OECD/CERI ICT PROGRAMME

# A Case Study of ICT and School Improvement at

# Basisschool 'De Verrekijker', Amstenrade, The Netherlands



February, 2001

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## 1. Overview

### 1.1 School description

Basisschool 'De Verrekijker' is a catholic school for primary education in a small village (Amstenrade) in the south of the Netherlands. Amstenrade has only one primary school. Most parents in Amstenrade choose this school for their children, but some choose a school in a neighbouring village because this school is closer to their homes. The income level of the parents is about mid (on average). About 320 students visit the school. The board of this school has four other schools in surrounding villages.

The school has twelve classrooms and a playroom for the young children. The computers are in the common lobby of the school. In the classrooms, the teachers have a computer on their desks. There are also one or two computers in each classroom for the students.

The educational staff of the school consists of a principal, fifteen teachers (four of them have a shared job), a remedial teacher, an internal counsellor, and a technology co-ordinator. The principal and the technology co-ordinator teach no classes. The seven teachers of grades 3 to 6 are involved in the innovation (some classes are combination classes or parallel classes).

The school has the traditional year group system. The developments in primary education have resulted in more attention to the individual student. The teachers apply differentiation within the groups.

### 1.2 Educational system

In the Dutch educational system, primary education starts at the age of four and ends at the age of twelve. The first two grades are Kindergarten. When a child has become five years of age, primary education is obligatory. Core objectives have been established for all subject areas and educational fields. For children with learning difficulties (related to behaviour), there is special education. The policy of the government is to keep these children in primary education ('Going to School Together'). By catering for a wider range of educational needs, these children can attend lessons in regular education.

After primary education, the students go to secondary education. They start with 'basic secondary education', after this period of two years they continue with pre-vocational secondary education, general secondary education (junior or senior), or with pre-university education.

### 1.3 School improvement and ICT

In fact, there are two innovations related to ICT running parallel at this school. The first one is the implementation of a student monitoring system for all grades. The second one is the implementation of designing and publishing of web pages by the students of the upper grades (i.e., grades 3 to 6, age 8/9 to 11/12). Word is used for creating HTML-documents (web pages), the documents are placed on the Intranet of the school; students and parents have access to the Intranet. The working method is based on independent information processing.
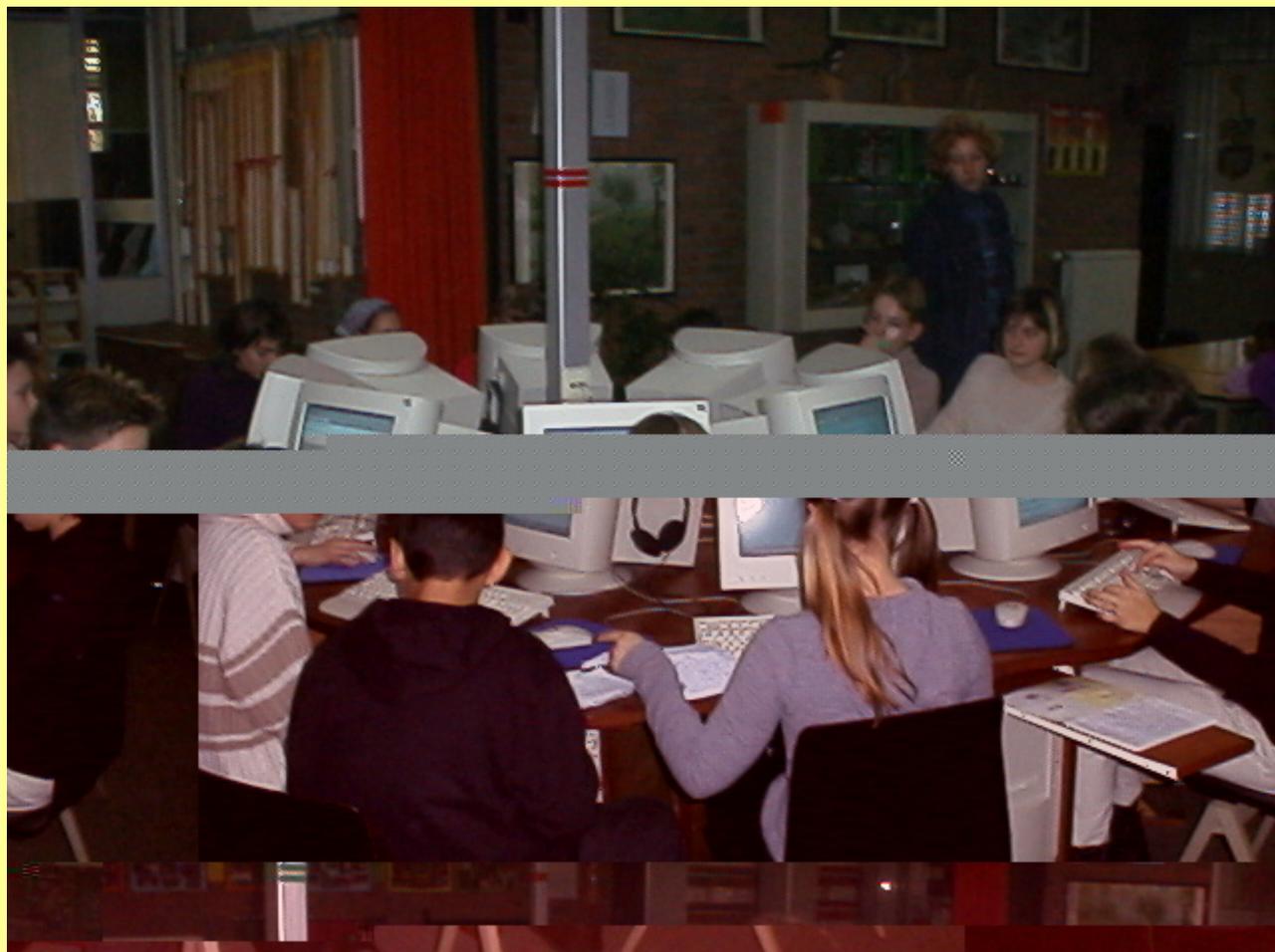
*Photo 1: Students working in the common lobby*

The initiative is with the students, the teacher supervises their activities. During one hour per week, students collect information, process this information and present their results to the class by means of a web page. In our case study of this school we focus our attention to the second innovation.

## 1.4 Profits of improvement

The innovation that we have studied is still in progress. All students of the upper grades have learnt the basic ICT-skills for making web pages and publishing these pages on the Intranet of the school. Now they write short stories, reports and poems and publish them. Later on, they will engage in doing projects (individually or in collaboration with other students), write about their findings and present their results on their websites. The surplus value of ICT is that everyone can read them and give his or her reaction.

Students will have to learn to work co-operatively and independently. They also need to plan their activities. They help each other when they have a problem.

By publishing the web pages on the Intranet communication is encouraged. Students, teachers and parents can give a reaction on a website by e-mail.

## 1.5 Accomplishments

In this innovation, most attention has been paid to teach the students the basic ICT-skills. Teaching materials have been developed by the technology co-ordinator. We observed that the students could apply these skills very well. Changing the design of a web page, adding a picture or a sound is done very rapidly. Typing a text takes a lot of time.

The students regard their activities as a good preparation for learning in secondary education. They say that they will be using the Internet for searching information when they will be doing a project. They have learnt to use a word processor and to scan images. They also think that they can help classmates who do not have these skills.

Many students use a computer at home, sometimes to prepare documents for their websites. The access to the Internet from their homes has increased because of the activities of the school.

*1.6 ICT use in the school*

The teachers use ICT for entering observations and other data in the student monitoring system, inspecting this system and setting up activity plans for those students who need extra attention. Teachers have also access to the information of their colleagues. If a teacher has observed a problem in his class, he can see whether a colleague has had this problem before and what he did to solve the problem.

Teachers also use ICT for preparing their lessons, writing activity plans. At home, they have their own computer. The Office programmes are available. Each teacher has an e-mail address. From their homes, they have access to the Intranet of the school, e.g., for printing documents at school.

In their lessons, the teachers use educational software. Most of this software is integrated into the textbooks the school uses for reading, mother tongue and arithmetic. But there are also other programmes (drill and practice programmes) and cd-roms, like Encarta. Kennisnet (a national computer network for schools and related organisations, which gives the schools access to the Internet) is used to collect information, as an alternative for the books in the information centre of the school.

The students can use the computer in their classroom or in the common lobby. In the afternoon, the common lobby is used for the innovation, while in the morning other classes can make use of the computers (mostly for educational programmes). In the common lobby, there are two clusters (octagonal tables) with 8 computers in each cluster. Each week, students work for about one hour individually or in pairs (these clusters are also used for training the staff) on their web pages.
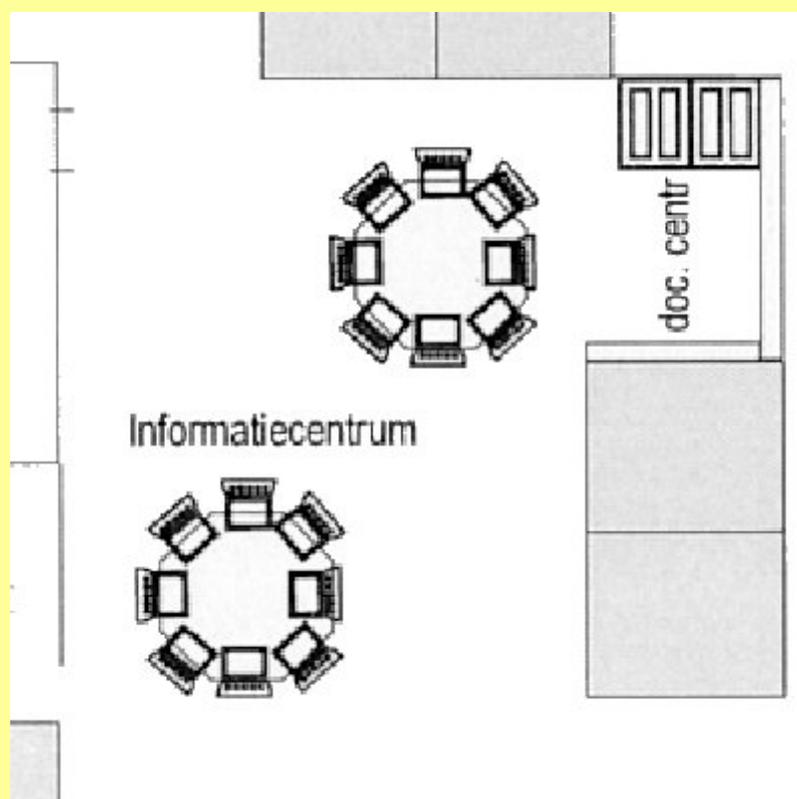


*Figure 1: Layout of the common lobby*

At the end of the lesson, students are allowed to send e-mails, play games or browse Kennisnet. The students have their own website, e-mail address and mailbox at school (their parents have access to the mailbox).

*1.7 Primary innovations*

Computers have been used in this school for a long time. About fifteen years ago, the school received the first computers from a bank. Students of grade 5 and 6 worked with these computers during one hour per week.

The school has also participated in the so-called 'Comenius' project. This was a project of the government, aimed at the integration of computers in primary education. The school received one computer for every 60 students. According to the principal, the project failed in many schools. He bought several computers from other schools because they did not use them.

Next to these innovations in the field of ICT, the school has participated in several other innovations, like 'reading comprehension' and 'adaptive education'. The use of ICT by teachers and students in the two ICT-innovations (see section 1.1) enhance these

innovations. One of the teachers understood how ICT could help him to implement adaptive education in his class. He has now a positive attitude towards that innovation, due to the use of ICT.

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## 2. The Past

### 2.1 Innovation history

From multiple sources we have been informed that the school has participated in several innovations and projects to improve the quality of education. The major innovations concern 'reading comprehension' and 'adaptive education'.

Some of these innovations are related to the 'Going to School Together' policy. By improving and catering for a wider range of educational needs for low ability students, the school wants to meet the differences between students. Independent learning can help the teacher to spend more time to students who need additional instruction. Also ICT is used in this school for this purpose.

The members of the staff have participated in several courses within the framework of staff development, like classroom management and effective instruction/teaching.

The ICT-innovation can be regarded as an extension of these innovations. The developments that are taking place in the school have been the starting point for the ICT-policy plan of the school. By applying to the 'Vanguard school'-project of the government in 1998, the school could realise its ICT-infrastructure and training of the staff. A connection to Kennisnet was also part of this project.

### 2.2 Initiator of the innovation

Both ICT-innovations have been initiated by the technology co-ordinator. Several years ago he started to develop his ideas how computers can be applied in education.

The technology co-ordinator has presented his ideas to his colleagues. By participating in the 'Vanguard school'-project, these ideas could be realised. He has written, with the help of some people, the ICT-project plan. The staff of the school fully agreed with the application and supported the ideas.

The technology co-ordinator has developed the teaching materials for his students in the period that he had his own class (now he teaches no classes). He used their reactions to adapted the lessons and develop new lessons. These activities made his colleagues enthusiastic about the use of ICT.

He also has set up the training for his colleagues: he prepared the materials and gave the instruction.

The technology co-ordinator has also organised training for parents. Since the parents have access to the Intranet of the school and the mailboxes of their children, many parents wanted to learn the basic ICT-skills. The parents have to pay for this training.

### 2.3 Supporters of the innovation

The board of the school has supported the innovation by organising a 'private PC' project as an incentive. Teachers could borrow money which will be deducted monthly from their salary to buy a computer. This also gave them a reduction on their income tax.

The management of the ICT-infrastructure is now done by the technology co-ordinator. In January 2001, he will leave the school. There is already a second co-ordinator who will take his place, but the technical knowledge of the ICT-infrastructure goes beyond of what can be expected from a teacher. Therefore, the supplier of the ICT-infrastructure will take over these tasks.

One of the parents maintains the website of the school (http://www.deverrekijker.nl/). Together with other parents, he came with the suggestion to arrange chat facilities on the website. The technology co-ordinator supervises these activities and takes care of the technical aspects of the website.

### 2.4 Innovation problems

The ICT-project plan is very ambitious with regard to the ICT-infrastructure. The finances from the 'Vanguard school' project were not enough. Each participating school in this project receives 130.000 Dutch guilders. The ICT-infrastructure (computers, network, and server) as well as the training of the teachers has to be financed with this budget.

*Photo 2: The teacher supervises the students*

The principal has discussed this problem with the board. By paying the ICT-training from the normal training account and withdrawing money from an account with a high balance, the ICT-infrastructure could be realised.

Several (regional) organisations promised to give money to the school for the innovation. But the school has not received any money from them.

The management of the ICT-infrastructure is a serious problem. If ICT has to be integrated in education, attention and money has to be paid to management. If not, the principal foresees that integration will fail, like the 'Comenius' project.

With the (increasing) number of students per class, the two clusters in the common lobby will not be sufficient in the long term. The technology co-ordinator thinks that a third cluster will be needed.

The innovation gives also an organisational problem. The common lobby is an open area in the middle of the school. Enthusiastic students can sometimes produce a lot of noise and maybe disturb other classes.

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### 3. The Present

*3.1 Diffusion patterns*

The technology co-ordinator has presented his ideas to his colleagues at a meeting. There was no resistance to the proposed ICT-project plan. All staff member were enthusiastic from the beginning. Some teachers had concerns about the technical aspects (hesitance to work with technical devices).

The technology co-ordinator started with the personal use of ICT, then the educational use followed. He has chosen for this approach because in this way the members of the staff would recognise the surplus value of ICT. When they experience the benefits for themselves, they will also use ICT in their teaching. Not both at the same time or in the reversed order, this is the opinion of the technology co-ordinator regarding the diffusion of the innovation. Doing two things at the same time charges the teachers double and then they will not accept the innovation.

*3.2 Staff development and involvement*

As part of the innovation, the technology co-ordinator has trained the staff of the school in the basic ICT-skills (Windows 98, Office programmes [Word], Internet). This training lasted one year, nearly every Wednesday afternoon (four hours). All have achieved the European Computer Driving Licence (ECDL). One teacher, who was appointed after this training, will join the training for the parents. The cost will be paid from the training budget.

It was not easy for the teacher to keep up the pace of the training. Sometimes, the principal and the technology co-ordinator discussed the need to slow down. Some teachers needed some encouraging because they did not feel comfortable with the computer.

Though they have learned the basic ICT-skills, one of the teachers states that is it necessary to practice regularly until it has become automated. If you do not use it during a couple of months, you will loose your skills.

At this moment, the technology co-ordinator gives training every three or four weeks, during one hour. Mostly it is a new topic, but sometimes the teachers ask to repeat a topic. The teachers also learn from each other. When a teacher has a problem or question he/she goes to a colleague who knows more about it for help. They also go to the technology co-ordinator. It is the task of the technology co-ordinator to help those who have problems with ICT. He recognises that some teachers have problems.

One of the teachers notices that the training was not aimed at the educational use of ICT. But she talks about it with her colleagues. They ask each other how they instruct a certain topic with ICT and then they get a suggestion from a colleague. Another teacher says that he knows enough to use ICT in his class.

The technology co-ordinator has done several courses (Windows NT, network management, Exchange), but also learned a lot by working together with professionals.

## 3.3 Role of leadership

The principal of the school creates the conditions for the staff to develop themselves. He has given and still gives space to the technology co-ordinator to implement the innovation. If there is a question from another school about the innovation, the principal passes it on to the technology co-ordinator, because he does not know every detail.

According to the principal, is it important to be not so formal when it comes to questions of the staff, but always look for a solution. In an atmosphere of trust, teachers are willing to do some extra if the school does some extra to them if they ask a favour (and it is reasonable). This mutual understanding is the basis for co-operation.

He has delegated several tasks to teachers: the deputy principal has the educational affairs and all matters concerning ICT are delegated to the first and second technology co-ordinator. They have a budget and are responsible for their tasks. But the principal says that he takes the final responsibility. He does not want to call it mandating.

According to the parents, everything in the school is well organised. They attribute this to the principal. Some of them prefer a less formal approach, but recognise that the school pays attention to discipline, norms and values.

## 3.4 ICT-innovation Connections

The school does not put teachers under pressure to use ICT, but does encourage them to use it. If they need help, the technology co-ordinator will spend time to instruct a teacher individually. They want to prevent that one or more teachers cannot keep up with the developments, especially with regard to the student monitoring system, because the one who stays behind will influence the pace of the development.

The staff of the school has become very dependent on ICT. They use daily the computer for entering data into or consulting the student monitoring system. Their monitoring system is based on technology. Teachers use the computer frequently for preparing their teaching or drawing up activity plans. Documents made at home are sent over the Internet to the printer at school.

Other schools frequently visit the school. Being a 'Vanguard school', the school has to inform other school upon request. The school, especially the technology co-ordinator, is invited regularly by others to present their ICT-activities. In the future, this will take place more frequently.

## 3.5 ICT-infrastructure

The school has forty-three computers: thirty-four (all multimedia computers, i.e., equipped with a CD-ROM and a sound card) for educational purposes and nine for managerial purposes. They are all connected to the internal network of the school. The school has its own DHCP-server for an Intranet. The server is also connected to Kennisnet. With Kennisnet, the school is connected to the Internet. The school has chosen for this infrastructure because of the problems with the connections the school does not want to dependent of Kennisnet. Laser printers, a video-projector and a scanner are available in the school. In the future, the school would like to buy a digital video camera. This camera can be used to observe students in the classroom.

Computers are available in the common lobby (sixteen) and in the classrooms, one for the teacher and one or two for the students. The room in the classrooms is limited to place more computers. All classrooms are connected to the Internet.

Students as well as parents think that the computers in the school are up to date. For Word you do not need the newest computer, according a student.



*Photo 3: Cluster (octagonal table) with eight computers*

The web pages of the students are published on the Intranet of the school. Those who have permission (teachers, students and parents) can only access this Intranet. In this way, the school wants to protect the websites from the Internet. Students can send e-mails to other students of the school. If they want to send an e-mail to a person outside the school, they have to ask permission. In most cases, they are allowed to send the e-mail.

The school does not have received information yet (from the parents) that students are abusing the facilities (sending unfriendly e-mails to classmates).

The computers are not available for the students after the school hours. The school would need someone for supervision. About eighty percent of the parents have a computer, so there is no need for access after the school hours.

Technical support is provided by the technology co-ordinator. He installs hard- and software, gives technical support to teachers, and organises ICT training for the teachers. From January 2001, when the technology co-ordinator has left the school, technical management will be contracted out to a company. The new technology co-ordinator will do only small problems.

*3.6 Effectiveness*

The respondents notice the students are very enthusiastic. In the innovation, the students need to demonstrate other skills. You can observe that some students change completely: from inactive and not interested to very active and highly motivated.

A teacher says that the students have become more independent, but wonders whether this is caused by this innovation because in the classroom she also pays attention to independent working.

At this moment is not yet possible to compare the results of the students in the innovation with the results before the innovation was implemented, because there is no material now. Students do not have published their projects on the Intranet yet. A teacher

believes that it will take five years before results can be seen. The innovation is still developing and it is not known what will be the end.

This teacher also questions the effects of educational programmes. He thinks that it is the medium that motivates the students, but they would have learned it in the traditional way too, without the computer.

We noticed that the students are very skilful. Students learn very quickly, according to a teacher. The students themselves say that they have learned a lot at school. Before, they did not have the basic ICT-skills to design a web page. Also parents agree, according to them is not problematic for their children, because they will learn it easily.

### 3.7 Academic rigour

In this innovation, the students learn the basis ICT-skills. The students learn what they need to make and publish a web page. The school teaches students to write a story in Word, to save the file in HTML (web page), they learn how they can change the lay-out of their text, how to add a background. They learn how they can add images and sounds to their web pages and how they have to make links to other documents or to bookmarks in their document. They also learn some basic aspects of Windows (how to copy a file, etc.), how to write and send an e-mail, and how to browse the Internet.

The ICT-skills are not related to a specific subject area. Though the technology co-ordinator had suggested to the teachers to use a text of a web page to talk about the structure of the text and how a student composes the text. This text from a web page can replace a text from the textbook they use for reading comprehension.

He also notices that the initiative in the classroom is with the teacher and not the students. The teacher asks the questions and students answer, but they forget to ask other students what they think of an answer: let students react on each other. When they have learned this skill, they can apply this skills when give a reaction to each other's web pages.

Because of the introduction of ICT, some skills may get less attention, while other skills have become (partly) ICT-skills (writing skills became typing skills).

The projects the students will do after they have learnt the basic ICT-skills can be linked to any subject area. The principal told that they would set up three displays in the common lobby with materials (books) for three subject areas (biology, geography and history). The students can make use of these materials when they are collecting information for the project they are working on.

### 3.8 Equity

The school does not notice that there are differences between girls and boys when it comes to the use of ICT. The principals and a teacher confirm that both sexes are equally skilled in making web pages and applying ICT-skills, though the teacher notices that the topics and the design of the web pages slightly differ between girls and boys, e.g., the choice of colours and images.

A more serious difference has been observed between the high ability and the low ability students. The high ability students profit more from the use of ICT. The teachers agree that the low ability students are not really interested, they learn the more basic skills and do mostly educational programmes, but the high ability students are more curious, they take the initiative to use the possibilities of ICT. The first type of students will use the computer for 'reproduction', while the second type will use the computer as a 'production' tool.

The principal supposes that differentiation will be needed in the future. Just as in the other subject areas, the teachers have to adapt their teaching to the abilities of the individual student.

The technology co-ordinator has noticed that students, who have ICT-facilities at home and may use these facilities, are handier and learn the skills quicker. He says that many parents encourage their children to use ICT. The parents confirm that their children use the computer very frequently at home. Having not a computer at home does not imply that those students are not skilful or perform less than other students. An example of some students shows that it needs not to be a disadvantage. They are very motivated to use the computer and have become very skilful.

### 3.9 Sustainability

The technology co-ordinator has taken the initiative for this innovation. This school year he teaches no classes and can focus all his attention on the two innovations. In January 2001, he will leave the school. They have agreed that he will assist the school during the remainder of the school year, each month he will be in the school for a couple of days. He wants to develop new lessons. The teachers are aware that the situation will change, they want to continue the innovation, but need someone who will take the lead. One teacher says that they also have to think and discuss the content and the vision on how ICT is used in the school. He expects that the school will loose its leading position. As a 'Vanguard school' you have to share your experience with other schools.

The principal raises the topic concerning the costs and the management of ICT. After a certain period the computers have to be

renewed. The government will have to realise what this means for all schools. He also mentions the costs of electricity and the connection to Kennisnet (subscription costs). The money the school receives per student, does not cover the costs of the replacement of the computers, etceteras.

To maintain the ICT-infrastructure and to solve problems, the school would need someone who looks after the infrastructure full-time. Up to now this is done by the technology co-ordinator. After he has left, the provider of the ICT-infrastructure will do the management. The second technology co-ordinator will do only some simple activities.

The principal says that the members of the staff are worried about the period when he will leave the school. In about one year, there will be a new principal. What are his of her ideas about ICT? What kind of person will it be?

### 3.10 Scalability

For the implementation of this innovation, a school needs to have an area in the school where all students of a class can work individually or in pairs with computers at the same time. This can be a classroom (a computer lab) or a common lobby as in this school. Another requirement is, according to the technology co-ordinator, an Intranet in the school. The structure of the Intranet should not be complicated.

Two 'Vanguard schools' in the region have implemented the same ICT-infrastructure. The technology co-ordinator has informed the co-ordinators of these schools. One of the schools has already started with this innovation.

The principal points out that the success of the implementation also depends on the staff of the school. If there is not a good atmosphere, or when there are large problems within the school, the implementation will fail. One of the teachers agrees with this view.

The staff has to be trained. This will take place after the school hours. Does the staff of the school want training during one school year? According to one of the parents training of all members of the staff is a requirement. A school with an ICT-infrastructure but without training will not be successful.

A school also needs some enthusiastic teachers who take the lead, support each other, and convince their colleagues. This should result in a vision on how ICT will be used in the school and to which everybody agrees.

### 3.11 Results of the Teachers ICT Practices Survey

Thirteen teachers have completed the survey (8 women, 3 men, 2 unanswered). Six of them have a class in the lower grades (K1, K2, grades 1 and 2) and seven in the upper grades (grades 3 to 6). Tables with the results are presented in Appendix B.



*Photo 4: Classroom (note the computer on the desk of the teacher)*

Most of them feel (very) comfortable in writing a paper, searching information on the World Wide Web, using a database, and sending and receiving e-mail. They do not feel comfortable of somewhat comfortable in creating and maintaining web pages, programming, drawing a picture or diagram, and presenting information.

In the past school year teachers of the upper grades used the World Wide web, created web pages, sent and received e-mail, used a word processing programme several times each month in their classes. They used the computer to play games in their classes a few

times. Hardly or never, they used a spreadsheet, graphics programme, or presentation programme or joined in an on-line forum or chat room. The use of instructional programmes varied in these classes from never to several times each month.

The respondents rate their ability to use a computer as fair (77%) or good (23%).

Student computer use was not used for grading. Nearly 55% created or modified a website with their class. Nearly a quarter of the respondents indicated that most of the computer use in their classes was directly related to the course content. Two-thirds answered that most of the computer use that they assigned was done by students individually.

Six teachers allowed students to search on the World Wide Web on designated sites only; two teachers gave some restrictions. Nearly 70% used the computer at home for preparing their teaching several times each week.

None of the respondents had participated as a student or instructor in a virtual course through the Internet. Seldom, students are involved in collaborative learning over the Internet with students from other classes. Only one respondent 'yes'. Nearly one third of the respondents was using technology to collaborate with other teachers.

Nearly all teachers sent one to five e-mail messages each day on average.

Eight teachers have updated an application programme, five have recovered a damaged file, seven have created a web site, and five have developed a database.

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## 4. Main hypotheses

### 4.1 Technology is a strong catalyst for educational innovation and improvement

The technology, used in this innovation, can be regarded as an extension of previous innovations in the school and has enhanced the innovation (section 1.6). The innovations, mentioned in section 2.1, were aimed at improving the quality of education. In this ICT-innovation the school wants to realise independent and collaborative learning. What is learned in reading comprehension, can be applied in writing web pages (section 3.7). The Intranet is used to publish their products (sections 1.2 and 3.5), aimed at the communication between the student and other persons (e.g., parents, teachers, and classmates). However, the possibilities to search the World Wide Web and to communicate with persons outside the Intranet are limited (section 3.5).

On a smaller scale, technology has stimulated a teacher to make activity plans for students with learning difficulties in his class.

Evidence is present to support the hypothesis, though the final aim of the innovation has not been reached yet. The school has a clear vision on teaching and learning, and ICT fits well in this vision.

### 4.2 The diffusion followed the traditional diffusion pattern for innovations

The innovation was the idea of the technology co-ordinator (section 2.2). He convinced his colleagues of the possibilities of the innovation. The staff of the school agreed. The number of teachers is small (section 1.4) and there is a good atmosphere (section 3.3). This may have contributed to a unanimous stand: there were no early or late adopters, or resisters.

It should be mentioned that some teachers do not feel comfortable with regard to the technical aspect of the innovation (section 3.1). Now and then, they need extra assistance. But this fact did not result in a refusal to agree with the innovation.

The approach by the technology co-ordinator (first personal use, then educational use; section 3.1) may also have contributed to the adoption and implementation of the innovation.

It can be concluded that evidence is found for supporting the hypothesis. However, the diffusion pattern in this school is not so complicated.

### 4.3 Successful implementation of ICT depends mostly upon staff competence

In fact, the staff in this innovation is limited to one person. The technology co-ordinator has developed the lessons for the students (section 2.2). The teachers of the upper grade use/implement these lessons. The ICT-infrastructure of the school (section 3.5) and the organisation of the innovation (section 1.5) also influence the outcomes of the innovation. The students have also contributed to the outcomes at an earlier stage. The technology co-ordinator developed the teaching materials in his class (section 2.2). The students made suggestions for lessons. Their competence helped to improve the teaching materials.

It is not possible to support or to reject the hypothesis. This hypothesis and the rival hypothesis have elements that apply to this innovation.

*4.4 Gaps in academic performance between high and low poverty students will not increase*

During about one hour per week, the students work on their web pages (section 1.5). After the school hours, the students do not have access to the computers in school (section 3.5). One of the reasons is that most students have a computer at their disposal at home (section 2.2). About eighty percent of the parents have a computer (section 3.5). The technology co-ordinator mentioned two students who do not have a computer at home. They are active in school and have become very skilful and do not show any disadvantage. But this is only one case. On the other hand, students tell that they go friends or relatives who have a computer (although they have a computer at their disposal; section 1.3).

The teachers did not notice differences between high and low poverty students, but did between low and high ability students (section 3.8).

At this school, there are no real high poverty or low poverty students. Some do have access to ICT at home, but they can compensate this in different ways. Differences or an increase of the gap due to unequal access to ICT have not been reported. This supports the hypothesis.

*4.5 Successful implementation of ICT will lead to the same or higher academic standards*

This hypothesis is not quite applicable to this innovation because students do not really browse the World Wide Web. At this moment, their searches are limited to the website of Kennisnet (section 1.5). The teaching material that is used in the innovation, developed by the technology co-ordinator, deals with the basic ICT-skills.

More important to the successful implementation is the strategy that was followed: after the installation of the ICT-infrastructure, care was taken for the personal (i.e., teachers) use (and training) and then educational use (section 3.1). Teachers have achieved their European Computer Driving Licence (section 3.2). This strategy takes a number of years and therefore, the innovation is not finished yet. It will take some years before results can be seen (section 3.6).

Though not completely applicable, evidence is present that may support this hypothesis in the future.

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## 5. Projection to the future

*5.1 Sustainability*

The innovation has a solid foundation in several ways. It is integrated in the school policy. The ICT-infrastructure is up to date, though the number of computers in the common lobby is minimal. The staff is well trained. New staff members have to be at the same level, or have to learn the basic ICT-skills.

A possible problem may rise when the technology co-ordinator has left the school. The teachers have to take up what he has done and continue the innovation until the goals are met. They think that it will slow down the innovation process and that they will lose their leading position to other schools.

Another problem is possible when the principal leaves the school. The principal is aware the teachers are worried about this, not only for this innovation. What will be the vision of a new principal on teaching and education, the use of ICT and the innovation in particular?

At this moment it is not possible to foresee what will happen.

*5.2 Scalability*

This innovation can be transferred to other schools. In section 3.10, some requirements are mentioned. In combination with an enthusiastic technology co-ordinator, supported by one or two teachers, a successful implementation of this innovation is possible.

The development stage is finished. The products (teaching materials for students, layout of the infrastructure) are available for other schools.

More problematic can be that the ideas of the innovations do not fit with the vision of a school towards teaching and learning and the use of ICT. The innovation is not just learning how to make a web page. It is part of a philosophy that starts with the previous innovations. Only schools which have gone through the same (or nearly) the same development can implement this innovation successfully.

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## Appendix A: Tables for Teacher ICT Practices Survey

*Gender of the respondents*

| | | Count | Col % |
|---|---|---|---|
| | female | 8 | 72,7% |
| Gender teacher | male | 3 | 27,3% |
| | not answered | 2 | 18,2% |
| Group Total | | 13 | 118,2% |

*How comfortable are you with using a computer to do each of the following?*

| | Create and maintain web pages | | Write a paper | | Search for information on the World Wide Web | |
|---|---|---|---|---|---|---|
| | Count | % | Count | % | Count | % |
| not at all comfortable | 6 | 46,2% | 0 | ,0% | 0 | ,0% |
| somewhat comfortable | 5 | 38,5% | 0 | ,0% | 2 | 15,4% |
| comfortable | 1 | 7,7% | 3 | 23,1% | 6 | 46,2% |
| very comfortable | 1 | 7,7% | 10 | 76,9% | 5 | 38,5% |
| Total | 13 | 100,0% | 13 | 100,0% | 13 | 100,0% |

*How comfortable are you with using a computer to do each of the following? (continued)*

| | Use a data base | | Send and receive e-mail | | Programming (i.e., use a programming language) | |
|---|---|---|---|---|---|---|
| | Count | % | Count | % | Count | % |
| not at all comfortable | 0 | ,0% | 0 | ,0% | 13 | 100,0% |
| somewhat comfortable | 4 | 30,8% | 0 | ,0% | 0 | ,0% |
| comfortable | 7 | 53,8% | 4 | 30,8% | 0 | ,0% |
| very comfortable | 2 | 15,4% | 9 | 69,2% | 0 | ,0% |
| Total | 13 | 100,0% | 13 | 100,0% | 13 | 100,0% |

*How comfortable are you with using a computer to do each of the following? (continued)*

| | Draw a picture or diagram | | Present information (e.g., use PowerPoint) | |
|---|---|---|---|---|
| | Count | % | Count | % |
| not at all comfortable | 3 | 23,1% | 2 | 15,4% |
| somewhat comfortable | 6 | 46,2% | 10 | 76,9% |
| comfortable | 4 | 30,8% | 1 | 7,7% |
| very comfortable | 0 | ,0% | 0 | ,0% |
| Total | 13 | 100,0% | 13 | 100,0% |

*During the past school year, how often did your students on average do the following?*

| | Use the World Wide Web | | Create web pages | | Send or receive e-mail | |
|---|---|---|---|---|---|---|
| | Count | % | Count | % | Count | % |

| | | | | | | |
|---|---|---|---|---|---|---|
| never | 4 | 30,8% | 6 | 46,2% | 7 | 53,8% |
| a few times | 3 | 23,1% | 1 | 7,7% | 2 | 15,4% |
| several times each month | 6 | 46,2% | 6 | 46,2% | 4 | 30,8% |
| several times each week | 0 | ,0% | 0 | ,0% | 0 | ,0% |
| Total | 13 | 100,0% | 13 | 100,0% | 13 | 100,0% |

*During the past school year, how often did your students on average do the following? (continued)*

| | Use a word processing program | | Use a computer to play games | | Use a spreadsheet | |
|---|---|---|---|---|---|---|
| | Count | % | Count | % | Count | % |
| never | 5 | 41,7% | 2 | 15,4% | 11 | 84,6% |
| a few times | 0 | ,0% | 7 | 53,8% | 1 | 7,7% |
| several times each month | 7 | 58,3% | 3 | 23,1% | 0 | ,0% |
| several times each week | 0 | ,0% | 1 | 7,7% | 1 | 7,7% |
| Total | 12 | 100,0% | 13 | 100,0% | 13 | 100,0% |

*During the past school year, how often did your students on average do the following? (continued)*

| | Use a graphics program | | Join in an on-line forum or chat room | | Use a presentation program (e.g., PowerPoint) | |
|---|---|---|---|---|---|---|
| | Count | % | Count | % | Count | % |
| never | 10 | 76,9% | 12 | 92,3% | 13 | 100,0% |
| a few times | 3 | 23,1% | 1 | 7,7% | 0 | ,0% |
| several times each month | 0 | ,0% | 0 | ,0% | 0 | ,0% |
| several times each week | 0 | ,0% | 0 | ,0% | 0 | ,0% |
| Total | 13 | 100,0% | 13 | 100,0% | 13 | 100,0% |

*During the past school year, how often did your students on average do the following? (continued)*

| | Use an instructional program (including simulations) | | Other computer uses | |
|---|---|---|---|---|
| | Count | % | Count | % |
| never | 2 | 15,4% | 5 | 83,3% |
| a few times | 4 | 30,8% | 1 | 16,7% |
| several times each month | 5 | 38,5% | 0 | ,0% |
| several times each week | 2 | 15,4% | 0 | ,0% |
| Total | 13 | 100,0% | 6 | 100,0% |

*Rating the ability to use a computer*

| | | Count | Col % |
|---|---|---|---|
| | poor | 0 | ,0% |
| How would you rate your ability to use a computer? | fair | 10 | 76,9% |
| | good | 3 | 23,1% |

| | | 13 | 100,0% |
|---|---|---|---|
| Group Total | | 13 | 100,0% |

*Based on experiences or polices from the last school year*

| | Was student computer use ever evaluated for grading? | | Did you create or modify a Web site with any of your classes you taught? | |
|---|---|---|---|---|
| | Count | % | Count | % |
| no | 11 | 91,7% | 6 | 46,2% |
| yes | 1 | 8,3% | 7 | 53,8% |
| Total | 12 | 100,0% | 13 | 100,0% |

*Based on experiences or polices from the last school year (continued)*

| | What portion of the computer use in your classes was directly related to the course content? | | What portion of the computer use that you assigned was done by students individually? | |
|---|---|---|---|---|
| | Count | % | Count | % |
| very little | 1 | 7,7% | 2 | 16,7% |
| some | 9 | 69,2% | 2 | 16,7% |
| most | 3 | 23,1% | 8 | 66,7% |
| all | 0 | ,0% | 0 | ,0% |
| Total | 13 | 100,0% | 12 | 100,0% |

*Based on experiences or polices from the last school year (continued)*

| | If you assigned World Wide Web searching, how much freedom did you allow? | |
|---|---|---|
| | Count | % |
| designated sites only | 6 | 75,0% |
| some restrictions | 2 | 25,0% |
| no restrictions | 0 | ,0% |
| Total | 8 | 100,0% |

*Based on experiences or polices from the last school year (continued)*

| | How often did you use a computer at home for preparing for teaching? | |
|---|---|---|
| | Count | % |
| never | 0 | ,0% |
| a few times | 3 | 23,1% |
| several times each month | 1 | 7,7% |
| several times each week | 9 | 69,2% |
| Total | 13 | 100,0% |

*Based on experiences or polices from the last school year (continued)*

| | Did you participate as a student or instructor in a virtual course through the Internet? | | Did you involve your students in collaborative learning over the Internet? | |
|---|---|---|---|---|
| | Count | % | Count | % |
| no | 13 | 100,0% | 12 | 92,3% |
| yes | 0 | ,0% | 1 | 7,7% |
| Total | 13 | 100,0% | 13 | 100,0% |

*Using technology to collaborate*

| | | Count | Col % |
|---|---|---|---|
| Are you using technology to collaborate with other teachers? | no | 9 | 69,2% |
| | yes | 4 | 30,8% |
| Group Total | | 13 | 100,0% |

*Sending e-mails each day on average*

| | | Count | Col % |
|---|---|---|---|
| How many e-mail messages total do you send each day on average? | none | 1 | 7,7% |
| | 1-5 | 12 | 92,3% |
| | 6-11 | 0 | ,0% |
| | more than 12 | 0 | ,0% |
| Group Total | | 13 | 100,0% |

*Have you ever done the following?*

| | Made changes to a computer's hardware | | Updated an application program (word processor, graphics program) | | Recovered a damaged file | |
|---|---|---|---|---|---|---|
| | Count | % | Count | % | Count | % |
| no | 13 | 100,0% | 5 | 38,5% | 8 | 61,5% |
| yes | 0 | ,0% | 8 | 61,5% | 5 | 38,5% |
| Total | 13 | 100,0% | 13 | 100,0% | 13 | 100,0% |

*Have you ever done the following? (continued)*

| | Created a web site | | Developed a data base | |
|---|---|---|---|---|
| | Count | % | Count | % |
| no | 6 | 46,2% | 8 | 61,5% |
| yes | 7 | 53,8% | 5 | 38,5% |
| Total | 13 | 100,0% | 13 | 100,0% |

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### Appendix B: Other supporting evidence

- There are 34 computers available for 320 students (student : computer ratio = 9.4).
- The educational staff of the school consists of a principal, 15 teachers (4 of them have a shared job), a remedial teacher, an internal counsellor, and a technology co-ordinator.
- All classrooms (12) and the common lobby are connected to the internal network. This network gives via Kennisnet access to the Internet.

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### Appendix C: Documents

- Basisschool 'De Verrekijker', (2000), Schoolgids 2000-2001 (School Guide), Amstenrade.
- Basisschool 'De Verrekijker', (1998), ICT Projectplan 1998-2000, versie 5 (ICT-Policy document), Amstenrade.
- Website Basisschool 'De Verrrekijker: http://www.deverrekijker.nl/.
- Examples of teaching materials ICT-basic skills (for students).
- Examples of web pages made by students.

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