

OECD/CERI ICT PROGRAMME

A Case Study of ICT and School Improvement at Bokn Elementary and Lower Secondary School March, 2001

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1. Overview

A local resource centre.

Bokn School was introduced to the concept of an ICT and educational reform by representatives from the local municipality administration. Bokn is an island community threatened by urbanisation and a decrease in population. When the island was connected to the mainland by a bridge, several of the social arenas vanished.



Fig. The Island of Bokn with Bokn School

The reform was therefore originally established as an attempt to create new ways of communicating, both externally and within the community of Bokn. The intention was that the school would become a recourse centre where people of all ages could meet in a creative environment. ICT and ICT-related competence were to enable the school to improve education and also offer courses and other IT services to the community and local businesses. In return, the school was supplied with a number of computers that made it a leading school as far as equipment was concerned.

Reports on the reform worked out by the administration group seem to indicate that goals were reached. Certain practical steps that were successfully implemented may help to exemplify this. In the original reform, the different goals were clarified, some of them in such a way that subsequent results could be quantified. It seems that most of the students have reached a common understanding that ICT is a necessity. "Students never question the use of ICT", teachers say. In our opinion this is mainly due to the national Reform-97 and to teachers who regard ICT as a central part of modern world and modern communication.

In student and teacher interviews the students at Bokn School are rated above national/regional average.

The Norwegian school structure and system.

Schools in Norway accommodate anything from less than 50 students in rural areas to 600-700. The school sizes in Norway vary from schools with 50 students or less in the rural areas to 600-700 students in urban areas. The explanation for these differences is the geography. Norway has a beautiful nature, but it divides the country with deep fjords and high mountains. Thus we have a decentralised population and this is reflected in school sizes. In rural areas the school will often represent a social meeting place for the community. The education is free of charge the first ten years. The expenses are covered by taxes.

In 1997, the starting signal was given for a national reform called Reform-97. The Reform-97 introduced ten years of compulsory school, from the age of 6-16 years. This meant a new milestone in Norwegian school history. After ten years of compulsory education, youths in the country have the right to achieve three further years of education. Thus we can say that youths in Norway remains in school for at least 13 years.

The 10-year compulsory school is based on, and consolidates, the principle of "one school for all". The compulsory school must, based on the same curriculum, provide equal and suitably adapted education for everyone in a co-ordinated system of schooling. Everyone has the same right to education, regardless of economic background, race, sex and language. This required that the schools spend time and resources in order to educate all sorts of students, including those with special needs. Reform 97 also clarified what methods the Ministry wanted to see more of. Certain parts of the teaching are organised thematically. The themes can also provide a basis for project work. The projects can be carried out in the school or in the local community. As long as local reforms initiated by a school or a local school authority do not interfere with the basic ideas described in the national reform, the schools can create their own profile.

2. The Past

School authorities and local businesses working together towards a common goal.

The goal of the original reform at Bokn School was to establish a new meeting place and a resource centre for the island's inhabitants. ICT-related competence was important to improve education and offer IT-services and courses to the local community. The work was initiated in August 1995 with an planned evaluation in December 1997. The local authority gave the school the adequate number of computers and the school administration contacted two of the teachers who had ICT competence. Their task was to work out the practical steps necessary to implement the reform. Some of them were taken into the administration group, which consisted of people within and outside school. The school administration initiated an introductory course for the staff, and they also signalled that in the future they would ask the teachers to do some ICT-work with the purpose of strengthening the general ICT competence of the staff. We have found no other evidence indicating that further steps were taken by the school administration or by the administration group of the reform programme.

Although the local school authority and the school administration initiated the local reform, it is our impression that the ICT-teachers played a significant role in the innovation process.

Of course there were barriers along the way. The impression is that the reform was introduced without preparing the organisation by changing it or the relevant parts of it, into a project "mode". Key people and people supposed to be active in the reform process were not sufficiently freed from their everyday tasks. This implied too little attention to building up necessary competence. Making space enough in between daily activities to be able to concentrate on changes was to some extent neglected, and this had the effect that the reform activities were sometimes put aside and received less attention in competition with more urgent tasks.

The fact that two key people were granted leave of absence at a critical stage of the reform created an additional problem, but may on the other hand have led to the establishment of a technical specialist service at school. In this way, the responsible ICT teacher was able to concentrate on pedagogical issues.

Diffusion pattern

The local reform did not concern the whole organisation, but only students from 12-16 and their teachers. The teachers involved were introduced to each other and to the ideas at a very early stage. They were more or less left to carry out all the necessary work as soon as it had been initiated. After the introductory course, staff development was mostly based on individual initiative. Many teachers made their progress by working with ICT-equipment by themselves or with a colleague or an ICT -teacher in their spare time. Some teachers did not join the introductory course. In addition, some of those who completed the course have now left school and new teachers have taken their place. In the initial phase, many teachers who were not directly involved, showed no reluctance to adopting ICT, thinking that the project did not affect their work at school.

Maybe a correct description would be to say that the use of ICT among staff diffused like rings in the water during the first years, and that only some of the work was related to the local reform. However, the local reform did provide new ICT-equipment and thus accelerated the use of ICT. Later on, when the new national Reform-97 made it clear that the Ministry wanted ICT to be used as a tool in several subjects, many teachers wanted to improve their ICT-competence in order to comply with the national reform.

The connection between ICT and student business enterprise

The fact that the reform provided the school with a number of computers generally gave the ICT work a flying start, and it encouraged many teachers to implement ICT. On the other hand, the ICT structure was an important factor of the reform, since it in many ways functioned as means of production. The school was to supply the local business with ICT-related services like creating PR pamphlets or tourist brochures and giving lessons in how to use ICT/personal computers. In this period the school offered an open evening with free use of the ICT equipment.

Further steps that were meant to become lasting effects of the project:

- Establishing student business enterprises with the purpose of giving students more practical work training and a more thorough understanding of the challenges that face entrepreneurs of today.
- Making partnership agreements between the school/classes and local companies, for the same reasons as mentioned above.
- Establishing plans for teaching in collaboration with interesting and suitable partners in the local community.

Reports on the reform worked out by the administration group seem to indicate that goals were reached, and to a certain degree this is exemplified by mentioning certain practical steps that were carried out successfully. In the original reform the different goals were clarified, some of them in such a way that subsequent results could be quantified. However, the interviews indicate that there was in the beginning only a slight awareness of the goals that were worked out and consequently the exact value of the outcome of the work.

The original reform documents outlined important goals and to some degree the process was evaluated along the way. In August 97, the school's project leader wrote a periodical evaluation, and a preliminary report was issued in that connection. There were a number of meetings during the reform period, but we have not discovered if any evaluation was done where all the participants contributed. The conclusions after the reform project were outlined in a final report in late December 1997.

3. The Present

ICT influences on the way of teaching

Our interviews give us the impression that the ICT-innovation has grown. In the original local reform, it had a kind of catalytic function, whereas it later became more of a tool and a way of teaching for some of the teachers. It seems obvious to most of the students that ICT is something they need to deal with.

In our opinion, this is mainly due to the national Reform-97 and due to teachers who see ICT as a central part of the modern world and modern communication.

The ICT infrastructure is dependent upon service supplied by the technical specialist teachers. In order to give support and keep the system running they are paid for this extra work. They also offer the community ICT-courses and services.

Bokn School has during spring 2000 generated an ICT-plan for all the students, from the age of 6-16. The plan will be carried out 2000-2001.

At present, the ICT-equipment is placed partly in the library and partly in classrooms. However, the school administration is planning to improve facilities for ICT-use next year.

Nearly all students like working with computers at school and find the equipment up to date. The parents have given us the same impression. The students are only allowed to use computers in connection with schoolwork and projects. Many of them would like more time in front of the computer, especially some free use in order to send e-mail and join chat rooms.

The teacher interviews tell us that the ICT-use influences how they teach. The teachers spend less time monitoring and lecturing and more time on guidance. " Teachers have to give up some of their control and challenge the students' sense of responsibility and self-control" Adm.

The original reform was limited, both within the organisation and in time. In addition, it only concerned a few resource teachers. It was therefore important that the students were on the right level at the right time. Within this group of students

there was no administrated difference in participation. However, skills and personal involvement among the students is likely to be crucial for their participation in the different practical parts of the reform.

The principle of equal education established by law must be present in all areas of the school's activity, including ICT-use. The parents and the teachers gave us the impression that the school tries to follow this principle, and that all students are given the same access.

Students with special needs are given their own training courses and extended access to the computers.

There is only little evidence to indicate that the reform triggered any change in the academic rigour at school. In order to create an interactive atmosphere between the school and the local community, the school's ICT equipment was made available to all citizens one evening per week. Except for this, the prevailing impression is that the work was done within the existing framework and that it caused no more alterations than traditional reforms and projects do.

As to the results of the reform we find that certain elements in school life can be traced back to and related to the goals of the reform, even if they too are adjusted to the school's normal structure and framework.

Some student business enterprises exist, and they are connected to local resources like aquaculture and agriculture. However, the key people who worked with the reform are still heavily involved with it, and only few new initiatives among the teachers have occurred since then. We have detected no plans for securing the sustainability and growth of such enterprises.

Two partnership agreements have been signed between local companies and the school. The agreements give the students an opportunity to use the companies as an information resource when it is relevant for learning, for example in projects on higher education and future professions.

Bokn School has also managed to establish a certain degree of interaction between the local community and the learning environment at school, in the sense that students are capable of offering required services. An example of the latter is a local tourist map which shows locations where fishing traditionally is good. The map is based upon information collected by students from experienced local fishermen.

There has also been established formal contact between the school and local trade and business through an appointed contact person.

The intentions of changing the school into a cultural and social meeting place in the community has not succeeded. This may have to do with the fact that plans for extending the school building have been delayed, and to some extent these plans were incorporated in the original reform ideas.

When studying the latest history of Bokn School, we see that there is a tendency towards a greater degree of experimenting and openness in pedagogical methods. Willingness to take part in different projects and to follow the waves of change has grown, even if it implies a certain degree of disturbance in daily routines. Furthermore, it demands the ability and enough confidence to challenge the values and the ideological platform on which the organisation and individuals in it base their activity. It might be logical to assume that the reform at Bokn School has contributed to establish a habit of reflecting on current practises.

ICT and new ways of communication

At present, the original reform has been transformed into other projects of development in related areas. Bokn School participate in a nationwide project called PILOT, also focusing on ICT.

Practical results of this work are the establishment of a web site for the school and national and international student-to-student contact via e-mail. In this sense, the learning arena has been significantly enlarged, especially for skilled students. Joint educational projects with collaborating schools have also been carried out.

The 10th grade at Bokn School, together with Jørpeland School, has produced the first joint online newspaper ever made in Norway. Five sub-editorial groups recruited from both schools constitute the main editorial staff. All jobs in the project were advertised and had to be applied for by interested students.



Fig: The first joint online newspaper ever made in Norway. <http://www.viten.no/bokn/>.

There are reasons to believe that this project has a fair chance to be successful. The ultimate product, a joint school paper, is text based and so are the methods most frequently used in the process. This makes it different from many other projects leading up to products slightly or not at all related to the working methods.

It is difficult to have a fixed opinion about to what extent the school business reform has triggered these changes, but we find it likely that it induced a process towards a more ICT based learning at Bokn School.

A general tendency we can trace in communicative use of ICT. From the early stages with mainly one way communication consisting of ICT products, demanded by privates and small enterprises in the community at the time, there has been a development towards interactivity and dialog. A greater variety of ways of getting in touch with the outside world has been employed. New methods have been introduced and assigned by teachers and thereby brought into the academic practise. Contact between students and teachers via e-mail has become more usual and regular. Through joint projects like the one mentioned above students interact and communicate with students in other schools nationally and internationally. These projects are so far not sufficiently evaluated to reveal any impact on the academic level, good or bad. However, it is likely that barriers are being torn down by such ways of learning. Contacts by means of ICT also tend to bring people together socially which in itself is an educational goal.

4. Main Hypotheses

Conclusions related to hypothesis and conjectures of the study

4. 1 Hypothesis 1

Technology is a strong catalyst for educational reform, especially when the World Wide Web is involved.

Although the reform at Bokn School to some degree was based upon ICT, and even was started up by an ICT investment, no evidence is found which supports the hypothesis that technology has a significant catalytic function in educational work. An exception, of course, are the products and results directly dependent on ICT, such as courses in practical use of ICT and ICT-based productions made by students for local business and interest groups.

The rival hypothesis is that where true reform is found, technology served only as an additional resource and not as a catalyst, that the forces that drove the reform also drove the application of technology to specific educational problems.

We find that the technology soon takes on the part of an educational tool that is used whenever the teachers find it adequate. Furthermore, it turns out to be a popular means of learning with a motivational effect on the students, probably because it develops fast and always offers new and exciting challenges. The tremendous growth of ICT use in society makes it a meaningful tool for students in education.

"The students learn to utilise a tool that will be useful for them later in life. No one asks why he or she has to learn to use it. The negative aspect is that it tends to be looked upon as merely a toy. (Teacher nr. 4)

4. 2 Hypothesis 2

The diffusion of the reform (and therefore of ICT) followed the traditional diffusion pattern for reforms and innovations, as outlined by Rogers (1995). The rival hypothesis is that technology functions differently from traditional innovations and reforms and that therefore different diffusion patterns occur.

The idea of the reform was brought into the school organisation via the school administration. It did not concern the whole organisation only students from 12 to 16 years of age and their teachers were involved.

Our study reveals that there is no fixed opinion among the staff as to who initiated the reform. Teachers involved in the program seem to agree that the principal played the most important role, while others point out teachers with current updated competence. This could indicate that the reform was insufficiently communicated to the organisation as a whole, not to mention the parents who had only a vague knowledge of the reform or none at all. Even students, even though they had participated, were just slightly aware of the reform.

As mentioned earlier, the reform was spread from the administration and down to the part of the organisation which was directly involved. Further diffusion has not taken place, and the ideas of the reform are still assigned to the teachers who participated. After having introduced the reform, the role of the formal leadership has not been significant.

In Norway there has been a long lasting tradition that reforms and changes within the school system are initiated and carried forward by individuals with competence and initiative. Very often the reforms existence are dependent on these people. (Rogers)

In the Bokn case, the initiation part of the reform differs from this tradition, perhaps because the school was given an offer it couldn't refuse and to a certain extent was followed up by external partners.

What makes it even more difficult to draw conclusions about this matter, is that the Bokn reform coincided with the above-mentioned nationwide Reform 97. This reform provided a set of prescriptions rather than guidelines and signals of intentions to secure changes. Of course this escalated the importance of formal leadership. Rather than seeing the alternative pattern of diffusion in relation to the fact that the reform was of a technological nature, the factors mentioned above have to be considered to be decisive.

As to the ICT part of the reform and the ICT implementation at Bokn School in general, we find that Roger's theories are a lot more relevant. Personal initiative and willingness to employ new technology in education has to a significant degree been decisive for the diffusion of ICT use. However, some ICT work assigned by the administration and the above-mentioned Reform 97 can't be neglected as initiating factors.

4. 1 Hypothesis 3

Successful implementation of ICT mostly depends upon the technological infrastructure and student ICT competence, rather than upon staff competence in the integration of ICT into instruction.

We find nothing to support this hypothesis in our interviews with the different participants.

The rival hypothesis is that teachers mediate such applications when they are successful, and that their academic value relates positively to teacher competence.

As to implementation of ICT, we find that the teachers' competence is the decisive factor. One or two answers in the teacher survey give the opposite impression. Some teachers have high ICT competence without employing it in their classes. There may, of course, be alternative explanations.

In general, access to ICT technology is only interesting when the staff has gained enough knowledge and competence to see its relevance to educational challenges.

When it comes to staff development within ICT, our study reveals two incitements:

- The prescriptions of Reform 97 demand specific skills in various subjects. This is a fact that cannot be neglected by any school.
- The general implementation of ICT in daily life has exploded and made everyone see that it is necessary to learn how to handle this new way of communication. Consequently, reluctance among staff had decreased rapidly.

4. 4 Hypothesis 4

Gaps in performance between high and low poverty students will be enlarged rather than diminished where all students have equal access to ICT. The rival hypothesis is that equal access to ICT will lead to high poverty students closing the gap with low poverty students.

Gaps in school performance due to economic poverty has to our knowledge not been revealed in Norway, or at least not in the area where Bokn is situated. No one is unable to buy, learn or use the ICT for economic reasons. However, dynamic economic trends within trade and industry is about to create more of a class society with enlarged differences between the poor and the rich, but so far we are at an early stage in that process. ICT does give low ability students the opportunity to experience success.

4.5 Hypothesis 5

Successful implementation of ICT will lead to the same or higher academic standards in spite of the low quality of many ICT materials. Academic standards are a function of teacher and school expectations and not of the standards of textbooks, ICT materials, and the like.

All our interviews indicate that the academic expectations and the context in which ICT is utilised are key points as to its positive influence on academic standards. Teachers with insufficient ICT competence tend to use ICT more reluctantly, having themselves difficulties in seeing its relevance to the subjects they are teaching. " ICT was the tool, but the force that made it possible was the teachers." (adm.)

The alternative hypothesis is that ICT use will lead to lower academic standards as students spend more time on marginally beneficial searches and in browsing poor quality Web and courseware content.

There is little evidence in our material showing with certainty that student ICT use not strictly directed by the teacher has a negative impact on academic standards. One exception was a teacher who claimed that : "As long as ICT is used within a social setting there will few negative effects. ICT employed uncritically, without any response from a teacher might be risky." A higher degree of browsing might provide some sort of additional learning, such as technical skills, practical/technical language learning, self activation and independence. Such skills and abilities are seldom tested and are therefore hard to identify, and these reflections are of course not based on evidence.

5. Projection To The Future

If the reform had been anchored in the academic structure or had created alterations in daily routines, the chances of sustaining and developing it would probably have been better. As the situation is now it is more a question of personal initiative.

The teacher interviews tell us that staff competence and staff development will be an important and critical factor together with systematic steps to secure sustainability.

The conditions in the community that led to this reform, are similar to those that prevail in others rural areas in Norway. As far as the reform has proved effective, it could be relevant to other schools and other rural municipalities.

Information and PR about the original reform and results achieved has not had a high priority at Bokn School. It is not heavily promoted on the school's web site, but some information has been given to the local school authority. A new school building, which can have a positive social effect for the whole community on the island, will hopefully be completed within a few years.

Bokn School has profiled themselves in a new ICT project by participating in a nationwide project called Pilot.

Appendix A

The Norwegian research team:

Assistant Professor Lars Vavik

Senior Research Johannes Johannessen

Senior Research Marianne R. Notland

The team visited three schools in different areas in Norway. The time spent at Bokn school was five days for the research + one meeting prior to the visit to organise the research.

At all three schools we used the Workbook Appendix C-H for the different interviews.

Most of the interviews were 50-70 minutes long.

At Bokn school we interviewed the following number of participants:

Teacher: 6

Student: 6

Parent: 3

Tech.int: 2

Adm.int: 2

Experts outside school: 1

For observations inside and outside classrooms we used Appendix J and K . In addition to these instruments we translated appendix I in order to avoid negativity and misunderstanding.

We also produced a final form to collect all data from the Prac. Survey (Appendix I) and from this final form we have included some graphs in the report. The average duration (in Time) of the different interviews are:

Teacher: 50-60 minutes

Student: 40-50 minutes

Parent: 40-50 minutes

Tech.int: 60 minutes

Adm.int: 60-70 minutes

Experts outside school: 50 minutes

Other supporting evidence collected at Bokn School (Appendix C):

Examples of : - Student, teachers and adm. work

- School newsletter

The homepage address is: <http://WWW.bokn.gs.rl.no/>

In order to enable search function we wrote all the information in Word and gave each part of the interviews a code. Thereby we got the opportunity to compare the different aspects more easily when we worked with the five hypotheses.

Appendix I

OECD/CERI ICT PROGRAMME ICT Practices Survey for Teachers

You need to spend about 15 minutes to fill in this form. Please answer as briefly as possible. You do not have to sign or fill in your name.

Thank you for your attention and co-operation.

I. How comfortable are you with using a computer for each of the following tasks?

	very comfortable	comfortable	somewhat comfortable	not at all comfortable
1. Write a paper.	10	4	1	0
2. Search for info on (WWW).	6	6	2	1
3. Create and maintain web pages.	1	0	1	12
4. Use a data base.	0	2	9	3
5. Develop a data base.	0	1	1	12
6. Send and receive e-mail.	9	4	2	0
7. Write a program.	0	1	2	10
8. Draw picture or program.	4	4	4	1
9. Present information (e.g. PowerPoint).	4	3	4	3

II. How important is each of the following computer-related skills for your teaching? (Choose the alternative which is right for you.)

	very important	important	so-so	not important
10. Write a paper with word processor.	7	9	0	0
11. Search for info on (WWW).	2	7	4	1
12. Create web pages.	0	1	5	7
13. Use a data base	0	2	6	5
14. Develop a data base.	0	0	3	11
15. Send and receive e-mail.	3	5	5	1
16. Write a program.	0	0	3	11
17. Draw picture or program.	1	5	7	1
18. Present information (e.g. PowerPoint).	3	3	4	4

III. During the previous school year, how often did your students on average do the following for the work you assigned?

	several times a week.	several times a month.	seldom	never

19. Search for info on (WWW).	3	4	7	1
20. Create web pages.	0	0	4	9
21. Send and receive e-mail.	2	6	3	4
22. Write a paper with word processor.	4	7	4	1
23. Use a computer to play games.	0	4	8	3
24. Use a spreadsheet.	0	3	4	6
25. Use a graphics program.	0	0	5	9
26. Join in chat-room.	0	2	3	9
27. Use a presentation program.	0	4	5	5
28. Use an instructional program.	0	0	3	11

29. Other computer uses:
Special chatroom.

30. How would you rate your ability to use a computer?:

good: 3, adequate: 11, poor: 1

IV. Answer nr.31-38 based on experiences from the previous school year.

31. Was student computer use ever evaluated for grading? (yes/no): Yes: 2, No: 6

32. If you assigned WWW searching, how much freedom did you allow students in locating sites to visit?

No restrictions: 2, some restrictions: 6, designed sites only

33. Did you modify a Web site with any of your classes that you taught? (Yes/no): Yes: 3, No: 6.

34. What portion of the computer use in your classes was directly related to the course content?
all: 3 most: 3, some: 5, very little: 1

35. What portion of the computer use that you assigned was done by students individually?
all: 0 most: 8, some: 1 very little: 2

36. How often did you use a computer at home to prepare teaching?

several times a week: 7, several times a month: 5, a few times: 2, never: 0,
no computer: 0

37. Did you participate as a student or instructor in a virtual course through the Intranet/WWW? (Yes, no):
Yes: 6, No: 7

38. Did you involve your students in collaborative learning over the Internet/WWW? (Yes/no): Yes: 4, No: 8

39. Are you currently using technology to collaborate with other teachers (chat-room, or the like)

(yes/no): Yes: 4, No: 9

40. How many e-mail messages do you send each week on average? (

more than 12:	3
6-11:	2

1-5 :	7
None:	2

V. How many of the following tasks have you ever performed?

	often	sometimes	never
41. Made changes to computer hardware.	1	4	9
42. Updated an application program (Word processor, graphics).	2	1	11
43. Recovered a damaged file.	2	6	7
44. Created a web site.	1	3	11
45. Developed a database.	0	2	13