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Abstract

The NKI Electronic College has proved its value through five years of operation, eight-hundred sold courses, and, to date, twenty graduated students. These students have completed a ten course program--equivalent to one year's full-time study--via computer conferencing. Further, the students have obtained better grades than either correspondence students or on-campus students. The student surveys show that the students have a positive perception of the curriculum and the Electronic College. Student feedback also indicates that teacher activity is of crucial importance to students' perception of a course. The teachers are generally positive about the Electronic College and its opportunities; their main reservation is in regard to the heavy teacher workload introduced by the medium. The article presents results from surveys of teachers, students, and administrators, as well as information about dropouts and grades. The appendix, which is available as a separate file, includes descriptions of the courses, of the conferencing system EKKO, of examination results, of graduated students' opinions, and of applications not included in EKKO.

The NKI Electronic College: Five Years of Computer Conferencing in Distance Education

By Morten Flate Paulsen

NKI

The NKI College, located in Oslo, is one of the largest non-governmental educational institutions in Norway. NKI comprises The College of Engineering, The College of Computer Science, The Division of Distance Education, and The Publishing House. It was founded as a correspondence school in 1959.

The Division of Distance Education offers 60 correspondence programs and 250 correspondence courses, mainly in technical and vocational subjects. The division has about 17,000 students and an extensive network of local partners around the country that offer face-to-face support classes adjunct to many of the correspondence courses. The correspondence teachers are part-time employees recruited from around the country.

The College of Computer Science was established in 1983. It offers both a full-time and a part-time program in information processing, emphasizing programming and system analysis. Both are two-year programs, and every year about one hundred students in each category are admitted to the college. The part-time program is offered in three modes: face-to-face classes, correspondence courses, and the Electronic College. The Electronic College is designed so that distant students can do all their communicating online. In contrast, many of the internationally renowned implementations of "electronic colleges" are actually using computer conferencing as a

supplement to correspondence courses or on-campus teaching.

The Electronic College

The idea of the Electronic College was conceived in 1985 and further developed by research on existing computer conferencing systems such as PortaCom, EIES, and CoSy, and on electronic colleges such as Connected Education and the Western Behavioral Sciences Institute (Paulsen 1989a). In the first two years, the project was propelled by a handful of enthusiasts who devoted much of their spare time to the project. The idea was to use computers to facilitate flexible interpersonal communication in distance education. Students, faculty, and staff could communicate independently of time and space through the college's central computer. They could exchange written messages both individually and in groups.

The Electronic College needed administrative and logistical support from the Division of Distance Education, and faculty and user support from The College of Computer Science. At first, few believed in the project, making it hard to get the necessary support and to integrate the project into the NKI organization. Gradually, the Electronic College thrived, receiving both national and international recognition. Suddenly, both the College of Computer Science and the Division of Distance Education wanted to be in charge of the project. By the spring of 1992, the Electronic College had sold about 800 courses, but the organizational adaption needed to be developed further.

The first version of EKKO--the Computer Conferencing Software emulating an electronic college--was designed and implemented during 1986. A more detailed description of EKKO is included in appendix 2. The system was used for the first time, as an optional supplement to on-campus teaching, in the Fall of 1986.

The first attempt to deliver a distance education course via EKKO was made during the Fall of 1987. Two more courses were added for the following semester. Since the Spring of 1990, the college has offered all ten courses in the Information Processing Program every semester. These ten courses constitute the equivalent of a one-year, full-time program.

Participants

Including the spring 1992 semester, the NKI Electronic College has sold about 800 courses. An overview of the number of students who have enrolled and completed each course since the fall 1987 semester is presented in table 1.

Table 1. Numbers of students enrolling/completing courses each semester since the Fall of 1987.

Courses	F87	S88	F88	S89	F89	S90	F90	S91	F91	S92
Intro.	4/2	22/16	6/4	12/7	33/24	10/5	21/11	5/4	22/?	8
Pascal		19/9	7/4	9/4	23/15	26/20	22/10	7/6	24/?	15
Info. Sys. I	16/10	8/5	12/4	33/23	20/15	23/12	8/5	25/?	12	
Intro. Bus. Adm.			7/2	3/2	2/2	17/14	3/2	7/?	9	
COBOL			3/1	4/4	12/11	9/8	7/7	5/?	11	
Database Systems				4/3	18/16	13/12	9/5	12/?	5	
Information Sys. II					20/17	12/11	20/13	12/?	15	
Mgmt. Info. Sys.						5/5	4/4	20/18	4/?	8
Socio-Tech. Sys. D.						4/4	5/5	17/15	5/?	8
Project Assignment				1/1	3/2	0/0	12/10	4/?	8	

Totals	4/2	57/35	21/13	43/18	101/72	120/97	126/87	108/85	120/?	97
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As of Spring semester, 1991, the student completion rate of all courses was 71%. The enrollment figures for each year depend on when enrollment information was gathered. In the few weeks before and after courses start, students frequently add and drop courses. The statistics for non-starters are not gathered, but observation indicates that many of the drop-outs were non-starters, i.e., they did not complete any of the assignments.

A 1988 demographic survey of students (Paulsen 1989b, 33-35) showed that the respondents were from 19 to 62 years old and that there was a substantial majority of men. A large majority of the students were married/cohabits and had children. Even though most of the students lived in the greater Oslo area, many came from other parts of the country, as well. The respondents were well educated; for example, several were teachers and engineers. Additionally, the students were relatively well-skilled computer users.

Needs

The College of Computer Science wanted to extend the part-time program to more students. Franchising and correspondence courses had been contemplated from the day the college was established. The computer boom in the second half of the 1980's propelled the demand for computer courses. However, no formal needs assessment for the Electronic College was conducted. How can one assess the need for concepts neither the consumers nor the providers comprehend? The Electronic college was obviously technology driven, promoted by people with a vision of a future educational medium.

Staff

The number of people involved with the Electronic College has increased as the project developed. The project administrator is the only full-time employee of the Electronic College. Over the years, about twenty part-time teachers have been engaged to teach courses. Some have taught just one course once, others have taught two courses each semester for several semesters. The rest of the project work has been provided on a part-time basis by NKI staff. The most important services were provided by the EKKO system operator, who handles operation of hardware and software as well as user support, and the course secretary, who handles enrollment and fees. Other important services provided by NKI are course development, logistics, and examinations. The extent of services provided by NKI varied from semester to semester, but can be estimated to be equivalent with one or two full-time employees.

Content

The Information Processing Program emphasizes information processing, programming, and system analysis. The goal of the Information Processing Program is stated in the 1991-92 handbook:

The program is primarily developed for users of computers and software applications. The responsibility for utilization of computers is increasingly transferred to the users, so there is a need for people who can assume responsibility for local computer applications. These people need--in addition to their ordinary job assignment

skills--enough knowledge about utilization of computers to understand the opportunities computers provide, and to participate in the implementation of computer projects. . . . The program provides knowledge about the opportunities revealed by computers. The students develop knowledge about information processing, allowing them to take part in system analysis and development as well as programming. They will be able to develop small scale information systems and modify existing systems. It is, in particular, pertinent that they can apply these skills in their work environment. (translated from NKI 1991, 4)

Each of the ten courses in the program is described in appendix 1.

Finances

Public schools, colleges, and universities charge no tuition fees in Norway. Thus, the non-governmental NKI has to compete with public colleges in this unfavorable financial environment. So, as was true of most NKI projects, The Electronic College was developed under economical constraints. There were limited grants to support the project, hence it was necessary to settle on pragmatic, low-cost solutions which seldom were optimal for the new medium.

The two important economical resources were student fees and research grants from the Norwegian Department of Church and Education and the Norwegian Teleadministration. In five years, the research grants have totaled about USD 100,000.

The Electronic College's fee structure developed over several semesters. For the first and third semester, each course was priced at the rate of the equivalent correspondence course. It was decided that courses offered the 2nd semester should be free (the students just paid for the text books) in order to encourage enrollment of enough students so that the college could gain experience with larger classes. By offering free courses, the college received positive and free media exposure for the, until then, esoteric concept "electronic distance education". For the fourth semester a USD 25 (NOK 150) communication fee per course was introduced. Finally, the fifth semester the communication fee was converted to a USD 150 (NOK 1,000) semester fee. The college stated that the communication fee and the semester fee should cover the use of EKKO and all data communication costs except local telephone charges.

The course fee has varied from course to course, increasing at a rate slightly higher than that of inflation. It has ranged from approx USD 300 to USD 500 per course. The course fee has covered tuition and textbooks. Students must pay an extra USD 100 if they want to take the course examination. As an incentive to complete the courses, students receive about USD 50 refund--payable toward another course--for each course they complete.

Facilities

The Work Station. The college does not require students to use any specific brand of microcomputer, modem, or communication program. The only requirement is that they can upload and download ASCII files via EKKO. Neither does the school provide or rent any equipment to the students. Consequently, the schools logistical workload is greatly reduced.

Communication Lines. From the spring 1988 semester, the following data about the communication lines are documented:

The use of EKKO was logged continuously. The use varied a lot from student to student. Among students who completed one or more courses, the number of "log-ins" varied from once a week to several

times a day. The minimum number [of "log-ins" during the semester] was 11, the average was about 80 and the maximum number was 350. . . .

We had two Public Telephone and Telegraph (PTT) lines for 300 bit pr sec modems and two autodetect PTT lines for 1200 and 2400 bit pr sec modems. We also had six Public Data Network (PDN) channels. These lines were available, not only for our distance students, but also for other users. . . .

The communication lines were used at almost any hour of the day. The peak frequency occurred during the afternoon and evening and the frequency dropped to a minimum at night.

Our four PTT lines and six PDN channels seem to have had the capacity to handle all our users during our experiments carried out so far.

We paid for the students' use of the PDN. In the 1988, the fixed PDN costs were \$293 and our variable cost for each of the 57 courses were \$22 on an average. (Paulsen and Rekkedal 1990a, 72-75)

User Support. The Electronic College had few resources to spend on user support. As a result, marketing and user support focused primarily on students who could master the communication system with minimal help from the college. The limited user support available was geared toward production and distribution of user manuals and communication software. In addition, students could request help over the telephone during work-hours and they could post questions in EKKO.

Organizing EKKO

EKKO serves about 3,000 users and many different user groups including on-campus students, prospective students, present students, former students, teachers, and administrative staff. Table 2 gives a schematic overview of how EKKO is organized to serve these user groups and their different needs.

Prospective students seek information about the college, the curriculum, the conferencing system, etc. They need access to sufficient information to decide whether to apply for a course. If they decide to apply, they should be able to both apply and register on-line. To reduce the labor-intensive counselling of prospective students, the college has given them necessary access-privileges to search for information themselves. They have access to the Curriculum board, the User Manual board, and the Published Articles board. Everyone in Norway has free access to EKKO. The college continuously announces how to access EKKO, so prospective students and "hackers" can get acquainted with the system. Providing this access might be the program's most valuable marketing activity.

Present students need tutoring, administrative information, and social recreation. It is necessary to organize a suitable infra-structure for these purposes. The College has established course conferences and course boards for tutoring, a Cafe conference for social activities, a Presentation board where students can introduce themselves, and Administrative and Exam boards for administrative and examination announcements.

Some former students may want to know when new courses are offered, others want to stay in touch with old peers. The college has given them access-privileges to stay on-line without any charges, hoping that continued access may develop an important alumni network.

Each teacher has a course board for distribution of information to the class. Each one also moderates a course conference. All teachers can access any course board or conference to pick up pedagogical ideas and approaches. The Faculty Club is set up for discussion of administrative and pedagogical issues.

The staff is responsible for distributing administrative information.

EKKO provides a Curriculum board, which is a "carbon copy" of the printed program handbook. The User Manual board is an on-line version of the paper back manual. Published articles and papers, describing distance education projects, are issued on the Published Articles board. The Administrative board holds information about registration fees, application deadlines, etc. Selected examples of former examinations are presented on the Exam board.

Students may order a course via e-mail, phone, or land mail. The program secretary informs the System Operator and the teachers via the Admission Office board whenever students enroll in courses. Then the System Operator grants the students the appropriate access privileges and the teachers welcome them as students.

Table 2. Some important user groups and their access privileges to EKKO conferences and bulletin boards.

Conferences/ bulletin boards	Prosp. students	Present students	Former students	Teach- ers	Staff
Curriculum board	RO	RO	RO	RO	RW
User Manual board	RO	RO	RO	RO	RW
Published Articles	RO	RO	RO	RO	RW
Admission Office	N	N	N	RO	RW
Faculty Club	N	N	N	RW	RW
Admin. board	RO	RO	RO	RO	RW
Exam board	N	RO	N	RO	RW
Course boards	N	RO	N	RW	RO
Course conferences	N	RW	N	RW	RW
Cafe conference	N	RW	RW	RW	RW
Presentation board	N	RW	N	RW	RW

N = No access, RO = Read Only access, RW= Read and Write access

Teaching

EKKO courses are based on the textbooks and curricula developed for the corresponding face-to-face courses. In addition, all courses include a study guide originally developed for the correspondence courses. The developers of the study guides have, however, become more and more aware of the fact that these guides also are used by the EKKO students. Most courses are based on six compulsory assignments. On occasion, EKKO teachers have substituted alternative assignments in order to experiment with other pedagogical techniques. The students can send their work as e-mail to the teacher, or as notes to the class conference.

To create group cohesiveness and to support student collaboration, it is necessary that the students within each course experience a fairly synchronous progression. The college therefore applies fixed dates for both the beginning of a course and for the final examination each semester. This policy is in contrast to that for correspondence courses, in which students may enroll at any time.

Since the courses are based on correspondence courses which have been adapted to the new medium, they may be criticized for being electronic correspondence courses. The following examples should refute these allegations.

Projects. The Project Assignment Course was taught by this author during Spring Semester 1991. The course-work involved collecting information, both by conducting interviews and through a literature search. An important goal was to familiarize students with project management and

cooperation. A second main objective was to teach students how to produce a written report of the project results. The students were encouraged to find a project related both to knowledge obtained through the Information Processing Program and to their jobs. They were asked to form project groups of from one to three students.

Each student received two textbooks through land mail. In addition to the textbooks, the students received a fifteen-page study-guide that was developed for both correspondence students and EKKO students. The guide included extra guidance for distance students, course requirements, and assignments. Since the study-guide was finished a few days after the course started, it was distributed via EKKO.

Twelve students, ten men and two women, enrolled in the course which for most of them, was the 10th and final course in the program. By this time they had all become advanced computer conferencing users, with no need for user support. Most of them had enrolled in more than one course in the Spring Semester 1991.

The course started the first week of February 1991; the final project report was due May 10th. During this period the students had to complete four assignments. The first assignment covered the theory from the textbooks. Each student had to turn in a short essay via e-mail. Additionally, students were asked to present project ideas in the class conference. For the second assignment the students had to form a project group and then present their project task, milestone plan, and responsibility chart. The third assignment asked each group to write a progress report from its project, and the fourth assignment asked for the final project report.

The teacher's job was to comment on the assignments and to help the students whenever they had questions about their projects and the project management tools. Most of this feedback was routed via e-mail to each specific group, but information of general interest was posted on the class bulletin board, or in the class conference.

Role Play. In the fall of 1988, Monica Johannesen taught "Information Systems I" via EKKO. In a class conference she presented a case that described a company planning to invest in a new computer-based office automation system. The students were assigned roles as user, accounting officer, project manager, labor union representative, etc. Over a period of about fourteen days the students were to elucidate the different facets of the case by enacting the different roles.

Peer Critique. In "Management Information", this author practised a technique by which the students presented the results of their individual assignments in a small group conference. The students' peers were then asked to critique the work.

Multiple Choice Database. Henny Lindland used the EKKO online multiple choice database described by Quale (1990) as part of "Introduction to Computer Science", for the first time in the fall of 1989. The students could first download a number of multiple choice questions, then figure out and later upload the answers for scoring by the database.

Programming. Beginning in the fall of 1988, Ragnar Boersum taught programming courses for several semesters. In the Pascal course, students used Turbo Pascal to develop programs on their home microcomputers. The program source code was posted to the instructor, or shared with the other students in the conferencing system. In this way the teacher and the students could download the programs, modify them if they so chose, and then execute them on their local computers. The Cobol course allowed student access to the host computer's Cobol compiler. Although this method was inconvenient, it was workable. The important lesson was, however, that distant students can access host computer applications such as compilers, database systems, statistics software, etc.

Grades

Grades are exclusively based on the results of the final four-hour essay examinations. EKKO-students, correspondence students, and on-campus students are given the same tests at the same time at several sites around the country. The results show that EKKO students achieve better grades than either correspondence students or on-campus students. On a scale from 1.0 (best grade) through 4.0 (lowest pass grade) to 6.0 (lowest fail grade), table 3 presents the total average grades from Fall Semester 1989 to Spring Semester 1991.

Table 3. Total average examination grades

Student group	Mean grade	N	Semesters
EKKO	2.57	288	fall 89 to spring 91
Correspondence	3.05	125	fall 89 to spring 91
On-campus	2.89	889	fall 89 to fall 90

Three factors may explain these differences in grades. First, EKKO-students seem to enter the courses with better general grounding than do on-campus and correspondence students. Second, EKKO-students have more compulsory assignments than do on-campus students. Third, the communication form they are required to use forces EKKO-students to write more than on-campus students must write. This necessity probably provides EKKO students an advantage over other students since it better prepares them for the typical four hour essay-style exam. An overview of examination results are included in appendix 3.

Feedback From Teachers

This author summed up the teaching experiences of the seminal spring 1987 semester in these three points (translated from Paulsen 1989b, 17):

1. My main impression is that we did not manage to utilize the opportunities to create a class cohesiveness. I believe this is because there were too few students in the class [four students] and because the students did not have a synchronous course progression.
2. The teaching was mainly an electronic version of a traditional correspondence course. The response time was shorter than what is usual in correspondence courses, which I perceived as an advantage. I had, though, to experiment to find an effective way to comment on the students' assignments.
3. The students had obvious problems in learning how to use a modem. As a teacher, I would like to have a support service that could help the students solve these problems.

By the spring, 1988 semester, there were more students in the classes, the course progress was synchronized, and the student support had improved. Lars Eskeland and Rolf Ingebrigtsen wrote extensive reports about their teaching experiences. Their reports, which are available in Norwegian (Paulsen, 1989b, 118-139), showed that:

It had been an interesting and work intensive teaching method. Their work could have been more efficient had EKKO been better adapted to the teacher's needs. The teaching will be less work intensive the next time the courses are offered because many of the text files can be

used again. (Paulsen 1989b, 45)

In the fall, 1988 semester, all the material from the previous semester was made available for new teachers in order to reduce their workload. Some changes in the EKKO software were also implemented to make the teachers' work more efficient. Roy Lindland, Ragnar Boersum, and Monica Johannessen were interviewed about their teaching experiences during the fall 1988 semester (Paulsen 1989b, 48-50). In summary:

They were pleased with the opportunity to work when it was convenient, and disturbed by the fact that it was hard to initiate communication in class. They stated that the instructor's workload was large, but that it would decrease when the courses were repeated. Pedagogical techniques that stimulate dialogue between the students are needed. The teachers believed that courses that rely heavily on graphical representations are not suited for this kind of teaching. (translated from Paulsen 1989b, 52-53)

The problems associated with sending and receiving graphic files in EKKO were handled by quasi keyboard-graphics, fax, or land mail. Later, an updated version of EKKO was developed to handle uploading and downloading of graphics and other binary files.

Ragnar Boersum (1990) described his teaching experiences in the Pascal and Cobol courses in 1988 and 89:

I logged on to EKKO twice a day as long as I was in the vicinity of my PC. I received the information in a file and logged off the system. Then, I wrote my comments, logged on again, and dispatched my comment files.

The students' notes and my corresponding comments were filed in the students' directories. I established one directory for each student. The comments were identified with references to the assignment number and question number. I believe it is important that the comments are written in a "friendly way". Emotions are hard to express in this medium, and they are easily misunderstood. One should have this in mind when one reads student contributions.

The workload is heavy when one teaches such a course for the first time. One needs a lot of notes and files compiled in a system. (translated from Boersum 1990, 108)

Henny Lindland, who taught "Introduction to Computer Science", reported that:

- The course "Introduction to Computer Science" is suitable for electronic distance education;
- Effective use of EKKO can to a large degree simulate a classroom;
- EKKO-base is a valuable tool. (translated from Lindland 1990, 124)

Ragnar Boersum, Einar Gaarder, Steinar Heggelund, and Henny Lindland responded to a thirteen item questionnaire about teacher experiences during the fall 1988 semester (Paulsen and Rekkedal 1990b, 89-103). Their comments include details about the specific courses, how the courses were taught, and how they could be improved. All four agreed that the workload was heavy.

Feedback From Students

There was no organized survey of the four students' opinions in the

fall 1987 semester. The following student statement is, however, documented:

Generally, I evaluate the scheme very favourably. It is right on target to offer a system pairing correspondence courses and evening classes. One may compare it with "combined courses", a combination of correspondence courses and lectures, which I have favourable experiences with from high-school courses. In my opinion, it is wonderful not to have to attend five-hour lectures twice a week after work.
(translated from Paulsen 1989b, 17)

In the spring 1988 semester, questionnaires were distributed to forty students. Twenty-eight were completed and returned. The results were summarized as follows:

In most cases, the students gave a positive overall assessment of this form of distance education. None of the students who expressed views was dissatisfied with the course. On a scale from 5 = very good to 1 = very poor, their average estimate of the courses was 3.9, 4.3 and 3.9.

The two main reasons for being interested in the course were the subject matter and the communication medium. Our distance students had a relatively good grounding in the use of computers and computer science prior to taking the EKKO courses. Most of them, but not all, already had experience of word processing and/or a PC/micro-computer. However, there were remarkably few who had experience with modems and/or conferencing systems before starting the course. The 1200 bit/sec users were mostly satisfied with the transmission speed, but the 300 bit/sec users were not. In general, students were satisfied with the lines of communication. The PTT users were little disturbed by noise, but the problems increased with speed. The PDN users claimed to be more disturbed by noise on the lines.

Most of our distance students live in the Oslo area; other parts of the country were also represented. Our distance education courses have attracted students with a good educational background and a wide variety of vocations. A great majority of the students are married or co-habit, and have children. There were though significantly more men than women among the students.

The text books and assignments for submission were developed for traditional correspondence courses. The students, by a large majority, felt that this had not hindered them in their learning. It is therefore possible to offer instruction without materials specially developed for courses of this kind.

The students reported that the tutors' individual responses to their assignments, and the chance to communicate with the tutor via E-mail, was very important to them. They were satisfied with the tutors' response time.

The instruction was planned with fixed deadlines for submission of assignments, in order to create a coordinated progression through the courses. This was a positive aspect for both students and teachers. However, everyone not completing claimed that lack of time was the main reason. The deadlines for submission of assignments should not have appeared as frequent as every second week. The main reasons for not entering for the exam were lack of time or lack of interest in formal accreditation. (Paulsen 1990, 239)

One student's evaluation of the Pascal course is documented from the fall 1988 semester. At the end of the report, the student states: "The electronic distance education developed to become a sort of electronic correspondence teaching." (translated from Paulsen 1989b, 48)

On the basis of a comprehensive telephone interview with 20 EKKO students, 26 correspondence students, and 20 prospective EKKO students, Rekkedal (1990) concludes:

Experiences from the Spring term 1989, previous experiences (and new data obtained in the Fall term 1989) have shown that distance education through the EKKO computer conferencing system has functioned quite well.

The NKI Information Processing Programs can now be studied in 4 different ways: full-time and part-time on campus, correspondence studies and electronic distance studies. These alternatives seem to reach different target groups, thus giving study opportunities for prospective students with different needs.

Correspondence studies and electronic distance studies seem today to attract different student groups, who deliberately choose their preferred method.

There is a need for better information to prospective students, on what electronic study involves of technological problems and costs.

Lack of modems and familiarity with the technology involved is still a major barrier for recruitment to electronic distance studies. There is a need for making the communication commands and procedures easier for novice users.

We see a great need for developing theoretical frameworks and methodological experiments to find teaching methods and learning techniques suitable for different subjects, types of objectives, content and evaluation procedures.

Research is needed to find teaching methods which stimulate meaningful course-related and social communication. In this work it is important to develop teaching behaviours stimulating active student contribution. Since teaching through computer-mediated communication seems to be extremely demanding and time-consuming, we also need to develop procedures which lead to cost-efficient teaching. (Rekkedal 1990, 103)

The responses from twelve students from the fall 1989 semester were analyzed and documented (Paulsen and Rekkedal 1990b, 52-54). Following is the final paragraph of the report that was returned to the students:

I am pleased to notice that most of the comments I received relate to teaching and learning. Very few comments report technical problems, even though we know that they still exist. I consider this to show that we in the future can concentrate on the important issues, namely to concentrate on quality education. (translated from Paulsen and Rekkedal 1990b, 54)

An e-mail interview with graduated students was conducted in 1991. Unfortunately, just five students responded. They were asked the following question: What is your opinion of the NKI Electronic College, now that you have finished all ten courses? The complete set of answers are included in appendix 4. The answers showed that the respondents were very positive about the freedom provided by the Electronic College and about the program contents. They also point out that teacher activity is of crucial importance to students' perception of a course. This is indicated by these two comments:

Some of the teachers should have been more active in trying to "drag the students into the conference". What I think is a problem . . . is that there are some teachers who are taking this job as a "secondary job" and consider it as a secondary job. They are not interested in answering questions in the conference, just in giving us

exercises and in correcting our written work. It sometimes made me quite frustrated, when I put a question into the conference and I didn't get the answer until the date for delivering my exercise was there. (Appendix 4)

In my opinion, the teachers are the most important parts of the program. They should always be very active and sensitive to questions posted by students. With regard to this, the differences between the various courses has been considerable. A teacher who continually monitors the activity and who responds promptly is a prerequisite for an effective program with motivated students. Some teachers have been terrific, others rather slack. (Appendix 4)

Administrative Feedback

A brief summary of the impressions of the program secretary, Bitten Tollan, indicated that:

EKKO is a very efficient communication medium. Information and orders can be executed much faster than via ordinary mail. As long as EKKO-students not are registered in the existing computer systems developed for our correspondence students, it is work intensive to do the administrative work. Much time and work can be saved when the EKKO students can be registered automatically. (translated from Paulsen 1989b, 53)

Since then, much work has been done to make the administrative work more efficient. However, there is room for improvement of both manual and automatic routines. A discussion of possible future administrative applications within EKKO is presented in Paulsen (1990b, 110-112). An edited excerpt of the discussion is reprinted in appendix 5.

Conclusion

The NKI Electronic College has proved its value through five years of operation, eight-hundred sold courses, and, to date, twenty graduated students. These students have completed a ten course program--equivalent to one year's full-time study--via computer conferencing. Further, the students have obtained better grades than either correspondence students or on-campus students. The student surveys show that the students have a positive perception of the curriculum and the Electronic College. Student feedback also indicates that teacher activity is of crucial importance to students' perception of a course. The teachers are generally positive about the Electronic College and its opportunities; their main reservation is in regard to the heavy teacher workload introduced by the medium. This perception highlights the importance of continued efforts to identify and refine efficient pedagogical techniques for the future Electronic College.

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THE NKI ELECTRONIC COLLEGE: FIVE YEARS OF COMPUTER CONFERENCING IN DISTANCE EDUCATION

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Abstract of Article

The NKI Electronic College has proved its value through five years of operation, eight-hundred sold courses, and, to date, twenty graduated students. These students have completed a ten course program--equivalent to one year's full-time study--via computer conferencing. Further, the students have obtained better grades than either correspondence students or on-campus students. The student surveys show that the students have a positive perception of the curriculum and the Electronic College. Student feedback also indicates that teacher activity is of crucial importance to students' perception of a course. The teachers are generally positive about the Electronic College and its opportunities; their main reservation is in regard to the heavy teacher workload introduced by the medium. The article presents results from surveys of teachers, students, and administrators, as well as information about dropouts and grades. The appendix, which is available as a separate file, includes descriptions of the courses, of the conferencing system EKKO, of examination results, of graduated students' opinions, and of applications not included in EKKO.

Appendix 1. The Courses Offered at the NKI Electronic College

Each course uses textbooks originally chosen for the face-to-face courses and study guides that gradually have been developed for the correspondence courses.

Introduction to Computer Science

- Introduction to electronic data processing (edp)
- Types of computers: super, mainframe, mini, micro
- Basic construction: CPU, storage, I/O, terminals
- Software: operating systems, programming languages, application programs
- Practical training in using a minicomputer
- Microcomputer architecture and operation
- Possibilities and limitations of microcomputers
- Practical training in using microcomputers (MS-DOS)

Features of special interest: Access to an online, multiple choice, database on the host computer.

Programming I: An introduction to structured programming in Pascal

- Console input/output of data, screen dialogue
- Variables and data types
- Computation
- Control statements: branching and iteration
- Procedures: with and without parameters
- Data structures: arrays, strings, records

Features of special interest: Students and teachers can send and share Turbo Pascal source code via EKKO. The programs can be edited and executed on local microcomputers.

Information Systems I

The purpose of this course is to give the students an overview of Information System Analysis and Design (ISAD) work: how it is organized, its phases, its importance to business organization, and the necessity of cooperation between various interested parties.

- General systems theory, information systems theory
- Analysis of change
- ISAD phases (with one method as an example)
- The use of models generally
- Modelling techniques (often called "tools") in analysis of change used in ISAD

Features of special interest: One of the teachers has experimented with roleplay, staging implementation of an office automation system.

Programming II: An introduction to programming in COBOL

- General COBOL syntax
- Numerical and character variables; pictures
- Console I/O of data, screen dialogue
- Computation
- Control statements: branching and iteration
- Sequential and index-sequential file processing
- Data structures: records and tables
- Searching through tables
- Subprograms

Features of special interest: Both a compiler on the host computer and local microcomputer compilers have been used.

Information Systems II

This course gives the students a detailed knowledge of three different ISAD methods, their modelling techniques (tools), and supporting CASE-tools.

- The three ISAD methods "SASD" ("Structured methods"), "ISAC" (the Scandinavian activity-driven method) and "SIV" (a systematic method for choosing standard software), all with phases, basic assumptions, and some of the historical background.
- Modelling techniques and standard documentation used in these methods, to perform and describe the analysis of activities, information, data, and processes/algorithms.
- Discussion, demonstration, and student trial of CASE-tools for the three methods.

Features of special interest: Fax machines have been available for transmission of graphs and charts. Further, software applications are distributed to the students.

Introduction to Business Administration

- Basic accounting
- Cost and Income Analysis
- Investment and Finance

- Planning and Budgeting
- Studies of edp Business Applications
- Use of Spreadsheets (Lotus 1-2-3, or other software packages)

Features of special interest: The course requires local spreadsheet software.

Relational Databases

Having completed this course, the students should be able to explain the principles on which the design of a RDBS is based, as well as the demands that should reasonably be put on its functionality and performance. The students should be able to use SQL.

- Basic definitions
- Database administration
- Logical (conceptual) and physical database design
- Use of the SQL query language
- Practical training in design and establishment of a SQL database

Features of special interest: A SQL software applications is distributed to the students.

Management Information Systems

- Office Automation
- Data Communications
- Operating Systems
- Accounting Systems
- Security

Socio-technical Systems Development

The aim of the course is to study the interdependence of information systems, organization development, and personnel development.

Project Assignment

The project consists of collecting information, both by doing interviews and by searching and reading literature. An important goal is to make the students accustomed to project management and cooperation. A second objective is to teach students to produce a written report of the project results. This report is presented orally in an examination.

Features of special interest: Students living in different parts of Norway work in groups of two or three students. The course has been taught by a teacher living in far U.S.A.

Appendix 2. The EKKO Conferencing System

EKKO is influenced by PortaCOM, EIES, CoSy, Participate and PC-based bulletin board systems. Development, based on Morten Flate Paulsen's specifications, started in the spring of 1986. During the summer, Bjoern Mobaek and Lars Hornfelt programmed the first version in Pascal for a HP-3000 minicomputer. In the fall semester 1986, EKKO was used for intra-mural communication at the College of Computer Science. In January 1987

users outside the college were given access EKKO. Since then, the system has continually been updated, first by Bjoern Mobaek, later by Jan Ner-gaard. The following is a description of EKKO version 3.30 that was released in September 1991.

EKKO is designed to work with all kinds of microcomputers and terminals, so that no prospective students should be excluded due to lack of compatible hardware. It is also designed to reduce communication costs.

EKKO consists of these five main modules: user directory, electronic mail, bulletin boards, conferences, and filetransfer.

User Directory

The directory registers information on each user (name, address, telephone numbers, and a five-line presentation) and user group. The information is entered by the users, so it is up to them to decide which data to declare. All user groups are formed by the system operator (SysOp), who is the only person allowed to add or remove a user from a group. All users can list the usergroups and their members. SysOp can, however, close a user group so that only members can list the group and its members. The usergroups are useful for clustering students into classes, departments, etc. In this way all users can identify their class, peers, etc.

Electronic Mail

The e-mail system is made for one-to-one communication. It is a traditional electronic mail system which enables a user to send private messages to one or more users or usergroups. After a note is sent, it is possible to list the users who have received the note, but have not yet read it. When the note is no longer of interest, the sender may discard it from the addressee's in-basket. It is not possible to store letters in the post system after they have been read. This limitation saves storage capacity in the host computer and reduces communication costs. It is, of course, possible for the recipient to store a local copy on a microcomputer.

Bulletin Boards

The bulletin board system in EKKO is organized for one-to-many communication. It is meant to be a one-way information channel for information "broadcasting". This system was made to meet the needs of faculty and staff to pass on information to one or more classes. The bulletin boards are set up and maintained by SysOp. Nevertheless, a user who has written a notice on a board may delete it. SysOp can limit the number of people with writing access to a bulletin board, and can even limit access to members only.

Conferences

Conferences are made to enable many-to-many communication. Sysop is the only user who can set up conferences, which can be open or closed. All users have read-and-write access to an open conference, whereas a closed conference is accessible only to privileged users. In a conference, EKKO differentiates between contributions and comments. In this context, a contribution is an introductory statement, while a comment is always a response to a contribution. Each contribution has a heading that is used in information searches. All comments are organized as a chronological chain linked to their respective contributions.

User Interface

EKKO is menu-driven. Each user may choose the extent of menu guidance. A new user automatically receives full menus, that show all commands. An advanced user may choose shorter menus, or skip them completely. A complete list of contents, showing new information, is displayed each time a user starts EKKO. The list shows, however, only information from bulletin boards and conferences in which the user is a member. All new information can be obtained with the help of a single news command.

File Transfer

The file transfer module, which allows transfer of binary files, is used to transfer non-text files. It can facilitate distribution of source codes in Pascal and Cobol courses, spread-sheet data in business administration courses, graphs and graphics in system analysis courses, etc.

Appendix 3. Examination Results Fall 89 - Spring 91

Most of the exams were prepared by teachers who taught the face-to-face students. The grades are presented as averages, because averages are automatically computed by the administrative software. On a scale from 1.0 (best grade) through 4.0 (lowest pass grade) to 6.0 (lowest fail grade), the students achieved the following grades:

	Average grades				Number of students				Number of students who failed			
	F89	S90	F90	S91	F89	S90	F90	S91	F89	S90	F90	S91
EKKO students												
1	2.58	3.17	3.10	2.40	18	3	10	5	0	0	2	0
2	2.66	2.50	3.00	2.75	22	3	13	4	1	0	2	0
3	2.38	2.47	2.70	1.33	12	16	10	6	1	1	1	0
4		2.50	2.65	2.45		18	10	11		0	0	0
5	2.00	2.60	2.44	2.00	4	10	9	7	0	0	0	0
6	2.50	2.75	2.64	3.25	2	2	14	2	0	0	0	1
7	2.00	2.93	2.83	2.70	3	14	12	5	0	3	0	0
8		2.60	2.00	2.43		5	3	14		0	0	0
9		2.75	2.60	2.38		4	5	12		0	0	0
All	2.50	2.64	2.75	2.34	61	75	86	66	2	4	5	1
correspondence students												
1	3.80	3.69	2.96	3.30	5	13	14	10	1	1	1	2
2	2.70	3.27	3.25	2.54	5	11	8	13	0	2	1	0
3	2.25	3.17	3.45	3.05	6	3	10	10	0	1	3	2
4		2.50					2				0	
5		3.50	1.75	3.50		2	2	1		0	0	0
6	2.50	2.50	3.00	2.17	4	2	1	3	0	0	0	0
7												
8												
9												
All	2.80	3.40	3.07	2.88	20	31	37	37	1	4	5	4
on-campus students												

1	2.69	4.53	2.69	61	3	56	6	2	4
2	2.95	2.50	2.72	55	2	39	6	0	1
3	3.48	3.86	3.35	54	8	58	18	3	12
4	2.61			71			5		
5	3.43			60			17		
6	2.74	2.75	3.04	68	2	54	6	0	11
7	2.59	2.94	3.05	73	20	32	3	0	7
8	2.63			85			1		
9	2.69	2.68		71	17		2	1	
<hr/>									
All	2.86	2.86	2.96	311	322	256	39	30	36
<hr/>									

1 = Intro. to Computer Science 6 = Intro. to Business Administration
 2 = Information Systems I 7 = Relational Databases
 3 = Pascal Programming 8 = Management Information Systems
 4 = Information Systems II 9 = Socio-Technical Systems Development
 5 = COBOL Programming

Appendix 4. Graduated Students' Opinions

Question: What is your opinion of the NKI Electronic College, now that you have graduated?

Solfrid Groendahl: I feel this is a difficult question for me to answer, though I have been a student at this College for nearly 2 1/2 years. First of all I want to say that I am grateful for the possibility this College has given me to take higher education without having to leave my house.

I also feel that the different courses and text-books (all printed material) are of rather high quality, and most of it is written in a language that makes it quite easy to understand. This is important, because, being a student at this Electronic College, is a rather lonely way of studying. Of course you have the possibility of asking the teacher, "putting" your questions into the conference (?), but this will cover only small parts of the curriculum. Most of it, you'll have to read, study and understand by yourself.

To get through, you need a great portion of self-discipline, because the studies takes the most of your spare-time. There is not much time left for your family and other social activities. It is of course easier being a student at an ordinary school, because then a great deal of the curriculum is being explained to you, but I think you learn and remember better when you have to study everything by yourself.

Some teachers have given me a lot of supplementary documents on the subject, and these have been of great help to me.

The fixed dates for delivering your written works, is of great help, because it forces you to work "all the time". The conferences created for those taking the same subject is a good idea, even if I feel they haven't had the mission they where thought to have. Some of the teachers should have been more active in trying to "drag the students into the conference". What I think is a problem for NKI is that there are some teachers who are taking this job as a "secondary job" and consider it as a secondary job. They are not interested in answering questions in the conference, just in giving us exercises and in correcting our written work. It sometimes made me quite frustrated, when I put a question into the conference and I didn't get the answer until the date for delivering my exercise was there.

Because I have been a rather active student, I have got a lot of new friends all over the country. I like this way of studying, first of all because i don't need to leave my house. What I feel is good, is of course the possibility of getting University studies in my own house. You have,

however, to do most of the studies by your own, so it's a hard way...
(Originally written in English)

Finn Kylland: I have a very positive impression of an electronic college. With modern datacommunication technology, it is much easier to transfer information than people. An electronic college can offer students a combination of flexibility, freedom, and efficient teaching, unattainable in traditional schools. With this in mind, Norway should offer electronic college programs at least as widely as traditional college/university programs. (Translated from Norwegian)

Ole Salomonsen: Using EKKO, I was able to study while I lived 500 kilo-metres away from the nearest college. EKKO has substantial advantages compared to information exchange via mail--especially the swift feedback on the assignments.

Technically, EKKO has worked nearly perfectly for me. I had some problems adapting my communication software, but it worked well after a while. I have used Procomm Plus/Galink/Telix for communication.

Taking part in education as a distance/part-time student has suited me perfectly. I could not pursue continuing education without moving, for instance to Oslo, with all the problems that would entail for my family. Neither would I be able to keep up with the technological development at my work place. (Translated from Norwegian)

Eva Reppen: I think NKI's electronic Information Processing Program offers an excellent way of studying. I live in a rural area and I worked full time while I was studying. I had no other opportunity than this program for continuing education in information processing.

Electronic programs are obviously the solution of today. First, it doesn't matter where you live. Second, the communication between the school and the student can be swift. Finally, you experience a cohesiveness with other students so that you don't feel as if you are studying alone.

Personally, I appreciated rigid dead-lines. In that way I had to work hard, even though it has often been tough to hang on. In my opinion, the teachers are the most important parts of the program. They should always be very active and sensitive to questions posted by students. In this regard, the differences between the various courses has been considerable. A teacher who continually monitors the activity and who responds promptly is a prerequisite for an effective program with motivated students. Some teachers have been terrific, others rather slack.

I have here expressed both praise and scorn. Thank you for having me, and I wish you good luck with future electronic distance education. It is possible that I will register for more courses if I find something of interest. Since I have tried electronic distance education, I am unlikely to ever again register for a correspondence program; I have become too selective. There is a tremendous difference between these two modes. I recommend the program to others and I have already found you another student from my county. Maybe I can find some more in the future. (Translated from Norwegian)

Stein Korten: As a student at the NKI Electronic College, I am not required to attend lectures two or three days a week. With a demanding job and two small children at home, I have obviously little spare time. So, the NKI Electronic College suits me perfectly. I can study when it is convenient without being dependent on teachers and co-students. I am also very pleased with the curriculum. A broad range of topics is included. One may start to cover the basic concepts and then progress as one prefers. The only thing I miss is the opportunity to choose certain subjects for in-depth study.
(Translated to English from a statement given in an NKI brochure)

Appendix 5. Applications Not Included in EKKO

There are still several applications which we can not handle in our present conferencing system. These tasks depend more or less on other application software systems. It is a future challenge to integrate these applications with the computer conferencing system. The most obvious applications are in accounting, the grading system, administration of textbooks and other course material, and software tools for students.

Accounting. Our students pay course fees for each of the courses they attend. The course fee covers tuition and textbooks. In addition they pay a term fee independent of the number of courses they attend each term. The term fee covers the communication costs and the use of EKKO. Students who want to take an examination pay an optional extra exam fee. These fees are handled in our traditional accounting system.

Our accounting system is tailor-made for on-campus students and correspondence course students. The lack of integration of the accounting applications and EKKO is a problem because of the doubled work-load and the loss of control over student payments. Further more, our EKKO-staff is not allowed to access the accounting system and the accounting personnel resist using EKKO.

Grading-application System. Students are offered the opportunity to take an examination on a voluntary basis. Most examinations are four-hour written tests. The examination can be taken either at the College of Computer Science in Oslo or in the students home town, provided an approved supervisor can be engaged.

Students may download the examination registration form from EKKO. The registration, however, has to be signed by the student and his local supervisor and land mailed to the examination secretary.

The grades are recorded in our tailor-made grading application system. Neither students nor teachers have access to this system. Our staff has no easy way of extracting grades, statistics, etc. to present information in EKKO. Once each term, we mail each student a transcript of accumulated grades. However, impatient students may phone our examination secretary if they want to know the results of recent examinations.

Software Tools for Students. Our students need an assortment of software tools, some of which should be multi-user programs located at the host computer. Others should be used as personal software, distributed to the students.

We have developed a multi-user multiple choice application for on-line use. This program is not integrated with the conference system, but it is accessible as a utility program on the same host computer.

The personal software includes some shareware programs that are distributed on diskettes, along with the text-books. We realize that a more sophisticated solution would be to establish a software library in the conferencing system from which students could download useful software.

Logistic System. A course application should result in the delivery of text-books and other course-material. There is, however, no integration of EKKO and the logistic system. In fact, the course secretary has a double work-load to catch up with both systems.

Since the students have no online access to the logistic system, they cannot check if the books are in stock, when they will arrive, etc.

The stock workers resist using EKKO, so inquiries about misplaced or insufficient course material are routed through the course secretary.

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