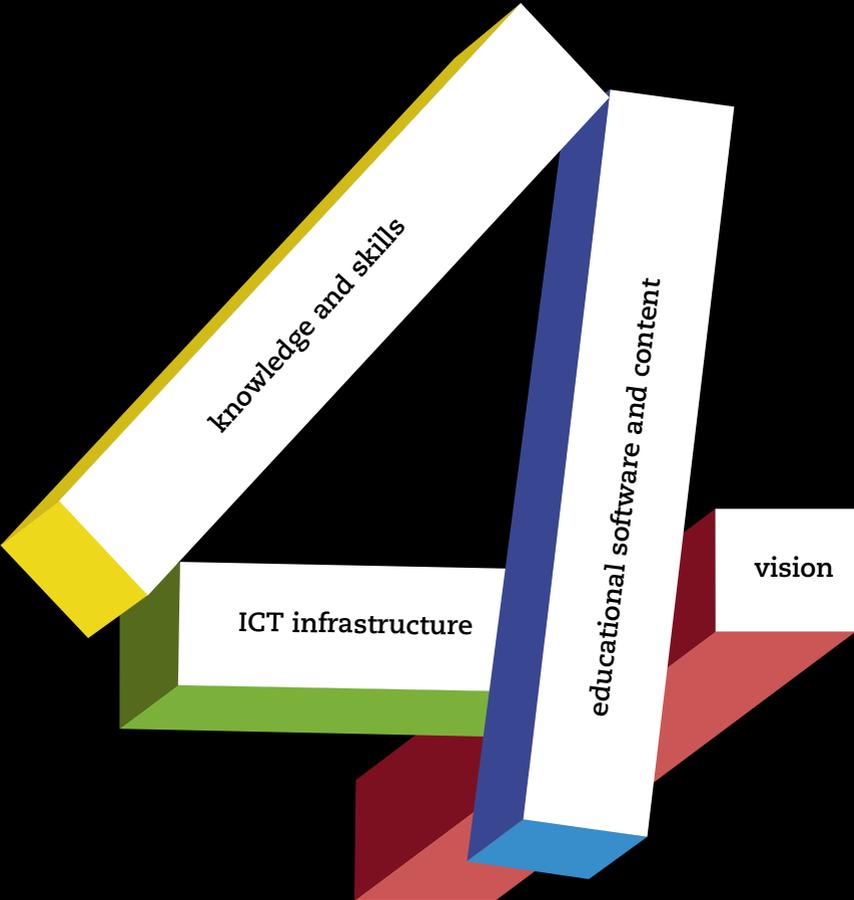


FOUR IN BALANCE MONITOR 2006

Evidence on ICT in education



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Summary

Until recently, ICT managers have above all focused their attention on the purchasing of hardware and educational software and content. These are the technical building blocks of Four in Balance. These technical building blocks can be acquired through a financial transaction. One important lesson that can be learned from the experiences acquired over the last few years is that the successful introduction of ICT is no longer a question of more computers or additional educational software and content. By also focusing sufficient attention on the social building blocks, the investments in hardware, educational software and content generate a greater return. There is a clear need for a vision and competent teachers equipped to make pedagogically sound use of the ICT facilities available.

For the coming years, the policy at Dutch schools is aimed at *making* more use of ICT for quality improvement in education. To achieve that goal, the management is convinced of the fact that priority will have to be given to pedagogical knowledge and the skills of teachers (see figures 1 and 2).

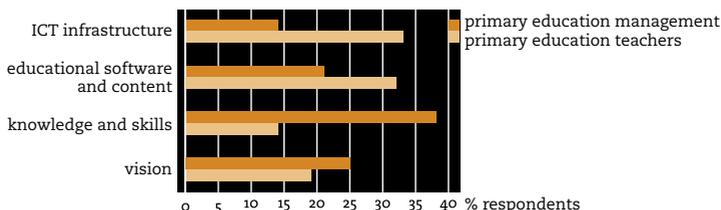


figure 1: Areas of attention of Four in Balance that according to ICT management and teachers in primary education have highest priority (source TNS NIPO, 2005)¹

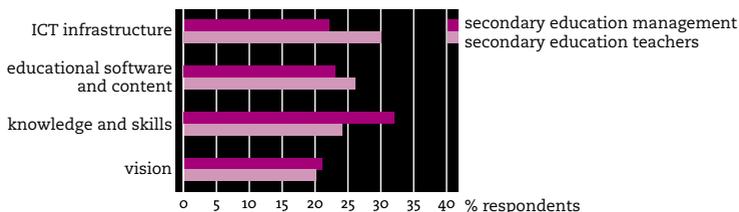


figure 2: Areas of attention of Four in Balance that according to ICT management and teachers in secondary education have highest priority (source TNS NIPO, 2005)

1 TNS-NIPO 2001-2005 - Available via www.ICTopschool.net/onderzoek

After years of giving priority to the technical building blocks (SCP 2006)² in the integration of ICT in education, managers are now suggesting that in the future, more attention should be given to the so-called social building blocks: knowledge and skills and a vision on education. Teachers support the attention for the development of a vision, but believe that proportionally, most attention should still be given to material parameters such as hardware and usable educational software and content. In this respect, the attitudes of the ICT management differ from the perception of teachers with respect to the status of ICT and the approach for the further introduction of ICT in education.

This discrepancy underlines the importance of competences within schools, necessary for the development of a broadly-supported vision on learning with ICT. Finding the correct balance within the local context of the school will call for leadership and cooperation skills.

Now that ICT is gradually being used more and more for educational purposes, it is becoming increasingly clear that many pupils lack the competences necessary for learning with ICT. The technical skills of pupils in operating ICT applications are considerable. Teachers often therefore tacitly assume that pupils who are skilled at operating a computer also have the necessary information handling skills. Problems then occur in searching for, selecting, interpreting and processing information. The majority of teachers in secondary education set homework assignments for which pupils are expected to use the Internet at home. Pupils are often dissatisfied with the tips offered by teachers for searching for information on the Internet. According to the majority of pupils, teachers are unaware when they (the pupils) have copied a piece of work from the Internet, whilst pretending they have written it themselves.

Introduction

What is the current status of Dutch education when it comes to the use of ICT in the classroom? Are the extra efforts by teachers, managers, parents and policy makers achieving results? How and where are computers used in modern Dutch education and, perhaps more importantly, is the use of ICT making education better and more attractive for teachers and pupils?

The Four in Balance Monitor 2006 provides an overview for primary and secondary education of the availability, the use and the impact of ICT in education. The report is based on developments over time, and in that way gives an insight into clear trends in the use of ICT for learning. Alongside the actual use, attention is given to the key factors that influence the effective and efficient use of ICT in education.

The conceptual framework for the monitor and the structuring of the report are taken from the Four in Balance model³. Four in Balance is a vision based on scientific research on the introduction of ICT in education. This vision was presented in 2001 by the ICT op School foundation, and updated in 2004 under the heading Four in Balance Plus. Below, a brief description is provided of Four in Balance. The core idea of Four in Balance is that the use of ICT for educational purposes is a matter of a well balanced deployment of four building blocks:

- vision on education
- knowledge and skills
- educational software and content
- ICT infrastructure.

The challenge facing education is to attune these building blocks to the learning process as it is organized for pupils. Managing this coherence is not a task for individual teachers, but it calls within the school organisation for leadership and cooperation. The four key building blocks that influence the use of ICT in education are depicted in figure 3.

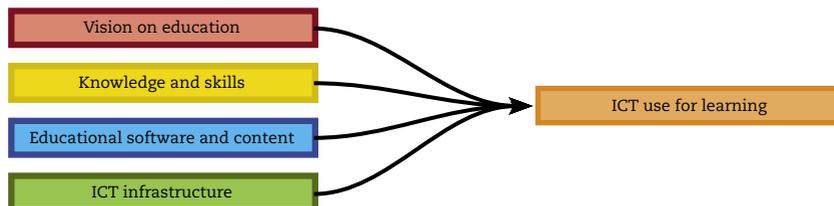


Figure 3: Building blocks of Four in Balance

Sources

This report provides an overview of the current state of affairs for the various aspects of Four in Balance, in relation to the developments over the last few years. The Four in Balance Monitor is based on the results of independent research. Recent data have been collected by the Educational Inspectorate⁴, and in research carried out by TNS NIPO, on behalf of ICT op School. For comparisons over time, use has been made of data previously collected via the ICT Monitor (1998-2000)⁵, the ICT education monitor (2001-2005)⁶ and surveys carried out by TNS NIPO during the period 2001 - 2005 on behalf of ICT op School. In addition, use has been made of other (inter)national studies in as much as these provide an insight into the building blocks of Four in Balance. These sources are annotated in the footnotes.

Benchmark

Alongside the similarities between the Four in Balance Monitor and previous monitor studies, there are also differences. Previous monitor studies were primarily aimed at accountability for government policy. This is not the case for the Four in Balance Monitor. The Four in Balance Monitor is primarily undertaken by and for schools. The purpose of this monitor is to provide management information for schools, using the building blocks of Four in Balance, to ensure the balanced and long-term integration of ICT. The results are a benchmark, and enable individual schools to compare their own position with that of other schools. In addition, the results provide an insight into the speed and direction of developments in the parameters, and the use of ICT within the sectors primary and secondary education. The Monitor in that way generates research-based 'hard' figures on the approach taken by schools in integrating ICT, and the results achieved. These insights are not only relevant for schools but also for providers of ICT products and services, policy makers and researchers.

Finally, it is important to point out that even now not much is known about the effectiveness of ICT in education. Further development and the dissemination of knowledge on the use of ICT are spearheads in the research programme of Kennisnet, ICT op School. This research programme is aimed at providing schools with an insight into the yield from ICT applications and the conditions under which this outcome can possibly be achieved by schools. By reducing uncertainty for schools about both yield and conditions of ICT use, on the basis of the research results, schools will be able to make more balanced choices about the use of ICT in education.

3 www.ictopschool.net/deskundigheid/publicaties/uitgaven/dutch_ict_tools.pdf

4 Educational Inspectorate (2006), ICT questionnaire 2005-2006

5 ICT monitor 1998-2000. Available via www.ictopschool.net/onderzoek/ICT-monitor_1998-2000

6 ICT education monitor 2001-2005. Available via www.ict-onderwijsmonitor.nl

1 Education and ICT

Effective and efficient use of ICT is the very heart of Four in Balance. This means that investments in the conditions that make up Four in Balance are aimed at improving the quality and yield from education. Conditions such as expertise amongst teaching staff or the availability of ICT facilities are not a goal, in themselves. The yield from investments in these parameters must be measured against the actual use of ICT applications in learning situations, and the related improvements in education. This section of the report deals with the yields from and the use of ICT for learning as seen by school management, teachers and pupils.

1.1 Development

Perspective of ICT management

According to the ICT management, the use of computers has reached a (well) advanced stage of development at eight out of every ten schools. In primary education, the advances are greatest; over the last four years, the number of schools at a (well) advanced stage of computer use has doubled. In secondary education, growth is less considerable. In secondary education, the majority of school managers in 2001 described their own school as (well) advanced in the field of ICT. In academic year 2005-2006, primary education had caught up the backlog as compared with secondary education.

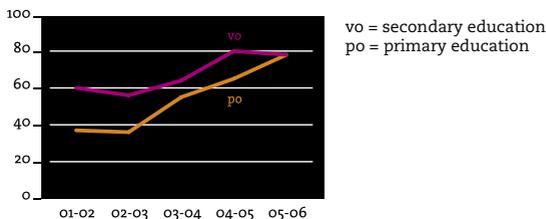


figure 4: Percentage of schools with (well) advanced stage of computer use according to ICT management. (source: TNS NIPO, 2001-2005)

Perspective of teachers

The vision of teachers on their own use of ICT for educational purposes is far less positive than the judgement by the management. In primary education, 43% of teachers classify their own use of computers for educational purposes as (well) advanced, and in secondary education just 29% of teachers.

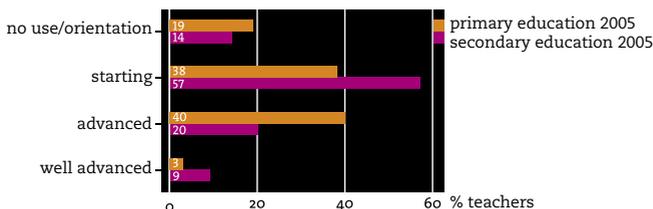


figure 5: Classification of computer use for educational purposes by teachers (source TNS NIPO, 2005)

1.2 Use in teaching

Primary education

The percentage of teachers using computers in their teaching in 2005 is considerably higher in primary education than in secondary education. According to the management of primary schools in 2005, 84% of teachers use computers in teaching⁷. When schools were asked in 2002 what percentage of teachers expected to use computers in the classroom in 2005, the estimate was 93%, an increase of 21%. In reality, computer use has actually increased by 12% over the last three years. For 2008, the management expects that 90% of teachers will use computer applications in teaching. This expected increase of 12% over the next three years is equivalent to the growth achieved over the last three years.

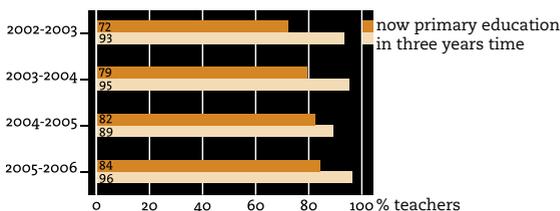


figure 6: Percentage of teachers using ICT in primary education according to ICT management (source TNS NIPO 2002-2005)

Secondary education

In secondary education, slightly less than half of the teachers make (regular) use of the computer in teaching. A further 34% of teachers do make incidental use of the computer, and 18% of teachers never use computers. According to the expectations of the school management, in three years time, in 2008, seven out of ten teachers in secondary education will be using computers. This calls for an increase of 22%. As compared with the developments over the last few years, this is an optimistic expectation. Viewed over the last ten years, the number of teachers using computers has grown annually by on average 3%. At this rate of growth, it will take more than fifteen more years before all teachers in secondary education use computers in teaching.

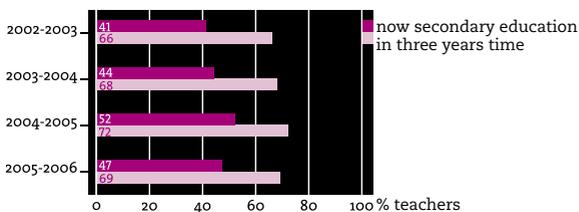


figure 7: Percentage of teachers using ICT in secondary education according to ICT management (source TNS NIPO 2002-2005)

1.3 Intensity

Teacher

A teacher in primary education on average uses a computer for 5-6 hours per week in teaching. This equates to more than one hour a day. Teachers in secondary education who use computers deploy this resource on average for 3-4 hours per week. The time spent by an individual pupil on the computer is dependent upon the ratio between the number of pupils in the class and the number of computers available. In secondary education, it is also above all a question of whether a student is taught by a teacher who makes any use of computers at all in teaching. During the first two years of their secondary education, one-third of the pupils is taught by teachers who make no use of the Internet in their teaching. This means that one-third of the pupils at school

⁷ Research by the inspectorate (2006) suggests a slightly higher number: nine out of ten teachers in primary education regularly use ICT in educating their pupils.

have little or no contact with the Internet. Practically all teachers in secondary education (95%) do set their pupils homework assignments, undertaken at home by pupils, using the computer (IVO, 2006⁸). Teachers often tacitly assume that pupils who are skilled at operating the computer also have the necessary information handling skills. Problems arise also for those pupils in searching for, selecting, interpreting and processing information (SCP, 2006).

Pupils

Pupils from grade 5 of primary education on average spend 9 hours per week on the Internet, at home. The use of the Internet rises to 14 hours per week for pupils in the second year of secondary education. The pupils spend most of their time on the Internet on MSN, profile sites and games. By using the Internet, three out of ten pupils claim they have improved their school performance. The use of the Internet at home for school subjects, according to 90% of school pupils, rarely leads to a hurried completion of homework. The majority of pupils therefore believe that their school performance does not suffer as a result of the time spent on the Internet. This does not apply to 15% of pupils in secondary education who suggest that things would be better at school if they were to spend less time on the Internet at home (IVO, 2006).

1.4 Homework

Practically all havo/vwo (senior secondary general education/ pre-university education) pupils are set homework assignments during their first two school years, for which the Internet must be used at home. Pupils use the Internet at home for searching for information (80%) and working on assignments together with other pupils (53%). Four out of every ten havo/vwo pupils believe that they receive good tips from their teacher for searching for information on the Internet. The majority of pupils, however, are critical about the support offered by school in searching for information on the Internet. Two-thirds of pupils believe that teachers are generally unaware when they have copied information for a piece of work from the Internet, and subsequently pretend that they wrote it themselves (IVO, 2006).

1.5 Methods of use

Computers are most widely used in primary education for drill and practice programmes. Over the last few years, the use of drill and practice programmes has doubled from twice a week to almost four times a week. In addition, searching for information is gradually acquiring a more important position: on average once a week. To a slightly lesser degree, teachers use the computer for word processing and for supporting independent working.

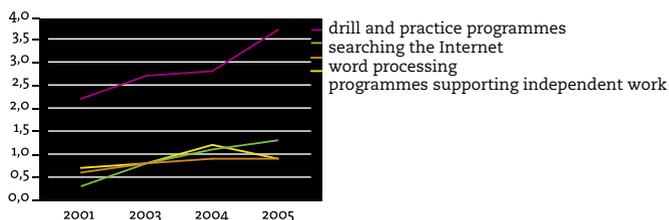


figure 8: Forms of use in primary education

In school year 2005-2006 more than 5000 teachers from 850 school teams have been using the so-called ICT tree. The ICT tree is a web-based tool from ICT op School (www.ICTopschool.net) that assists school teams in making choices for using ICT in teaching. The results of the ICT tree show that three-quarters of teachers express a preference for using ICT for practising learning material and searching for information. The number of teachers that opt to use ICT for communication and cooperation is limited. One in five teachers sees no added value in ICT, for their own teaching.

In secondary education, teachers above all have their pupils produce reports with the computer, and use is made of subject-specific drill and practice programmes. The importance of searching for information on the Internet and the use of the computer as an electronic learning environment for supporting independent working are also increasing (TNS NIPO, 2005).

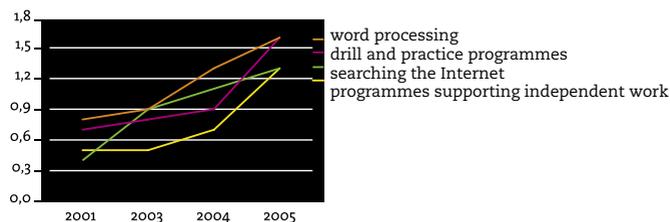


figure 9: Forms of use in secondary education

1.6 Yield

Research into the yield of ICT for educational purposes shows that depending on the context in which ICT is used, ICT can be a valuable tool in acquiring knowledge and skills. Greater learning productivity can rarely be exclusively attributed to an improved computer programme, but generally also results from an improvement in other conditions, such as:

- better computer facilities
- improved ICT skills of pupils
- greater expertise of teachers (Kulik, 2003⁹; Cox, 2004¹⁰).

Above all the skills of the teacher have emerged as an important factor. Research shows a clear relationship between the yield from ICT and the degree to which the teacher is equipped to integrate ICT in teaching (Cox, 2004, Becta 2005¹¹, Drent, 2005¹²). In generating a return on investments from ICT, the teacher plays a key role. A teacher equipped to expertly use ICT in teaching can ensure an improvement in the quality and return from education: pupils learn more, learn faster, learn with more pleasure and feel more successful. However, the same ICT application can have no or even negative effects on learning performance amongst pupils and quality of education, if inexpertly used. This explains why alongside studies showing positive effects of ICT, studies are also being published that show no or even negative results. The realisation that there is no single relationship or any linear connection between the use of ICT and learning yield is illustrated by figure 10.

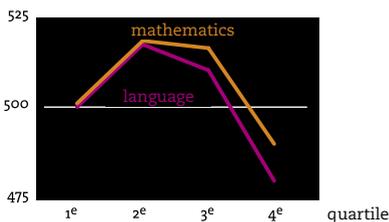


figure 10: Scale of use of ICT and learning performance for mathematics and language (source OECD, 2006¹³)

This figure shows that pupils who make moderate use of ICT (second and third quartile) perform better than pupils who have made little or no use of ICT in education. Very high levels of use of ICT (highest quartile) however, result in poorer learning performance, even when compared with absolutely no use of ICT. The phenomenon that after use of ICT is not always better occurs in both mathematics and language. The use of the correct amount and mixture of ICT materials in learning situations is therefore essential, and calls for considerable expertise on the part of teachers.

9 Kulik, J. (200). *Effects of using instructional technology in elementary and secondary schools: What controlled evaluation studies say*. Arlington: SRI.

10 Cox, M., M. Webb, C. Abott, B. Blakeley, T. Beauchamp and V. Rhodes (2004). *A review of the research literature relating to ICT and attainment*. London: Becta.

11 Becta (2005). *The Becta review 2005. Evidence on the progress of ICT in education*. Coventry: British Educational Communications and Technology Agency.

12 Drent, M. (2005). *In transitie. Op weg naar innovatief ICT-gebruik op de PABO*. Enschede: thesis University of Twente. Available via www.ICTopschool.net/onderzoek

13 OECD, (2006). *Are students ready for a technology-rich world?*. Paris: OECD publishing, programme for international student assessment.

1.7 What are ICT management doing, and what do they want?

The ICT managers of schools have expressed the ambition that more use should be made in the future of ICT applications, with as the primary objective improving the quality of education. To achieve this goal, education requires support. Table 1.2 contains an overview of the seven areas in which support is most badly needed. This table shows that schools need support both in making choices (development of vision and good examples) and the facilities necessary for the use of ICT (usable programs, content, pedagogical tips). The need for more computers is gradually shrinking. This means that according to the ICT management, the expansion of ICT facilities at school level has a lower priority than providing support to teachers in the choosing and using of ICT.

table 1.2: Top 7 areas for support (source: TNS NIPO 2003 - 2005)

Needs*	primary education			secondary education			Average
	03-04	04-05	05-06	03-04	04-05	05-06	
1. Computer programmes to enable pupils to work independently	75	72	72	70	78	68	73
2. Good examples of ICT and pedagogical use	72	67	69	63	76	73	70
3. More usable teaching material (content)	59	56	57	68	66	72	63
4. Tips for use of computer programs in lessons	57	65	56	59	60	53	58
5. A vision on ICT and education jointly developed by teachers and management	--	--	55	--	--	58	57
6. Courses aimed at teaching with ICT applications (pedagogical applications)	54	49	49	41	45	63	50
7. Extra computers or other computer facilities	57	57	43	49	42	42	48

* Ranking determined on basis of average percentage schools over the last three years.

The most important bottleneck in the further integration of ICT and education, according to ICT management, is the availability of financial resources

table 1.3 bottlenecks for ICT use (sources ICT education monitor 03-05; Educational Inspectorate 05-06)

Bottlenecks*	primary education			secondary education			Average
	03-04	04-05	05-06	03-04	04-05	05-06	
1. Costs of educational software (licences)	67	71	58	60	63	50	62
2. Financing for upgrading ICT facilities	41	37	46	56	59	61	50
3. Possibility of producing tailor-made programs	41	32	39	54	50	54	45

* Ranking determined on basis of average percentage schools over the last three years.

To encourage teachers to use ICT, at more than 80% of schools, ICT management consistently underlines the value of ICT for education. The majority of schools are offering content-based support, and at most schools the exchange of knowledge is encouraged, and space made available for trying out new learning arrangements with ICT (for example grassroots). The number of schools training teachers in ICT basic skills as a strategy for encouraging the use of ICT is gradually decreasing. There is also less attention for ICT skills amongst teachers in job-performance interviews or application interviews. So far, the least attention has been paid to specific teacher training in didactic ICT skills.

table 1.4: How are schools encouraging teachers to use ICT? (sources: ICT education monitor 03-05; Educational Inspectorate 05-06)

Contribution from ICT*	primary education			secondary education			Average 03-06
	03-04	04-05	05-06	03-04	04-05	05-06	
1. Consistent announcement that ICT is valuable for education	72	79	81	69	63	80	74
2. Content-based support by ICT coordinator/working group	62	68	69	61	57	56	62
3. Encouraging exchange of knowledge and experiences amongst colleagues	52	52	57	53	56	54	54
4. Offering space for experimenting / trying out new things in small steps	50	38	51	57	60	61	53
5. Training in ICT basic skills (ECDL, DRO)	50	48	41	51	46	44	47
6. ICT is a permanent part of integrated quality assurance	42	47	56	36	-	34	43
7. Making the use of specific applications compulsory	--	--	50	-	31	42	41
8. Taking into account ICT competences when selecting new staff members	16	18	36	28	30	30	26
9. ICT is a subject during job assessment interviews	24	31	32	26	21	23	26
10. Specific training in pedagogical ICT skills	22	23	18	19	18	21	20

* Ranking determined on basis of average percentage schools over the last three years.

2 Vision on education

2.1 Presence of a vision

A vision on education is guiding choices in respect of the use of ICT. In primary education almost three-quarters of schools have centrally developed a vision on the use of ICT. In secondary education, six out of every ten schools have an explicit vision on ICT.



figure 11: Percentage of schools that according to ICT management have centrally developed a vision on education (source: TNS NIPO 2003-2005).

To a considerable extent, the attitudes within a school towards the structuring and organisation of learning processes determine which ICT applications will or will not tie in with the educational objectives. The yield from ICT is related to the match between educational vision and choice of ICT. A mismatch between educational vision and ICT application means, in practice, the use of educational materials not developed for the learning situation in which they are deployed. This is for example the case when the intention is to encourage cooperation between pupils, whilst a computer programme is used, that was developed for individual exercises with study materials. More than half of schools in primary education and secondary education have developed a vision on the use of ICT in the form of an ICT policy plan, that is subsequently indeed implemented by the management. In addition, one-third of schools have an ICT policy plan that is not (any longer) in use.

The majority of ICT managers believe that within their school, there is a vision on ICT. This however does not tie in with the opinion of most teachers. Two-thirds of teachers express a great need for a school management, that together with the team takes responsibility for developing a broadly supported vision on the use of ICT in education.

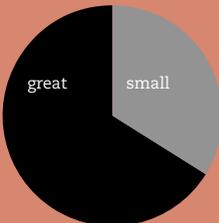


figure 12: Percentage of schools that according to ICT management have developed centrally a vision on the use of ICT. (source: TNS NIPO 2003-2005).

2.2 Leadership

Another aspect relevant for the use of ICT is the presence of leadership within the school. Leadership is first and foremost important in the process of vision development. The development of a vision on the use of ICT in practice means setting the direction for school development by identifying an inspirational goal, the striving for which is seen as valuable, by all involved. Leadership is of crucial importance within the school organisation. This is reflected by studies in the field of effective schools and educational innovation (Goodson, 2003 ; Hargreaves¹⁴, 2005¹⁵, Bolt et al¹⁶, 2006).

Once the picture of the kind of education and the role of ICT in that education within the school is clarified, and is broadly supported by team members, good management is essential in order to obtain harmonisation with the remaining building blocks of Four in Balance. In summary, it can be stated that achieving balanced coherence between the building blocks for the effective and efficient use of ICT in education calls for clear leadership.

A great deal is known about the characteristics of good leadership. The most important are:

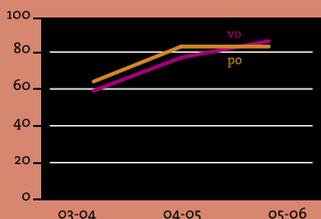
- the capability of developing a vision, and inspiring others on that basis;
- establishing shared goals and objectives;
- setting high expectations on the quality of education;
- encouraging the professional development of teachers;
- developing a structure that encourages participation and involvement.

Much less is known about the extent to which characteristics of ICT leadership are present in education. There is a lack of recent and systematically-collected data on ICT leadership in education. A number of selective examples have however been described by the Dutch Educational Inspectorate (see www.schoolvoorbeelden.nl). These examples are a source of inspiration, but do not provide a representative picture of the way in which ICT leadership is implemented in education. For the next data collection in the Four in Balance Monitor in 2007, it has already been decided to collect data on ICT leadership.

At this time, it is only possible to give an indication of the presence of ICT leadership in education, based on the finding that two-thirds of teachers expressed the need for a school management capable of developing a broadly-supported vision within the school on the use of ICT (figure 12). Based on the close ties between leadership and vision, this could be taken as an indication for the insufficiency of ICT leadership at schools. The management of more than half of schools state that they need support in jointly developing a vision on ICT and education, with the teaching staff (see table 1.2).

2.3 Contributions from ICT to the structuring of education

This section deals with the contribution that ICT provides to various aspects of education, according to the management. There is much similarity between primary and secondary education schools concerning the contribution of ICT to more attractive education for pupils. More than 80% of ICT managers share this opinion.



figuur13: Percentage of schools where the ICT management believes that ICT makes an important contribution to making education more attractive for pupils (source: TNS NIPO, 2003-2005)

¹⁴ Goodson, I.F. (2000). *Professional knowledge, professional lives: studies in education and change*. Philadelphia: Open university press

¹⁵ Hargreaves, A. (2000). *Teaching in the knowledge society: education in the age of insecurity*. Philadelphia: Open university press

¹⁶ Bolt, van der L, F Studulski, A van der Vegt, D. Bontje (2006). *De betrokkenheid van de leraar bij onderwijsinnovatie: een verkenning op basis van literatuur*. Utrecht: Sardes

The contribution of ICT in making education more attractive is operationalized at most schools in the promotion of independent learning, more efficient organization of education, the possibility of offering a richer learning environment, and an educational organisation that is more flexible and adaptive to pupils' needs.

In addition to these gains, ICT also offers support at a smaller number of schools in promoting cooperative learning, tailor-made testing and communication between teacher and pupil. Over and above the use by teachers during lessons, many schools also utilize ICT for remedial purposes for example by Internal Supervisors (IB workers). In primary education, this applies to 74% of schools, and in secondary education 58%.

table 2.1: Percentage of schools that experiences a (relatively) major contribution by ICT to educational goals

Contribution from ICT*	primary education			secondary education			Average
	03-04	04-05	05-06	03-04	04-05	05-06	
1. More attractive education for pupils	64	83	83	59	77	86	75
2. Creating richer learning environment	59	73	72	53	67	80	67
3. Encouraging independent learning	60	77	72	50	67	77	67
4. More efficient organization of education	--	58	56	--	--	53	56
5. Greater flexibility / individualizing of the learning process	35	63	56	38	47	55	49
6. Provision of adaptive education, tailored to needs	46	64	56	31	34	50	47
7. Promoting cooperative learning	--	38	30	--	43	36	37
8. Tailor-made testing	--	--	24	--	--	24	24
9. Intensifying communication between teacher and pupil	8	16	6	--	27	14	14

Figure 14 illustrates the relationship between the commonly occurring (1 to 6 in table 2.1) and less commonly occurring (7 to 9 in table 2.1) contributions by ICT. This figure shows for primary education and secondary education that the less commonly occurring contributions above all emerge in schools already making optimum use of the commonly occurring contributions. The experiences of these possibly pioneering schools illustrate that many schools could generate further added value from ICT in the fields of tailor-made testing, cooperative learning and intensifying of communication between pupil and teacher.

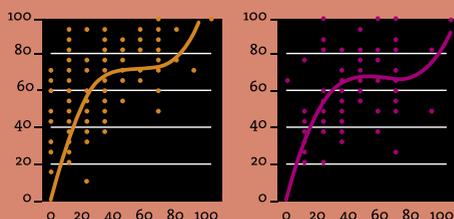


figure14: Relationship between experienced added value of ICT in commonly occurring and less commonly occurring contributions: left primary education and right secondary education (source: Educational Inspectorate, 2006)

3 Knowledge and skills

3.1 Expertise of teachers

ICT management

The technical skills of teachers in operating computers are increasing more and more. According to the ICT management, 80 to 90% of teachers have sufficient basic skills to use standard applications such as Internet and word processing. Pedagogical skills are also improving. Eight out of every ten teachers in primary education and six out of ten teachers in secondary education are, according to the management, are sufficiently skilled to use ICT in teaching environments.

table 3.1: Percentage of teachers with sufficient / good mastery of ICT skills according to ICT management (sources: 2003-2004: ICT Education Monitor; 2005: Educational inspectorate)

ICT skills	primary education			secondary education		
	03-04	04-05	05-06	03-04	04-05	05-06
1. Basis skills (word processing, Internet)	78	80	89	74	76	83
2. Pedagogical applications of ICT (use of ICT in education)	67	70	81	46	48	62

Teachers

Teachers believe to a lesser degree than ICT management that they are competent to use ICT in a teaching and learning environment. Although educational software has now been available for more than 25 years in all types of education, only half of teachers in primary education consider their own skills in the pedagogical use of educational software and content to be at an advanced level. In secondary education, one-third of teachers believe that they can use the computer as a pedagogical aid, at an advanced level. One-quarter of teachers feel comfortable with an electronic learning environment.

table 3.2: Percentage of teachers with (very) advanced level ICT skills (source: TNS NIPO, 2003 -2005)

ICT skills	primary education			secondary education		
	03-04	04-05	05-06	03-04	04-05	05-06
1. Use of the computer as a pedagogical tool	43		49	46		32
2. Organising lessons in which ICT is used	31		31	43		39
3. Use of educational software	53		51	66		36
4. Assessing the usability of software	40		43	44		44
5. Integrating ICT in your education to generate added value	33		45	40		38
6. Use of the electronic learning environment	--		24	--		28
7. Use of the pupil monitoring system	--		45	--		33

The number of teachers very familiar with the possibilities offered by computers has risen over the last four years from on average 6% to 28%, in 2005. The number of teachers only moderately or poorly informed of the possibilities of ICT fell in primary education in 2005 to 19%, and in secondary education to 39%. This means that increasingly, one of the essential preconditions for the use of ICT in education is being met, namely an understanding of the possibilities of ICT for their own teaching. This understanding is the starting point for subsequently acquiring the necessary pedagogical skills for the actual use of ICT in the teaching situation.

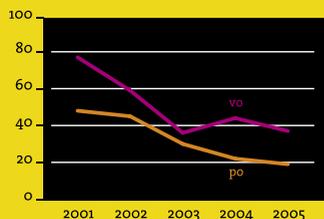


figure 15: percentage of teachers moderately/ poorly familiar with the possibilities offered by ICT (TNS NIPO, 2001-2005)

Cooperation

To establish greater expertise, cooperation with other schools is of essential importance. The number of cooperative ventures in the field of ICT has risen considerably over the last few years, in primary education. In the period 2000-2005, the number of cooperative ventures grew from 50 to 380 (figure 16).

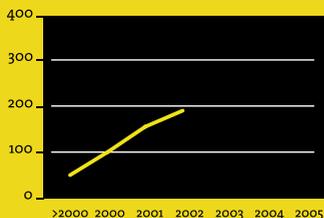
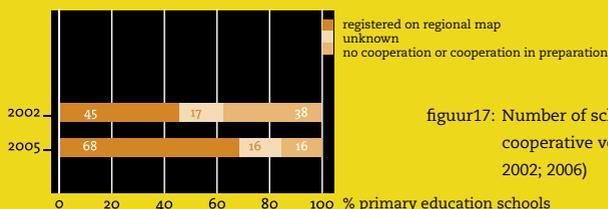


figure 16: Number of ICT cooperative ventures (sources Oberon, 2002¹⁷, 2006¹⁸)

In 2002, 45% of all primary schools were involved in cooperative ventures. In 2005, this number had risen to 68%. In total, 16% of primary schools are not involved in (formal) cooperation with other schools, in the field of ICT. For the remaining 16% of schools, no information is available as to whether they are part of a cooperative venture (figure 17). Cooperation between schools is above all aimed at exchanging knowledge and experiences on the use of ICT. In addition, cooperative ventures are active in combining educational needs, whereby the cooperative venture acts as broker between schools and market parties. 65% of the cooperative ventures identified exchange of knowledge and experience as the key success factor (Oberon, 2006). Cooperative ventures operate as so-called ‘communities of practice’ or ‘professional learning communities’, in this way contributing to the expertise of their teachers.



figuur17: Number of schools affiliated to an ICT cooperative venture (sources: Oberon, 2002; 2006)

In secondary education, less schools opt for cooperation in the field of ICT in the form of an (inter-administrative or intra-administrative) cooperative venture; however, ICT cooperation instead often takes the character of a project. The sharing and combined development of knowledge is also an important motif for cooperation in secondary education. Commonly occurring themes in secondary education, in respect of which schools do cooperate, include (Oberon, 2005¹⁹):

- developing a vision on the use of ICT;
- developing educational content in relation to the use of an electronic learning environment
- professional improvement for the pedagogical of subject-specific ICT applications.

17 Oberon, (2002). Focus on cooperation. Available via www.ICTopschool.net/onderzoek

18 Oberon, (2006). Developments in ICT cooperation in primary education. Available via www.ICTopschool.net/onderzoek

19 Oberon, (2005). Secondary education in motion. Available via www.ICTopschool.net/onderzoek

Via ties

Kennisnet ICT op School supports schools as far as possible via ties with existing organisations. The figures below illustrate the effectiveness of this chain approach. Figure 18 shows that ICT op School, according to the cooperative ventures, is the most important partner in offering them support. This figure also shows that cooperative ventures are of importance to one another. Figure 19 then shows that cooperative ventures in turn represent a network of schools, from which they draw most support.

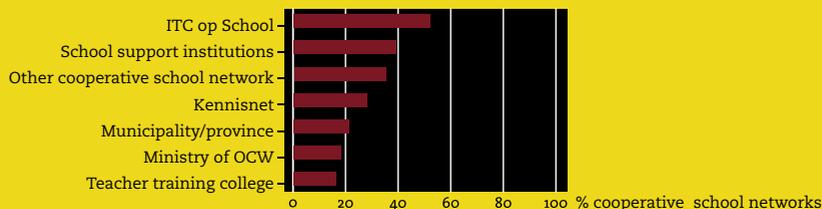


figure 18: Groups and bodies that have supported cooperative ventures to a considerable extent over the last twelve months (source TNS NIPO, 2005)

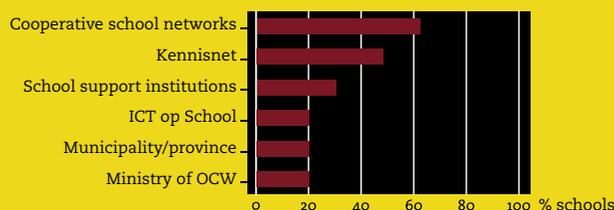


figure 19: Groups and institutions that have provided major support to primary schools over the last twelve months (source TNS NIPO, 2005)

Pupils

In the twelve to fourteen age group, 96% of pupils are active on the Internet, every week. Amongst children between the ages of six and eleven years, use of the Internet has risen from 48% in 2003 to 71% in 2005 (Sikkema, 2005²⁰). Pupils currently attending primary and secondary education have grown up with instant messaging, chat, e-mail and games. Instrumental skills for using computer facilities are therefore above all acquired by pupils outside school. Home use makes a greater contribution to ICT skills of pupils than the school (Kuhlemeier & Hemker, 2005²¹; De Haan & Huysmans, 2002²²; Ten Brummelhuis, 1998²³).

The majority of pupils have computer facilities at home. If pupils have no access to computers at home, the most important explanation is socio-economic (OECD, 2006). A number of municipalities in the Netherlands have decided to make computer facilities available to these families, in the framework of poverty policy and tackling social deprivation. Research into the provision of computers shows that home ownership of computers does contribute to reducing the level of disadvantages experienced by these pupils in terms of digital skills when entering secondary education. (Emmelot and Felix, 2006²⁴).

20 Sikkema, P. (2005). *Young people 2005*. Amsterdam: Qrius. Available via www.hetjongerenonderzoek.nl

21 Kuhlemeier, H. and B. Hemker (2005). Computer use at home and Internet skills in secondary education. *Pedagogische Studiën* 82, p. 5- 6.

22 Haan, J. de, and F. Huysmans (2002). *Van huis uit digital. Verwerving van digitale vaardigheden tussen thuismilieu en school*. The Hague: SCP

23 Brummelhuis, A.C.A. ten (1998). *ICT monitor 1997 - 1998: secondary education*. Enschede: University of Twente.

24 Emmelot, Y. and C. Felix (2006). *The digital divide bridged: investigation into (potential) effects of the PC supply scheme of the Municipality of Amsterdam*. SCO

Pupils are becoming more conversant with ICT applications, at an ever younger age. In 1999, less than half of pupils were able to insert a picture in a story, on the computer. In 2006, nine out of ten pupils in the upper years of primary education possess this skill. The skills amongst pupils in the field of Internet applications have risen even more steeply over the last few years. Whereas in 1999 only 19% of pupils from the upper years of primary education were able to send an e-mail, in 2006, this skill is mastered by more than 90% of pupils. Table 3.3 provides an overview of the skills pupils are able to demonstrate on the computer, without assistance, in 1999 and 2006.

table 3.3 Overview of the skills which pupils from the upper years of primary education are able to perform on the computer, without assistance, in their own opinion. (sources: ICT monitor, 1999; Evaluatie Diploma Veilig Internet, 2006 Data for 2006 are indicative).

General	1999 (group 7)	2006 (group 6, 7, 8)
Typing and saving a text on the computer	78	95
Placing a sentence at another place in a story	64	85
Using the spelling checker	48	83
Adding an existing picture to a story	41	88
I can burn a CD	-	45
Email		
I can send an e-mail	19	91
I can reply to an e-mail	18	93
I can forward an e-mail	15	83
I can send an attachment	7	56
I can surf on the Internet	29	97
I can print out an Internet page	27	88
I can use a search engine	25	96
I can download a file from the Internet	15	68
I can chat	17	79
I can make my own homepage / profile	--	51
I can use MSN	--	84

Safety

If pupils in the 10-14 age group use Internet at home, 64% of parents generally monitor them. At school, pupils are more closely monitored. According to 88% of pupils, there is someone at school who keeps an eye on them when they are using the Internet. As pupils get older, they feel safer on the Internet. In secondary education, one-third of pupils say they do not feel safe on the Internet. In the first year of secondary education this still applies to 26% of pupils, and in the second year of secondary education, 22% feel unsafe on the Internet. As pupils become older, they feel safer on the Internet. This trend is comparable with the occurrence of online bullying. In primary education, 20% of pupils say that they are bullied online. In the second year of secondary education, this percentage has fallen to 10%. Generally speaking, for pupils, a feeling of safety in the class or learning environment is an essential precondition for learning. Measured according to the sense of (un)safety, the Internet as a learning environment for pupils in primary education is a higher risk environment than for pupils from secondary education. A limited group of pupils (10-20%) is vulnerable on the Internet: they are bullied online at least once a month (IVO, 2006). The results illustrate that in using the Internet for school tasks, not only the learning and information skills of pupils should receive attention, but also issues concerning social standards and their implications for computer use.

4 Educational software and content

There is no accurate information concerning the educational software and content actually used by teachers and pupils. Information is above all available about the range of educational software and content on offer.

The need for usable educational software and content has been amongst the most important wishes expressed by schools, for more than ten years. The precise cause of this persistent demand is unclear, but may relate to a lack of awareness amongst schools of the programs and content available, the inability to find software that ties in with the needs of the school or a mismatch between supply and demand. Other countries are also struggling with the match between the supply of digital teaching material and actual use by teachers and pupils (Becta, 2006²³).

One quarter of teachers believes that educational publishers make good use of ICT in the teaching aids they offer. Forty percent believes that ICT is sufficiently integrated in the methods. More than one quarter of teachers is only moderately satisfied. Teachers in primary education and secondary education do not differ in their attitudes to the attention paid by educational publishers to ICT in the teaching resources.

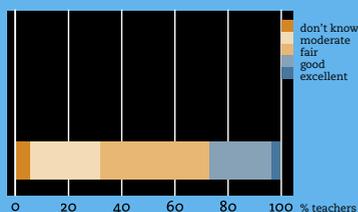


figure 20: Satisfaction amongst teachers in primary education and secondary education with the attention paid by educational publishers to ICT in teaching resources (source: TNS NIPO, 2005).

Despite the relative degree of satisfaction amongst teachers in respect of the ICT content of the methods placed on the market by educational publishers, three-quarters of teachers in primary and secondary education have expressed a need for more usable teaching material and content for computer use (TNS NIPO, 2005).

ICT management shares this opinion (see table 1.2, see pages 21/22).

In the Netherlands, pupils have access to more educational content than pupils in other countries. International comparisons by the OECD (2006) also show that the Netherlands is the only country in the world where more pupils use educational software and content in the home situation (65%) than school books (45%). Over the coming period, more research will be carried out into the position of digital teaching material in relationship to school books, and the match between supply and demand in the field of educational software and content.

5 ICT infrastructure

Over the last few decades, education in the Netherlands has invested heavily in purchasing infrastructural ICT facilities. Between 1997 and 2005, the government invested more than € 1.5 billion euro in integrating ICT in education. The central focus for investments in this period was on equipment, educational software and content, and Internet facilities. The scale of computer facilities has risen by some fifteen times, over the last twenty years. At present, schools in primary education and secondary education on average have access to one computer for every 7 pupils. With this pupil-computer ratio, the Netherlands occupies a mid-range position internationally, comparable with Belgium and Italy. Countries with the greatest availability of computer facilities for pupils are the United States, England, Australia, Korea, Hungary, New Zealand, Austria and Canada. In 2003, these countries already has at least one computer for every five pupils (OECD, 2006). As concerns the availability of computers for pupils in the home situation, the Netherlands is internationally in the upper levels. More than 95% of pupils in the Netherlands have a computer at home. In Europe, Dutch households are the best equipped with computers and Internet access. The availability of broadband Internet in Dutch households (62%) is considerably greater than in the rest of Europe (average 23%)²⁶.

table 5.1: Availability of computers expressed in the pupil-computer ratio (source: Educational Inspectorate, 2005)

	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04	'04-'05	'05-'06
primary education	27	17	12	9	8	7	7	7	7
secondary education	20	18	13	12	10	9	9	9	7

Over the last four years, the average number of pupils per computer has been stabilising in primary education. This suggests that a saturation point in computer equipment has been reached in many schools. In secondary education, more computers are now available per pupil. The pupil-computer ratio has fallen from 9:1 to 7:1.

The general trend is for schools to invest less in increasing the number of computers and instead to focus more on quality improvement in the ICT facilities available. According to the management of both primary schools and secondary schools, approximately one-quarter of existing computers are due for replacement. The management expects that 20-22% of these computers will actually be replaced in academic year 2005-2006. This discrepancy between the number of computers due for replacement and the number that will actually be replaced has become ever smaller over the last few years.

table 5.2: Replacement of computers (source: TNS NIPO, 2005)

	primary education			secondary education		
	03-04	04-05	05-06	03-04	04-05	05-06
Percentage of computers for educational purposes ready for replacement	22	27	21	25	24	25
Percentage of computers actually replaced this academic year	12	15	20	19	16	22

Schools are also investing more and more in improving Internet facilities such as the laying of broadband and wireless networks. In secondary education, 95% of computers have access to the Internet. In primary education, 83% of computer equipment is connected to the Internet (Educational Inspectorate, 2006). Table 5.3 provides an overview of the type of Internet facility at schools

table 5.3: Type of Internet link

Internet link	primary education	secondary education
Ordinary telephone + modem	1	0
ISDN + modem	5	1
ADSL	74	57
Cable	12	32
Optic fibre	13	12
Satellite	0	1
Other	1	13
Don't know	5	0

Note: Total percentage is more than 100%, because a number of schools have different types of Internet link (source: Breedbandmonitor, 2006²⁷)

Satisfaction

Generally speaking, the ICT management considers the ICT facilities available in schools sufficient for use in lessons. In 2005, 90% of primary schools indicated that ICT facilities are (more than) sufficient. This applies for 80% of schools in secondary education. The number of schools that score ICT facilities as moderate or poor has fallen considerably over the last few years, in particular in primary education. In the period 2001-2005, the percentage of schools with insufficient ICT facilities in primary education fell by 30%, and in secondary education by 12%.

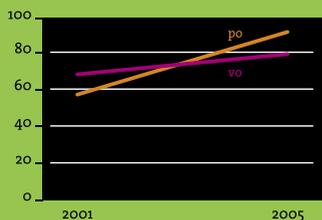


figure 21: Schools with (more than) sufficient ICT facilities.

ICT managers are positive about the management and maintenance of ICT facilities.

Nine out of every ten managers in primary education and secondary education share the opinion that the management and maintenance are (more than) sufficiently organised. The number of schools whereby computer management is moderate or poorly organised has fallen considerably over the last few years. In primary education, the number of schools with management problems has fallen since 2001 from 40% to 11%, and in secondary education from 32% to 8%.

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The foundation promotes the interests of the Dutch educational sector in the field of ICT, offers tools for making choices of ICT products and services, and supplies educational services and products for educational renewal.

ICT op School is a label of Kennisnet ICT op School. As an interest group, ICT op School has set itself the objective of equipping organisations in primary and secondary education, and supervising them in their choice of ICT products and services, for example through accurate specification of educational needs in the field of ICT. ICT op School promotes collective interests in respect of ICT and education in interaction with market parties and politics. Important instruments are research into the effect and return of ICT and monitoring of developments in the field of education and ICT.

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