in this sector than in primary and secondary education.

Compared to the 2013 Four in Balance Monitor, the use of ICT in secondary processes has increased.

**Need for ICT**

The majority of school managers believe that ICT is necessary to run an efficient organization. They also believe that ICT promotes transparency in education. It provides a better understanding of institutional and pupil performance.

The available data is also used in communications with parents and to discuss pupils (or groups of pupils) internally. This is substantiated by studies on the use and benefits of digital administrative systems. School managers consider it highly advantageous that such systems compile data and provide an overview. This gives them a better grasp of their pupils' results. The most important benefits are knowledge, insight, and greater awareness. Digital administrative systems also help local managers [locatieleiders] analyze teacher performance (*Lockhorst et al., 2014*).

**Need for ICT in primary education**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Agree (completely)</th>
<th>Neutral</th>
<th>Disagree (completely)</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT is essential in helping teachers' continuing professional development</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICT is essential to the efficient organization of teaching at our school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using ICT leads to a better understanding of the institution's performance (e.g. pupil information management systems)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using ICT leads to a better understanding of pupils' performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICT makes it easier for society, parents/guardians, and pupils to assess the school's quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Need for ICT in secondary education

- Using ICT leads to a better understanding of the institution's performance (e.g., pupil information management systems)
- ICT is essential in helping teachers' continuing professional development
- ICT is essential to the efficient organization of teaching at our school
- Using ICT leads to a better understanding of pupils' performance
- ICT makes it easier for society, parents/guardians, and pupils to assess the school's quality

Need for ICT in VET

- ICT is essential to the efficient organization of teaching at our school
- Using ICT leads to a better understanding of the institution's performance (e.g., pupil information management systems)
- ICT is essential in helping teachers' continuing professional development
- Using ICT leads to a better understanding of pupils' performance
- ICT makes it easier for society, parents/guardians, and pupils to assess the school's quality

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Benefits
School managers were asked how ICT affects the way teaching is organized. School managers are generally more critical than teachers about the effects of ICT. That is especially true in VET when it comes to learning outcomes and motivation.
School managers were also asked to consider a number of additional statements. Most school managers believe that ICT will not cut the cost of teaching. They are a bit more positive about the time that ICT can save teachers and the money it can save school boards.

References:

Additional benefits of using ICT

<table>
<thead>
<tr>
<th>Using ICT leads to lower teaching expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>prim</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Using ICT leads to lower school management expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>prim</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Using ICT results in time saved for teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>prim</td>
</tr>
</tbody>
</table>

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Research background

In February and March 2015, I&O Research conducted an online survey among teachers and school managers in primary and secondary education and VET. The purpose of the survey was to get an idea of the state of affairs in the education sector. The respondents were drawn from I&O’s Education Panel (assembled for other Kennisnet studies), the I&O Research Panel, and web addresses published by DUO-IB. Because of the low response rate among secondary and VET school managers, the online survey was followed up by a telephone campaign (result: 30 surveys, 26 filled in by school managers). In addition, the websites of the Primary, Secondary and VET Councils drew attention to the survey on their websites.

**Background respondents**

<table>
<thead>
<tr>
<th>Schools/institutions</th>
<th>prim teachers</th>
<th>sec teachers</th>
<th>vet teachers</th>
<th>prim managers</th>
<th>sec managers</th>
<th>vet managers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>177</td>
<td>146</td>
<td>12</td>
<td>161</td>
<td>53</td>
<td>7</td>
<td>556</td>
<td></td>
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</tbody>
</table>

| I&O Research panel   | 129           | 92           | 42           | 9             | 6            | 8            | 286   |

| Teachers and school managers panel | 46 | 69 | 53 | 21 | 15 | 13 | 217 |

| West Frisian panel | 12 | 11 | 9 | 3 | 2 | 1 | 38 |

| Personalized e-mail addresses | 0 | 47 | 37 | 0 | 5 | 10 | 99 |

| Telephone | 0 | 1 | 3 | 0 | 4 | 22 | 30 |

| Spontaneous | 45 | 13 | 90 | 19 | 7 | 18 | 192 |

| Total       | 409 | 379 | 246 | 213 | 92 | 79 | 1418 |

**Total no. of teachers:** 1034  
**Total no. of managers:** 384

**Characteristics of survey population**

<table>
<thead>
<tr>
<th>Average age</th>
<th>prim teachers</th>
<th>sec teachers</th>
<th>vet teachers</th>
<th>prim managers</th>
<th>sec managers</th>
<th>vet managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>45</td>
<td>47</td>
<td>50</td>
<td>54</td>
<td>53</td>
<td>52</td>
</tr>
</tbody>
</table>

| Male | 27% | 56% | 63% | 63% | 74% | 63% |
| Female | 73% | 44% | 37% | 37% | 26% | 37% |

Appendices

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- Cooperation Kennisnet and SLO
- References

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Cooperation between Kennisnet and SLO

Since 2013, the definitions and questions used in Kennisnet’s Four in Balance Monitor and SLO’s Educational Resources Monitor surveys have been aligned. Where possible, the two organizations compare their results. This makes it possible to sketch annual trends and developments in digital learning materials.
References


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• WRR. (2013). *Naar een lerende economie*. Amsterdam: Amsterdam University Press.

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About Kennisnet

Kennisnet is a public organization that focuses on the use of ICT in education. We are responsible for a basic national ICT infrastructure, share our expertise with the primary, secondary and vocational education and training sectors, and advise their respective representative councils. Along with the sector councils, we see that the education sector is capable of achieving its aims using ICT.

kennisnet.nl

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