

# Make a good school better

- a report on the Danish Folkeskole and the challenges facing it



The Danish Union of Teachers  
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## **Preface**

The Danish primary and lower-secondary school, the Folkeskole, is doing well in most respects. This is apparent, for instance, from international surveys. From time to time, however, such surveys also give rise to criticism of the Folkeskole, most forcefully the OECD's PISA 2000 survey which gave a poor rating to the reading science literacy of Danish pupils.

The purpose of this report from the Danish Union of Teachers is to make a few proposals on how specifically to follow up on some of the problem fields indicated by international surveys and comparisons. Not that we are particularly concerned with moving one or two places up on the international charts. It is rather that we see a need for prioritising and targeting out efforts and to concretise them – for the benefit of the pupils and society.

The Danish Folkeskole has already very much shown that it takes the criticism seriously. A number of initiatives have been established in the local communities and at schools across the country, focusing on the substance of the teaching and on the pupils' skills, but we need to ensure a more systematic effort.

Much of the debate on the school concerns the structure of the Folkeskole – class sizes, school sizes and the placing of fields of responsibility, but we shall not concern ourselves with that in this report.

We shall concentrate on what is all-important to quality: how do we improve the contents of the Folkeskole for the benefit of both the weak and the strong pupils in the Folkeskole. For this purpose, we shall present a number of recommendations. The recommendations involve all responsible parties in the Danish Folkeskole: the municipalities, the principals, the pupils, the parents and the teachers.

We propose taking responsibility for local initiatives at the central level. At this level we need to clarify where to concentrate our efforts in order to ensure the same good conditions for everyone. But it is within the individual local community and at the individual school that initiatives must be turned into concrete action. Especially the school management and the teachers have a great responsibility for the dialogue which is the precondition for applying the methods required and at the just the right pace in relation to the individual pupils concerned.

As teachers we every day assume the responsibility for ensuring that the pupils get the maximum benefit from their years at school. With these proposals, the Danish Union of Teachers hopes to contribute to making a constructive agenda for the development of the Danish Folkeskole. This is why we have chosen this moment to present our views of how things might be improved. We propose a dialogue on how to make the Folkeskole even better.

**Anders Bondo Christensen, president**

**Stig Andersen, vice-president**



## **The good Folkeskole can become even better**

### ***Summary and recommendations***

Denmark has a good Folkeskole, and most pupils in the Folkeskole are doing well. After finishing the Folkeskole, the great majority move on to vocational training after which they get jobs in the labour market. The business sector is satisfied with their skills, because the Folkeskole attaches importance to both academic qualifications – teaching the pupils reading, writing, arithmetic, foreign languages – as well as the social qualifications – making them independent, creative, critical, able to work together and willing to accept responsibility.

Still, the Danish Folkeskole can become even better. International surveys, such as the OECD's PISA 2000 survey, show that not all pupils are equally well-equipped when they leave the Folkeskole. Some have problems with basic skills such as reading, writing and arithmetic. According to the PISA survey, eighteen percent of Danish fifteen-year-olds had difficulties using reading as a tool in their continuing education and in their future jobs. And figures from the Danish Ministry of Education show that thirteen per cent of a youth age group acquires neither occupational competencies nor qualifications for further study. This is clearly unsatisfactory for all who share responsibility for the educational system – including the Folkeskole.

Even more must be done to ensure that all Danish children leave the Folkeskole with the best possible qualifications. And the great efforts made to improve reading literacy at the vast majority of Danish schools clearly demonstrate their worth. Quality improvements must be carried out in the specific teaching context. Therefore, it is necessary for teachers and pre-school class teachers to help formulate the answers to the challenges facing the individual school.

The key parties of the Folkeskole, the Ministry of Education, Local Authority Denmark and the Danish Union of Teachers are in a position to formulate goals and objectives and to support the work at the schools. The key parties must assume responsibility for prioritising action areas to ensure that the schools do not feel that they are facing impossible expectations. The parents are key collaborators for the Folkeskole, so, in a number of respects, the parent organisation Skole og Samfund (School and Society) will have to be involved in the work at the central level.

As regards implementation at the individual school, the school management plays an all-important part. The school management must ensure that the teachers commit to the task and that the management is responsible for describing the school's efforts.

This summary briefly introduces the areas that we believe should form part of the prioritisation of a common goal-oriented effort in the years to come. The report will go into greater depths with the background for this view.

### **Massive efforts to improve reading literacy**

Within the past ten years, 81 per cent of the municipalities have taken initiatives to improve reading literacy, and in 83 per cent of the local communities, one or several schools have taken their own initiatives within the field of reading literacy.



And, according to a new survey conducted by the Danish Union of Teachers, 94 per cent of teachers in the municipalities that have undertaken such initiatives do believe that they have improved the teaching of reading literacy.

We need to include the final twenty per cent or so. They, too, need to initiate special reading initiatives for pupils with special needs. There must be a common, binding goal that all schools must implement initiatives to improve reading literacy. But no-one should be forced to carry out such initiatives in any specific way. Experience from other municipalities shows that good reading results can and must be achieved on the basis of very different pedagogical approaches and starting points.

Another important issue in this context is strengthening in-service and further training of teachers. 97 per cent of the teachers asked by the Danish Union of Teachers say that more in-service training would improve their teaching of reading skills.

Over the past ten years, just under half the Danish language teachers have had more than fifteen hours of continuous in-service training within the field, whereas 29 per cent have had none at all. This is not good enough.

#### **The Danish Union of Teachers recommends:**

- **Prioritisation of reading the teaching of reading literacy as a national action area to support and continue existing initiatives within the field for the purpose of making *all* municipalities and schools prepare action plans for their initiatives to improve reading literacy**
- **That teaching of reading literacy and of Danish as a second language be made a compulsory part of teacher training**
- **Establishment of a working relationship between schools and day care centres on children's language development**
- **A systematic effort to strengthen the parents' possibilities for supporting their children in acquiring reading literacy**
- **That all schools have well-trained reading specialists at their disposal to ensure professional sparring of colleagues**
- **That within a limited number of years all teachers with responsibility for the teaching of reading literacy must be offered the necessary in-service training within this field**
- **Establishment of a professional environment for teachers focusing on the teaching of reading literacy**
- **That reading literacy must remain in focus throughout the years at school – including focus on bilingual pupils and the oldest pupils**



## Science subjects must be placed on the national agenda

The researchers behind the OECD's PISA survey were not impressed by the Danish pupils' science literacy. They concluded that the pupils were able to use ordinary science-related knowledge but were unable "fully to use the concepts of the natural sciences for making predictions or as part of an explanation."

But efforts in the field of science subjects contrast sharply with reading as an action area. According to a survey conducted by the Danish Union of Teachers, only twelve per cent of municipalities have taken steps to improve the teaching of physics/chemistry within the past ten years, whereas 24 per cent have taken initiatives in relation to the teaching of 'nature and technology', and, apparently, the general opinion is that these efforts have not been particularly successful. Where 83 per cent find that initiatives within the field of reading have led to better results, the corresponding figures for 'nature and technology' and physics/chemistry are only 56 and 53 per cent. And as few as respectively five and four per cent are of the opinion that initiatives have been taken which greatly improve the pupils' results in the subjects 'nature and technology' and physics/chemistry.

'Nature and technology' was introduced as a subject in the Folkeskole's first to sixth grades in 1993: and at first the subject was characterised by uncertainty, lack of special-subject rooms and the fact that none of the teachers had specialised in this subject. Because 'nature and technology' was only introduced as a main subject at the teacher training colleges later, which meant that the first teachers specialising in the subject did not graduate until 2003 – i.e. ten years after the subject had been introduced in the Folkeskole.

There remains a shortage of teachers specialising in 'nature and technology', and, according to earlier surveys, many teachers feel badly equipped to teach the subject.

In the mid-90s, the Danish University of Education carried out a survey showing that on distributing subjects among teachers, 76 per cent of school principals placed a lot of emphasis on ensuring that the 'nature and technology' teacher also taught the class another subject, while only 28 per cent emphasised a background in the natural sciences. The same survey showed that 57 per cent of the teachers of 'nature and technology' had not specialised in the natural sciences at college, and that figure had fallen to just under 32 per cent in 2002.

These figures are confirmed by the Danish Union of Teachers' survey which showed that only five per cent of the teachers teaching 'nature and technology' actually had that subject as their main subject. This is not so surprising considering the fact that so far only very few teachers leave teacher training college with that subject as their main subject. But it is worrying that the majority of teachers teaching this subject have no other background in the natural sciences. Only 40 per cent have physics/chemistry or biology as their special subjects, and only 60 per cent have a background in the mathematics line of upper-secondary school (Danish 'high school').

The profile of teacher training is evidently more characterised by the humanities than the natural sciences. For that reason, it will very likely continue to be difficult to recruit a sufficiently large number of 'main-subject teachers' within the natural sciences straight from the teacher training colleges. On the other hand, there will be a considerable need for target-oriented in-service and further training. The Danish Union of Teachers survey shows that within the past ten years, only 24 per cent of teachers of 'nature and technology' have had more than fifteen hours of continuous in-service training in the subject, and 57 per cent have had none. 97 per cent estimate that that more in-service training would improve their qualifications for teaching 'nature and technology'.



The Danish politicians have wanted to carry on the cross-curricular elements of the science subjects in the oldest classes. As a consequence, the new act on the Folkeskole introduced a common final examination for physics/chemistry and biology. At the same time, the number of lessons in physics/chemistry was increased at the expense of 'nature and technology' lessons in the sixth grade.

But the wish for cross-curricular elements did not result in the production of material that may assist the teachers in realising this wish. The Ministry of Education's subject-related pamphlets from April 2004 contain neither syllabus nor curriculum guidelines for such subject interaction. The Ministry recommends such interaction, but does not propose to say how it is to be done.

Compared with 'nature and technology', the situation is better for the oldest pupils in terms of teachers with science subjects as their main subjects.. The Danish Union of Teachers' survey shows that 66 per cent of physics/chemistry teachers have specialised in the subjects. But things may very well change in a matter of a few years, since more than half the physics/chemistry teachers will be retiring within the next ten years, and it may prove very difficult to replace them with new teachers with similar qualifications. So, in this field, too, more in-service training is required. 96 per cent of physics/chemistry teachers are calling for such training, but 44 per cent have never participated in any subject-related in-service training.

In several places initiatives have been taken within the natural sciences, and that has led to close cooperation with other educational institutions and with business enterprises, such as 'Naturvidenskaberne Hus' at Bjerringbro (house of natural sciences), Science Team at Kalundborg and Natlysprojektet (Night Light) in Århus.

#### **The Danish Union of Teachers recommends:**

- **Prioritisation of the Natural sciences as a national action area to support municipalities, schools and teachers in their local initiatives**
- **A follow-up on the action area by the Danish Parliament combined with true commitment to the teaching of natural science subjects**
- **Preparation of a 'general' curriculum for the all the natural science subjects**
- **That all schools have well-trained specialists at their disposal to ensure professional sparing of colleagues**
- **The dissemination of knowledge across municipal and school boundaries**
- **That all schools prepare a mapping of the physical framework at and around the school in order to increase focus on the creation of possibilities for experimental teaching adapted to local conditions at the individual school**
- **Strong emphasis on academic qualifications on distributing subjects and establishing teams at the schools**



- **As teacher training colleges alone cannot supply a sufficient number of teachers qualified to teach ‘nature and technology’ and physics/chemistry, special funds should be set aside to enable interested teachers, through in-service training, to acquire the qualifications required to teach these subjects**
- **Calling on trade and industry to assume responsibility for the schools to supplement their general social responsibility in order to strengthen the co-operation between the Folkeskole and the business community**

### **Denmark is breaking the impact of the social inheritance - but we can still do better**

According to the PISA 2000 survey, Denmark is less successful than the other Nordic countries in terms of breaking the negative social inheritance. This statement is based on the fact that Danish pupils whose parents have the shortest educational background are performing relatively more poorly in the PISA reading tests than the pupils whose parents have the longest educational background.

It is to be assumed, that bilingual pupils account for a large number of the children whose parents have the shortest educational background. Other surveys show that it is not the educational background of the parents of second-generation immigrants but rather their association with the labour market which is of the greatest importance to children’s abilities.

Professor Gøsta Esping-Andersen has reached a conclusion which differs from the PISA survey. Professor Andersen’s research demonstrates that Denmark is among the best when it comes to breaking the social inheritance. He stresses that it is of considerable importance that so many children attend various types of day-care institutions which provide them with stimulation and ensures everyone a better background for starting school.

In his analysis of the PISA survey, Professor Niels Egelund has pointed out that ability is ‘contagious’. If you attend a class with many competent pupils you will be stimulated and your academic level will be higher than would otherwise have been the case. By contrast, if you attend an academically substandard class, it is highly probable that you will not be able to exploit your academic potential to the full. In Denmark, subsidised housing is placed in one corner of the local authority area, whereas private residential districts are placed in another, and that is reflected in the schools’ academic results.

The Union of Early Childhood Educators (BUPL) and the Danish Union of Teachers have previously prepared a number of specific proposals for how teachers may best co-operate on supporting children from disadvantaged families with special attention being paid to conceptualisation and language development. Such initiatives may strengthen efforts to break the negative social inheritance.

There are still no Danish surveys demonstrating the importance of schools in breaking the social inheritance. But in the half-yearly report from the Council of Economic Advisors from December 2003, the economic ‘wise men’ single out a report by Browning and Heinesen which concludes that the teacher-pupil ratio is of significance to the pupils’ educational benefit.

Finland and Sweden find that free school meals are of considerable importance for creating the basis for breaking the social inheritance. In Denmark school meals were abolished in 1902, and today it is certainly possible to introduce fully parent-financed school meals, something that will not contribute to evening out the social inheritance.





Competent school principals with time for both professional and pedagogical sparring with committed and professional teachers with responsibility for the teaching combined with sufficient resources are the basic prerequisites for enabling the schools to help increase social mobility. However, nothing seems to indicate that external control, such as centrally formulated tests etc, will support this work – on the contrary.

#### **The Danish Union of Teachers recommends:**

- **That Municipalities establish socially balanced school districts. Free choices for the strong must not be at the expense of the weak.**
- **Supplementing the school's efforts to integrate bilingual children and their parents with greater focus on employment and housing**
- **That schools and institutions prepare action plans for how parents may support the work of the schools and institutions. Parents' boards play a key part in this work**
- **Strengthening of the class and the role of the class teacher**
- **Increased focus on socially disadvantaged children through co-operation between day-care teachers, pre-school class teachers and teachers**
- **Free school meals for all pupils**

#### **Evaluation creates the basis for dialogue**

Changes and quality development must be implemented in the concrete teaching situation. For this reason, evaluation should be a natural part of a professional teacher's work. Among other things, the professional ideal formulated by the Danish Union of Teachers' states that 'the teacher will reflect on and actively develop his/her teaching practices and "enter into partnerships with colleagues based on equality and loyalty and accept co-responsibility for joint professional and pedagogical reflection and development."

Therefore, there is every reason to consider initiatives intended to further the teachers' practical use of evaluation tools.

PISA 2000 showed that Finland is the OECD country that allows the individual teacher the greatest freedom – and whose pupils at the same rank among the best in the PISA survey. The Finnish board of education does not attach importance to inspections and control but it has faith in the school and faith in teachers working professionally on the basis of the targets.

In contrast to this, there is the experience from the UK, which makes frequent use of national tests. It appears that such tests do not support a positive development in the schools. On the contrary, it narrows their scope of action.

With the project "Evaluation on the way" the Danish Union of Teachers has attempted to support the teachers in their evaluation work.

The Danish Government wants increased focus on evaluation in the Folkeskole, and the Danish Union of Teachers has offered to commit to a national effort to develop the culture of evaluation in the Folkeskole. But as with the experience gained from the reading initiatives, it is extremely im-



portant that this culture is created voluntarily and through local initiative. With its basis in a central responsibility for action, municipalities and schools must develop the evaluation tools that suit them best.

**The Danish Union of Teachers recommends:**

- **That the Ministry of Education, Local Government Denmark and the Danish Union of Teachers make continuous evaluation a joint action area in the school year 2005/2006**
- **That the three parties jointly prepare inspirational material for the schools**
- **The teacher's evaluation of the concrete teaching is of decisive importance to quality development at the school. For this reason the evaluation culture in the Folkeskole must be strengthened**
- **Evaluation must support the development of teaching and must not turn into a bureaucratic obstacle**
- **Teachers, pre-school class teachers and school principals must jointly develop the continuous evaluation**
- **At the end of the school year, the individual school must be obliged to explain how its has accomplished the task of evaluation.**



## Denmark has a good Folkeskole

The Folkeskole's crucial role as one of the pillars of society dates back to its origins in 1814 and to its affirmation in the first Danish constitution of 1949. The object clause's emphasis on the all-round development of the individual pupil, thus, is no coincidence. Already in 1814 when the school was founded by Frederik the sixth, the Reventlow brothers wrote in Section 1: *With equal care and equal sense of responsibility shall you assume responsibility for the upbringing and development of each individual child*". Later, Grundtvig declared: *We learn for life*. A declaration which has found its way into the logo of the Danish Union of Teachers: *We learn for life – not for the school*.

The Folkeskole lives up to this goal in important areas. The pupils are happy about going to school to meet their teachers and classmates. And international surveys do show that Danish pupils are in a league of their own when it comes to their preparedness for living and acting in a democratic society. This means that young people face the challenges of everyday life with a considerable amount of confidence, and many of them chose to continue into further education.

International assessments, such as the results of the PISA survey on Cross-Curricular Competencies show that Danish pupils have great faith in themselves and their surroundings and that they are ready to co-operate. This also contributes to making the Danes the people in Europe who are most satisfied with their lives<sup>1</sup>. Also in future, the Folkeskole must ensure that all pupils leave the school with the self respect and best qualifications for living in and working with others.

There are areas where the school fails to live up to expectations, and the subsequent sections will include proposals on how the school may improve its qualifications within these areas. However, at the same time, it is important that we preserve the existing qualities of the school.

### ***Most Danish pupils are doing well***

There are many indications that Danish pupils are leaving the school with quite a good practical and mental basis for life-long learning. Thus, there is a tendency for the pupils to perform better in post-compulsory education and as adults than they do in the achievement tests to which they are exposed in the Folkeskole. This indicates that to a large extent Danish pupils have 'learnt to learn'. This view is also supported by the PISA survey, which shows that Danish pupils demonstrate great interest in the subjects and are very happy about going to school – something that is not always true in the countries with which we are compared.

But even if the number has been declining, it is still not satisfactory that thirteen per cent of a youth age group never manage to get any vocational training<sup>2</sup>. In many cases because they drop out of post-compulsory education, but it may also be that the qualifications they have acquired in the Folkeskole are not good enough.

The majority of young Danes are doing well in the labour market. The organisations of trade and industry, labour market researchers etc. generally express satisfaction with the qualifications of

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<sup>1</sup> *Quality of life, a key priority for citizens across the enlarged European Union*. European Commission and the European Foundation for the Improvement of Living and Working Conditions, marts 2004

<sup>2</sup> *Fewer end up in the residual group*. Press release from the Danish Ministry of Education, Monday 27 May 2004



young Danes and their value to the labour market, placing great emphasis on a number of competencies given high priority by the Danish Folkeskole, such as independence, creativity, self-confidence, critical sense, social skills, the ability to both co-operate and compete, readiness to assume responsibility and good communication skills.

On December 2, 2003, Danish Radio published a survey conducted among 40 chief executives in Denmark. The survey showed that three out of four chief executives in Denmark's largest business organisations were satisfied with the young people's qualifications. Robin Chater, the director of the association of employers' confederations in Europe, singles out the flexibility and efficiency of Danish wage and salary earners as the main reason why international companies continue to invest in Denmark in spite of the wage level. The Folkeskole deserves some of the credit for the position of the Danish labour force as among the most productive in the world and for Denmark's position as one of the richest countries in the world and number four on the list of the world's strongest economies, despite few natural resources.<sup>3</sup>

Co-operation and creativity are qualities which are highly valued in the school. Following a delegation visit to Denmark<sup>4</sup>, the head of the OECD's education department, Richard Sweet, declared that the Danish school system is encouraging the qualifications that are of great importance to the quality of the Danish society but which are difficult to render measurable in international comparisons.

In a major international survey on the ability of countries to develop, Denmark is singled out among countries that have the greatest creative capacity<sup>5</sup> in the form of talent, technology and tolerance. Capacities which according to the survey give Denmark a potential for growth which by far exceeds that of countries like France, the UK, Germany and Italy. Moreover, the capacity for creativity, and the young people's confidence in that capacity, helps explain Denmark's leading position in the Internet revolution<sup>6</sup>.

So, for the Danish competitiveness, too, it is worth preserving the values of the Danish school system.

In an interview with *Folkeskolen*, Thyge Winther-Jensen, Denmark's first professor of international comparative educational studies, puts it like this<sup>7</sup>: »We should not throw the qualities that we have developed overboard. Because, in the Danish population there are considerable resources of creativity, critical thinking and independence, and these qualities, of course, are also the products of our approach to education «.

### ***The pupils understand democracy***

Democratic understanding and insight are crucial prerequisites to the development of the Danish society. And in one of the latest international surveys, Danish pupils take a first place in terms of knowledge about the economic, political and democratic organisation of society<sup>8</sup>. The survey shows that Danish pupils possess an active knowledge that makes them able to assess political statements, written as well as oral.

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<sup>3</sup> World Economic Forum, *The Global Competitiveness Report 2003.2004*

<sup>4</sup> *OECD roser unge i Danmark (OECD praises young people in Denmark)*. JP, 2 December 1998

<sup>5</sup> *Europe in the Creative Age*, Professor Richard Florida and Irene Tignali, Demos 2004

<sup>6</sup> *Danmark fører an i internet-revolutionen (Denmark leads IT revolution)*. Politiken, 19 April 2004

<sup>7</sup> *Børn skal redde Danmark (Our Children will save Denmark)*, The Folkeskole 17/2004

<sup>8</sup> *Danske unge er not at all så dumme (Young Danes aren't all that stupid)*. Berlingske, 27 September 2003



The result confirms a previous international survey, which puts Danish pupils at the top when it comes to knowledge and attitude to democratic processes, institutions and values<sup>9</sup>. Based on 2240 interviews and classroom observations, Professor Carole L. Hahn of Emory University, Atlanta, concludes that Danish pupils score the highest in terms of interest in, knowledge of and ability to discuss political issues.

As a part of the Danish Government's recent analysis of the power structures of the Danish society, a report has just been issued on the subject of the school class as democratic workshop.<sup>10</sup> The report shows that the community of the class is crucial to developing the ability to handle disagreement – and thus the foundations for democratic understanding. A good sense of community in the class gives the individual pupils the confidence to express their own views and to tackle disagreement constructively. In the report, 82 per cent of the pupils claim that they are able to assert their individuality in class. The report concludes that the Folkeskole must continue to safeguard that sense of community out of consideration for the democracy of tomorrow.

Danish pupils like to go to school This is apparent from both the OECD survey and a research project comparing Denmark, the UK and France<sup>11</sup>. The research project also showed that Danish pupils are at the top in terms of taking responsibility for their own learning.

Also the parents are generally satisfied with the school. This is shown by a large number of satisfaction surveys such as Local Government Denmark's KL-Kompas from December 2002, in which 78 per cent of parents declared that they were satisfied or very satisfied with the school. Also parents who have experienced the school systems of other countries express faith in the Danish school system. Among them Bjarne Lundager Jensen, head of research in the Confederation of Danish Industries<sup>12</sup>, who claims that an important reason for the return of 66 per cent of Danish academics who had emigrated in 1995 was that they wanted their children to attend a Danish school.

### ***The ambitious Folkeskole***

It is well documented that the rich, highly developed countries invest many resources in education<sup>13</sup>. This is the main reason why they continue being rich – generation after generation. The Danish Folkeskole fits well into that picture. For decades Denmark has given high priority to the school, and it is an important reason why Denmark today is one of the richest countries in the world, a country which relatively easily can set aside considerable resources for continuing investments in education. It is a matter of a beneficial circle, which we would do well to preserve.

The Danish Folkeskole is ambitious. This is apparent both from the wording of the broad objects clause of the Act on the Folkeskole and from school practice, and that must be reflected in the resources spent on the school. Moreover, the Danish Folkeskole undertakes to perform many tasks which are not narrowly tied to the actual teaching. Tasks that might alternatively be the responsibility of the family, the social authorities or voluntary organisations: teaching the children how to get along with others, helping them process their grief, crime prevention, road drill etc. There are many good reasons for entrusting these tasks to the Folkeskole, but naturally that requires resources.

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<sup>9</sup> *Presse release*. Danish Ministry of Education, 15 March 2001

<sup>10</sup> *Den vordende demokrat (The budding democrat)*. Report by Professor Bo Jacobsen, University of Copenhagen. Expected to be published during the summer of 2004

<sup>11</sup> *A World of Difference*, Open University Press, 2003

<sup>12</sup> *Hjerneflugt er på retur (Brain-drain halted)*. Berlingske 22. April 2003

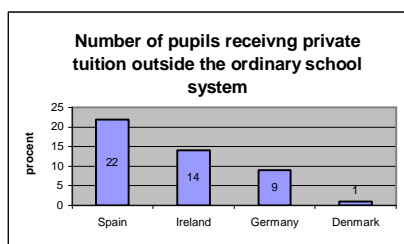
<sup>13</sup> See for instance "Education at a Glance. OECD Indicators", OECD 2003, page 191.



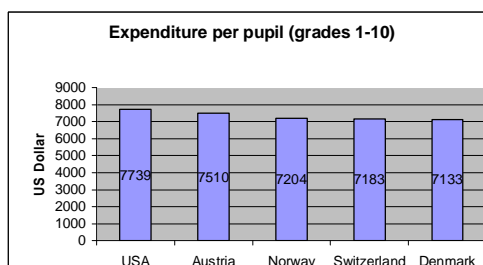
In Denmark we have chosen to prioritise a broad and accommodating school which separates out as few pupils as possible. A school, which is so accommodating that it does not fail the pupils, as in certain other countries, requires special efforts. This is expressed, for instance, in the fact that twelve per cent of pupils get special education of some form or other which puts us in the fourth place among European countries<sup>14</sup>.

It is possible to mention one important factor, which contributes to making the Folkeskole expensive, although it cannot be said to represent an actual ambition of school policy. Denmark has many small schools, which gives a low average pupil-teacher ratio. This is the result of two sets of political choices. Partly a number of local decisions to preserve small schools out of consideration for the local communities or the reactions of parents. Partly an Act on Private Independent Schools which makes it possible for parents to establish free basic schools to replace the small public schools that are closed down.

All in all it is not surprising that the Danish Folkeskole, together with schools in other of the world's richest countries, is to be found at the expensive end of the scale when the OECD publishes its comparisons of expenditure on the national educational systems. However, it is both a matter of misinterpretation when certain debaters occasionally claim that the OECD figures justify the conclusion that the Danish Folkeskole is the most expensive in the world. The difficulties of comparing the countries are so great that specific figures and rankings must be subject to considerable reservations. For one thing, it is extremely difficult to collect adequate and comparable information on private contributions to the financing of schools.



The same applies to expenditure on pensions for civil servants and expenditure on special education. Furthermore, the OECD's division into respectively primary education (grades 1-6) and lower-secondary education (grades 7-10) and Danish inability to report figures matching this division means that the Danish figures in the comparisons appear decidedly misleading in the OECD's tables<sup>15</sup>. In the figure below, the figures reported by the countries to the OECD's Education at a Glance 2003 have been adjusted to cover grades 1-10. This gives a truer picture.



<sup>14</sup> *Danmark i top med specialundervisning (Denmark tops with special education)* Press release from the Danish Ministry of Education, 21 March 2003

<sup>15</sup> *Er the Folkeskole dyr og middelmådig (Is the Folkeskole expensive and mediocre?)*, Note from the Danish Union of Teachers, 12.9.2003



We must therefore settle for the conclusion that the Danish Folkeskole is in the category of countries with relatively high expenditure levels per pupil. Certain debaters have linked this to PISA's test results in reading and natural science subjects and have reached the conclusion that the Danish Folkeskole is expensive in the sense that the society and the pupils do not get a sufficient return on the investment. As pointed out by, among others, the Council of Economic Advisors<sup>16</sup>, such an evaluation cannot be carried out on this narrow basis. An assessment of the return of the investment in the Folkeskole must necessarily be made for all skills and abilities and for the entire personal development which follows from the Folkeskole's efforts to live up to its objects clause. In this connection, the economic advisors point out that it is "striking that no independent Danish conceptual framework has been developed for the purpose of evaluating the successfulness of the Folkeskole in terms of living up to its objects clause".

### ***Things are going well - but not well enough***

In general, the school is doing a good job, but that does not obscure the fact that in certain respects, the school's results have not lived up to expectations. This means that in the ongoing debate on the Folkeskole, attention is often focused on individual results from the OECD's PISA comparisons. Comparisons have shown that the literacy of Danish pupils in the natural sciences are below average and that they score average in terms of reading. These results have given rise to observations that the Danish Folkeskole is mediocre and incapable of ensuring sufficient social mobility.

Since 1993, the Danish Folkeskole has endeavoured to improve the results as far as reading is concerned – and the results are beginning to show. But the test results are lagging behind reality. The latest published reading test (PISA) was carried out on fifteen-year-olds in year 2000. These pupils had their basic reading instruction at the beginning of the 1990s. During the past ten years, a number of initiatives have been taken in order to improve reading literacy.

Professor Thyge Winther-Jensen<sup>17</sup> points out that the researchers behind the PISA programme themselves are worried that their endeavours to find explanations and differences between the performances of pupils by means of statistics are distorted and used as comparable figures for pupil performances from country to country. Professor Winther-Jensen concludes that "if these figures are left unchallenged, we shall be thrown hither and thither by one survey after another and destroy all pedagogical discussions in the process, because quality is reduced to what can be measured".

The PISA surveys have a tendency to develop into a race between the countries. In Korea, for instance, many school principals followed up on the latest PISA test with a pep-talk to the pupils, telling them to defend the Korean colours in this international competition.<sup>18</sup> Often there is no great difference between "success and failure". For instance, in the latest PISA comparison, Danish pupils had a score of 497 points, which gave them an average position, whereas Icelandic pupils with an average score that was only two per cent better were placed significantly above average. However, the international assessments are a relevant contribution to determining whether special efforts are required within a specific field, as we have seen with the field of reading.

Where there has been a general strengthening of reading, however, only a few municipalities and schools have undertaken to strengthen the natural science subjects. Because, even if the less good

<sup>16</sup> *Dansk økonomi efterår 2003 (The Danish Economy, autumn 2003)* p. 9 The Council of Economic Advisors

<sup>17</sup> *Test skal ses i sammenhæng. (Tests must be viewed in context)* 'Folkeskolen' no. 15/2004

<sup>18</sup> Interview with Professor Mogens Niss in 'Folkeskolen' no. 7/2003



OECD score is modified by the fact that in the science subjects (which so far have been of relatively minor importance in basic school) the pupils seem to do better in post-compulsory education, it is obviously very reasonable to take a look at the things that could be improved. Therefore, the fields of reading and natural science subjects will be dealt with separately in this report.

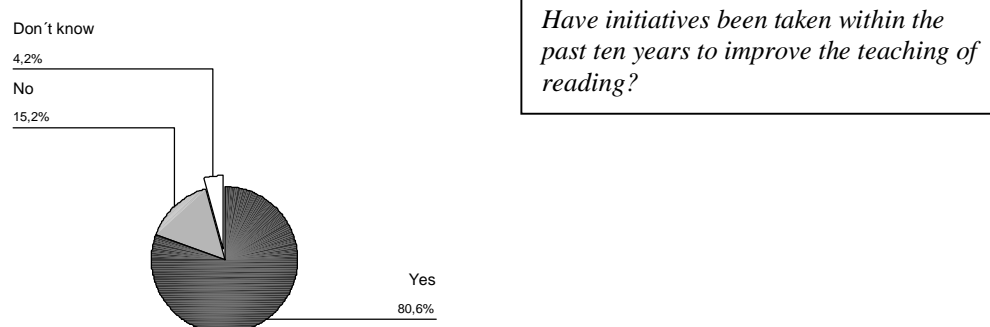




## Danish children must develop into better readers

Taken together, Danish pupils score an average in the PISA 2000 Survey, so all in all it cannot be viewed as a disaster, but on the other hand the result cannot be considered to live up to the Folkeskole's ambitions. From the third grade reading is included as an important factor in all subjects, or put differently: if you cannot read at that stage, there is a very great risk that you will also have academic problems in other subjects. Therefore it is important to give a very high priority to the training of reading literacy during inschooling to do as much as possible to ensure that pupils are able to read at the beginning of the third grade.

It is clearly unsatisfactory for everyone who shares responsibility for the Folkeskole that according to PISA-2000, eighteen per cent of Danish fifteen-year-olds had difficulties using their reading as a tool in their continuing education and in their future work. Therefore, it is gratifying that a large number of schools and local school systems have undertaken to deal with the problem. The Danish Union of Teachers'<sup>19</sup> survey from May 2004 shows that within the past ten years at least 81 per cent of the municipalities have taken initiatives to improve the teaching of reading. And in 83 per cent of the municipalities one or more schools have taken independent initiatives within the field of reading.



It appears that it is possible to improve the pupil's reading literacy through target-oriented work laid down in curricula involving all levels from local government to the work carried out in the individual class. Even in a municipality with an already high level of reading literacy, improvements have been achieved, and in a local community with a previously very modest level of reading literacy, the improvement is so great that the local level of reading literacy now corresponds to the national standard. 'Danlæs'<sup>20</sup>, a project launched by Denmark's Pedagogical Institute in response to the poor reading results at the beginning of the 90s, has also shown very large differences between local municipalities, schools and classes, but has also documented that these differences are not permanent – on the contrary, they may be influenced by pedagogical initiatives.

And 94 per cent of Danish teachers in the local communities that have taken initiatives within this field do stress in the Danish Union of Teachers' survey<sup>21</sup> that the initiatives have improved their teaching very much or to some extent.

<sup>19</sup> *Undersøgelse af initiativer til forbedring af undervisningen i udvalgte fag (Survey of initiatives to improve teaching of selected subjects)*. The Danish Union of Teachers, maj 2004 – the survey is enclosed with this report

<sup>20</sup> Jørgen Christian Nielsen, *Projekt danlæs*, 1999

<sup>21</sup> *Undersøgelse af vilkår for undervisningen i udvalgte fag. (Survey of the conditions for teaching selected subjects)* The Danish Union of Teachers, May 2004 – the survey is enclosed as an appendix to this report



The project "the Folkeskole year 2000" was followed up by an evaluation of the pupils' literacy in reading and maths in respectively third and eighth grade<sup>22</sup>. The results from the third grade showed that a target-oriented effort within a subject field may result in noticeable improvement. But the variation in results from school to school and the results from the eighth grade classes also showed that general, unspecific focus on a problem area is not enough.

'Danlæs' operates with a number of fair-wind and headwind factors of importance to reading literacy. The fair-wind factors are: A large total number of weekly lessons for the class, a large weekly number of Danish classes, target-oriented efforts to increase linguistic awareness, an annual reading conference in class, that the Danish teacher has good experience of providing the teaching of reading to beginners, that the Danish teacher has acquired considerable knowledge of reading and the teaching of reading through participation in in-service training, that the class' annual plan is discussed with the pupils, use of differentiated teaching, great emphasis on oral aspects of the teaching and dramatisation of the pupils' language and vocabulary, and enabling parents to exert influence and accept co-responsibility.

An important point in 'Danlæs' is that there is not just one recipe for good teaching instruction. Good reading results can probably be achieved in more than one way. It is not necessarily the same fair-wind factors that provide the foundation for all classes exhibiting excellent reading results.

Jørgen Christian Nielsen, one of the researchers behind 'Danlæs',<sup>23</sup> states that in one particular class the strongest fair-wind factors may be the following: The diligence and discipline of the class, good co-operation between school and homes, the Danish teacher's experience and academic knowledge about reading and the teaching of reading. In another, the strongest fair-wind factors may be: The Danish teacher's pedagogical approach, the pupils' own activities and sense of co-responsibility, discussion of the class' annual plan with the pupils and their ability to influence it – combined with a systematic use of a number of reading-specific initiatives – language training, direct focusing on the names, shapes and sounds of letters, systematic use of internal reading evaluation. It is commonly recognised that children learn in different ways.

What is exciting, then, is that good reading results may be achieved on the basis of very different pedagogic approaches and conditions. Good results can be achieved in more ways than one. It is important that all schools and municipalities take goal-oriented initiatives within this field, but it is equally important that the specific initiatives are designed locally with respect for local conditions.

Among headwind factors the following may be mentioned: Lack of diligence and discipline in class, a generally large number of absences due to sickness, that the Danish teacher has not participated in any courses on reading during the last five years, that the co-operation between school and homes is not particularly well-functioning. According to Jørgen Christian Nielsen, successful improvement of reading literacy in class depends on how adequately the teachers are equipped for the job.

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<sup>22</sup> *Evaluering af Folkeskolen år 2000 – færdigheder i læsning og matematik. (Evaluation of the Folkeskole year 2000 – reading and math literacy)*, publ. by the Ministry of Education 2001

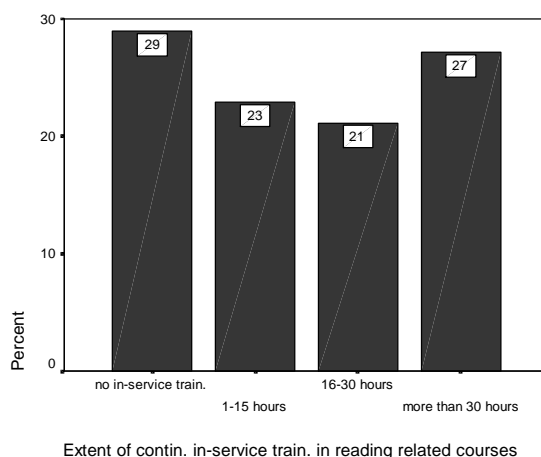
<sup>23</sup> *Flere dansktimer er ikke nok (More Danish lessons are not enough)*, Article by senior researcher Jørgen Christian Nielsen in *Folkeskolen* no. 6 2003



In the 'Danlæs' survey, 44 per cent of Danish teachers who teach in first grade say that they are experienced in the teaching of reading. 28 per cent have Danish as their main subject and have at the same time been involved with reading and the teaching of reading. 48 per cent state that they have participated in at least 30 hours of continuous courses on reading within the past five years. On this background, Jørgen Christian Nielsen concludes that in-service training in reading and the teaching of reading are still required, as the teachers' own statements seem to indicate that a large percentage of teachers might be better equipped to undertake the teaching of reading.

This is supported by the Danish Union of Teachers' latest survey<sup>24</sup>. It shows that as many as 97 per cent of the Danish teachers interviewed find that more in-service training would improve their teaching of reading. 61 per cent even believe that it would improve their training to a high or even to a very high degree.

Within the past ten years, just under half the Danish teachers have had any continuous training within this field exceeding fifteen hours. 29 per cent have not had any in-service training within this field at all.



In connection with previous reading surveys<sup>25</sup> it has been emphasised that especially in the lower grades, the teachers overestimated the reading literacy of their pupils. The results from the evaluation of "The Folkeskole year 2000" show a pronounced change of this situation. It is concluded in the evaluation that the teachers have markedly changed their opinion of what is required in order to assess someone as a good or a bad reader in the third grade. The teachers have begun making greater and more relevant demands of the pupils' reading abilities. Consequently, it must be taken into consideration that today, through more systematic evaluations, the teachers have a knowledge of the pupils' concrete benefit from participating in the teaching of reading.

The latest research results from 'Danlæs' had been expected at the end of 2003, but they still remain to be published. However, they are said to show improvement in the reading results of the youngest age group, but they also show that the efforts have not been sufficiently successful among the oldest pupils. So even if the general picture is that municipalities and schools have taken up the challenge posed by the reading results at the beginning of the 90s, it is still important for the schools and the municipalities to pay attention to how the teaching of reading may be supported throughout the

<sup>24</sup> *Undersøgelse af vilkår for undervisningen i udvalgte fag. (Survey of the status of selected subjects)* The Danish Union of Teachers, May 2004 – the survey is enclosed as an appendix to this report

<sup>25</sup> Jens Mejdning: *The Ugly Duckling and the Swans*. DPI, 1994



years at school. This is not least true of the relatively few local authority areas and schools which have yet to take any initiatives within this field.

There is no doubt that pupils in many local authority areas and schools with an ambitious reading policy and with a history of investment in qualified consultancy assistance and relevant in-service training of teachers have profited from the investment. The common objective must be to minimise the number of pupils leaving school as poor readers.

**The efforts to improve reading literacy must be maintained and expanded to cover all schools. Therefore, the Danish Union of Teachers recommends:**

- *That reading be prioritised as a national action area, supporting and continuing reading initiatives for the purpose of making all municipalities and schools prepare action plans for the efforts to improve reading literacy*
- *The teaching of reading and Danish as a second language must be a compulsory part of teacher training*
- *Steps must be taken towards establishing co-operation between schools and day-care institutions on the children's language development*
- *A systematic effort must be made to strengthen the possibilities of parents for supporting their children in learning to read*
- *That all schools have well trained specialists at their disposal to ensure professional sparing of colleagues*
- *Within a few years all teachers with responsibility for the teaching of reading must be provided with the necessary in-service training within the field*
- *A professional environment must be established for teachers focusing on the teaching of reading literacy*
- *Reading literacy must remain in focus throughout the years at school – including focus on bilingual pupils and the oldest pupils.*



## Science subjects must be made a national priority

The results of Danish pupils were not at a satisfactory level in the part of the PISA survey from 2000 that dealt with science subjects. The results justifiably caused some concern, especially because the PISA survey's framework for measuring literacy in science subjects more closely than in the past matched Danish expectations of what the pupils are to benefit from science subjects in basic school.

Danish boys had a higher average than the girls. In other words, the traditional gender-related differences prevailed in Denmark, whereas the other Nordic countries either showed no differences, or the girls performed better than the boys.

In contrast to most other countries which are at the same level in natural sciences and reading, Denmark scores significantly lower in science subjects than in reading. One important reason for this poor result may be the PISA survey's focus on writing. Precisely in the science subjects, practical experiments and oral assessment prevail in the Danish school system. In addition to the fact that the pupils of certain countries are more experienced in tests than others, there are a number of specific problems related to comparing countries. For instance, what is the significance of Danish fifteen-year-olds having attended school for a shorter period than most fifteen-year-olds in other countries, or that practically all Danish pupils – regardless of any individual needs for special support – attend a national school, the Folkeskole, and therefore are included in the Danish test population?

Instead of focusing on the results of previous surveys, it is far more important to concentrate on the position and priority accorded to the individual subjects during the school years to ensure that the pupils have the right conditions for acquiring literacy in the science subjects.

The OECD's report based on the PISA survey attempts to interpret the Danish average by means of a 'portrait' of an imaginary Danish pupil who has achieved the average Danish score. This pupil is able to do more than "apply general natural-science knowledge", but the pupil is not fully able to "employ the common terminology of the natural sciences in making predictions or as part of an explanation." The report concludes that there is a need for a more detailed survey of where and how to intervene if we want young Danes to score at the level of youngsters elsewhere, in the other Nordic countries, for instance.

In Denmark the number of lessons in science subjects has traditionally been below that of our neighbouring countries. Thus, when the PISA survey was conducted, the recommended number of lessons in the subjects 'nature and technology', biology and physics/chemistry was only 630 lessons in the Danish basic school, whereas Swedish pupils, for instance, were guaranteed a minimum of 800 lessons in the same subjects. In an interview, professor of mathematics Mogens Niss comments on the PISA survey: "In view of the neglect of science subjects in the Danish Folkeskole, any other score would have been surprising. There is very little teaching of science subjects in the Danish school system".

The Danish Union of Teachers has just carried out a survey<sup>26</sup> to establish how many municipalities have taken local initiatives within the past ten years to improve the situation within the field of the

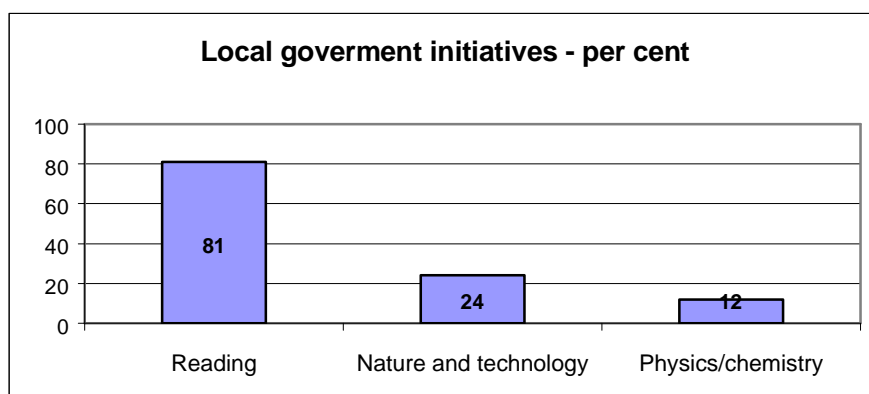
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<sup>26</sup> *Undersøgelse af vilkår for undervisningen i udvalgte fag. (Survey of the status of selected subjects)* The Danish Union of Teachers, May 2004



natural sciences. The survey shows that only a small number of municipalities (12 per cent ) have taken the initiative to improve physics and chemistry. According to the survey, 24 per cent have taken initiatives to improve ‘nature and technology’.

Municipal efforts within the field of science subjects sharply contrast with corresponding figures for municipal efforts to improve reading. In the past ten years, as many as 81 per cent of the municipalities have taken initiatives to improve the teaching of reading. And, as this report’s chapter on reading shows, these efforts have proven successful. Therefore, it follows that target-oriented municipal efforts within the field of the natural sciences would have the same positive effect on the pupils’ science literacy.



Even in places where municipal initiatives have been taken within the field of the natural sciences, they have generally been less ambitious than within the field of reading. Where 83 per cent estimated that reading initiatives had led to better results, the corresponding figures for ‘nature and technology’ and physics/chemistry are only 56 % og 53 %. Only respectively five and four per cent believe that initiatives have been taken which very much lead to an improvement of pupil results in ‘nature and technology’ and physics/chemistry.

The Danish Union of Teachers' survey confirms a charting carried out by the Danish Evaluation Institute in 2001. It shows that only ten per cent had taken initiatives to promote focus on technical or science subjects<sup>27</sup> or focused on science subjects as their action area. So, in spite of the poor results then, nothing much has happened during the past three-four years. The Evaluation Institute found that in the municipalities and schools that did focus on this field, environmental aspects dominated. Whereas subject fields such as technology and physics did not figure prominently in the initiatives. The same trend can be found in the Danish Union of Teachers’ survey of initiatives regarding ‘nature and technology’.

The Evaluation Institute’s report points out that, today, teaching of science subjects has been turned upside down in terms of ”pre-disposition”, to the effect that children in the junior grades are confronted with the larger social issues, whereas children in the senior grades of the Folkeskole and in upper-secondary school are expected to learn a lot of details and to push the big issues into the background.

<sup>27</sup> Danmarks Evalueringsinstitut: *Kortlægning af initiativer der skal fremme interessen for teknik og naturvidenskab 2001* (Charting of initiatives to promote focus on technology and science subjects 2001)



In the Ministry of Education's special publication on natural science education<sup>28</sup> it is emphasised that a strong culture of focusing on the natural sciences in basic school depends on principals', teachers, pupils and parents recognising that:

- the science subjects are not concerned with isolated islands of unworldly knowledge. On the contrary they play an important role in the general education of the pupils, on equal terms and in co-operation with the other subjects.
- that it requires considerable competence on the part of the teacher in terms of academic and didactic knowledge within the field of the natural sciences in order to teach science subjects. Therefore, it is necessary to use teachers who have specialised in science subjects at college or who have acquired similar qualifications through in-service training.
- the science subjects are based on empiricism and therefore require the availability of special-subject rooms, tools and longer teaching periods in order to provide the basis for practical/experimental work.
- the science subjects taken in isolation provide the basis for an understanding of aspects of life, nature and society, which means that they cannot substitute for each other. However, co-operation between the subjects is needed in order to enable the pupils to acquire qualifications within this field at an adequate level. Therefore, it is necessary for the teachers to work together in subject-related teams.
- teaching science subjects requires constant development of competencies as well as a well-functioning didactic community and co-operation among teachers.

In the public debate, recruitment for further education in the natural sciences has often been singled out as a separate problem. Over a number of years there has been a need for greater recruitment to the field of physics/chemistry, but that has not been the case for geography, geology and the traditional university programmes in biology. However, according to its objective, as well as the objectives of the individual science subjects, it is not the Folkeskole's responsibility to ensure recruitment to specific educational programmes. On the other hand, in listing the objectives of the science subjects<sup>29</sup>, it is emphasised that the most important function of the teaching of science subjects is to contribute to making pupils experience that they are part of nature and to make them recognise new ways of working with nature. Recognition of the importance of the natural sciences for participation in a democratic society is another objective. Today, the natural sciences and technology are of crucial importance to the development of our society and the democratic decision-making processes.

In the light of the disappointing results of the PISA survey, it is therefore remarkable that Denmark is still favoured by having a relatively large part of the population that is basically positive to the natural sciences and technology while at the same time being critical of the direction of research<sup>30</sup>.

The Board of Education, under the Ministry of Education, has appointed a working group to consider natural-science education in the future, emphasising on the following as the principal aims of teaching the natural sciences in the common part of the educational system<sup>31</sup>:

- To be able to take pleasure in, to respect and to show responsibility towards nature.
- To be familiar with fundamental elements of today's scientific picture of the world – and some features of its historical development.

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<sup>28</sup> Fremtidens naturfaglige uddannelser. Undervisningsministeriet, 2003 (Natural-science education in the future)

<sup>29</sup> Ministry of Education's special publications 13, 15 og 17 'nature and technology', biologi, physics/chemistry), 2004

<sup>30</sup> *Hvad kommer livet os ved?, (Is life any of our concern?)* Mandag Morgen Strategisk Forum. 1998

<sup>31</sup> Natural-science education in the future. Ministry of Education 2003



- To have and to be able to draw upon a certain level of general, scientifically generated knowledge in relevant situations.
- To understand the methodology behind scientific knowledge and recognition, especially the importance of observation, experimentation, the use of models and quantitative approaches.
- To understand, respect and value strengths and limitations of scientific methodology, values, proofs and facts.
- To be able to assess and contribute to debates on risks and to perceive ethical, moral and political issues related to the scope of action provided by the natural sciences and technology, including the ability to distinguish between scientific argumentation and value-based assessment in socio-scientific problems of topical interest.
- To understand the role of the natural sciences and technology as elements in the development of our culture and welfare society, to be able to assume and to formulate a critical position and to understand and argue against the criticism of the natural sciences.
- To know about the position of the natural sciences in our cultural heritage, i.e. in terms of the history of ideas and from a philosophical point of view.

### ***Belated introduction of 'Nature and technology' as main subject***

The subject 'nature and technology' was introduced in grades one to six in the Folkeskole in 1993. This means that the pupils who participated in the PISA 2000 survey did not have this subject in their first year at school. In spite of a curriculum and a description of aims and goals which provoked international recognition<sup>32</sup>, the start-up phase was characterised by uncertainty as to contents and the fact that no teacher had this subject as his/her main subject. The first teachers with 'nature and technology' as their main subject did not graduate until 2003. That very year, doubts about the status of the subject were provoked by the legislators, as an increase of the number of lessons in physics/chemistry in the 9<sup>th</sup> grade, resulting from the most recent amendment of legislation, was at the expense of a corresponding reduction of 'nature and technology' in the sixth grade.

There was and is a shortage of teachers with this subject as their main subject, so when the subject was introduced by the Act on the Folkeskole from 1993, the teaching was characterised by the fact that only a few of the teachers involved had had any of the other science subjects as their main subject at teacher training college. In general, it seemed that the teachers were uncertain about the subject, that the schools did not have suitable special-subject rooms and that parents and pupils paid the subject very little attention because they concentrated on Danish and mathematics in the lower grades.<sup>33</sup>

A major survey of 'nature and technology'<sup>34</sup> was carried out, and it showed that many teachers feel insufficiently equipped to teach the subject and that often insufficient time is allowed to give the pupils the required co-influence on the teaching. This means that in some cases the teaching is more teacher-centred than the ideal, or that it is very much based on books which are not necessarily aimed at the group of pupils you are dealing with. A situation which is in neither the pupils' nor the teacher's interest.

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<sup>32</sup> Fensham, P. J. *Time to Change Drivers for Scientific Literacy* in Canadian Journal of Science, Mathematics and Technology Education 2, (Yesnuar 2002), 9-24.

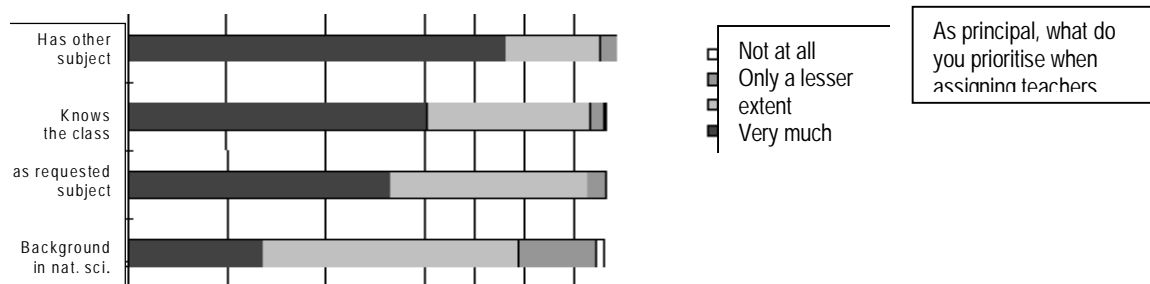
<sup>33</sup> Andersen, A., Dragsted, S., Nilsson, D. & Sørensen, H.. *'nature and technology' on the way - where? Copenhagen: Denmark's University of Education. 1997*

<sup>34</sup> Tordis Broch and Niels Egelund. *Et lærerperspektiv på natur og teknik – og fysik/kemi undervisningen – en kvalitativ analyse (A teacher's perspective on the subjects 'nature and technology' and physics/chemistry. – a qualitative analysis) DPU 2003*



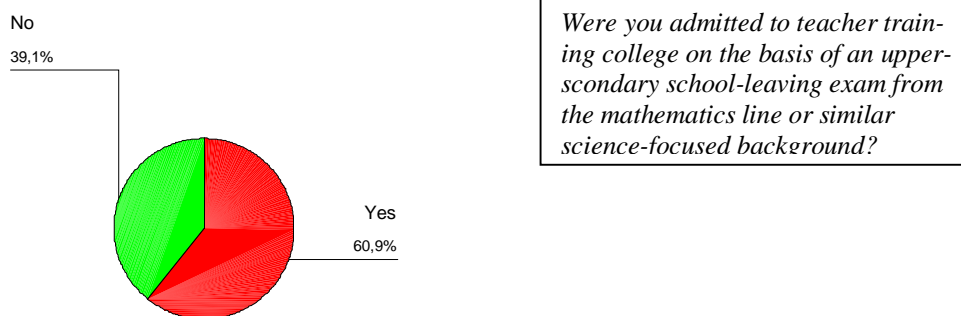


In 1996 Denmark's University of Education carried out the so-called LUNT survey<sup>35</sup>, which included a questionnaire aimed at school principals. It showed that on distributing subjects, 76 per cent emphasised that the 'nature and technology' teacher also taught the class in another subject, whereas only 28 per cent stressed the importance of the teacher's academic background in the natural sciences.



The survey showed that 57 per cent of the teachers in the subject 'nature and technology' did not have a main subject based on the natural sciences. In 2002 the number had dropped to 31.6 per cent<sup>36</sup> with geography, at 23.2 per cent, being the main subject most teachers had as their background for 'nature and technology'. Only 7.9 per cent had physics/chemistry.

These figures are confirmed by the Danish Union of Teachers' new survey<sup>37</sup>, which shows continuing problems getting teachers with the relevant professional qualifications to teach the subject. Only five per cent of 'nature and technology' teachers have the subject as their main subject. This is not surprising, given that the subject is very new, but it is all the more worrying that the share of 'nature and technology' teachers with a background in other science-related subjects continues to be low. For instance, only 40 per cent of the teachers have physics/chemistry or biology as their main subject, and only 60 per cent of teachers of 'nature and technology', attended the mathematics line of upper-secondary school



The profile of teacher training is obviously more influenced by the humanities than the natural sciences. Therefore, it must be considered whether it is possible to meet the need for teachers of sci-

<sup>35</sup> Annemarie Møller Andersen, ea. *Preliminary report from the LUNT project*. DLH 1997

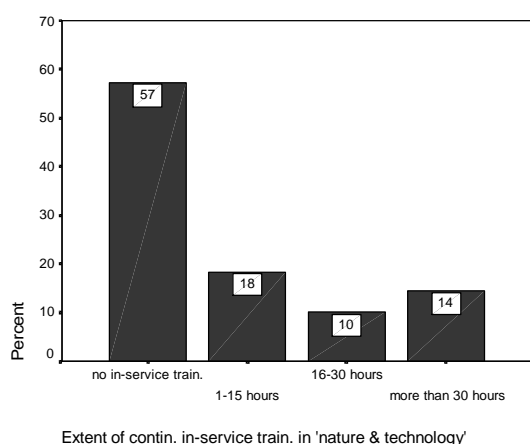
<sup>36</sup> Tordis Broch and Niels Egelund. *Naturfag og teknik – hvad ved vi i dag om elevinteresser ('Nature and technology' - what do we know about the pupils' interests today)*, DPU 2002

<sup>37</sup> *Undersøgelse af vilkår for undervisningen i udvalgte fag.. (Survey of the status of selected subjects)* The Danish Union of Teachers, May 2004 – the survey is enclosed as an appendix to this report



ence subjects through recruitment from teacher training colleges. It is more realistic to promote interest in the subject among teachers at the school - and to extend their competencies through target-oriented in-service and further training.

The Danish Union of Teachers' survey shows that only 24 % of teachers have had more than fifteen hours of continuing in-service training within this field in the past ten years. 57 per cent have had none. The need to make a special effort within this area is underscored by the fact that as many as 97 per cent claim that more in-service training would improve their qualifications for teaching the subject.



The survey shows that 45 per cent of teachers saw the physical framework for the teaching as unsatisfactory or very unsatisfactory. This trend is confirmed by a previous survey<sup>38</sup>, which points to a disastrous situation in which the materials required for the practical and experimenting activities must first be located in a store room or special-subject room and then be carried back to the classroom. It points to the problems that arise if teacher and pupils decide to switch to unplanned activities – spontaneous ideas, requiring other materials than those specifically planned for the sports ground etc.

In a survey of school premises, Søren Dragsted, MA, has shown<sup>39</sup> that within the traditional framework of the special-subject rooms there are great opportunities for creating a far more exciting framework for the teaching at very little expense. At a simple level, a number of schools have established experimental fields as a supplement to the biology, 'nature and technology' or science lab. In such fields measuring equipment for weather observations, boxes for experimenting with water as a landscape-creating factor, mini-gardens with composting systems and a place for chopping and shaping materials in wood etc. have been installed. In the slightly larger perspective, the school has attempted to create a close and exciting relationship between classroom teaching and the immediate surroundings outside. Among such places, Søren Dragsted singles out 'Lærkeløngen' at Albertslund, which is a new building designed for inschooling with a ditch bordering on the south side of the school as well as an experimental field with an area set aside for making fires, a mini wood, an energy plant with solar cells in the skylight window etc.

<sup>38</sup> Annemarie Møller Andersen, ea, *natur og teknik på vej – hvorhen?* ('Nature and technology on the way – where?') DLH 1997

<sup>39</sup> Søren Dragsted i, 'Skolens rum' (*The school rooms*), DLH 1999



In April 2004, the Academy of Technical Sciences (ATV) published a report on the present conditions and future development potential of science subjects in basic school<sup>40</sup>. Their general recommendation on 'nature and technology' reads as follows:

"ATV recommends maintaining the subject 'Nature and Technology' in the Danish school system and that adequate resources be provided to ensure the quality of the subject. At the individual school 'nature and technology' must be ensured proper facilities and relevant teaching materials. The schools must show both teachers and pupils that the subject 'nature and technology' is given a high priority – a priority that extends to science subjects in general. The schools must provide relevant and thorough in-service training to the teachers teaching 'nature and technology.'"

Likewise, the working group on science subjects appointed by the Ministry of Education<sup>41</sup>, recommends that the integrated subject 'nature and technology' be maintained for the first six grades. The subject is to be strengthened by development of local curricula, introduction of ministerial requirements on provision of suitable special-subject rooms and teaching resources as well as on in-service training of teachers who do not have 'nature and technology' as their main subject.

### ***A common test but no common curriculum***

One of the reasons why, through amendment of legislation, the number of lessons in physics/chemistry was increased for the ninth grade, at the expense of 'nature and technology' in the sixth grade, was the need to strengthen science subjects. When the bill was introduced, it was claimed that the interdisciplinarity, represented by the subject 'nature and technology', was to be carried into the teaching of science subjects in the senior grades.

The only concrete initiative to strengthen interdisciplinarity is the introduction of a common test in physics/chemistry and biology. On the basis of a newspaper article about the knowledge of geographical locations of pupils in upper-secondary school, geography was also included in this complex of tests. However, this does not mean more hours for the subject. The plans for this complex of tests so far involve a written test in each of the three subjects in addition to a practical/oral test to be assessed by an external examiner whose primary qualifications are within the field of physics/chemistry.

The Confederation of Danish Industries, among others,<sup>42</sup> has stated that the common test in the science subjects is a poor idea, since geography is not an experimental science subject. Already today, the practical/experimenting part accounts for only a very small part of biology<sup>43</sup> and geography classes<sup>44</sup>. Only one out of six biology teachers include practical aspects of the subject every week. 46 per cent do so approximately once a month. The teachers themselves point to the availability of lab facilities and lack of personal qualifications as the main reason.

As will appear from the following, no initiatives have been taken as regards how science subjects are to strengthen each other. Thus, the form of testing involves a risk that biology and geography will unilaterally focus on the skills tested in the written tests.

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<sup>40</sup> *Det begynder i skolen (It all begins at school)* The Academy of Technical Sciences, April 2004

<sup>41</sup> *Fremtidens naturfaglige uddannelser* ((Natural-science education in the future), Ministry of Education 2003

<sup>42</sup> Chief Consultant, Conf. of Danish Industries, Hanne Schou: Nakskov-syndrome affects physics/chemistry, *Folkeskolen* no. 20/2004

<sup>43</sup> Søren Breiting in *Undervisningsnyt (Teaching news)*, 2001 [www.undervisningsnyt.com](http://www.undervisningsnyt.com)

<sup>44</sup> Mogens Lerbech Jensen et al. *Geospørg '98*, Geografforlaget



In 2004, the Ministry of Education published a new set of special pamphlets focusing on, among others, physics/chemistry and biology<sup>45</sup>. In view of the desire to strengthen the interaction of the science subjects, it is surprising that neither curriculum nor curriculum guidelines call for any co-operation between teachers of biology, geography and physics/chemistry. And the teachers do not get any more help from the pamphlet on physics/chemistry. This pamphlet also calls for close co-operation between the biology teacher, the geography teacher and the physics/chemistry teacher on the teaching of natural sciences – with profound respect for each other's academic qualifications, as it says. But in this case, too, there is no hint of a suggestion as to how such co-operation might be realised.

As a consequence, it is difficult to see how these special publications support the recommendations of the working group<sup>46</sup> appointed by the Board of Education itself. They recommend co-ordination of science subjects in grades 7-9, to the extent that academic content from the three subjects be combined to provide a better basis for both immersion into the substance of the natural sciences as well as participation in cross-curricular teaching.

Likewise, a description of the academic progression for the teaching of science subjects as a whole throughout the school career is missing. The special pamphlets recommend the keeping of a log-book to act as the setoff for the communication between 'retiring' and new teachers, for instance on the transition from 'nature and technology' to subject-specific teaching in the senior grades. However, it is doubtful whether that alone can solve the problem of continuity in the science subjects, considering that 'nature and technology' does not sufficiently act as an introduction to the subsequent science subjects<sup>47</sup>.

Previous surveys<sup>48</sup> have shown that it is difficult to provide the pupils with the required possibilities of immersion in physics/chemistry and at the same time cover the syllabus required to pass the Leaving Examination of the Folkeskole. Therefore, it may seem worrying that, politically, a form of testing has been chosen which is intended to reflect the knowledge of the pupils in three different subjects without providing any ideas in the subject-related pamphlets etc. as to how the three subjects may be combined.

The Ministry of Education's evaluation of the final examinations of 2003 shows that the actual number of lessons in physics/chemistry in the ninth grade varied from 32 to 146. With an average of 70 lessons. In the tenth grade the average was 67 lessons. According to the guidelines for the distribution of lessons, the pupils should have had 80 lessons. There are a number of different reasons for the major differences in terms of lessons provided. In some schools, planned cancellations during the school year are taken into account when the timetable is made (such as project periods, work practice, immersion weeks, school camps and excursions). Only just 20 per cent of the ninth grades had participated in cross-curricular tuition involving physics/chemistry.

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<sup>45</sup> Ministry of Education's special publications 13, 15 and 17 'nature and technology', biology, physics/chemistry), 2004

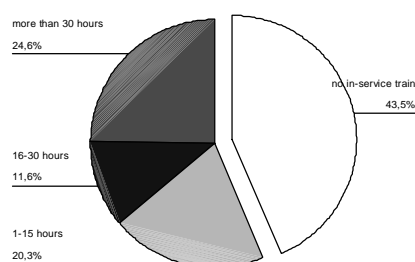
<sup>46</sup> *Fremtidens naturfaglige uddannelser* ((Natural-science education in the future), Ministry of Education 2003

<sup>47</sup> Tordis Broch and Niels Egelund, *Et forældreperspektiv på naturfagsundervisning* (A parents' perspective on science subjects). DPU 2002

<sup>48</sup> Tordis Broch og Niels Egelund. *Et lærerperspektiv på 'natur og teknik' – og fysik/kemi-undervisningen – en kvalitativ analyse* (A teacher's perspective on the teaching of 'nature and technology' and physics/chemistry – a qualitative analysis). DPU 2003



The Danish Union of Teachers' survey shows<sup>49</sup> that 66 per cent of the teachers are teaching their main subjects, but the situation will become critical in the years to come, because as many as two thirds of the Folkeskole's physics/chemistry teachers will have to be replaced over the next fifteen years<sup>50</sup>, the pressure being especially big over the next ten years. As mentioned in the chapter on 'nature and technology', it is not realistic to recruit a sufficiently large number of teachers with the specific, academic competencies straight from teacher training college. Therefore, it will be necessary to provide target-oriented programmes of in-service and further training. 44 per cent of the present physics/chemistry teachers have not participated in any in-service training over the past ten years. This should be seen in the light of the fact that 96 per cent of the teachers believe that more in-service training would improve their qualifications to teach the subject.



*Extent of continuous in-service training in physics/chemistry over the past ten years.*

Physics/chemistry classes take place in one special lab. As many as 99 per cent of the teachers who participated in the Danish Union of Teachers' survey teach in a room which is equipped for the purpose. On the other hand, the rooms are often marked by wear and tear. A survey among physics/chemistry teachers<sup>51</sup> shows that 46 per cent either disagree or disagree very much that conditions are satisfactory.

### ***Finland invests millions in development of science subjects***

Under the Ministry of Education's development programme "A school on the move" there are certain limited opportunities for obtaining funds for local development projects devoted to the science subjects. The Ministry is expected to select 30 applications which may receive grants up to DKK 30,000 to cover travelling expenses, meetings and the collection and dissemination of experience, etc. By comparison, the Finnish Ministry of Education spent e34 million (approx. DKK 255 m) on the LUMA programme during the period 1996 – 2001. To this comes local funds as well as contributions to the project by Nokia.

LUMA is an abbreviation in Finnish of the natural sciences and mathematics. The LUMA programme<sup>52</sup> was a long-term Finnish attempt to strengthen the natural sciences, both in the educational system and in the society. The LUMA programme was implemented in 16 regional networks, in-

<sup>49</sup> *Undersøgelse af vilkår for undervisningen i udvalgte fag.. (Survey of the status of selected subjects)* The Danish Union of Teachers, May 2004 – the survey is enclosed as an appendix to this report

<sup>50</sup> Niels Egelund *Fysik/kemilærernes syn på deres undervisningssituation i danske skoler (The physics/chemistry teachers' view of the status of their subject in the Danish schools)*. DPU, 2002

<sup>51</sup> *Ibid*

<sup>52</sup> *Finnish knowledge in mathematics and sciences in 2002*, Final Report of LUMA programme



volving 78 municipalities and a total of 270 educational institutions. Networks were established between basic schools, upper-secondary schools and vocational schools, and among these institutions and institutions of higher education and business enterprises in the local areas. The preference for local roots and local ownership was an important part of the LUMA programme's general strategy. Pilot schools have worked as communicators of LUMA's methods and ideas.

An important qualitative parameter has been the focus on the teachers' academic qualifications. The intention has been to guarantee high quality throughout the school system through motivated and enthusiastic teachers, in recognition of the fact that the pupils' choice of future areas of study depend very much on their experiences of their teachers. Thus, strengthening of teacher qualifications has been a key goal. Other qualitative goals have been:

- To boost science literacy for all pupils
- To strengthen efforts to attract girls and women to the natural sciences.
- To develop learning environments with a view to involving pupils in observing phenomena of natural science, carry out experiments and use their knowledge to solve problems in life-like situations. Interest in the natural sciences was to be continued from the school and into society.
- For teachers of mathematics and the natural sciences to work much more closely together at the various levels of the educational system for the purpose of ensuring continuity and smooth transition from basic school to upper-secondary school and further on.
- To strengthen multi-disciplinarity at the different grade levels among the mathematical and science-related subjects as well as their applications.
- To ensure that the mathematical and science-related subjects establish a close link to environmental problems in recognition of the fact that many children and young people are interested in and worried about the environment.

Among the results of the evaluation of the LUMA programme are:

- That many LUMA schools now have prepared their own curricula for mathematics and science subjects..
- That co-operation among teachers has been strengthened.
- That co-operation between the schools and actors outside the schools has been strengthened.
- That the experimental aspects of the teaching have been strengthened.
- That many teachers have enthusiastically participated in in-service training and have given their academic level a boost as well as extending their didactic competencies. This has produced a greater sense of professional pride and identity.

### ***Local initiatives from which others may learn***

A number of municipal school systems have independently taken initiatives to strengthen efforts on behalf of the natural sciences. One of the more recent projects is the establishment in 2003 of the House of Natural Sciences in mid-Jutland. There, Bjerringbro Municipality, the local university college and other educational institutions, the electricity museum and local trade and industry, among others Grundfos, have combined their forces to upgrade and develop literacy in the natural sciences among children and young people. The project is ambitious and will focus on academic and pedagogical innovation of the science subjects at Folkeskole level and in post-compulsory education.



Other large companies have accepted co-responsibility for giving greater priority to the natural sciences through the Lundbeck Foundation's contribution to Science Team<sup>53</sup>. This is a project in the north of Zealand which through in-service training of teachers, networks between institutions, support to new teaching, evaluation and dissemination of experience seeks to promote the natural sciences and technology to children and young people.

In Århus the local schools and the Faculty of the Natural Sciences at Århus University have launched a project which has already yielded results. The project, which is called Night Light<sup>54</sup>, was launched in 2001 and is intended to strengthen children's and young people's competencies and interest in the natural sciences and technology.

The core of the project is a 2½-year diploma programme at Århus university for the municipality's Folkeskole teachers (corresponding to a one-year full-time programme). The aim of the programme is, on a scientific basis, to provide understanding of and insight into academic and didactic problems of teaching the natural sciences in public school, for the purpose of enabling the teachers independently to plan, rationalise, implement and evaluate their teaching of the natural sciences and thus contribute the development of the Folkeskole.

When the first teachers graduated from the programme, Poul V. Thomsen, the programme director, stressed the fact that he was impressed with the enthusiasm demonstrated by the participating teachers, who had very much absorbed theoretical knowledge and by virtue of their broad experience had been able to convert this knowledge into practice. He remains convinced that the programme has given the natural sciences in Århus a boost.

The teachers who have completed the programme are academically and didactically qualified to function as resource teachers at their own school and thereby support the school's scientific environment. Previous surveys<sup>55</sup> have shown that new and inexperienced teachers' willingness to take up the practical and experimenting elements of the teaching will be strengthened if there are possibilities of sparring with experienced colleagues. Part of the Night Light project is also to create a knowledge and resource centre where teachers may get concrete assistance with teaching problems, find experience in new materials, participate in discussions with experts from university, museums and business life and to discuss academic and didactic problems with colleagues.

In connection with the Night Light project, Århus municipality is preparing its own syllabus for 'nature and technology'. A syllabus which gives the teachers concrete support in the form of using local museums, nature centres and areas in their teaching. Thus, the creation of a centre where the pupils, as a supplement to the special-subject facilities at the schools, may work with nature, natural sciences and technology is also a part of the project.

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<sup>53</sup> [www.scienceteam.dk](http://www.scienceteam.dk)

<sup>54</sup> Faculty of Natural Sciences at Aarhus University, [www.nat.au.dk](http://www.nat.au.dk) and Århus Municipal School System, [www.aarhus.dk/skole](http://www.aarhus.dk/skole)

<sup>55</sup> Annemarie Møller Andersen ea. *'nature and technology' on the way – where* DLH 1997



As mentioned, only a very few municipalities made special efforts as regards the natural sciences, and this is in glaring contrast to efforts to improve reading. The introduction of 'nature and technology' in the junior grades has created a colossal need for teachers with a background in the natural sciences, and many teachers therefore lack knowledge about science subjects. At the same time, the political system wants the science subjects of the senior classes to work more closely together.

**There is a need for making the natural sciences a national action area with a centrally placed responsibility for goals and frameworks within which local initiatives may be taken. Therefore, the Danish Union of Teachers recommends:**

- *Prioritising the natural sciences as a national action area to support municipalities, schools and teachers in their local initiatives*
- *That Parliament follow up on the action area with a genuine commitment to teaching of science subjects*
- *Preparation of a "general" curriculum for the entire area of natural sciences*
- *That all schools have well-trained specialists at their disposal to ensure professional sparing of colleagues*
- *Dissemination of knowledge among municipalities and schools*
- *That all schools prepare a mapping of the physical framework at and around the school in order to increase focus on the creation of possibilities for experimental teaching adapted to local conditions*
- *Academic competencies should be given a high priority on distributing subjects and establishing teams at the schools*
- *As teacher training colleges alone cannot supply a sufficient number of teachers qualified to teach 'nature and technology' and physics/chemistry, special funds should be set aside to enable interested teachers, through in-service training, to acquire the qualifications required to teach these subjects*
- *Calling on trade and industry to assume responsibility for the schools to supplement their general social responsibility in order to strengthen the co-operation between the Folkeskole and the business community*





## Denmark is breaking the impact of social inheritance – but more could be done

Based on the PISA 2000 survey it is often claimed that Denmark does a poorer job breaking the negative impact of social inheritance than the other Nordic countries. This statement is based on the fact that the Danish pupils whose parents have the shortest educational background are performing relatively more poorly in the PISA reading tests than the pupils whose parents have the longest educational background.

The survey shows that social mobility in a country first of all depends on the general organisation of society. Therefore, it may be difficult to make concrete comparisons between school systems in practice.

Professor Gøsta Esping-Andersen<sup>56</sup> does not agree with PISA's conclusions. He concludes that Denmark is one of the countries that is best at countering the negative effects of the social inheritance. According to Professor Esping-Andersen, this is because such a large number of Danish children attended crèche, kindergarten or day care. In those institutions, children from disadvantaged homes are stimulated, enabling them to start school on a more equal footing with children from more advantaged homes.

Professor Esping-Andersen concludes that the persistence of the parents in helping and motivating their children from between the ages of one and six, affects the children's future far more than the family's finances or the father's position or educational level, on which the PISA survey is focusing. High-quality childcare institutions may compensate for lack of stimulation at home.

These results are supported by other international studies<sup>57</sup>, showing that the parents' investment in the first six years of a child's life are of decisive importance to how the children do at school. If further initiatives are to be taken in relation to the social inheritance, the framework provided by the day-care institutions is of key importance. In the Ministry of Social Affairs' report on accumulation of knowledge about social inheritance<sup>58</sup> it is pointed out that the framework of day care institutions would be ideal:

- If there were time for the children – i.e. sufficient adult resources to take care of the individual child but also time for the families, for visiting the children's homes and for early contact
- If there were closer cross-curricular co-operation and supervision by various authorities such as visiting nurse, psychologist, social worker etc.
- If you did not have to begin all over again when a child moves on from the crèche with massive problems. You start at point zero every time due to this obligation of professional secrecy
- If there were trained early-childhood teachers in all positions and continuity in the composition of staff to ensure experienced teachers
- If you could become part of the family's network

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<sup>56</sup> What might create more equal opportunity? Money, cultural, capital and government in, Corak, M (red). 2003: *Comparative Intergenerational Income Mobility in North America and Europe*, Cambridge University Press

<sup>57</sup> Reay, D.: *Cultural Reproduction: Mothers Involvement in their Children's Primary Schooling* In, Greenfell, M. (red). 1998: *Acts of Practical Theory, Bourdieu and Education*, Grenfell

<sup>58</sup> *Vidensopsamling om social arv* (Accumulation of knowledge about social inheritance), Niels Ploug (red.) 2003, Ministry of Social Affairs



An early effort in day-care institutions in the form of quality adjustment is expected to yield positive results in the form of strengthened cognitive, social and language competencies in the children. Furthermore, early intervention would mean a strengthening of the child's association with its parents and that the child's general development would be extremely positive. On the other hand, surveys from abroad show that low-quality day-care may have a negative impact on children's playing culture and perhaps contribute to increasing the impact of a negative social inheritance. It is a fact that children of socially weak parents continue to use day-care institutions less than those who are more advantaged.

As far as an early effort is concerned, it is thought-provoking that the ministerial order on special educational assistance to small children (from 1979) only operates with a compulsory requirement of assistance to language and conceptual development. For the remaining handicaps the ministerial order provides only 'may-do provisions'. It seems paradoxical that within these fields, small children do not have the same rights as school children.

### ***The teacher-pupil ratio of importance to educational benefits***

So far, there are no Danish surveys of the role of schools in breaking the impact of the social inheritance. Surveys from abroad<sup>59</sup> show that schools with a good record of strengthening the subject-related literacy of children from socially disadvantaged families are characterised by the following:

- A school management characterised by a leadership style emphasising goal-oriented management and dialogue with the teaching staff.
- A visible interest in development, well-being and academic progress among pupils as well as teachers and the fact that both deputy principal and teachers are involved in the school management through dialogue.
- A didactic relationship, where teachers demonstrate consistency in terms of the values of going to school, of teaching based on didactic principles and on social fellowship, Establishment of a framework organised by the teachers and characterised by intellectually challenging teaching which enables the pupils to work and which at the same time allows them a certain freedom.
- Continuous evaluation and planning.
- Parent participation promotes efficiency at school, and it is supportive of children's school attendance when parents get involved in their children's lives a school and help them study and prepare etc.
- The climate which is created by the teachers for the pupils and by the principal for the teachers is an important aspect of a school's efficiency. According to the surveys, the results are favourable when teachers and school management pay less attention to punishment and critical control and more to praising and rewarding the pupils.

To this may be added, as mentioned in the economic advisors' report<sup>60</sup> from the autumn of 2003, that the teacher-pupil ratio is of importance to how much the pupils benefit from the teaching. The economic advisors point to a report by Browning and Heinesen from 2003. In contrast to previous surveys, this survey takes into consideration that a low teacher-pupil ratio may be a reflection of the fact that the pupils have special subject-related problems which are being dealt with in this way.

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<sup>59</sup> *School Matters. The junior years*, P. Mortimore e.a. 1988, Sommerset, Open books

<sup>60</sup> *Dansk økonomi efterår 2003(The Danish Economy autumn 2003)* The Council of Economic Advisors



The economic advisors' report is supported by the preliminary results of a Danish team of researchers who have taken a look at what actually goes on during classroom instruction<sup>61</sup>. They have found a school which is situated in a so-called 'disadvantaged' area, a small class and a group of teachers who are making an effort to break the negative social inheritances. The class only had sixteen pupils and occasionally an extra teacher attached.

In Finland, the class teacher normally teaches her class in all subjects from the first to the sixth grade<sup>62</sup>. The class teacher, who holds a five-year MA degree, has a good knowledge of the individual pupil, for whose instruction she has full responsibility. This knowledge is supported by the fact that nearly all teaching is carried out as classroom teaching and that the class rarely numbers more than twenty pupils.

Research on the so-called "pattern-breakers"<sup>63</sup> shows that a trusting and close relationship with independent and responsible teachers plays an important role in breaking a social pattern. For many pupils especially the class teacher is an important fixed point in their lives, one with whom you can discuss personal problems. If the school is to fulfil this function for the disadvantaged pupils, it requires stability in the group of teachers that surround the individual class.

In a feature article, Professor Bo Jacobsen, who is responsible for the major survey of school democracy which forms part of the so-called 'Power and Democracy in Denmark' survey<sup>64</sup> states that: "Learning at a high level is dependent on a well-functioning class undergoing continuous social development year after year. This claim is supported by more than fifty years of research in social psychology which unequivocally shows the importance of the permanent group to the development of norms and values in individuals."

In order for the school to contribute to social mobility, it seems that competent school principals with time for academic and didactic sparring with committed and professional teachers in charge of the teaching in combination with adequate resources constitute the basic prerequisites. However, nothing suggests that external control, centrally designed tests etc. support this work – on the contrary.

### **Swedish and Finnish parents read more aloud to their children**

If we are to determine the reason why for instance Finnish children of parents with only modest educational qualifications are doing relatively well in the PISA reading tests compared to Danish pupils, it will be necessary to take a look at the framework surrounding the school and its teaching. The percentage of working mothers in Finland is smaller than in Denmark and, as was already documented in the 'Nordlæs' report<sup>65</sup> from 1996, it is a fact that both Swedish and Finnish parents to a much greater extent than Danish parents stimulate their children by telling stories, playing with letters and words etc. According to Professor Gøsta Esping-Andersen's research within this field, this must be assumed to be a major reason why Finland and Sweden are scoring better in this PISA

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<sup>61</sup> *Forstå koderne (Learn how to decipher the codes)* Article in 'Folkeskolen', Thursday, 20 March, 2003

<sup>62</sup> *Utbildningen i Finland*. Utdanningsstyrelsen 2003 (Education in Finland – Finnish Board of Education)

<sup>63</sup> *Den sociale arv og mønsterbrydere (Social inheritance and pattern-breakers)*, Elsborg, Steen et al. Denmark's Pedagogical Institute, 1999

<sup>64</sup> *Vi ødelægger børns demokrati (We destroy the democracy of our children)*. Feature article by Bo Jacobsen, Politiken 11 May 2004

<sup>65</sup> Sommer, Marianne, Jytte Lau and Yesn Mejding: *Nordlæs - en nordisk undersøgelse af læsefærdigheder i 1.-3. klasse (Nordlæs – a Nordic survey of reading literacy in grades 1.3)*, Denmark's Pedagogical Institute, 1996



survey. There is a clear potential in increased focus on the role of parents in relation to the efforts of both day care institutions and the school. This area should be further developed in co-operation with the parents' boards of both day care institutions and schools.

BUPL (the union of early-childhood teachers) and The Danish Union of Teachers have prepared a number of concrete proposals for how<sup>66</sup> concept formation, attention to language etc. in children from disadvantaged families may be improved by a focused effort in which the various categories of teachers complement each other. Early-childhood teachers have theoretical and practical expertise on children's development, needs and interests, on playing, friendship and conflicts, which may support the school's efforts to break social inequality and marginalise as few children as in any way possible. This may contribute to children taking part in self-organised games, for instance, which stimulate language development.

Co-ordinated co-operation between early-childhood teachers, pre-school class teachers and teachers on the transition from day care institution to school and leisure-time institution will especially be beneficial to socially disadvantaged children. Early-childhood teachers and teachers are not to take over each other's functions but must co-operate and co-ordinate their efforts in order to provide the best possible conditions for the children's overall development.

### ***Ability is contagious***

In his analysis of the PISA survey, Professor Niels Egelund<sup>67</sup> from Denmark's University of Education states that academic ability is contagious. If you attend a class with many good pupils, you get stimulated, which will increase your ability to a higher level than would otherwise have been the case. On the other hand, if you attend an academically weak class, it is very likely that you will not exploit your academic potential to the full. This correlation results in special problems in Denmark, where our town planning, as opposed to the Finnish, tends to limit social dispersion. We huddle together in ghettos. In Denmark subsidised housing is placed in one corner of the municipality, private residential housing in another, and that influences the academic results of the schools. Pupils from academically weak environments will be going to school with others in the same situation and vice versa.

Professor Egelund's analyses support a survey conducted by the Economic Council of the Labour Movement and Bureau 2000<sup>68</sup>. Their survey showed that 68 per cent of children from Copenhagen who in 1981 came from disadvantaged families but attended school with many advantaged pupils had managed, by 2001 as adults, both to complete an education and to find a foothold in the labour market. Whereas only 48 per cent of the socially disadvantaged children in 1981 who attended school with similarly disadvantaged children had completed an education and found a job by 2001.

At the same time, the survey shows that things are going in the wrong direction, resulting in increasing polarisation. In the most disadvantaged fourth of the schools there are now more pupils with a disadvantaged background and fewer from advantaged homes than in 1981. At other schools the situation is the reverse with more pupils from advantaged homes and fewer socially disadvantaged pupils than in 1981.

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<sup>66</sup> *Notat om rummelighed*, BUPL og DLF, september 2003

<sup>67</sup> *Sådan bliver eleverne dygtige (How to make the pupils better)*, article in 'Folkeskolen', Thursday 28 February 2002

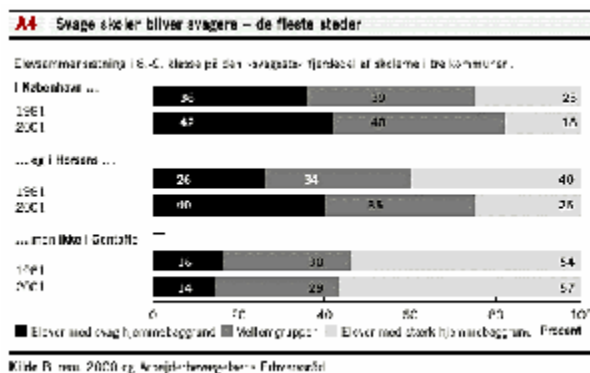
<sup>68</sup> *The Folkeskole splittes i to, (The Folkeskole is split into two)* Ugebrevet A4, 17 November 2003



In the most disadvantaged fourth of the schools in Copenhagen, 42 per cent of pupils today come from a disadvantaged family. Only eighteen per cent come from advantaged families. At 21 out of 52 schools in Copenhagen, more than thirty per cent of pupils come from disadvantaged families. The same is true of a number of schools in Århus, Odense and other major provincial towns.

**Weak schools becomes weaker – in most places.**

*Composition of pupils in 8-9 grade in the weakest fourth of schools in three local authority areas*



■ Pupils with a weak family background □ Intermediate group □ Pupils with a strong family background

In connection with the above-mentioned survey, Professor Erik Hansen, Denmark’s University of Education, concluded that breaking the social inheritance is inconceivable as long as the residential areas are as separate as they are.

It should be added that the Fins themselves claim<sup>69</sup> that an important reason for the relatively modest variation in pupil results is the widespread social equality of their schools. Compared with Denmark, it is very difficult to establish private schools in Finland.

**Free school meals - the way ahead**

A large number of surveys<sup>70</sup> have demonstrated that a correct diet facilitates the ability to learn. The ability to concentrate, in addition to both physical and mental endurance and capacity for problem solving, is increased considerably with the right nutrition, which will also affect the child in a positive way.

The evaluation of the American project ‘Head Start’, which launched a number of goal-oriented in-schooling projects, particularly aimed at especially disadvantaged children and families, clearly showed that a healthier diet had a positive effect on both their learning, their health and their socio-emotional characteristics

It is characteristic of the other Nordic countries that they have maintained the free school meal for everyone. The fact that pupils eat a nutritional hot meal together in the middle of the school day is singled out by the Fins<sup>71</sup> as an important factor in their work to create the basis of social equalisation.

<sup>69</sup> *The Finnish model.* Working paper by Pirjo Linnakylä, 2003, Institute for Educational Research, University of Jyväskylä

<sup>70</sup> *Kost, adfærd, indlæring, (Nutrition, behaviour, learning)* Frede Bräuner, 2002, Klim

<sup>71</sup> *The Finnish model.* Working paper by Pirjo Linnakylä, 2003, Institute for Educational Research, University of Jyväskylä



In Denmark it has been many years since we abolished the act on school meals from 1902. Instead, we are now opening up for school-meal schemes that are fully financed by the parents. Which is likely to intensify social injustice.

### ***Parents with no work experience place bilingual pupils at a disadvantage***

It is to be assumed that bilingual pupils account for a large section of the Danish pupils whose parents only have little educational background and who are not scoring satisfactorily in the PISA reading tests. In this connection it is relevant to note that surveys<sup>72</sup> show that for young second-generation immigrants it is not the education or income of their parents which is of the greatest importance to their social mobility. It is rather their parents' work experience which has the greatest impact.

Canada has been singled out as a country where children of immigrants are doing relatively well at school. According to the latest figures from the Ministry of Integration<sup>73</sup>, Canada is the country in which foreigners are best integrated in the labour market. The rate of participation in economic life for foreigners is almost as large in Canada as it is for Canadian nationals. Whereas Denmark is the country with the lowest employment rate among foreign nationals from non-western countries. Only 42.9 per cent of such foreign nationals are associated with the labour market in Denmark.

With our knowledge of what is of key importance to the social mobility of young second-generation immigrants, it seems obvious to assume that the most important reason why children of immigrants are doing relatively better, academically speaking, in Canada than in Denmark, must be a generally good integration policy. A labour market with room for the parents of bilingual pupils is of decisive importance to acting successfully in relation to these pupils.

In contrast to Denmark, Sweden and Finland have maintained mother-tongue teaching, and bilingualness is seen as a strength. At the beginning of 2002, the educational committee of the Danish parliament went on a study visit to the Nordic countries to discover why pupils there scored so well in the PISA tests. In her weekly letter, Mrs Marianne Jelved concluded as follows: "In Sweden it is considered an invaluable advantage for children to be able to speak many languages. It is also an advantage to Sweden in the future, for as a nation and society Sweden must be able to do well in international contexts. The children must have a good command of their mother tongue. This is a language they already have. They must keep it and become good at speaking it. Then, of course, they must learn Swedish and be good at it. Finally, they have to learn English, German, French etc. Throughout their years at school, the number of foreign languages is increased. Both Sweden and Finland have had the experience that if you learn one language in addition to your mother tongue, it will be much easier to learn more foreign languages". In the Danish Union of Teachers we agree that it is important to focus on the potential of children with other ethnic backgrounds than Danish, as represented by their mother tongue, and we have previously issued material<sup>74</sup> with recommendations that we strengthen integration at school.

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<sup>72</sup> Rosholm et al, *Integration over generationer? Andengenerationsindvandrerne's uddannelse. (Integration across generations. The education of second-generation immigrants)* Article in *Nationaløkonomisk tidskrift* no. 140

<sup>73</sup> Udlændinge- og integrationspolitikken i Danmark og udvalgte lande (The policy towards foreigners and integration in Denmark and selected countries) The Ministry of Refugees, Immigrants and Integration 2004

<sup>74</sup> *The school of the community in a multi-ethnic society*, The Danish Union of Teachers, 2002



**A great effort must be made to ensure that a poor social background does not have any negative impact on the child's opportunities, therefore the Danish Union of Teachers recommends:**

- *A national action plan to counter the effect of ghettoisation. The action plan must include elements of employment policy, housing policy and educational policy.*
- *The municipalities must establish socially balanced school districts. A free choice for the most advantaged must not be at the expense of the disadvantaged.*
- *The school's integrational efforts towards bilingual pupils and their parents must be supplemented with initiatives that focus on employment and housing.*
- *Schools and institutions must prepare action plans to help parents support the school or institution in its work. Parents' boards play a key role in these efforts.*
- *The class and the classroom must be strengthened.*
- *Increased focus on socially disadvantaged children through co-operation between early-childhood teachers, pre-school class teachers and teachers*
- *Free meals for all pupils.*



## Evaluation creates the basis for dialogue

Development of teaching takes place in the actual teaching situation. As a consequence, evaluation today should be a natural part of a professional teacher's work. Among other things, the Danish Union of Teachers' professional ideal<sup>75</sup> holds forth that "the teacher will reflect on and actively develop teaching practices" and "will enter into partnerships with colleagues based on equality and loyalty and accept co-responsibility for joint professional and pedagogical reflection and development". Continuous evaluation gives rise to reflection and enables teachers to further develop the professionalisation of their work in co-operation with colleagues. Evaluation helps put what happens during lessons into words. And that provides the basis for a sensible dialogue with pupils, parents, politicians and population on the quality of the school's work.

Therefore there is every reason to consider initiatives which may urge the teachers to use evaluation tools. However, it is of key importance that this does not lead to any limitation of teaching practices. The teaching must be based on the pupils' development and not on statistical statements of narrow test results. The PISA 2000 survey<sup>76</sup> concluded that the countries in which teachers possessed a high level of academic knowledge and autonomy in the choice of teaching methods and materials scored the highest. The more decisions the individual school and the individual teacher were able to take themselves in relation to their teaching, the greater the sense of responsibility, flexibility and creativity in relation to the teaching, which again led to better results for the pupils.

PISA 2000 also showed that Finland is the OECD country that allows the greatest freedom to the individual teacher<sup>77</sup>. The Finnish Board of Education emphasises that their school system is not based on inspections and control but on faith in the school and faith that teachers will work professionally on the basis of the targets set. Choice of teaching materials and methods is the exclusive prerogative of the teachers. Thus, it is characteristic of the Finnish basic school that it does not have any national school-leaving test. Before the Fins knew their good results from PISA 2000, they initiated a project to prepare more detailed curricula. But the professional teacher's choice of method etc. remains the basis of the Finnish school system<sup>78</sup>. Comparison of tests and publication of marks do not take place in Finland.

On the basis of an overall analysis of the participating countries, Andreas Schleicher, head of the OECD's Education Indicators and Analysis Division, the man responsible for the PISA survey, emphasised that the amount of knowledge at the individual school and possessed by the individual teacher, in combination with the teachers' possibilities for making independent decisions and assuming professional responsibility, plays a key part in enabling the pupils to benefit from the teaching.<sup>79</sup> And Mr Schleicher has illustrated this by means of the model<sup>80</sup> shown overleaf.

The model for a new agreement on working hours presented by the Danish Union of Teachers in connection with the coming round of collective bargaining for teachers is based on the same kind of thinking.

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<sup>75</sup> *Professional ideal for The Danish Union of Teachers*, 2002 [www.dlf.org](http://www.dlf.org)

<sup>76</sup> *The learning environment and the organisation of schooling* in Knowledge and Skills for Life. OECD 2001

<sup>77</sup> *Utbildningen i Finland. (Education in Finland)* Utbildningsstyrelsen 2003 (The Finnish Board of Education)

<sup>78</sup> *Grundskolan förnyas (Renewal of the basic school)*. Utbildningsstyrelsen, 2004

<sup>79</sup> Præsentation på EI's møde i Firenze 17. november 2003 (Presentation at EI meeting in Florence on 17 Nov. 2003) see [http://www.ei-ie.org/events/english/oeed/2003/2003\\_oeed\\_presentation\\_schleicher1\\_e.ppt](http://www.ei-ie.org/events/english/oeed/2003/2003_oeed_presentation_schleicher1_e.ppt)

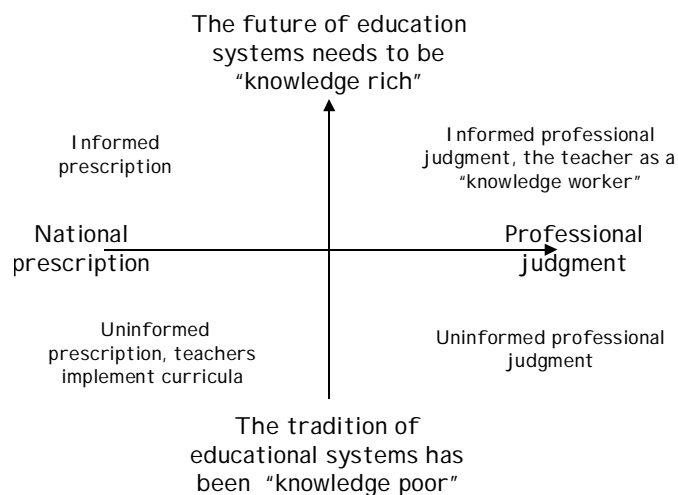
<sup>80</sup> Ibid





It is based on the idea that by virtue of his/her education and professionalism, the teacher must assume responsibility for the teaching. The school management has general responsibility for the school, but in co-operation with colleagues the individual teacher must assume responsibility for prioritising the tasks and deciding what methods, materials and educational content will be best suited for any specific educational target. This is a prerequisite for the best possible teaching in relation to any specific situation.

### One challenge - different approaches



*The head of the OECD's Education Indicators and Analysis Division, Andreas Schleicher, used this illustration to conclude on the PISA 2000 results. It does not represent a standardised "method" of how to meet the future challenges in the educational system. What determines success is a system that focuses on increasing the qualifications of individual schools and teachers. The amount of knowledge of the individual school and teacher, in combination with the possibility for making your own decisions and assuming professional responsibility are of key importance to the pupils' benefit. National standard solutions do not allow sufficient space to deal with the problems of the individual pupil.*

And experience from, among others, the UK<sup>81</sup> does show that national tests<sup>82</sup> do not support a positive development of the schools. Rather, they narrow down the scope for action. Such narrowing down has proven destructive to the broadness of the schools and will be contrary to the unique and real purpose of the Danish Folkeskole. Test results and marks are used as a basis for ranking schools, which has led to dramatic consequences, including the draining of pupils and teachers from some schools. The test results have not given the public any fair impression of the quality of the schools. Instead they have restricted the schools in their activities and have transformed constructive dialogue on the development of the schools into a destructive trench war.

In The Danish Union of Teachers we have endeavoured to support the teachers in their evaluation work. One way of doing that has been the project 'Implementing evaluation<sup>83</sup>', showing how self-evaluation may be used in the daily teaching. The idea behind the project was to bring the work of evaluation into close contact with daily teaching practices and to make methods and tools easily available and unbureaucratic in daily use. The experience gained from the project was good – and demonstrated a lot of good will on the part of teachers in relation to developing their working practices and sharing their knowledge about such practices.

In 2002 the Danish Institute of Evaluation prepared a so-called map of self-evaluation in the Danish Folkeskole.<sup>84</sup> The survey shows that 83 % of the schools that participated in the questionnaire have

<sup>81</sup> [www.teachers.org.uk](http://www.teachers.org.uk)

<sup>82</sup> *Ofsted* (Office for Standards in Education)

<sup>83</sup> *På vej med evaluering (Implementing evaluation)* DLF 1999

<sup>84</sup> *Selvevaluering i praksis (Self-evaluation in practice)* . Denmark's Institute of Evaluation, 2002



evaluated their activities or parts of them within the past three years. This experience is supported by the Institute's survey of English teaching<sup>85</sup>. It shows that the teachers want to develop their evaluation competencies, but a number of them feel uncertain about how to tackle the job. Therefore, the choice of evaluation tools is partly characterised by tradition and underrepresentation of new forms of evaluation. Therefore, there is good reason for launching a goal-oriented initiative to support the teachers in professional use of various evaluation tools in their teaching.

### ***A culture of evaluation under way at many schools***

Many schools are in the process of developing an evaluation culture in which tools employed in the teaching process are used for forward-looking evaluation, focusing on where you are in relation to a future goal. Log books and portfolio evaluation are examples of evaluation tools which today are relatively widely used in the school. As a supplement to these tools, the teacher will regularly assess the pupils in well-defined skills, such as testing of arithmetic or spelling.

Many schools and teachers are also well on the way. The following description of Egedalsskolen<sup>86</sup> in Karlebo municipality concretises the deliberations of an ordinary school and defines the framework that must be present in order to support a school in which the required knowledge-sharing can take place.

Egedalsskolen has been making a targeted effort with evaluation for a number of years. The teachers work in self-governing teams in accordance with an annual standard, but with flexible planning. This type of organisation has created a need for clarification of the mutual expectations of the collaborators. The team's most important tool for control and development, thus, is an annual plan consisting of targets, action plan and type of evaluation for each year group.

Each year-group team prepares an annual plan for the team. The annual plan must include targets and action plans for the subject-related and cross-curricular elements of the teaching, the well-being and development of the pupils, parent-school co-operation and the team's work. The plan must include pedagogical and didactic considerations of how the teaching can enable the pupils to reach the goals of the individual subjects. As a tool for the preparation of the annual plan, the Ministry of Education's Quality Star<sup>87</sup> is used. The annual plan is an internal development document which is placed on the school's intranet.

In addition to that, an external annual plan is prepared, and this plan is distributed to the parents and is placed on the school's homepage. Furthermore, it is presented to the parents at parent-teacher meetings.

Annual and action plans are seen as a tool for dialogue. They are evaluated by the team, in addition to which they are discussed at two annual conferences between the team and the school management. The first team conference is held in September/October, at which the team discusses the annual plan for the class. The second team conference is in February/March. At this meeting the parties discuss how the targets and plans are coming along, i.e. a joint evaluation of the annual plans.

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<sup>85</sup> *Engelsk i grundskolen (English in basic school)*. Denmark's Institute of Evaluation, 2002

<sup>86</sup> [www.egedalsskolen.dk](http://www.egedalsskolen.dk)

<sup>87</sup> The quality star is a model for development which has been developed by the Ministry of Education. See also [www.kif.emu.dk/uvmproject/login.jsp#](http://www.kif.emu.dk/uvmproject/login.jsp#)



While the individual teachers and teams are responsible for evaluating the teaching, a co-ordination and development group consisting of representatives of both teachers and management has been established. The teachers are represented by their union representative. The group is responsible for development and evaluation of all the school's activities. This includes structure of meetings, the school's competence centre and the established action areas. For these purposes no fixed type of evaluation is used. Rather, it is decided from time to time what method will be best suited for evaluating the area concerned. Moreover, the group is responsible for communicating the results of the evaluations internally at the school.

### ***Evaluation is necessary but requires many resources***

In Boston, USA, the Harvard Graduate School of Education has carried out a development project with ten schools in which teachers and researchers together have developed a number of tools to further the teachers' possibilities of making methodical decisions based on the pupils' evaluation results. The experiment showed that it was possible to give the teachers useful knowledge about the teaching but also that much time and many resources had to be allocated to develop tools – and to train teachers in analysing and using the knowledge acquired in their teaching.

A similar conclusion is reached by a working group established by the Danish Board of Education. The report 'The future of education. *The new professionalism and its prerequisites*'<sup>88</sup> concludes that widespread use of national, standardised tests requires establishment of a national testing programme. Development of reliable and adequate tests in such a testing programme will demand considerable resources and may economically be compared to the current focus on buying computers for pupils in the Folkeskole. According to the working group, the evaluation tool is a double-edged sword which must be used for well-defined and specific purposes and only by actors having the required qualifications.

Incompetent handling of evaluation very easily undermines the preconditions of professionalism and may be costly – both in terms of human resources and financially. Therefore, it is important to focus on development of evaluation qualifications among the actors in the educational system. The working group appointed by the Board of Education recommends as follows:

- Teachers and managers in the educational system should locally give a higher priority to the development and the strengthening of an evaluation culture and evaluation practice. A qualifications approach must be used in describing the aims and methods of the evaluation.
- The Ministry of Education should implement centrally controlled experiments to ensure new forms of evaluation and teaching. Danish and international research environments must be involved in this work.
- Provision and use of instruments for formative evaluation must be intensified. Collaboration on this must take place at the individual educational institution (e.g. in subject-related teams or general teacher teams), at regional level (in terms of in-service and further training) and involving relevant research institutions. It is the responsibility of the individual institutional management to ensure the development of this co-operation.
- The Ministry of Education is recommended to ensure that Denmark increase its commitment to follow-up research and accumulation of experience in the wake of the international, comparative surveys in which the country participates. At the same time it is recommended that stan-

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<sup>88</sup> *Fremtidens uddannelser. Den ny faglighed og dens forudsætninger (The future of education. The new professionalism and its prerequisites)*. The Ministry of Education, 2004



standardised national tests only be introduced to a very limited extent, and if so only on a solid didactic basis that suits the subject in question.

Knowledge-sharing and co-operation are necessary in order for the schools to develop and adjust in relation to changing requirements and conditions. Only by showing trust in the teachers' willingness, responsibility and ability to perform with quality will we be able to foster a working culture characterised by commitment and the joy of working and in which the individual will find it natural to make his/her knowledge available to others. In addition to mutual trust, such knowledge-sharing presupposes joint reflection among teachers and among teachers and management as to the performance of their joint responsibilities.

**The teacher's evaluation of the concrete teaching is of key importance to the development of quality in the school. In order to strengthen continuous evaluation in the Folkeskole, the Danish Union of Teachers recommends:**

- *Strengthening of the evaluation culture in the Folkeskole.*
- *Evaluation must support the development of teaching and must not turn into a bureaucratic burden.*
- *Teachers, pre-school class teachers and school principals must jointly develop a form of continuous evaluation.*
- *The Ministry of Education, Local Government Denmark and the Danish Union of Teachers must make continuous evaluation their common action area in the school year 2005/2006.*
- *The three parties must jointly issue inspirational material to the schools.*
- *At the end of the year, the individual school must be obliged to give an account of how it has carried out its responsibilities.*



## Appendix A

# Survey of initiatives to improve the teaching of selected subjects

In April and May 2004, the Danish Union of Teachers carried out a survey of initiatives to improve the teaching of reading, 'nature and technology' and physics/chemistry. The survey was conducted by asking local branches of the Danish Union of Teachers to answer a questionnaire on the state of conditions in each of the municipalities for which the Branch is responsible and of which it has local knowledge.

The results of the survey are presented in the tables below. The results are based on conditions in 165 municipalities out of 271, giving a response rate of 61.

### 1. Reading

<b>Table 1.1 Have municipal initiatives been taken within the past ten years to improve the teaching of reading?</b>	<b>Percentage of municipalities</b>
Yes	<b>81%</b>
No	<b>15%</b>
Don't know	<b>4%</b>
Total (165 municipalities)	<b>100%</b>

<b>Table 1.2. In addition to any municipal initiatives, does the Branch know of any initiatives at school level to improve reading (within the past ten years) ?</b>	<b>Percentage of municipalities</b>
Yes	<b>83%</b>
No	<b>17%</b>
Total (163 municipalities)	<b>100%</b>



<b>Table 1.3. Percentage of municipalities in which initiatives have been taken to improve reading at municipal and/or school level</b>	
Percentage of municipalities in which the Branch is aware of initiatives at municipal level	81%
+ Percentage of municipalities in which the Branch is aware of initiatives at school level – but not at municipal level	13%
= Percentage of municipalities in which the Branch is aware of initiatives at municipal and/or school level	94%

<b>Table 1.4. Does the Branch view these initiatives to have given better results in terms of reading literacy?</b>	<b>Percentage of municipalities</b>
Yes, very much so	27%
Yes, to some extent	56%
No, not at all	0%
Don't know	17%
Total (153 municipalities)	100%

## **2. 'nature and technology'**

<b>Table 2.1 Have municipal initiatives been taken within the past ten years to improve 'nature and technology'</b>	<b>Percentage of municipalities</b>
Yes	<b>24%</b>
No	<b>64%</b>
Don't know	<b>13%</b>
Total (165 municipalities)	<b>101%</b>



<b>Table 2.2. In addition to any municipal initiatives, does the Branch know of any initiatives at school level to improve the teaching of 'nature and technology' (within the past ten years) ?</b>	<b>Percentage of municipalities</b>
Yes	43%
No	57%
Total (162 municipalities)	100%

<b>Table 2.3. Percentage of municipalities in which initiatives have been taken to improve 'nature and technology' at municipal and/or school level</b>	
Percentage of municipalities in which the Branch is aware of initiatives at municipal level	24%
+ Percentage of municipalities in which the Branch is aware of initiatives at school level – but not at municipal level	27%
= Percentage of municipalities in which the Branch is aware of initiatives at municipal and/or school level	51%

<b>Table 2.4. Does the Branch view these initiatives to have given better results in 'nature and technology'?</b>	<b>Percentage of municipalities</b>
Yes, very much so	5%
Yes, to some extent	51%
No, not at all	1%
Don't know	43%
Total (82 municipalities)	100%



### 3. Physics/chemistry

<b>Table 3.1 Have municipal initiatives been taken within the past ten years to improve physics/chemistry</b>	<b>Percentage of municipalities</b>
Yes	<b>12%</b>
No	<b>76%</b>
Don't know	<b>13%</b>
Total (165 municipalities)	<b>101%</b>

<b>Table 3.2. In addition to any municipal initiatives, does the Branch know of any initiatives at school level to improve teaching of physics/chemistry (within the past ten years) ?</b>	<b>Percentage of municipalities</b>
Yes	25%
No	75%
Total (164 municipalities)	100%

<b>Table 3.3. Percentage of municipalities in which initiatives have been taken to improve physics/chemistry at municipal and/or school level</b>	
Percentage of municipalities in which the Branch is aware of initiatives at municipal level	12%
+ Percentage of municipalities in which the Branch is aware of initiatives at school level – but not at municipal level	17%
= Percentage of municipalities in which the Branch is aware of initiatives at municipal and/or school level	29%





<b>Table 3.4. Does the Branch view these initiatives to have given better results in physics/chemistry?</b>	<b>Percentage of municipalities</b>
Yes, very much so	4%
Yes, to some extent	49%
No, not at all	2%
Don't know	44%
Total (45 municipalities)	99%



## Appendix B

# Survey of the conditions for teaching selected subjects

In April and May 2004, the Danish Union of Teachers carried out a survey of the conditions for the teaching of 'nature and technology' as well as physics/chemistry. The survey was conducted by asking teachers of these subjects at 40 schools to answer, through their union representatives, a questionnaire about existing conditions for teaching the subjects. The 40 schools were selected at random, but steps were taken to ensure that the schools display a suitable variation in terms of geography and size.

The Union has received replies from teachers at 35 out of 40 schools. For 33 of these schools – based on special registration – we have been able to compute the following response rates:

- 78 % of the teachers teaching Danish in grades one, two, six and seven have answered a questionnaire on the existing conditions for the teaching of reading
- 83% of the teachers teaching 'nature and technology' have answered a questionnaire on the existing conditions for 'nature and technology'
- 91% of the teachers teaching physics/chemistry have answered a questionnaire on the existing conditions for physics/chemistry.

The results are presented in the tables below. In all tables, the computation of percentages has taking into account the actual number of teachers for whom it would make sense to answer the question. For instance, in table 1.2 only those teachers who state that they are trained teachers are included in the computation of the percentage of graduates from teacher training college with Danish as their main subject.

### 1. Reading

**The results for the teaching of reading are based on responses from 168 teachers teaching Danish in grades one, two, six or seven this school year**

Table 1.1. Do you have a degree from teacher training college?	
Yes	97%
No	3%



Total (168 teachers)	100%
Table 1.2. Did you specialise in Danish at teacher training college?	
Yes	43%
No	57%
Total (162 teachers)	100%

Table 1.3. What is the longest continuous period of in-service training in the teaching of reading that you have attended over the past ten years?	
No in-service training in the teaching of reading	29%
1-15 hours	23%
16-30 hours	21%
More than 30 hours	27%
Total (166 teachers)	100%

Table 1.4. Have you applied for in-service training in the teaching of reading within the past ten years and been rejected?	
Yes	31%
No	70%
Total (167 teachers)	101%



Table 1.5. To what extent, in your assessment, would more in-service training in the teaching of reading improve your qualifications for teaching the subject?

To a very high degree	26%
Very much	35%
Somewhat	36%
Not at all	3%
Total (168 teachers)	100%

Table 1.6 How do you rate the teaching materials available for the teaching of reading?  
*I find the materials for the teaching of reading:*

Very satisfactory	19%
Satisfactory	67%
Unsatisfactory	13%
Very unsatisfactory	1%
Total (167 teachers)	100%

Table 1.7. Have special initiatives been taken at your school within the past ten years to improve the teaching of reading (including the school's participation in municipal initiatives, if any)?

Yes	74%
No	7%
Don't know	20%
Total (168 teachers)	101%



Table 1.8. In your opinion, have these initiatives contributed to improving the teaching of reading?	
Yes, very much so	35%
Yes, to some extent	59%
No, not at all	2%
Don't know	5%
Total (123 teachers)	101%

## 2. 'nature and technology'

**The results for 'nature and technology' are based on responses from 181 teachers teaching 'nature and technology' this school year**

Table 2.1. Do you have a degree from teacher training college?	
Yes	94%
No	6%
Total (180 teachers)	100%

Table 2.2. Were you admitted to teacher training college on the basis of an upper-secondary school-leaving exam, mathematics line (or other exam with similar science-related level)?	
Yes	61%
No	39%
Total (169 teachers)	100%



Table 2.3. Did you specialise in 'nature and technology' at teacher training college?	
Yes	5%
No	31%
The subject did not exist at the time	63%
Total (169 teachers)	99%

Table 2.4. Do you have one or both the subjects below as your main subject(s) from teacher training college?	
Physics/chemistry	14%
Biology	25%
None	60%
Both subjects as main subjects	1%
Total ( 169 teachers)	100%

Table 2.5. What is the longest continuous period of in-service training that you have attended in 'nature and technology' over the past ten years?	
No in-service training in 'nature and technology'	57%
1-15 hours	18%
16-30 hours	10%
More than 30 hours	14%
Total (180 teachers)	99%



Table 2.6. Have you applied for in-service training in 'nature and technology' within the past ten years and been rejected?	
Yes	18%
No	82%
Total (180 teachers)	100%

Table 2.7. To what extent, in your assessment, would more in-service training in 'nature and technology' improve your qualifications for teaching the subject?	
To a very high degree	37%
Very much so	31%
Somewhat	29%
Not at all	3%
Total (179 teachers)	100%

Table 2.8 How do you rate the physical framework at and around the school in relation to the experimental element of the subject 'nature and technology' (specifically special-subject rooms and/or access to nature)? <i>I find the physical framework:</i>	
Very satisfactory	13%
Satisfactory	41%
Unsatisfactory	32%
Very unsatisfactory	13%
Total ( 179 teachers)	99%



Table 2.9 How do you rate the teaching materials available for 'nature and technology' <i>I find the materials for 'nature and technology':</i>	
Very satisfactory	8%
Satisfactory	62%
Unsatisfactory	25%
Very unsatisfactory	6%
Total ( 179 teachers)	101%

### 3. Physics/chemistry

**The results for 'physics/chemistry' are based on responses from 181 teachers teaching 'physics/chemistry' this school year**

Table 1.1. Do you have a degree from teacher training college?	
Yes	97%
No	3%
Total (69 teachers)	100%

Table 3.2. Were you admitted to teacher training college on the basis of an upper-secondary school-leaving exam, mathematics line (or other exam with similar science-related level)?	
Yes	82%
No	18%
Total (67 teachers)	100%





Table 3.3. Did you specialise in 'physics/chemistry' at teacher training college?	
Yes	66%
No	34%
Total (67 teachers)	100%

Table 3.4. What is the longest continuous period of in-service training that you have attended in 'physics/chemistry' over the past ten years?	
No in-service training in physics/chemistry	44%
1-15 hours	20%
16-30 hours	12%
More than 30 hours	25%
Total (69 teachers)	101%

Table 3.5. Have you applied for in-service training in physics/chemistry within the past ten years and been rejected?	
Yes	35%
No	65%
Total (69 teachers)	100%



Table 3.6. To what extent, in your assessment, would more in-service training in physics/chemistry improve your qualifications for teaching the subject?	
To a very high degree	28%
Very much so	28%
Somewhat	41%
Not at all	4%
Total (69 teachers)	101%

Table 3.7. Are special-subject rooms available for physics/chemistry?	
Yes	99%
No	1%
Total (69 teachers)	100%

Table 3.8 How do you rate these special-subject rooms? <i>I find the special-subject rooms in physics/chemistry</i>	
Very satisfactory	29%
Satisfactory	38%
Unsatisfactory	18%
Very unsatisfactory	15%
Total ( 68 teachers)	100%



Table 3,9. How do you rate the teaching materials available for physics/chemistry? <i>I find the teaching materials available for physics/chemistry:</i>	
Very satisfactory	23%
Satisfactory	57%
Unsatisfactory	16%
Very unsatisfactory	4%
Total ( 69 teachers)	100%