TEACHING ALN COURSES

Svein Nordbotten

Department of Information Science, University of Bergen

Email: svein@nordbotten.com

ABSTRACT

Two different topics were run as five ALN courses for two universities and a research organization in different countries during the time 2001-2003. The courses required no face-to-face contact between instructor and participants. All course activities were logged and analyzed. The course system used for the courses is described, the results discussed and some main conclusions presented.

KEYWORDS: ALN courses, remote teaching, learning environment.

A. Introduction

This paper reports experience from running 5 ALN (asynchronous learning networks) course at different times and locations. The system tool used to implement the courses was developed for the purpose to record all visits and use of the courses to gain knowledge about the use for future improved course design. Some of the research questions we hoped could be answered were the effect on the students' time schedules and access frequencies, their contacts with the instructor, learning aspects and relationships between test results and factors as time spent on the course, and frequency of visits to the course material.

The course system used supports typical ALN features permitting instructors and students to be scattered geographically with freedom to course participation around the clock according to their individual time schedules work patterns. It also enforces work discipline by making the course sessions available according to a predetermined timetable, requiring each student to pass compulsory tests and submit assignment reports before being allowed to continue on the next course step.

The course system was implemented on a Windows 2000 Server by means of the Macromedia's ColdFusion, a scripting language for developing and implementing dynamic web applications. Access to the courses required only a standard browser and Internet connection.

B. Course system

The course system framework is similar to structures found in a number of online courses, but

was developed to satisfy special requirements. The standard structure is briefly outlined here.

There are 5 main modules:
- the access authorization and authentication,
- the general course information,
- the course sessions,
- the tests and assignments associated with each session, and
- the communication tools including synchronous connection, e-mail, etc.

Each module has a number of features, and internal and external hyperlinks to other parts.

The authorization and authentication module represent the entrance to the system, and assists in authorizing students who apply for taking the course and controls that only authorized students obtain access to the system. The authorization function automatically assigns access codes to approved applicants. The list of assigned access codes is kept in a protected file. *Figure B.1* illustrates the interface to these 2 functions.

Figure B.1: Authorization and authentication interface

The information module contains a number of optional functions including information about the course, frequently asked questions, curriculum and literature, links, virtual classroom with pictures of students, etc. These functions can be obtained from a list of links, which resides permanently in a frame at the left side of the display as shown in *Figure B.2.*

Information links:

- About the course
- Articles
- Assignments
- Calendar
- FAQ
- Examples
- Grades
- Literature
- Progress report
- Search for information
- Software
- Virtual classroom
- Web links

Figure B.2: Links to general course information.

The core of the framework is the session module. It is equivalent to the lectures in a face-to-face exposition. A course can typically be composed of 10 sequential sessions. Access to a new session can be regulated by a time schedule. A new session can, for example, be opened every second Monday morning for a 20 weeks period. Before that time a message will be displayed informing that the session is not yet open.

Session links:

1. Introduction
2. CFML
3. Web market research applications
4. Web database for opinion polls
5. Web perception application
6. Web search engine
7. Web courses
8. Web shop
9. Web agent
10. Research

Figure B.3:Links to sessions in a course on dynamic web applications.

At any point during the course, a student can by means of the link in module 2 requests a private progress report for himself which is automatically generated based on the tests results obtained and the assignments submitted.

At the end of each session there is a link to the test module. A set of multi-choice questions is assigned to each session. A subset is drawn at random and presented for the student. The test module controls the answers and if a predetermined fraction of the questions are correctly answered, the student's progress record is updated. The student is required to have passed the test and possibly also uploaded an assignment report before she/he can proceed to the next session. *Figure B.4* presents an exhibit of a test question.

3

Figure B.4: Question from the first session test.

The fifth module contains 5 communication channels for uploading and reading assignments, disseminating general messages, public questions and answers, synchronous chats and for personal communication by email.

Figure B.5: Links to the different possibilities to communicate.

Each visit to the course site by the participants is logged. From the log, we get data on how the students take advantage of the course and how the authors may improve the course.

C. Courses

Two courses have been converted to ALN courses by means of *snALN* with topics:

Topic A: Data Mining by Means of Neural Networks
Topic B: Dynamic Web Applications Using ColdFusion

Both courses are run as university courses. Topic A has been run at for 3 different organizations, while topic 2 has so far been run for 2 universities. The instructor did not meet the students face to face during the courses.

In chronological order, the courses with participating students were:

Course 1, topic A in 2001: 19 students in Israel.
Course 2, topic A in 2001: 8 students in Norway.
Course 3, topic A in 2002: 4 students in USA.
Course 4, topic B in 2002: 21 students in Norway.
Course 5, topic B in 2003: 21 students in USA.

The total number of students participating in the 5 courses was 73 of which 65 completed. Even though the 2 topics were quite different, the courses were implemented within the same framework, and the students' behavior seemed to be quite similar.

D. Use of the course site

The use of the courses can be summarized by 33 329 calls for course pages distributed to 3529 sessions, i.e. nearly 10 page calls per session. In this context, a session was defined as a sequence of page requests by the same student with less than 30 minutes between each page call. Each student had in average almost 50 sessions in average. There was, however, a significant variation among the student as to their use of the course site.

E. Student - instructor contact

A frequent objection to ALN courses is the loss of face-to-face contact between students and instructor. This is of course a fact. However, it does not necessarily mean that the communication between the individual student and the instructor is reduced. On the contrary, the experience from these ALN courses indicates an extensive bilateral email contact between students and instructor.

In total 1.473 messages were exchanged between the students of the 5 courses and the instructor, in average 20 message exchanges per student.
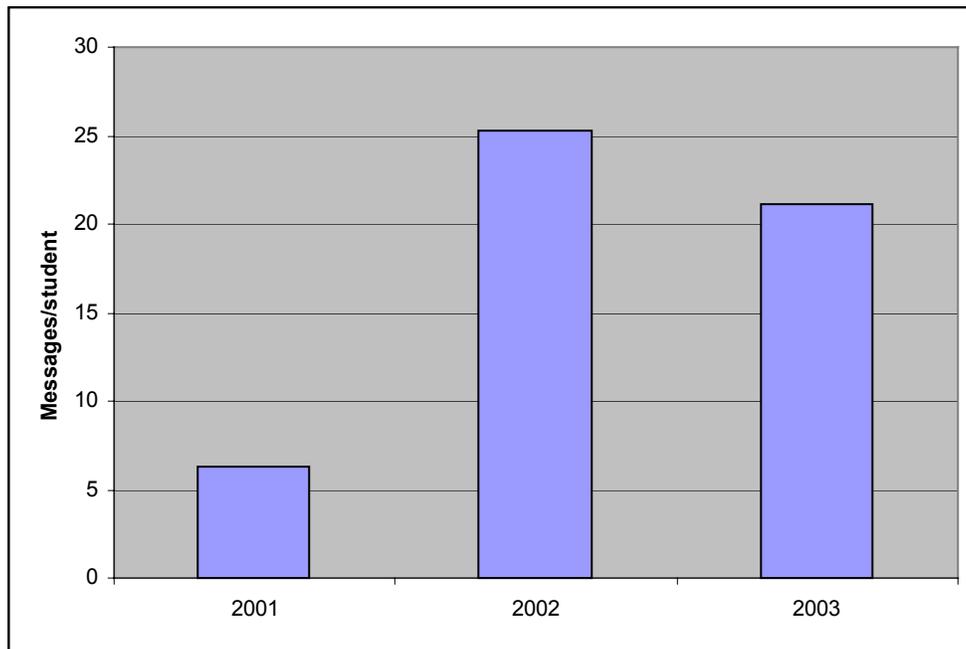

Figure E.1: Average message exchange between students and instructor

Looking on the students, some had many problems while others had a moderate number of problems they wanted to bring up with the instructor. The author's experience through more than 40 years of university lecturing, lectures courses never generated near that number of questions from each student. It is believed that this bilateral contact was beneficial to both the students who hopefully got more problems clarified an to the instructor who learned about the points which could be made more precise in the course.

It should be emphasized that the extensive contact also requires additional resources compared with ordinary teaching.

F. ALN anywhere and anytime

ALN is characterized as learning *anywhere*. According to the author's experience, locations of the students have little effect on the use of the site. This is particularly true from 2002 when most students reported that they used their own PC connected to Internet from their homes and are quite independent from the university at which they were registered. As a particular case, one student went through most of a course as a crewmember on a ship in the Pacific Ocean.

The second ALN characteristic is learning *anytime*. Do the students take advantage of this? Do their course work outside the regular teaching hours at a university? There is a marked difference

between the 2 courses given in 2001 and those given in 2002 and 2003. As the *Figure F.1* indicates, calls in 2001 were distributed all over the 24 hours, but with a concentration around hours when the students had access to web connected computers at university laboratories and at work. More than 60% of all calls were made between noon and 6 pm. The timing was corrected for different time zones. As late as in that year, it was a small group of students who owned their personal computers with Internet connection.
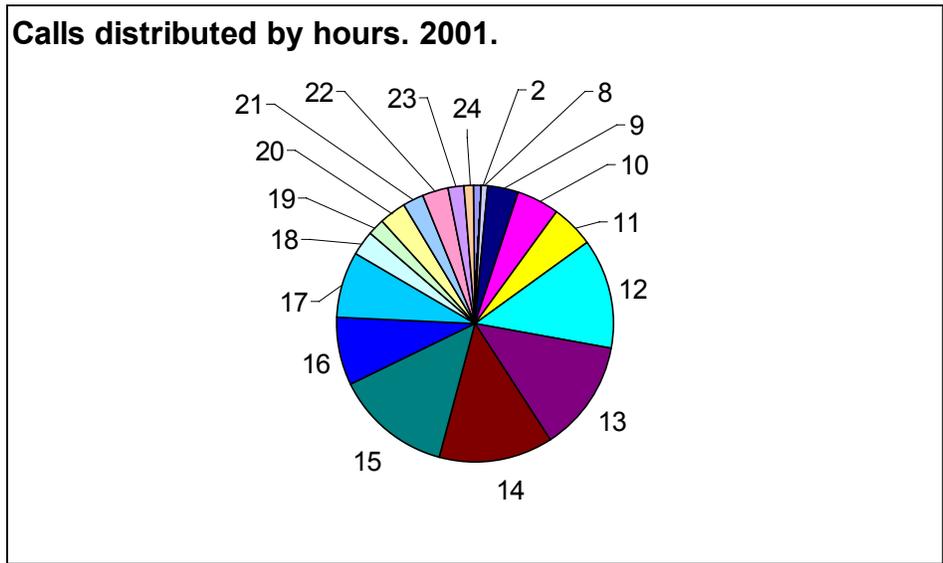

Figure F.1: Calls to course site by hours in 2001. 8 927 calls.

In the 2 courses given in 2002 the situation is completely different as demonstrated in *Figure F.2*. The calls are much more evenly distributed. Less than 40% of the calls were now made in the 6-hour period from noon to 6 pm. The proportion of call done in the evening and even during the night indicates that students are now able to work with the course anytime. A probable explanation is that the cost of Internet connected powerful laptops has become acceptable to the students.
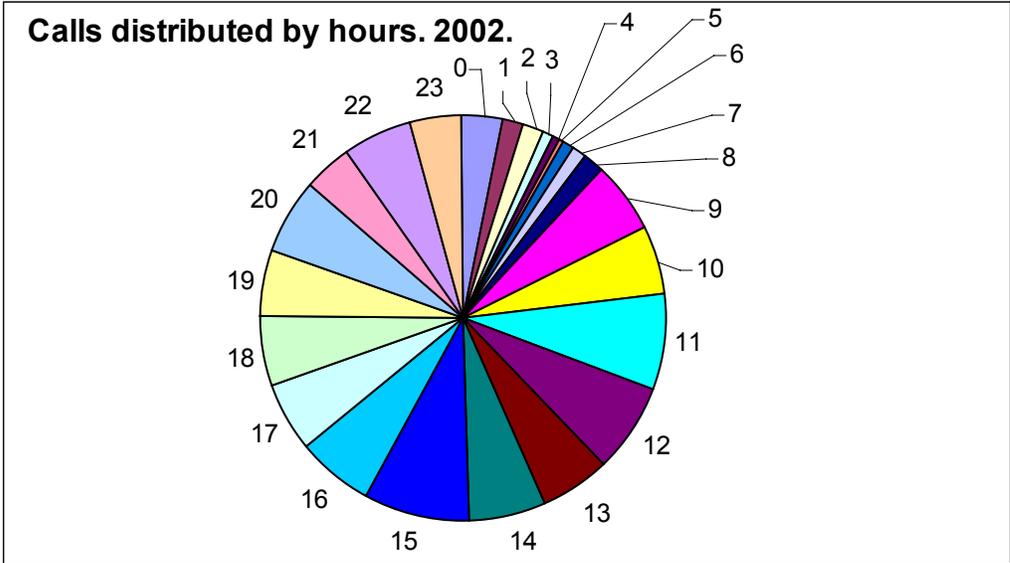
Figure F.2: Calls to course site by hours in 2002. 12 318 calls.

Course no.5 run in the spring of 2003 supports the impression of this development as illustrated by Figure 6.3.
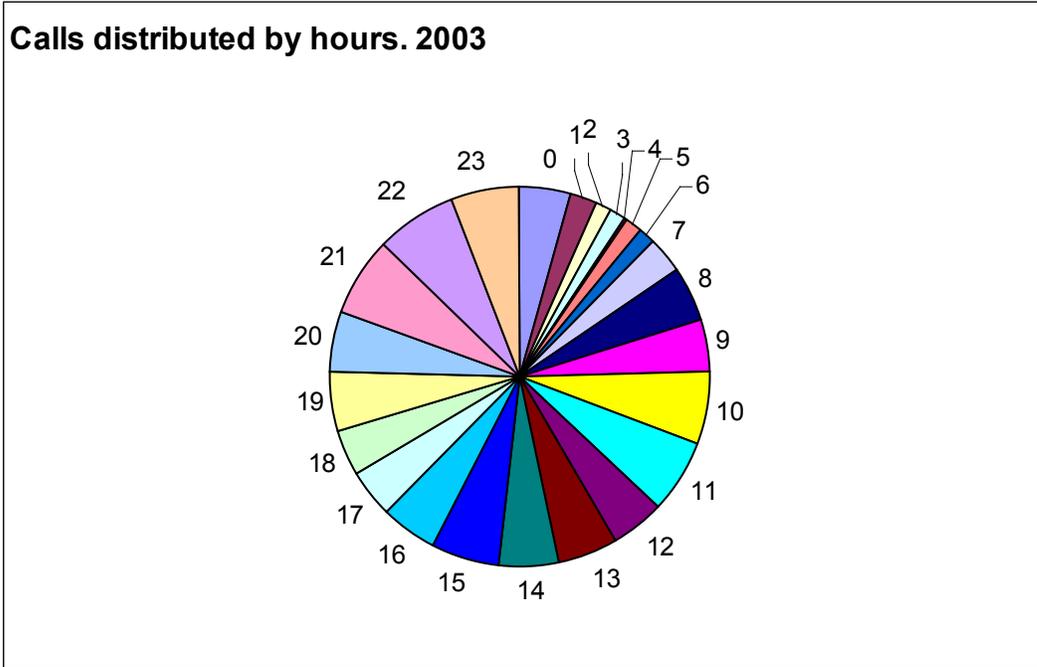

Figure F.3: Calls to course site by hours in 2003. 12 323 calls.

The 3 figures support the assumption that ALN courses invite and permit the students to work according to their individual time schedules, and are particularly interesting for young people not having the resources for living at a university, for persons wanting to update or extend their knowledge while working or taking care of other responsibilities.

G. Duration of on-line sessions

The extent of the courses, on which this report is based, corresponds to 24 hours face-to-face lecturing. What is the time spent on-line in an ALN course? How many repetitive visits to sessions do the students make?

Because of the nature of web operations, the time when a student initiates calls to the course site can easily be established, but it is impossible to establish the time at which the student terminates working with the response from the web site. To get around this problem, we introduce the concept of a *web session* defined as the time from a student initiates the first call of a sequence of calls with less than 30 minutes between each call to the time of the last call plus the average time between the calls as an estimate of the time spent by the student on the response from the last call.

From log records, we never know exactly how much time the students spend on-line in an ALN course. But it is even more difficult to measure the attention time of the students in a course lectured face to face.
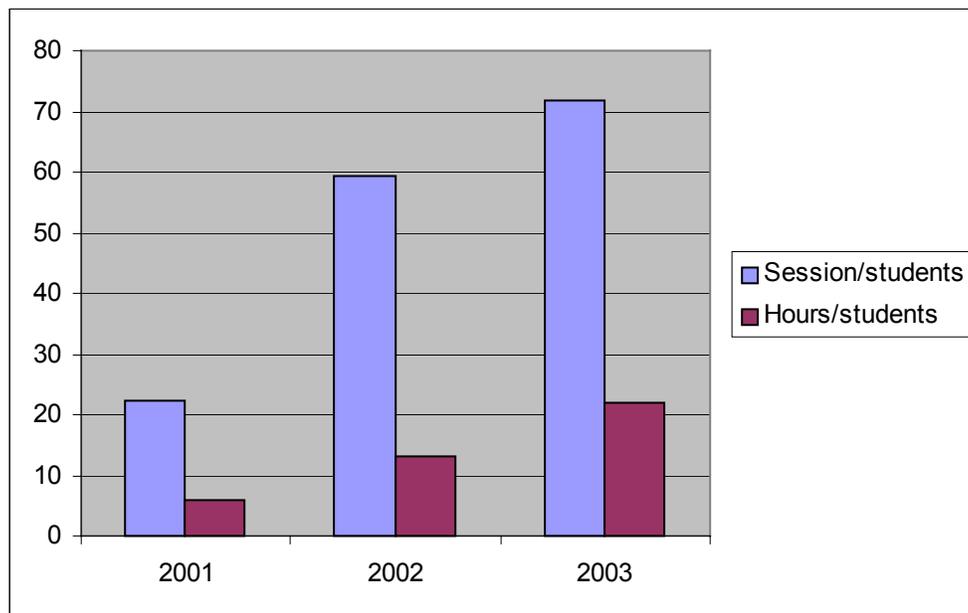

Figure G.1: Average session visits and hours spent on-line per student

Figure G.1 shows average sessions visits and on-line time spent at the course sites per student in

2001, 2002 and 2003. As indicated above, the numbers of student were 27, 25 and 21 in 2001, 2002 and 2003, respectively. The figures indicate that the students were on-line with the course site for more than twice as long time in 2002 as in 2001. This may of course be due that Topic B which dominated in 2002 might be more time consuming for the students than Topic A. This is not supported by the log data. The main explanation is probably again that students in 2001 were more restricted by equipment and limited access to Internet, than the students of courses given in 2002. The tendency continues in 2003.

We can probably expect that this type of web courses will engage the students to more on-line work when the costs of equipment and access to Internet become reduced.

We do not know whether an ALN course requires or stimulates the students to more additional off-line activities than do a corresponding face-to-face course, but, as we shall see in section 9 below, the activities of the ALN students in addition to the interaction with the web site are high.

H. Calls to course sessions

How the students traverse the course is important knowledge for future course improvement. How frequently do the students consult the general information provided? Do they use the sessions equally frequent? Do they use the illustrations?

These are questions of substantial interest for the course designer. For the 2 course topics observed, 2 main components where distinguished,

The sessions containing the data on the course topic,

The other pages explaining how to work with the course.

The visits to the 2 parts illustrated in *Figure H.1* reflect the relative use of the two parts for the students in the topics offered.
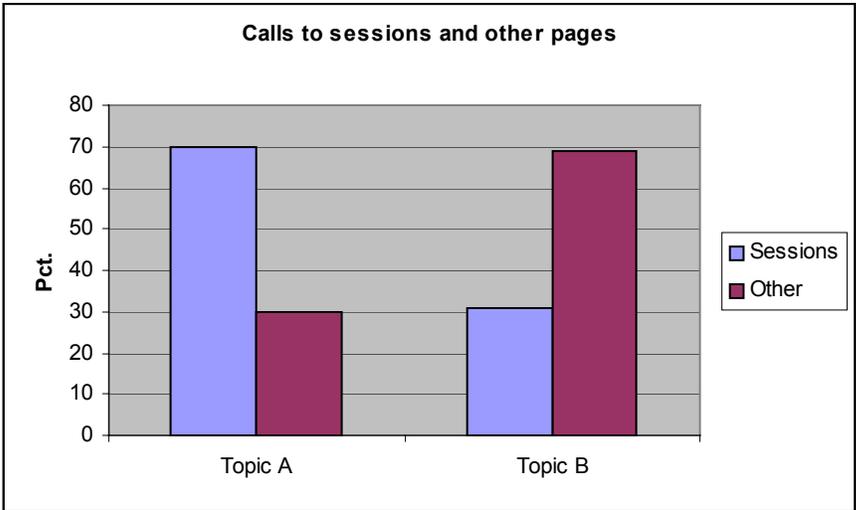
Figure H.1: Calls to sessions and other component in 2 courses

While the students of the Neural Network course used 70 pct of their calls to the topics discussed in the course sessions, the students of the CF scripting course spent only 30 pct on the topic. The explanation is probably that the curriculum text used for the latter course topic was more comprehensive.

In the first course topic, the students were trained to use a user-friendly modeling and computational tool to analyze their problems with a weight on solving the problems, while in the
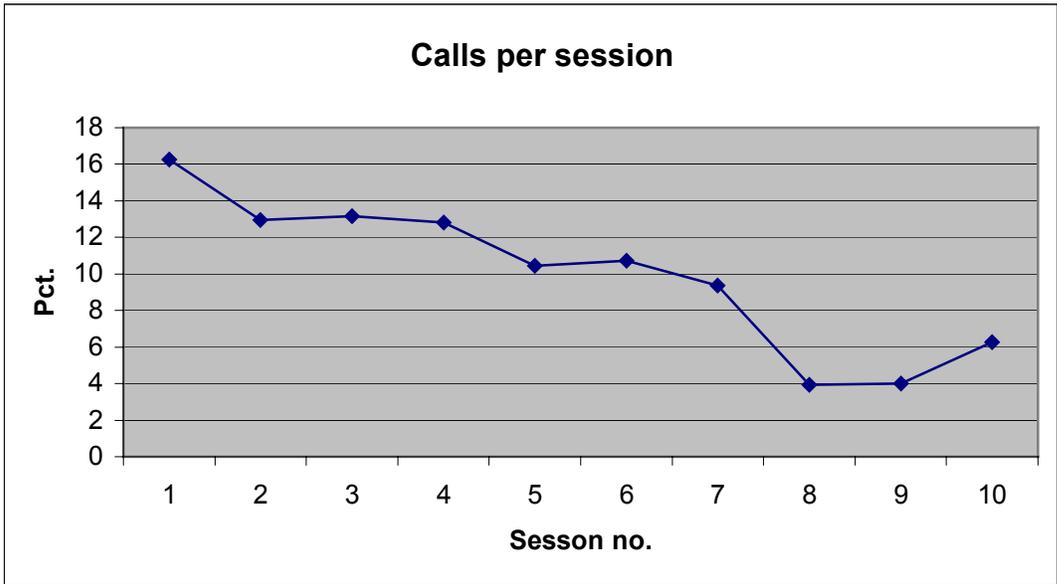

Figure H.2: Relative frequency of calls to sessions

second course topic the objective was to train students to use a scripting language with focus on the tool. An ALN course designer must be prepared to pay a substantial attention to the supportive components informing about and explaining tools and techniques needed for the learning of the topic presented in sessions.

An interesting question is whether the students change their behavior during the course, e.g. do they study the first sessions more extensively than the last.

Figure H.2 shows how the relative distribution of calls by session number. The data indicate a clear reduction in the number of calls when the students proceed through the course. As we shall see below, the performance does not decline, and a possible explanation is that the students get more proficient as ALN students when they get experience. The relative increase in calls from session 9 to session 10 should be expected because of the main test included in session 10.

The courses have been well illustrated to make the topics easier to get to. An interesting question is to which extent do the students look up and return to the illustrations. The recorded data permit a detailed analysis of this question, which will be reported in a separate paper

I. Learning

In the previous section, it was concluded that it seems that the students learn to be effective ALN students because they requested less pages from the later sessions than from the first. Learning were also indicated by observed test results at the end of each session, by the responses to the assignments, by the questions brought up in emails as well as by final grades obtained in separate exams if such were arranged. In this report, we limit discussion to the recorded test results.

The test results from each session are illustrative. As indicated in section 2 above, to proceed to the next session each student had to pass 8 sets of multi-choice questions, each with 4-5 alternative answers. Opposite to what could be expected, there were only minor differences between the results from the two sets of topic courses. The recorded answers for all courses are reported in *Figure I.1* and the results for the individual courses in *Figure I.2*.

*Figure I.*1 shows the average number of correct answers for each of the 10 tests.

The tests were designed to be randomly selected from a repository of test questions referring to topics in the current and all previous sessions. The repository increased by 8 questions per session for each of first 9 sessions, and by 30 for the last. In the figures, the results for the last session were scaled by a factor of 8/30 to make them comparable with the previous tests.
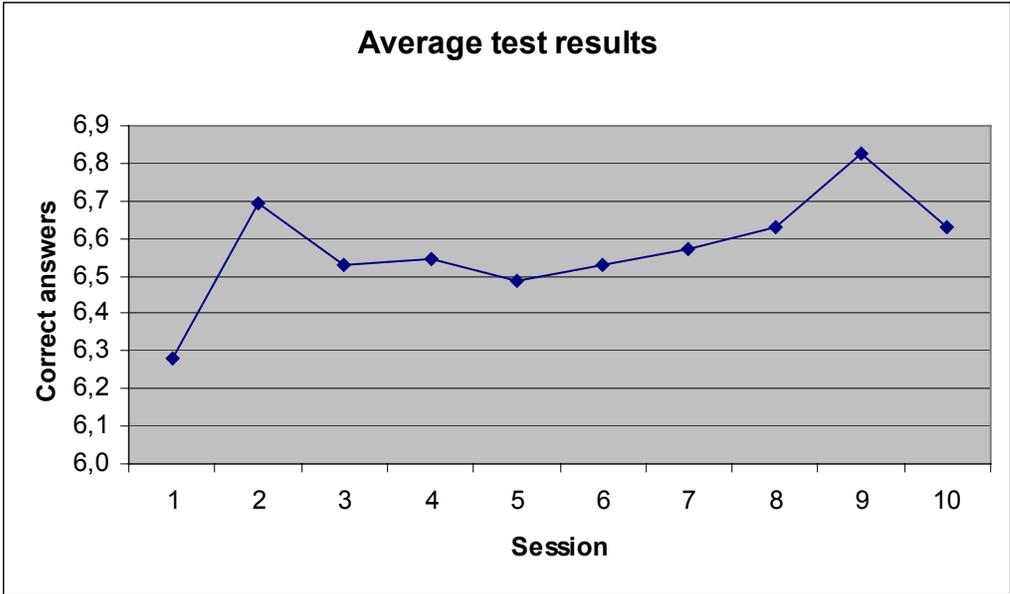
Figure I.1: Average number of correct answers for each test.
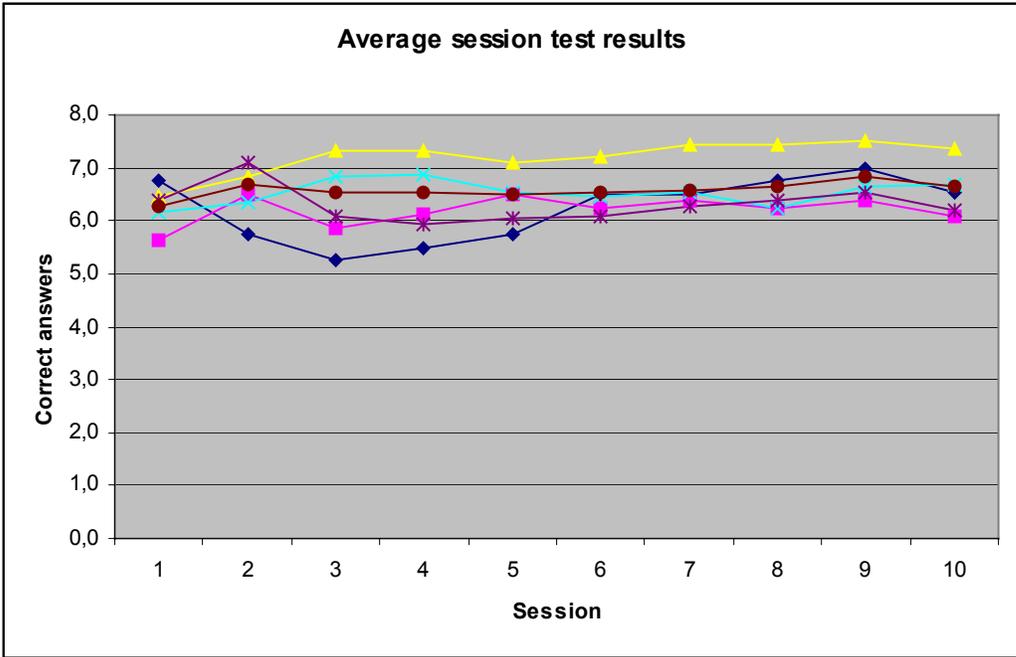

Figure I.2: Average number of correct answers for each course

It might be expected that the students learned the correct answers to some of the questions as they advanced through the courses. The curves for the individual courses in *Figure I.2* do not, however, support this hypothesis.

The average result per course for the final test ranged from 23 to almost 28 correct answers out of 30. Both extremes are for Topic A. The explanation is probably that the course with the lower average had a final written exam on which formal course grades were based, while the participation in the course with the higher extreme received grades based on the results from the test in session 10.

As an indicator for the course performance, we can choose between the scores obtained at the final session test, or the sum of scores for all tests. As may be expected, the correlation between the two alternatives is high, 0.91, and, and disregarding other aspects, the first can serve as indicator as well as the other. Explorative analysis of relationships between result indicators and course use indicators, i.e. course time spent online and total number of course calls, has been carried out without any significant result.

A version of the Topic A course was given as a lectured face-to-face course in Spring 2000. Both the lecture and the ALN version included development assignments. There is no indication that the ALN course version students solved their tasks less satisfactory the students of the regular course.

At the end of each course the students were invited to respond to a set of evaluation questions. As frequently experienced, few students accepted the invitation, and the answers received cannot be considered representative.

J. Resource considerations

To offer an ALN course on Internet requires:
- An *author* with professional knowledge of the topic
- An course *system* by which the system can be run on Internet
- A net *host* providing the necessary hardware and software
- A web *designer* who can upload the course to the host facilities
- An *instructor* who can run the course

Compared with a traditional course, an ALN course does not require an auditorium with the presence of the instructor at predetermined hours. On the other hand, the ALN course requires a system for running the course, a net host and a web designer. Usually the same system, host and design can be used for several runs of the same ALN course, and running the course can be automated.

A major difference between the 2 approaches is that the ALN course requires much more preparation before the course starts than does the traditional course which can to a certain degree be shaped during the lecturing period.   The instructor's role, relieved for the continuous

adjustments and the trivialities of running a lecture course, can be focused on answering questions and explaining details. On the other side, an ALN course is less flexible and cannot to the same degree be continuously adjusted to the students as a regular lecture can be.

The experience, on which this report is based, refers to all the requirements listed including time-consuming system development, hosting and web course design. But it should be emphasized that the authoring of a web course requires more time than preparing for a lecture series.

K. Some conclusions

The goal of the present report is to present experience from teaching 5 ALN courses based on a system designed to save data on the use of the course.

A huge material of data exists, and this report only touches the surface of the experience represented by the data. The main conclusions emphasized in this report, are:

- Preparation of an ALN course requires more time preparing the course than an equivalent face-to-face series of lectures.
- Running an ALN course can to a large extent be programmed. Assignment reports uploaded to the system require, however, evaluation by the instructor. Time for attending to e-mail requests of different types from the students tends also to grow to a significant volume.
- An ALN course does not reduce the overall contact between students and instructor. Because of easy access through electronic question-answer facilities and email, the interaction between instructor-students seems to become more extensive and effective than in an ordinary course.
- After the PC became an available tool for the average student, and access to Internet usual, ALN anywhere and anytime also seem to become a reality.
- With affordable on-line access, the net-time spent on ALN courses has also increased significantly in the recent years.
- Our data indicate that it is possible during an ALN course to monitor the use of the course components, and in fact, that the courses ran have provided the students with topical knowledge.
- Comparative evaluation of learning is always difficult. To conclude how ALN compares in general with face to face lectures, is not possible in our case, but we may infer that ALN satisfies a need for training for those who have not the possibility because of physical handicaps, family, resource and/or work situation to live near or to follow the timetables of a university.

L. Further work

As indicated in the introduction, this report discusses only a few aspects of net-based teaching. Other data reflecting the experience during a couple of years using a support system for recording the interactions between a thesis preparing students and her supervisor, have been collected as well as data from experiments on the net with synchronous student colloquia.

M. About the Author

Svein Nordbotten is Professor emeritus at the University of Bergen, and has previously been working at several universities and international organizations. He is currently running ALN courses for universities in several countries and working as a consultant.