

# OECD/CERI ICT AND THE QUALITY OF LEARNING PROGRAMME

Case Studies of ICT and Organisational Change

Denmark

Summary

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# Preface

## Preface

The present case study was carried out as part of the Danish participation in the OECD framework project *Schooling for Tomorrow*.

The study forms part of a major project on ICT and the Quality of Learning initiated in 1998. The project comprises three themes: criteria for software quality, market problems and partnerships between the public and the private sector and research in the consequences for the academic standards.

The third theme has developed into an effort in Research and Evaluation. Here the case study makes up the third of four activities:

1. Construction of an international network of researchers and educators to work with evaluation.
2. Identification and development of a series of quantitative and qualitative methods for evaluation of the consequences of ICT to learning.
3. Analysis of leading examples of good practice in the use of ICT as a means of promoting educational innovation and changes in schools and other educational institutions.
4. Development of techniques based on research and analysis aiming at evaluating the importance of ICT's consequences for academic standards and teaching in classrooms.

Denmark joined the project in May 1999 and the Ministry of Education asked the former Danish National Institute for Educational Research to contribute to the study with case studies from five Danish schools.

Today 23 countries are involved in the identification of those conditions, on which ICT may promote school development and innovation. One objective is to offer decision makers and practitioners insight

into how investment in ICT can be implemented in the most expedient way. Another objective is an evidence-based elucidation of school policy fields at the beginning of the 21st century.

The selected schools have been studied through interviews, observation and analyses in accordance with the methods chosen by CERI/OECD. A research team has visited each school for a period of five days, and the result of its work was to confirm or invalidate a series of hypothesis on ICT and school innovation set up by CERI/OECD.

In the end all reports will be integrated into a trans-national synthesis report.

The national research team comprised Project Researcher Arne Carlsen, who was national research co-ordinator and project leader; Project Researcher Lotte Broe and Project Assistants Ulla Milner Drewsen and Lea Holst Spenceley. Correspondents Lise Wendelboe and Mette Broström were project secretaries, and 12 student employees transcribed 65 interview tapes. Secretary Bente Søgaaard has translated into English, and Secretary Bente Løvgren Nissen has set up the reports. Leading Researcher, fil.dr. Poul Skov was in charge of the co-ordination of the concluding preparation of the reports.

Authors of the report are Lotte Broe, Ulla Milner Drewsen and Lea Holst Spenceley.

Much thank should be given to the many school principals, ICT co-ordinators, secretaries, teachers, parents and students of the five schools, who did the planning of visits, let themselves be interviewed, allowed observations to be made and provided materials.

Arne Carlsen

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# AIM

# AIM

Basic general education in Denmark is characterised by a great diversity of pedagogical approaches at the large number of institutions that perform the task of educating children and adolescents. The purpose of basic general education is to ensure that children and adolescents acquire basic academic, social and personal skills, which afford everyone (equal) opportunities to take up their place in society and contribute to the continued development of democracy, which is the foundation on which Danish society rests.

This overall aim encompasses more than basic skills such as literacy and numeracy. Apart from ensuring the acquisition of basic skills, schools shall further pupils' all-round personal development. The aim of teaching is for pupils to develop all their faculties and acquire insights, knowledge and social skills, which will enable them to draw on and respect each other's differences. Schools endeavour to create such opportunities for experience, industry and absorption that pupils develop awareness, imagination and an urge to learn. At the same time, primary and lower secondary education shall prepare pupils for active participation, joint responsibility, rights and duties in a society based on freedom and democracy. Basic general education is thus equally concerned with academic skills and a broad, liberal education that fosters active citizenship.

## Organisation

**Organisation** Denmark has a long-standing tradition of delegating power and responsibility in basic general education to local authorities and individual institutions. This is reflected in a high degree of organisational autonomy. The educational system is made up of a majority of public

primary and lower secondary schools, state-funded free schools and continuation schools as well as a significant number of private schools, which together safeguard the principle of parents being able to freely choose the institution at which their child should be educated. Basic general education in Denmark thus comprises a variety of educational offers characterised by great diversity in terms of ideological foundation, pedagogical practice and size. However, all children and adolescents must complete nine years of compulsory schooling, i.e. nine years of primary and lower secondary education. Pre-school and tenth grade education constitute optional supplements.

A central element in the practical organisation of basic general education in Denmark is the principle of democratic user participation, which means that parents, pupils, teachers and authorities all have a say in the running of their school. Parents at individual schools are represented on the school board, which, among other things, is in charge of approving the school's finances in accordance with the economic framework set by local authorities. At the same time, the school board lays down the principles for the running of the school and its activities, such as the organisation of teaching, the number of hours pupils are taught, optional subjects, the distribution of responsibilities between teachers, special education, etc.

Local authorities appoint a principal for each school who is in charge of its administrative and pedagogical management. Teachers at individual schools are represented on a pedagogical council, which acts as advisory body for the principal.

## **Development in primary and lower secondary education**

**Development in primary and lower secondary education** ICT is having a profound impact on our everyday- and working lives. In the course of the 1990s a number of initiatives have been developed to safeguard high standards in education, and to ensure that basic general education

lives up to the demands of a society in flux. These initiatives have resulted in, for instance, the introduction of new pedagogical methods and forms of organisation, teachers, for example, have been organised into teams in working with classes. Other initiatives have focused on the significance and potential of ICT in basic general education today.

The Danish Ministry of Education has recently drawn up a strategy for the ways in which information technology shall be implemented in the realisation of an educational policy that strives to ensure high quality education for all.<sup>1</sup> Part of the strategy concerns a shift of focus from learning *about* ICT to learning *with* ICT. Information technology shall be implemented in education with regard to both content and form in contexts where this is considered reasonable. One aim is that information technology will be used to develop teaching methods, which consider individual needs and circumstances and thus make the most of individual pupils' potential and personal and academic competence. Furthermore, information technology shall contribute to the creation of a comprehensive educational system, which through differentiated and flexible approaches to teaching ensures that everyone is afforded the possibility of receiving education on any level. Acquainting pupils with information technology from an early age, its potential and limits, shall further their ability to become active participants in the knowledge society. At an organisational level this will contribute to the development of educational institutions into knowledge-based, learning organisations.

## **Aim of the study**

**Aim of the study** The aim of this study has been to furnish insights into the experiences acquired in connection with a number of initiatives in basic general education, based on an examination of

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<sup>1</sup> "Denmark's strategy for education, learning and IT", 2001. ([www.it-strategi.uvm.dk/frameset.php3](http://www.it-strategi.uvm.dk/frameset.php3))

selected individual schools. A further aim has been to raise awareness of a number of issues relating to the implementation of ICT in basic general education.

## **Selection criteria**

**Selection criteria** The selection of five individual schools for this study was based on a number of criteria. The schools were examples of "best practice" institutions by virtue of having participated in a number of ICT projects, which were initiated by the ministry of education. We have striven to represent the diversity in Danish school culture by incorporating classic primary and lower secondary schools as well as a continuation school and a private school. Finally, we took care to select schools from different geographic areas.

# A short explanation of concepts and projects mentioned in the school descriptions

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### Concepts

**Concepts**The **Pedagogical Council (Pædagogisk Råd)** of a school is an obligatory institution of the Danish folkeskole (primary and lower secondary school), whose task is to render advice to the leadership and school board in pedagogical matters. In practice the council consists of representatives of the staff of all departments of the school and makes up a forum of discussions on pedagogical issues and the general pedagogical development of the school.

**The Pedagogical Service Centre (Pædagogisk Service Center)** of a school is a development B initiated in the 1990ies B of the traditional school library. The centre is the place where teachers and students can seek assistance regarding the procurement of all kinds of relevant teaching materials. Physically the centre provides possibilities of independent or group work with books, audio-visual and ICT equipment. Often the staff will have various competences and act as consultants and inspirators for teachers as well as students.

**Computer Driving License (PC-kørekort)** is the Danish equivalent of The European Computer Driving License (ECDL) and the International Computer Driving License (ICDL).

**The pedagogical ICT Driving License (Pædagogisk IT-kørekort)** is a series of training courses developed by the Ministry of Education. The courses are especially focussing on how teachers may

integrate ICT into their teaching in a pedagogical and creative way. The participants must obtain acknowledgement of eight so-called modulus tasks in order to obtain the license.

## Projects

**Projects** It is compulsory for the Danish primary and lower secondary schools to integrate ICT into all subjects, and there is much political awareness on the general development of ICT in school. Especially the Ministry of Education is trying in many ways to further the integration of ICT into the field of education, among other things, by supporting and implementing a series of ICT-related projects. These projects should contribute to an innovation of knowledge and methods to support the integration of ICT in the best possible way in order to derive the optimal benefit from the media's potentials. An essential aspect of the projects is the fact that they must comprise descriptions of procedures and results, so that other schools may learn from the experiences of those involved. Furthermore, several projects comprise one or several components that may prove useful to the general innovation of school organization, which also is a political focus point. This fact becomes evident in the reports of those individual schools, where such projects have been an important part of the innovation of ICT and school organization. Consequently, the reports contain references to various projects and ICT efforts, of which a short presentation is offered in the following:

**The Sector Net (Sektornettet)** was established in 1993 on the initiative of the Ministry of Education. Its setup and maintenance are taken care of by UNI-C, which is a government institution under the Ministry of Education whose task is to assist educational institutions in developing web-based solutions and strategies. The Sector Net offers all educational institutions in Denmark inexpensive connection with the internet and a series of services which, among other things, enables schools to establish for instance e-mail and conference systems and have access to relevant teaching materials (this part of the Sector Net is called **Skolekom**). The five schools participating in the OECD study were connected with the Sector Net and generally consider it a profitable arrangement from which they have benefited greatly.

**The leap into ICT (It-springet)** was a project started by the Ministry of Education and the Ministry of research in co-operation. On application a number of schools were selected for participation in the project, the objective of which was that the schools should develop wide and versatile ICT competences throughout the school and assess whether such competences had any influence on co-operation and innovation internally. The entire staff of each of the selected schools had a home-based computer at their disposal, and were, at the same time, committing themselves to acquire the >Pedagogical ICT Driving License= and the >Computer Driving License=, securing that the staff members developed both pedagogical and technical competences for integrating ICT in their teaching.

**Poseidon** was a project initiated by the Ministry of Education in co-operation with a consulting firm, which took care of the practical part of the project. 10 educational institutions were selected for participation in the project, the objective of which was to cement an ICT integration in the institution by starting a simultaneous innovation of the organization, where those involved were instructed in systematic and strategic control and support of the development. A so-called tool box and a homepage were established to support the participants in the process, but also, to a wide extent, to let others be inspired by the experiences of those participating in the project.

**ENIS** (European Network of Innovative Schools) is a project which several of the schools in the present study have taken steps to enter actively. ENIS is a project under EUN, and the intention is to establish a web-based meeting place for schools all over Europe. It is up to the schools to register and communicate their experiences on the net to serve as inspiration for others, who might be interested.

**The Janus Project (Janusprojektet)** came into being on the basis of a wish to elaborate the influence of ICT in a teaching situation and was established in co-operation between the Ministry of Education, researchers from the then existing Royal Danish School of Educational Studies and six school classes. The teachers of these classes had a home-based computer put at their disposal, and the classes had a certain number of computers allocated in order to secure adequate access to ICT. The

results have been given the shape of a collection of experiences and are accessible on the net to serve, hopefully, as an inspiration to others.

**The Pathfinder Project (Stifinderprojektet)** had as its objective to develop new forms of teaching through the use of ICT. 10 schools participated in the project, which was managed by >ORFEUS=, which today forms part of UNI-C. A series of private companies and the Ministry of Education supported the project, which resulted in several ICT-related teaching programmes, which via the internet were made accessible to everybody.

**The Pioneer Project (Banebryderprojektet)** came into being with support from the Ministry of Education and Erhvervsfremmestyrelsen (The Danish Agency for Development of Trade and Industry). The project comprised two phases, where the objective was a testing and innovation of teaching connected with ICT etc. All students of the participating classes have had a home-based computer at their disposal, and an adequate number of computers were accessible in the classrooms to be used during school hours. The focus was set on the effects of these arrangements on the academic standards of the students, and on how the media can be applied in an up-to-date teaching.

More information on the above described and other efforts in the field are found on the address:

<http://www.uvm.dk/grundskole/it/>

# Executive Summary

## Executive Summary

### Hypothesis 1

**Hypothesis 1** *Technology is a strong catalyst for educational innovation and improvement, especially when the World Wide Web is involved. The rival hypothesis is that where true school-wide improvement is found, technology served only as an additional resource and not as a catalyst, that the forces that drove the improvements also drove the application of technology to specific educational problems.*

The main issue of Hypothesis 1 is the question whether ICT (by virtue of the special characteristics of technology) functions as a real *catalyst* for organizational innovation in the school field, or whether technology should be considered rather as a *resource* (on a par with other resources) in a process of innovation urged by other basic forces.

In our discussion of this question we have chosen to define organizational development/innovation with references to theories on *AThe learning Organization*<sup>1</sup> aiming at identifying more concrete criteria for organizational development. These criteria make up the background of our discussions of Hypothesis 1 in the individual case studies, which on their part form the basis of the overall conclusion. The following is a short summary of the criteria:

5. It is of decisive importance to ensure the *sustainability* of the organizational innovation through preparation of *objectives and strategies* for the implementation of ICT. The objectives and the strategies contribute to set the direction of development and help the staff to find their bearings in the practical implementation. Such project guidance is important in order to clarify, how the objectives can be carried into effect and to prevent mere ad hoc solutions of identified problems.

6. It is important to establish *common visions and awareness* of where the organization is heading. By involving the staff in the setting-up of visions etc. the development is made a joint project, which will render the organization a focus and demand dedication and co-responsibility on the part of the staff members.
7. Conditions for *common processes of reflection and learning* must be established in order to enable the staff members to continuously relate themselves to their own practice. By confronting underlying acceptancies of ways of thinking and acting the organization, ideally, will be able to transgress inexpedient routines and problem solving procedures, to render visible new possibilities of action/new objectives thus establishing the preconditions for implementation of more up-to-date patterns of action. (Double loop learning).
8. It is an important precondition that *the staff is in focus* as co-founders of the reality of the organization. A basis for encouragement and support of the staff members should be established, so they become open to learning and development.
9. The organization must be able to *develop and utilize internal resources*, thus applying the organization=s immanent potentials to support further innovation. In this connection knowledge, a.o., is an important resource. Possibilities must be established for producing and exchanging knowledge, which will also make it easier for the actively involved to find their bearings in the organization. Further the diffusion of knowledge and competences will have the effect that more will sustain the development, so it does not depend on certain persons.

On the part of OECD it has been pointed out that in the present study innovation implies a development of fundamental processes in the school=s way of functioning.<sup>2</sup> Of course a school=s >way of functioning= and further characteristics of organization concern both the field of teaching and a series of conditions, which, generally, contribute to defining a >company culture=, e.g. communication, co-operation, staff development, leadership style etc. In the five case studies we have chosen as a presentation technique to distinguish between organizational development in general and teaching as the school=s specific field of action. This trick has permitted a more detailed presentation

of advantages and disadvantages at the application of ICT in the teaching; however, it has also made it clear that the implementation of technology may act as a catalyst at one organizational level without necessarily penetrating in relation to teaching.

Thus, the material from the five case studies does not indicate an unambiguous answer to the question of the hypothesis B however, there are clear tendencies which make it possible to point out various patterns for the functioning of ICT in the organizational development. At two of the five schools the implementation of ICT has contributed to initiate and support more radical innovations in the organization B and at a third school this catalyzing function is at least partially identifiable. As regards the two remaining schools it can be concluded that technology, primarily, has functioned as a resource in connection with the attempts to meet the demands for changes, development, problem solving etc.

At the schools where a catalyst function can be identified it is characteristic that the implementation of ICT more or less markedly has been incorporated in a school culture where ideas of innovation are closely attached to pedagogical strategies. This has been of decisive importance to both speed and ways of the diffusion of organizational innovation. Among other things an innovative scenario like that can be characterized by comprising some or all of the following elements:

X *In-service-training* B the material from the schools indicate that there is a direct connection between teacher competences and level of integration B if the teachers do not possess the necessary competences, ICT will not be integrated. However, experience tells that it is not sufficient that the teachers acquire technical competences only. It is important that the teachers move beyond a personal user level and acquire a series of pedagogical instruments for integrating technology in a teaching context.

X *Technical and pedagogical supportive systems* B three of the schools have successfully established supportive systems, where a.o. teachers teach teachers. Thus, the organizations are able to make use of their own resources for the diffusion of knowledge and the upgrading of their staff=s qualifications which often will be far more efficient than external courses. Above pedagogical

assistance supportive systems are needed for specific solutions of technical problems, which many teachers consider one of the greatest obstacles in the implementation process.

- X *Education of ICT co-ordinators* B establishing an education for ICT co-ordinators directed towards adult education is expedient as it is important that the supportive persons in school are capable of >reading= the teachers= various needs and of stimulating the teachers with regard to their preconditions B too many ICT co-ordinators set too much focus on the technical aspect and are unable to render pedagogical assistance, which is often a great need.
- X *Home-based computer facilities* B the two schools participating in the >leap into ICT= both emphasize that the development started to run fast when the teachers were given a home-based computer B with the home-based computers the teachers overcame the obstacles and became familiar with the media.
- X *Sector Net, intranet etc.* B the technology concretely contains potentials for exchange and sharing of knowledge, and at some of the schools the development and use of various web-based communicative instruments has led to better planning and has saved a certain amount of time for other purposes. At the schools where the entire staff has committed itself to using the technology, ICT is emphasized as a factor that makes the organization more coherent.

*Based on the material of the study we must conclude that ICT is not automatically B or due to special immanent logics B a catalyst for organizational innovation in a school context. On the other hand, however, it is evident that technology can be made a catalyst for a radical innovation, provided active efforts are made to establish an innovative pedagogical scenario for the implementation.*

## **Hypothesis 2**

**Hypothesis 2** *The diffusion of the innovation/improvement (and therefore of ICT) followed the traditional diffusion pattern for innovations, as outlined by Rogers (1995). The rival hypothesis is that technology functions differently from traditional innovations and that therefore different diffusion patterns occur.*

In our dealing with Hypothesis 2 we have chosen to present for each of the five case studies a description of the actual diffusion pattern at the school in question. This description is not specifically related to the theories of diffusion patterns of innovative arrangements as described by Rogers<sup>3</sup> but are structured with consideration for those conditions generally characteristic for innovative school development in Denmark. Experience in this field indicates that, generally, a *taking root* of innovation in the school world presupposes dedication and commitment at three interdependent levels: Firstly, it is decisively important that the innovation is introduced to the organization by an *entrepreneur* who is enthusiastic for the idea and is technically and pedagogically competent at a level enabling the person in question to demonstrate the operationability of the innovation to the organization. However, one entrepreneur cannot establish a sustainable development in a larger organization B it will be necessary to develop a *network* of dedicated persons, who are capable of keeping up a continued development and of supporting the initiated innovation. Finally it is essential that the *leadership* of the school demonstrates a distinct backing of the innovative efforts and develops strategies to increase the staff members= wishes and actual possibilities of participating in the process B for instance through upgrading of their qualifications, pedagogical innovative work etc. (cf. Hypothesis 1).

The material from the five case studies suggests that the taking root of an ICT-based innovation follows the same overall patterns characterizing other kinds of innovation in a school context, thus, can be said to depend on the interaction between the above described levels. Even though the diffusion pattern and taking root of the innovation B seen in an overall perspective B follows a homogeneous pattern at the five schools, there are, however, distinct differences as regards how deeply the innovation has taken root in the organization. Partly these differences can be related to the level of success as regards the involvement of the three levels in an expedient interaction, but they are also related to differences in the strategies specifically aimed at the integration of ICT in the individual organization.

X At the two schools where the taking root of the innovative effort is the most evident (schools III and IV) they have succeeded in involving all staff members in the development to a degree where a majority of staff members are taking co-responsibility for the continuation of development.

X At these two schools and at School 1, where the innovation has also taken deep roots, there has also been active support and dedication on the part of the leadership which has involved itself in the establishing of strategies and negotiations with the teachers, which has contributed to a sustainable and coherent development.

At School 4 the development has run considerably faster than at the other schools, which must be ascribed, a.o., to the very goal-directed work with the establishing of long-term strategies in connection with the participation in actual ICT projects, e.g. Poseidon.

*Summing up it must be concluded that on the overall level the diffusion pattern characterizing an ICT-related innovation does not distinguish itself from other forms of innovation in a school context. The concrete differences between the schools in the degree and character of taking roots are not conditional on structures but must be ascribed to variations in the choice of specific strategies for support of the implementation of ICT.*

## **Hypothesis 3**

**Hypothesis 3** *Successful implementation of ICT depends mostly upon staff competence in the integration of ICT into instruction and learning. This hypothesis assumes that teachers mediate ICT applications when they are successful, and that ICT's academic value relates positively to teacher competence. The rival hypothesis is that the school technological infrastructure and student ICT competence rather than staff competence determine ICT implementation outcomes.*

The material from the case studies unambiguously indicate that *teacher competences as well as technological infrastructure* are decisive for a successful implementation of ICT in school, and it is extremely difficult to decide which of the two factors is playing the most important role. In relation to the value of technology as far as teaching is concerned it is obvious that teacher competences play a decisive role B if the teachers do not find themselves technically and pedagogically fit for using ICT, they will tend to refrain from choosing the possibility, even though at school they have access to the

necessary equipment, and irrespective of what competences the students might have in the ICT field. In this connection it is important that the upgrading of teacher qualifications emphasize technical as well as pedagogical competences specifically in relation to ICT. As it appears from the material from the schools it is necessary but not sufficient that the teachers can use a computer (independently) B they must also be able to teach computer use and relate it to overall pedagogical objectives.

On the other hand it is also evident that precisely the access to functional computers is a precondition for both the teachers= development of competences and the application of ICT in teaching. The importance ascribed to home-based computers by the teachers of the two schools that have established such possibilities supports this point of view. In relation to the importance of the technological infrastructure it is also important to be aware of the necessity of minimizing the technical problems that may be connected with the application of ICT in teaching. If the major part of the lessons are spent on solving technical problems (be it hardware or software problems) the integration will soon be limited.

*On the background of experiences from the five schools it must be concluded that teacher competences as well as technological infrastructure are of decisive importance to the implementation of ICT in school. Furthermore, the material indicates a complex connection of conditions between the various factors: On the one hand an elaborate infrastructure makes up the possibility condition for upgrading of teacher qualifications as well as application of technology in the teaching. On the other hand teacher competences are decisive for whether ICT B given the necessary infrastructure B is, in fact, integrated in the teaching.*

## **Hypothesis 4**

**Hypothesis 4** *Gaps in academic performance between high and low poverty students will not increase when all students have equal access to ICT. The rival hypothesis is that equal access to ICT will lead to more advantaged students increasing the performance gap with disadvantaged (high poverty) students.*

The Danish school culture in general is characterized by a democratic ethos, which makes it difficult to answer the question about academic benefits derived from the ICT implementation. The teachers are simply reluctant to characterize the students with reference to this background, as doing so, generally will be seen as a categorization inconsistent with the basic values of the Danish school. Thus, it has been impossible within the frames of the study to obtain the necessary information for such categorization; instead we have chosen to deal with the question of academic benefit in relation to an intern evaluation by the school of the students= general performance and academic standards.

Totally, the material from the five schools does not indicate that the access to ICT has a direct influence on *differences* in the students= academic standards. Even though certain statements and observations indicate that primarily the highly performing students benefit from ICT, while others, quite contrary to this, suggest that the academically weakest students benefit especially from the access to ICT, the main impression is that technology offers potentials which, in principle, may be useful to all students. Primarily these potentials are seen in relation to:

- X increased differentiation of teaching B implying more consideration for the individual student=s specific prerequisites,
- X more variation in teaching B implying an offer of education, which, potentially, will motivate and involve students with different approaches to learning, and
- X application of word processing programmes which, generally, make the writing process easier to grasp for the students and offer them the possibility of preparing a more homogeneous and nice-looking product.

However, it is often emphasized that this is a question of precisely potentials of the application of ICT and that a realization of such possibilities will demand that technology is used with care B meaning both technical and pedagogical insight.

*On this background we must conclude that equal access to ICT has no systematic influence on differences in the academic standards of highly performing and not so highly performing students. To a wide extent it is the concrete pedagogical application of ICT which decides whether certain student groups profit especially from the use of ICT, or all students are given the possibility of using the technology constructively in accordance with their own prerequisites.*

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

Originally, the question whether the students= academic standards are primarily influenced by the expectations with which the school and the teachers meet their performance in connection with ICT, or it is rather the quality of ICT-related teaching material that decides the achievement level, has been the crux of Hypothesis 5 and the rival assumption. During the study a new version of the wording of the hypothesis was prepared by OECD/CERI:

*Successful implementation of ICT will lead to the same or higher academic standards regardless of the quality of the ICT materials. Academic standards are a function of teacher and school expectations and not of the standard of textbooks, ICT materials and the like. The alternative hypothesis is that ICT will lead to a lowering of academic standards because teachers will demand lower quality work when it is done via the Web or other electronic procedures.*

In this wording it is implicitly assumed in the rival hypothesis that teacher expectations have a decisive influence on the students= academic standards, and the question is whether the teachers lower their expectations to the students= work because ICT is involved.

Dealing with the material from the five schools we have emphasized the examination of *what* factors the individual schools consider decisive for the students= academic standards; *how* they find the quality of ICT-related teaching materials; *whether* there are signs of a generally decreased academic standard in connection with the use of ICT, and *whether* the teachers tend to lower their expectations to the students= performance in connection with the use of technology.

As regards the first question the material indicates that at all the schools teacher expectations to student performance are considered of great importance to the academic standards. This is reflected a.o. in the school curriculum prepared by the individual schools. However, teacher expectations are one of several decisive factors influencing the academic standards, and the quality of teaching materials must also be considered an important element in this connection. However, the schools are generally very attentive to this and set up demands on the quality of the material applied, so that in practice it will not be decisive for the students= benefit from the teaching. Also the schools are aware of the fact that an inexpedient use of ICT on the part of the students *may* lead to a lowering of the academic standard. In general the schools attempt to prevent this by instructing the students in the possibilities and limitations of ICT, and on the whole to make them conscious about the characteristics of the media, the ethical aspects of its use etc. Thus, it is demonstrated that in connection with ICT use the teachers do not lower their demands on their own teaching and on the students= academic standards.

## Notes

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1. Cf. For instance: Christensen, Allan (ed.): *Den lærende organisations begreber og praksis: læring B refleksion B ændring*. Aalborg: Aalborg University Press, 1998. Senge, Peter M.: *Den femte disciplin: den* Summary Denmark.rtf

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*lærende organisations teori og praksis*. Århus: Klim, 1995.

2. Cf. *A Methodology for case studies of organisational change*. CERI/SFT (2000) 1.)
3. Rogers, Everett M.: *Diffusion of innovations*. New York: Free Press, 1995. (Rogers was used as an example in OECD/CERI A Methodology for Case Studies of Organisational Change, version 12-21, June 2000)