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ABSTRACT

Two pilot schools for general secondary education in Enschede (The Netherlands) are taking part in the Technology Enriched Schools Project. One of the research questions is the valuation by the students of the use of computers in education. The valuation is influenced by factors which deal with the perception of the student; the use of computers in teaching-learning situations; the circumstances in which the computers are used; background information on the students; and the frequency of use of computers in education. The research question is investigated by two identical instruments: a paper and pencil questionnaire and a computerized questionnaire. The questionnaire is administered to 816 students. Findings from this study show that about 20% of the students have much experience with computers out of school hours; some students have used the computer at school frequently. No evidence has been found in this study that students with much computer experience at school value the use of computers in education differently from students who have little experience, and the intensity of use of computers for instruction in the pilot schools has not yet affected the enthusiasm and motivation of the students. Thirteen tables and two figures display the findings. A copy of the student questionnaire with a tally of the frequency distribution of responses is appended. (Author/ALF)

THE VALUATION BY STUDENTS OF THE USE OF COMPUTERS IN EDUCATION

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Abstract

Two pilot schools for general secondary education in Enschede are taking part in the Technology Enriched Schools Project. One of the research questions is the valuation by the students of the use of computers in education. The valuation is influenced by factors which deal with the perception of the student, the use of computers in teaching-learning situations, the circumstances in which the computers are used and background information on the students. The frequent use of computers in education can make the students less enthusiastic.
The research question is investigated by means of two identical instruments: a paper-and-pencil questionnaire and a computerized questionnaire. The questionnaire is administered to 816 students. About 20% of the students has much experience with computers out of the school-hours.
Some students have used the computer at school very frequently. There is no evidence found in this study that students with much computer experience at school, value the use computers in education different from students who have little experience. The intensity with which the computers are used by the teachers of the pilot schools has not yet a restraining influence on the enthusiasm and the motivation of the students.

Introduction

In 1987 the Dutch Minister of Education and Science started the Technology Enriched Schools Project (TESP). The aim of the TESP is to investigate various ways of realizing computer integration in the pilot schools.
Two pilot schools for general secondary education in Enschede are taking part on this project. One school comprises of about 850 students and 65 teachers, the other school comprises about 1,400 students and 90 teachers.
At this moment the schools are equipped with 45 computers each, spread over two computer rooms and some stand-alone sets used for demonstration in the teachers' own classroom.
The schools receive funding for 25 hours a week of released time for teachers participating in the project and 10 hours a week of released time for two computer co-ordinators. Furthermore, the participating schools receive a budget for the purchase of courseware and the organization of in-service training.
A team of researchers from the Centre for Applied Research in Education of the University of Twente is conducting a programme of research on the implementation process of information technology in these schools.
The computers are used for organizational and management purposes and for educational purposes. In autumn 1990 61.5% of the teachers (n = 143) have used the computer at school. From this group of teachers 61.3% uses the computer for educational purposes. The use of computers in education is not restricted to certain subject areas. All subject areas are allowed to buy courseware and to use the computers in the computer room or the stand-alone sets. The computer rooms are given preference over the stand-alone sets. Over 80% of the teachers who uses the computer for educational purposes visits one of the computer rooms, while 7% of the teachers uses a stand-alone set (10% of the teachers uses both possibilities).
It also appears that some members of a subject area use the computers in the computer education very frequently, while other members use these computers only a few times or do not use the computer at all.
The subject area 'information technology' uses the computer room very frequently. When this subject area is left out of consideration the other subjects areas vary greatly in their use of the computer room. The subject areas Dutch, French, mathematics and history are frequent users, while (among others) German, English, chemistry and economics are not (Doornekamp & Carleer, 1992a).
This paper deals with COMPRO (Computer in Pilot schools), one of the research projects of the TESP. Since the start of this project the research questions have focussed mainly on the teacher

(e.g., the concerns of teachers, the selection of courseware, the integration of courseware in the curricula, etc.), but in the last stage of the project attention is also paid to the students (Van Diggele & Carleer, 1990).

Research question

The students are an important target group of the use of computers in education. Their opinions on computers and courseware are extremely relevant. A side-factor is the rather unique situation at the pilot schools. During several years the use of the computer rooms has been recorded. Information is now available on the past history of these students with regard to their use of computers at school.

In this computer enriched environment, the students can come into touch with computers. This depends especially on the teachers who teach them. Since the start of the project most of the students will have been introduced to computers in the computer room.

When the students have lessons in the computer room, they are very enthusiastic. They like these lessons better than the ordinary lessons. But one can imagine that after many lessons in the computer room the students will not be so enthusiastic as before. The novelty-effect will have disappeared. Or will the students still be enthusiastic?

The research question focuses on teaching-learning situations. In those situations the computer is used to achieve a goal. In doing so, the use of the computer as teaching method is distinguished from other teaching methods.

It is generally well-known that when a certain teaching method is used over and over again, the students will be bored. To keep the students motivated variation in teaching methods is needed. It can be expected that instruction by means of the computer, as a teaching method, can be boring when the teachers are using the computer too many times.

The research question is whether the students still like to use the computers: how do the students of general secondary education value the use of computers in education and which factors influence this valuation of the students? (Doornekamp & Carleer, 1992b).

The following aspects are of importance in this research question:

- the perception of the student;
- the use of computers in teaching-learning situations;
- the factors that are related to this use of computers;
- the background factors of the students.

The factors that are related to the use of computers can be divided into two groups:

1. Factors which deal with the use of the computer itself. The factors are qualities by which courseware packages can be distinguished from each other. The students will be questioned how they value these qualities of a particular courseware package. Examples of these qualities are: interactivity, individualization and practice.
2. Factors which can be carried back to the circumstances in which the computers are used. During a lesson the students work alone or in couples while the teacher helps them on request. Examples of these factors are: alone or in couples, courseware, guidance by the teacher and availability of equipment).

A number of background factors play a part in the interpretation of the differences in the valuation of certain group of students. The factors which count in this study are: school, grade, gender, age, achievement level, computer experiences at school, and experience with computer out of the school-hours.

Method

The research question is investigated by means of a questionnaire. The questionnaire consists of two parts. The questions of the first part refer to (a) background information on the student (school, class, gender, etc.), (b) the use of computers out of the school-hours, (c) alone or in couples in the computer room, and (d) a general valuation of the use of computers in education. In the second part the student has to value two out of five courseware packages. For each grade (of each school) the five best used packages were selected. A student only needed to give his valuation for two packages he has used in the present school-year. From a try-out we learned that when the students have to do three or more packages, they loose concentration. Therefore the number has been limited to two.

For this study two versions of this questionnaire were developed: a paper-and-pencil questionnaire and a computerized questionnaire. Both questionnaires contain the same questions, only the way the questionnaire is administered differs. It is not the aim of this study to compare both instruments, only to gather some experience with a computerized questionnaire.
Usually a paper-and-pencil questionnaire is used to collect data from a large group of respondents. It happens very frequently that the respondents do not fill out the questionnaire correctly: questions are skipped or questions that do not apply are answered. After the questionnaire's administration, the data have to be entered into the computer before they can be analyzed. This a time-consuming procedure.
By using a computer the respondents can be guided through the questionnaire. They only need to answer those questions that apply to their situation. The remaining questions are not shown. The computer also makes it possible to record the answers of the respondents. After administration, the data are ready to be analyzed.
First, the paper-and-pencil questionnaire was developed. The content is based on the factors mentioned above. Some questions regarding background information on the students were also entered into the questionnaire. The background information regards, among others: gender, age, grade, computer at home, (previous) experience with computers and career planning.
In spring of 1991 the prototype version of the questionnaire was administered to a small group of students (n = 31) of both schools.
After this questionnaire had been adjusted, the development of the computerized version started. For this purpose the authoring system TAIGA (Twente Advanced Interactive Graphic Authoring System) is used. TAIGA is developed by the Educational Centre of the University of Twente. With TAIGA courseware can be developed by teachers or educationalists. The structure of TAIGA does not restricts its use to courseware, also a questionnaire can be developed. The authoring system consists of several modules. One of the modules makes it possible that the recorded answers of the students are written to a data-file which can be read by SPSS (Statistical Package for the Social Sciences). This saves a lot of time because the answers need not be entered into the computer after the administration.
The prototype version of the computerized questionnaire was administered to 20 students of both schools in December 1991. For this study an AT-computer (Olivetti) with a colour screen was used. A short introduction about how to fill out a computerized questionnaire precedes the actual administration of the questionnaire. The students are pleased with this way of administering a questionnaire though it takes more time than the administration of a paper-and-pencil questionnaire. This is mainly caused by the slow speed of the computer.

Design

From each grade (grade 7 up to and including grade 11) three classes (lower, medium and upper level) are selected. From grade 12 only two classes are selected because of the relatively small number of students in this grade. Each selected class (approx. 25 students) is split up into two equal groups. Girls and boys are spread equally over both groups. One group fills out the paper-and-pencil questionnaire and the other the computerized questionnaire.
It is the intention that per pilot school approx. 425 students participate in this study (about one half of the students fills out the paper-and-pencil questionnaire and the other half the computerized version).
The questionnaires are administered at the beginning of 1992 (January, February and March).

Sample

In total 816 students have participated in this study. Nearly the half of the students (49,1%) have filled out the computerized questionnaire and the other half (50,9%) the paper-and-pencil questionnaire.
The pilot school take part almost equally in this study (425 students of school A and 391 students of school B). The number of students per grade varies per school. The average number of students per class is 24 (school A 25 and school B 23).
The questionnaire (both versions together) is filled out by 440 girls (53.9%) and 375 boys (46.0%) (one student has not answered the 'gender'-question).

The age range is from 12 years of age (grade 7) to 21 years of age (grade 12). It is not usual that a student of grade 12 has this age. Twelve students have not indicated their date of birth (correctly).
It was planned to divide the sample equally over the two questionnaires, the two pilot schools and the two sexes. It can be concluded that the wanted divisions are realized.

Additional information on the sample

Additional information on the students of the sample is derived from questions regarding the use of a computer out of school-hours to form a new factor 'computer experience out of school-hours' or is obtained from the computer coordinators of the pilot schools (factors 'computer experience at school' and 'achievement level').

Computer experience out of the school-hours
In the questionnaire some questions regard the use of a computer by the students out of the school-hours (e.g., at home) The results of these questions are combined to get one factor called 'the experience with computers out of the school-hours'. According as a student answers more questions affirmative, it is considered that his experience with computers out of the school-hours increases.
The sample is divided into three categories: 'low', 'medium', and 'high'. Table 1 shows the results of this factor.

Table 1
Computer experience out of the school-hours of the sample (n = 816)

experience	n	%
low	423	51.8%
medium	253	31.0%
high	140	17.2%

Many students have experience with computers out of the school-hours, only 17% of the sample is a frequent user of the computer and uses the computer for several purposes.

Computer experience at school
As said before, since the beginning of the project the teachers have used the computers in their education, mostly in the computer rooms. During the last three years the use of the computer rooms has been recorded. This gives (among others) information how many times a class has visited a computer room. Students of classes that have visited the computer room very frequently have gained much experience.
The computer coordinators of the pilot schools have given information on the school career during the last three years. With this information it is possible to determine the computer experience at school for each student. Students of classes that have visited the computer not so frequently have a low experience.
A complicating factor is the educational organization of the upper level of these schools. Students form part of a class, but also form part of a cluster depending on the subject areas the students have chosen for their examination. The class-codes as well as the cluster-codes are recorded, but it is not always clear to which cluster a student belongs. By this, some information is lost. The amount of computer experience at school can be higher for some students.
The results of the factor 'computer experience at school' are shown in Table 2.

Table 2
Computer experience at school of the sample (n = 816)

experience	n	%
low	326	40.0%
medium	385	47.2%
high	105	12.9%

Nearly 13% of the students has acquired a lot of computer experience at school. For three successive years they sat in classes that have gone very frequently to the computer room. About 60% of these students is in grade 9.
There is significant difference ($p \leq 0.05$) between the boys and the girls. The girls have acquired as much experience at school as the boys.
In this paragraph the factors 'computer experience out of the school-hours' and 'computer experience at school' are discussed. Figure 1 shows that there is no relationship between these factors.

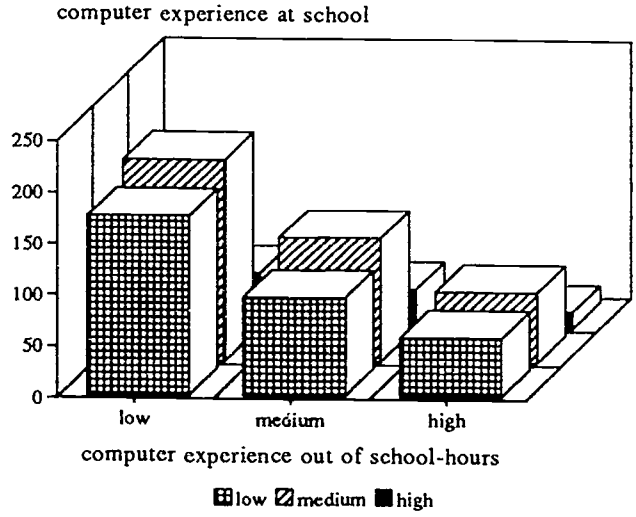

Figure 1. *The relationship between 'computer experience out of the school-hours' and 'computer experience at school'*

Achievement level of the students
The computer coordinators were also asked to indicate the achievement level for each student. They could choose between three categories: 'weak' (bad marks at school, will fail to pass), 'average' (good and bad marks, will maybe fail to pass), and 'good' (good marks, will be moved up). The coordinators were allowed to consult the teacher counsellors of the students.
The pilot schools are combined schools. This means that several types of secondary education are present. The achievement level of students of different types of secondary education cannot be compared. Therefore, the coordinators had to judge the students of a certain type of secondary education, independent of the other types of secondary education.
The results of the factor 'achievement level' are shown in Table 3 (no distinction is made for the types of secondary education). The coordinators were not able to judge 14 students because they had not written their names on the questionnaire (or did not want to write).

Table 3
Achievement level of the students of the sample (n = 802)

level	n	%
weak	179	22.3%
uncertain	370	46.1%
good	253	31.6%

It appears that there is no significant difference between the pilot schools or between the girls and boys.

Results of part I

The results of the first part of the questionnaire will be discussed in three separate sections: (a) the use of computers out of the school-hours, (b) alone or in couples in the computer room, and (c) statements regarding the use of computers in education.

The use of computers out of the school-hours
Many students acquire experience with computers out of the school-hours (this can also be in free periods at school). Nearly two-thirds of the students (537 students) have used a computer out of the school-hours, especially the students of grade 7, 8 and 9. Most of them use a computer at home, but also a computer of a friend or a relative is used (see Table 4). Students were allowed to tick two or more alternatives.

Table 4
Location where computer are used out of the school-hou ., (n = 537)

location	%
computer at home	74.5%
computer of a friend or relative	58.4%
computer of a computer club	4.1%
computer at school in free periods	21.2%

Though there is a computer at home with 65,3% of the students (n = 816), it appears that they are not always allowed to use this computer.

The frequency with which the computer is used by the students varies from 'about one time at six months' to 'a few times per week'. Table 5 shows how many times the students use the computer.

Table 5
Frequency of computer use out of the school-hours (n = 537)

frequency	%
about one time at six months	14.2%
about one time per month	23.1%
about one time per week	24.8%
a few times per week	37.2%
not answered	0.7%

About 40% of the students uses the computer very frequently. Students in grade 10, 11 and 11 use the computer less frequently than the other students.
Boys use the computer more frequently than the girls.

The computer can be used for several purposes. Table 6 shows how the computer is used out of the school-hours. Students were allowed to tick more than one alternative.

Table 6
Purpose of computer use out of the school-hours (n = 537)

purpose	%
word processing	58.2%
computer games	84.5%
learning programmes	19.2%

The computer games are very popular among the students. There is a change noticeable: students in lower grades use the computer mostly for computer games and less for word processing, students of higher grades give preference to word processing over computer games (see also Figure 2).

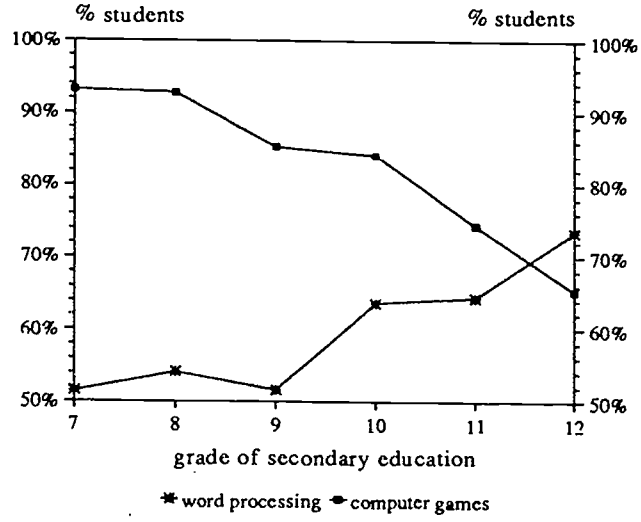

Figure 2. *The use of the computer for word processing and computer games*

Alone or in couples in the computer room
The students work alone or in couples with the computer. This depends on the size of the class, the number of computers that are available, and goal of the lesson (or courseware).
A little bit less than the half of the students (42.3%) prefers to work alone, 27.7% of the students prefer to work in couples and 29.9% of the students answers that it does not matter.
Students from grade 7 give more often preference to working alone over working in couples than student of the others grades.
The boys like to work alone better than to work in couple.
Students with low computer experience out of the school-hours choose more often for working in couples.

When the students work in couples and the may choose a partner, nearly 80% of the students chooses a class-mate with whom they work together frequently. The (remaining) results are shown in Table 7.

When the students work in couples and the may choose a partner, nearly 80% of the students chooses a class-mate with whom they work together frequently. The (remaining) results are shown in Table 7.

Table 7
Preference of the students for class-mates to work together (n = 815)

preference	%
class-mate with whom they work together frequently	79.0%
class-mate who is good at the subject area	2.0%
class-mate who is good at computers	2.8%
does not matter	16.2%

Students of grade 11 and 12 choose less often a class-mate with whom they work together frequently, but choose more often 'does not matter'.

When choosing a partner, the gender of that partner can also play an important role. Table 8 shows the preferences of the students.

Table 8
Preference of the students for the gender of class-mates to work together (n = 816)

preference	%
boy	15.6%
girl	14.1%
does not matter	70.3%

The majority of the student does not matter about the gender of the partner. Boys choose more often for a boy to work together than girls choose a girl to work together.

Statements regarding the use of computers in education

A great number of statements (19) regarding all kinds of aspects of the use of computers in education are put before the students. They had to indicate whether they agree or do not agree with these statements.

The results of the 19 statements are mentioned in Appendix A.

About 60% of the students will not choose a subsequent study to learn more about computers (nr. 1) or a profession in which computers are used (nr. 6).

The students (about 75%) want to use the computer more often in the lessons (nr. 4) or in free periods (nr. 19). The students (72%) like the programmes that are used at school (nr. 13).

About 60% of the students like to work with computer programmes with which they have to do many exercises (nr. 5), over 80% of the students think that they learn well from those programmes (nr. 8).

Whether the students like a certain computer programme or not depends on the subject of that programme (90% of the students; nr. 10), but does not depend on the teacher, according to 76% of the students (nr. 15).

A word processor is a useful tool for 90% of the students (nr. 9). Nearly 65% of the students think it is important to learn how to develop a computer programme (nr. 11).

Nearly all the students like it that there is someone (a teacher) about to help them when they are in trouble with the computer (nr. 14) or have questions about the subject matter (16). However, three quarters of the students think that it is not difficult to operate a computer (nr. 17).

The answers of the students are analyzed by means of a factor analysis in order to derive some scales. The factor analysis resulted in seven scales. Each scales comprises of three statements (except scale 3 and 4, they comprise of two statements). This is based on the factor loadings of each statement. Table 9 gives a description of the seven scales.

Table 9
Description of the seven scales

scale	description
1	Education and computers
2	Future and computers
3	Practicing with computers
4	Assistance in the lessons
5	Using the computer in the lessons
6	Valuation of courseware
7	Experience with courseware

For each student a scale score has been calculated with each scale. The results are shown in Table 10.

Table 10
Frequency distribution per scale

scale-score	scale 1	2	3	4	5	6	7
0	128	211	119	27	122	53	7
1	66	297	224	56	363	330	217
2	108	166	473	733	278	338	432
3	514	142	-	-	53	95	160

The seven scales are analyzed in order to determine which background factors (school, grade, gender, age, achievement level, computer experience at school, and computer experience out of the school-hours) influence the scale scores of the students. This is investigated by means of an analysis of variance for each scale. Because of the great number of independent variables, only the main effects of these variables are calculated (interaction effects are omitted). The results of the analyses are shown in Table 11.

Table 11
Results of the analysis of variance for each of the seven scales: F-values of significant main effects ($p \leq 0.05$)

factor	scale 1	2	3	4	5	6	7
gender	-	14.67	26.67	25.88	-	5.26	-
grade	9.87	2.43	-	-	2.82	-	-
comp.exp. out of sch.-hrs.	-	9.20	-	10.94	-	-	5.82
comp.exp. at school	-	4.08	-	-	-	-	-
ach. level	-	-	-	-	-	-	-
age	-	-	-	-	-	-	-
pilot school	-	-	6.01	-	12.00	6.95	-

The factor gender influences four out of seven scales, while the factors 'achievement level' and 'age' have no influence.
The relationship between the scales and the factors that have significant main effects, is discussed below.

1. Education and computers
The students of grade 7, 8 and 9 have higher scale scores than the students of grade 10, 11 and 12.

2. Future and computers
Four factors influence the scores on this scale. Girls have lower scores on this scale than the boys. Students who have much computer experience out of the school-hours or much computer experience at school have a high score on this scale more often.
Students of the higher grades have lower scores than students of the lower grades.

3. Practicing with computers
The girls have higher scores on this scale than the boys. The students of school A have lower scores than the students of school B.

4. Assistance in the lessons
The girls have higher scores on this scale than the boys. Students with much computer experience out of the school-hours have a high less often than students with little computer experience.

5. Using the computer in the lessons
The percentage of students with high scores on this scale increases in the higher grades. Students of school B have higher scores than the students of school A.

6. Valuation of courseware
The boys have a high score on this scale more often than the girls. Students of school A have higher scores than the students of school B.

7. Experience with courseware
Students with little computer experience have a high score more often than students with average or much computer experience.

Results of part II

In the second part of the questionnaire the students answered questions regarding the courseware they have used in this school-year. Each student valued two packages at most (as explained in the Method section).
A great number of packages (29) are judged by the students. The number of students per package is not equal: this varies from 230 students to 1 student. Therefore, no attention is paid in this paper to the packages that are judged by less than 50 students. This leaves 10 courseware packages. For each package there are two main questions: 'do you like the courseware?' and 'do you think you have learnt well with the courseware?'. In this paper no attention is paid to the other questions.
The results of these questions for those 10 packages are shown in Table 12. In this table the percentages of students that answered 'yes' are mentioned. The names of the packages are not translated into English.

Table 12
Valuation of 10 courseware packages by students (percentage of affirmative answers)

courseware package	number of students[1]	like it? 'yes'	learnt well? 'yes'
a. WordPerfect 5.0	230	72.6%	63.5%
b. Franse Werkwoorden	185	69.2%	77.3%
c. EDUC - Schaal	80	57.5%	76.3%
d. EDUC - Bevolkings-geografie	69	66.7%	50.7%
e. De Baas	67	58.2%	67.2%
f. Tekstnet	64	81.3%	78.7%
g. Breuken	59	39.0%	67.8%
h. Eetmeter	59	57.6%	55.9%
i. Alpha-Word	58	79.3%	86.2%
j. Taalkist	50	26.0%	26.0%

[1] the number of students does not indicate the number of students that have used the courseware.

Table 12 shows the majority of the students likes the courseware packages (except the packages 'g' and 'j'). Also a majority of the students thinks that they have learnt well with the courseware (except package 'j'). What the student have learned with the courseware is not investigated in this study.
In five cases (the packages 'b', 'c', 'e', 'g', and 'i') the percentage of students that likes certain courseware is smaller than the percentage of students that think that they have learnt well with the courseware. To think to learn well with courseware does not implicate that you like the courseware.

The girls like the packages more often than the boys (6 out of 10 packages) and think more often that they have learnt well with the package (6 out of 10 packages).
Students who have much computer experience at school, like the courseware and think that they have learnt well with the courseware.
The students like the packages for two important reasons: (1) working with the computer is a pleasant change with the ordinary lessons, and (2) the students like to work with the computer very much.
For learning well with a package there are three arguments: (1) there are many exercises included in the courseware, (2) the explanation given in the courseware is comprehensible, and (3) there is enough time to read the explanation.
The students do not learn so well with the packages because they think the packages are dull and the students have learnt the subject matter before in the lessons.

The answers on the two main questions per package are analyzed by means of an analysis of variance for each question. For the analyses the same procedure is used as to analyze the scale scores (see section Results part I).
The number of independent variables is always the same in each analysis because some packages are only used in one of the pilot schools. When a background factor is left out the analysis, it is indicated in Table 13 with an '*'.
There are no significant main effects ($p \leq 0.05$) with the first main question. None of the background factors influences the answers on this question about the ten packages. Probably, other factors play a more important role (e.g., the attitude towards the subject area).
The analyses of the second main question show that there are only significant main effects ($p \leq 0.05$) with five packages ('a' up to and including 'e'). Per package there are one or two main effects. Table 13 shows the results of the analyses for the five packages.

Table 13
Results of the analysis of variance for five courseware packages: F-values of significant main effects ($p \leq 0.05$)

factor	courseware package a	b	c	d	e
gender	-	9.79	-	4.78	4.42
grade	-	4.71	-	4.09	-
comp.exp. out of sch.-hrs.	3.84	-	-	-	-
age	-	-	7.75	-	-
pilot school[1]	*	*	3.97	-	*

[1] this background factor is sometimes left out of the analysis.

The students who have much computer experience out of the school-hours have a more positive view on package 'a' than students with average or little experience.
More girls than boys think that they have learnt well with package 'b'. Students of grade 2 and 3 are more positive than students of grade 4 and 5 with the second main question.
The students of school B are more positive than the students of school A with respect to package 'c'. Students of 13 years are more positive than 12-year old students about this package.
With package 'd' there is a great difference between boys and girls: most of the boys are positive, but most of the girls are negative. The students of grade 6 are more negative than the students of grade 5.
More girls than boys think that they have learnt well with package 'e'.
The background factors 'achievement level' and 'computer experience at school' have no influence on the valuation of the students.

Conclusions

In this study the valuation by the students of the use of computers in education is investigated. A questionnaire is administered to 816 students of the two pilot schools.
Though many students have experience with computer out of the school-hours, about 20% of the students is a frequent user of the computer and uses the computer for several purposes.
There is no relationship between the computer experience out of the school-hours and the computer experience at school.
In the computer room the students work alone or in couples. Over 40% of the students prefers to work alone. If they have to work in couples, nearly 80% of the students chooses a class-mate with whom they work together frequently. The gender of that partner is of minor importance.
A great number of statements (19) regarding all kinds of aspects of the use of computers in education are put before the students.

From the results can be concluded that the students of the sample like to use the computer very much, they would like to the computer more often. They think the computer is easy to operate, but like that there is someone to help them. The subject of the programme determines whether they like a programme or not.
Though the computer is very popular with these students, they do not want to learn more about computers after they have finished secondary education, or have a profession that has to do with computers.
From these statements seven scales were derived. The factors 'gender', 'grade', and 'computer experience out of the school-hours' have influence on these scales, while the factors 'age', 'achievement level', and 'computer experience at school' have no influence.
The students have given their opinion on a great number of courseware packages. Because of the design of the questionnaire these packages are not valued by all the students. Ten packages that are valued by 50 students or more are analyzed. The majority of the students likes eight of these packages and thinks that they have learnt well with nine of these packages. Further analysis is needed in order to recover the arguments of the students.
Some students have used the computer at school very frequently. There is no evidence found in this study that these students value the use computers in education different from students who have little experience with computers at school. The intensity with which the computers are used by the teachers of the pilot schools has not yet a restraining influence on the enthusiasm and the motivation of the students.

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Appendix A

Frequency distribution 19 statements regarding the use of computers in education (n = 816)

nr.	statement	agree	dis-agree	not answered
1.	Presently, I choose a subsequent study in which I will learn more about computers.	35.2%	62.5%	2.3%
2.	I would rather work with a programme I am familiar with than that I will work with a new programme.	48.7%	50.7%	0.6%
3.	I think that the programmes I have done very frequently are boring me after a while.	51.8%	47.1%	1.1%
4.	I would like to use the computer in the lessons more often.	75.5%	24.3%	0.2%
5.	I like to work with computer programmes with which you have to do many exercises.	62.3%	36.4%	1.3%
6.	Afterwards, I would like to have a profession in which I will work with computers often.	30.5%	67.4%	2.1%
7.	Now, I do not like the computer programmes so much which I used to like before.	44.7%	53.2%	2.1%
8.	I think that you learn well from computer programmes in which many exercises are found.	81.1%	18.0%	0.9%
9.	I think that a word processor is a useful tool for making essays and letters.	90.8%	8.7%	0.5%
10.	Whether I like to use a computer programme especially depends on the subject which is dealt in the programme.	89.8%	10.0%	0.1%
11.	I think it is important that you learn at school how to develop a computer programme (programming).	63.6%	35.5%	0.9%
12.	When I am working with the computer, I also like to look at the screens of the computers of my classmates.	57.2%	41.4%	1.3%
13.	I like to use the computer programmes at school.	72.3%	26.6%	1.1%
14.	When I have difficulties with the operation of the computer, I like it that someone is present to help me in such cases.	94.1%	5.5%	0.4%
15.	Whether I like to work with a certain computer programme especially depends on the teacher who is present.	23.7%	76.0%	0.4%

nr.	statement	agree	dis-agree	not answered
16.	When I have questions about the subject-matter, I like it when there is a teacher about to give an explanation.	92.4%	7.5%	0.1%
17.	I think it is difficult to operate computers.	23.4%	75.5%	1.1%
18.	I like to use a programme which you have to use a mouse.	51.5%	46.8%	1.7%
19.	I would like to work with computers at school more often.	75.7%	23.7%	0.6%