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DIRECTORATE FOR EDUCATION
CENTRE FOR EDUCATIONAL RESEARCH AND INNOVATION (CERI) GOVERNING BOARD

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NATIONAL REVIEW ON EDUCATIONAL R&D: EXAMINERS' REPORT ON DENMARK

To be held in Room 1, OECD Headquarters, 27-28 October 2004

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English - Or. English

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NOTE BY THE SECRETARIAT

Examiner's report on Mexico

1. The Examiners' Report on Denmark is the fourth OECD review of a Member country's educational R&D policy. The first three reports on, respectively, New Zealand, England and Mexico, were previously presented and discussed at the CERI Governing Board meetings in autumn 2001 and 2002 and in spring 2004.

2. The purpose of the OECD/CERI reviews of educational R&D is to assess the extent to which the educational R&D system within a country is functioning as an effective means for creating, collating and distributing the knowledge that teachers and policy-makers can draw on. Thus, the attached examiners' report on Denmark's educational R&D can be viewed as an evaluation of the effectiveness of Denmark's educational R&D system in developing and applying useable knowledge to improve the quality of educational practice and policy.

3. The review also suggests a generic template of educational R&D, which is a model for the evaluation (or self-evaluation) of an educational R&D system. The template does not prescribe the form an educational R&D system ought the take. Instead, it outlines the main dimensions of an R&D system and the issues to which such a system needs to respond if it is to be efficient and effective. The template has been applied to the Danish educational R&D system in the third section of the review report as an evaluation tool that highlights strengths on which to build and weaknesses that might require attention and action. It is suggested that it could be used by any country wishing to evaluate its educational R&D system and in future OECD educational R&D reviews. The suggested template is foremost relevant for an educational R&D system for schools but could possible be adapted also to better include and educational R&D system for higher education and lifelong learning.

4. The Examiners' Report on Denmark's educational R&D system is attached. A Background Report for the review prepared by the Danish Ministry of Science, Technology and Innovation is available as a Room Document.

5. The review team was composed of David Hargreaves, Fellow of Wolfson College, Cambridge, former Professor of Education at the University of Cambridge, and former Chief Executive of the Qualifications and Curriculum Authority; Elaine El-Khawas, Professor in education policy at George Washington University and Director of the ERIC Clearinghouse on Higher Education; and Mats Ekholm, Director General at the Swedish Ministry of Education and former Professor in Education and leader of the research group on school development and socialisation at the University of Karlstad.

6. At the CERI Governing Board, Elaine El-Khawas and Mats Ekholm will present the examiners' recommendations for Denmark's educational R&D system, and representatives from the Danish Ministry

of Education and the Danish Ministry of Science, Technology and Innovation will respond to them. The Members of the CERI Governing Board will subsequently be invited to comment on and discuss the examiners' report.

7. The OECD/CERI reviews on educational R&D systems is closely related to the work on evidence-based policy research in education (EDU/CERI/CD(2004)11. It is the intention to finalise a CERI report in 2006 on evidence-based policy research in education and the reviews would make a valuable contribution in contextualising such policies through a comparative analyses.

8. The Governing Board is invited to:

- NOTE the Examiners' Report and the Background Report on Denmark's educational R&D system;
- COMMENT on the Examiners' Report in the light of the presentations;
- ADVISE on the quality, relevance and coherence of the proposed template for evaluation of an educational R&D system ;
- NOTE that the OECD Secretariat will subsequently publish both the Examiners' Report and the Background Report on Denmark's educational R&D system.

FOREWORD

1. The Examiners' Report on Denmark is the fourth OECD review of a Member country's educational R&D policy. The first three reports were respectively on New Zealand, England and Mexico. The review report on New Zealand and England are published in the OECD publication *New Challenges for Educational Research* (CERI, 2003).

2. The purpose of the OECD/CERI reviews of educational R&D is to assess the extent to which the educational R&D system within a country is functioning as an effective means for creating, collating and distributing the knowledge that teachers and policy-makers can draw on. Thus, the attached examiners' report on Denmark's educational R&D is an evaluation of the effectiveness of Denmark's educational R&D system in developing and applying useable knowledge to improve the quality of educational practice and policy.

3. The work on educational R&D reviews came out of the generic work on knowledge management at OECD's Centre for Educational Research and Innovation (CERI) with the two central publications on *Knowledge Management in the Learning Society* (CERI, 2000) and *Innovations in the Knowledge Economy: Implications for education and learning systems* (CERI, 2004). Both publications make a strong plea for creating better knowledge bases for determining educational policy and practice given that the rate, quality and success in knowledge creation, mediation and application are relatively low in the education sector compared with other sectors such as health and engineering.

4. The Examiners' Report on Denmark's educational R&D system is based on the background report prepared by the Danish Ministry of Science, Technology, and Innovation in collaboration with the Danish

Ministry of Education, entitled *Education research and development in Denmark;* on reports from several research institutes engaged in educational R&D; and not least on interviews with stakeholders in the Danish educational R&D system.

5. The interviews were carried out in a friendly atmosphere and the review team would like thank all the people who contributed to the interviews for their openness and eagerness to discuss the Danish educational R&D system. The review team would especially like to express its thanks to Rene Bugge Bertramsen, Gitte Duemose and Jens Peter Jakobsen from the Ministry of Science, Technology and Innovation and Uffe Toudal Pedersen, Torben Kornbech Rasmussen, and Jørn Skovsgaard from the Danish Ministry of Education who were very helpful in responding to our requests and questions.

6. The review team was composed of David Hargreaves, Fellow of Wolfson College, Cambridge, former Professor of Education at the University of Cambridge, and former Chief Executive of the Qualifications and Curriculum Authority; Elaine El-Khawas, Professor in education policy at George Washington University and Director of the ERIC Clearinghouse on Higher Education; and Mats Ekholm, Director General at the Swedish Ministry of Education and former Professor in Education and leader of the research group on school development and socialisation at the University of Karlstad. Senior Analyst Kurt Larsen, OECD/CERI assisted the review team in carrying out the review and in writing the review report.

1. OVERVIEW AND CONTEXT OF THE REVIEW

1.1. Purpose and scope

1. This report on Denmark's educational R&D is the fourth OECD review of a member country's educational R&D policy and system. The three previous OECD reviews of educational R&D were carried out respectively in New Zealand, England and Mexico. The aim of this report is to review Denmark's educational R&D system. It will also contribute to a general understanding of educational R&D issues and challenges common in other OECD nations by means of a generic template of an educational R&D system and the issues to which such a system needs to respond if it is to be efficient and effective. This report will use this template as the basis for analysing the strengths and weaknesses of the Danish educational R&D system.

2. The purpose of the OECD review of a national educational R&D system is to assess the extent to which it serves its function of creating, collating, distributing and applying the knowledge on which practitioners and policy makers can draw. The aim is broader and different from a traditional educational R&D review that focuses on the quality of the research. Rather each of these reviews should be considered as an evaluation of the R&D system which, if it functions properly, will produce high quality research that contributes to the knowledge base of policy makers and practitioners and may be applied by them to improve the education service within a country.

3. To carry out the review, we examined national initiatives, strategies and policies for educational research and development in Denmark. We considered the organization and resources of the educational R&D system. This led us from basic research to applied research, from interpretation and dissemination of educational R&D to policy and practice in education as a complex and non-linear process with feedback loops between applied research, on the one hand, and policy and practice, on the other (OECD, 2003). We decided to focus in particular on interactions between producers and users of educational R&D in the Danish national context - a key issue being whether its current educational R&D system supports processes that generate an innovative learning environment for the whole education system. The review notably extends to teachers and the impact of R&D on the daily practice of teaching and learning. Scientific knowledge is thus treated as an important complement to practical learning. Educational researchers in collaboration with teachers and others in the education system are held to have an important role in accumulating and codifying new knowledge in the innovation process.

4. The knowledge available to teachers and policy makers at various levels in the education system derives not solely from scientific research. Insights grounded in the knowledge and experience of reflective teachers play a significant role in decision making. Another important contribution to the knowledge base is derived from administrative actions, such as monitoring and evaluation programmes, which are initiated at various levels in the education system. Furthermore, educational statistics and indicators constitute an important element of the knowledge base.

5. In the following section we will examine the main characteristics of Denmark's educational R&D system.

1.2. Denmark's educational R&D system

6. This section provides a brief overview of the Danish educational R&D system in terms of funding, organisation and profile. This analysis is based on a background report prepared by the Danish Ministry of Science, Technology and Innovation in collaboration with the Danish Ministry of Education, entitled

Education research and development in Denmark, on reports from several research institutes engaged in educational R&D, and on interviews with stakeholders in the Danish educational R&D system.

1.3 Funding of educational R&D

7. As in the case of other countries, it is no easy task to quantify the overall educational R&D expenditure and its varied sources of funding. Often there is no common or agreed definition of educational R&D, especially when it comes to applied research, experiments and innovation in educational institutions taking place outside traditional research institutions. However, two reports[1] that examine the scope, scale and nature of Danish educational R&D are helpful in addressing these issues. Compared with the other countries that have participated in this series of OECD reviews, Denmark provides a relatively clear account of the scope and scale of educational R&D. Six sets of figures stand out.

- It is estimated that 245 full-time researcher equivalents were engaged in educational R&D in Denmark in 2004. This corresponds to an expenditure of 172 million DKK[2] in educational R&D and amounts to 0.15 % of annual total public expenditure on education in Denmark[3]. However, these numbers might be underestimated as they do not include all funded research addressing issues relevant to education carried out in other disciplines. Nor do they include applied research and development work carried out by CVUs (Centres for Higher Education[4]) that includes teacher training colleges) and in schools. Comparisons with other countries are difficult, but OECD (1995) provides some indicators that may be used for comparison. The level of educational R&D, as a percentage of total expenditure on education, averages about 0.27 per cent in six OECD countries for which data are available (Australia, Canada, Finland, Ireland, the Netherlands and Sweden). The Danish expenditure on educational R&D is therefore lower than the OECD average spending on educational R&D.

- It is estimated that there has been a growth in the number of full-time researcher equivalents from 210 in 1999 to 245 in 2004 - an increase of approximately 17 per cent.

- A large share of educational R&D funding comes from the Ministry of Science, Technology and Innovation, through its annual research budget for universities. It is estimated that around 65 to 75 per cent of the funding for educational R&D at Danish universities is financed from this source. The university departments engaged in educational R&D have a great deal of flexibility in choosing how to spend the basic resources they receive from the Ministry of Science, Technology and Innovation. Another 5 to 10 per cent of the resources for educational research are allocated from the Danish Research Council for the Humanities on the basis of research project applications. Approximately another 5 to 10 per cent of the research funding is provided by ministries and local administrations for specified research projects and the balance is made up

[1] Lars Geer Hammerhøj and Lars-Henrik Schmidt (1999): 'Danish research in education and educational theory and practices - a survey of the period 1994-99', The Danish National Institute for Educational Research and Carsten Elbro and Jens Rasmussen (2004): 'Contribution to Country Background Report on educational research in Denmark'.

[2] In this estimation, it is stipulated that each full-time research equivalent in educational R&D costs the same as the average cost of a full-time researcher in humanities. According to the Danish R&D statistics for the public sector in 2002, the average cost of a full-time researcher in humanities was approximately 700.000 DKK.

[3] According to the publication '*Facts and Figures: Education Indicators'*, June 2003 from the Danish Ministry of Education, the total public expenditure on education was around 111 billion DKK in 2002.

[4] The Act on CVUs mentions an option for CVUs to gain accreditation as "University Colleges" by a specified assessment process. However, so far none of the CVUs have completed such an assessment.

of grants from private foundations and international funds (10 to 15 per cent). The average figures for funding sources do, however, vary considerably across different research institutions engaged in educational R&D.

- According to the mapping of educational R&D projects during the period 2000-04, just under half of the projects were carried out by the Danish Pedagogical University (DPU), while the universities of Aalborg and Roskilde conducted 23 and 14 per cent respectively. About 20 per cent of the educational R&D projects are carried out by the other universities, two business schools (in Aarhus and Copenhagen) and a few other sector-related research institutions. The mapping exercise also reveals the small size of most R&D projects, typically involving less than one full-time equivalent researcher. It also concludes that there is a positive link between the size of a research centre and its productivity, i.e. the number of publications, including international publications, per full-time equivalent.

- There is a long tradition in Denmark for experimental and developmental work in the school sector, especially in connection with educational reform. These initiatives are managed by the Education Ministry, often in collaboration with local authorities or their representatives. In the public sector's research budget for 2004, about 95 million DKK was earmarked for experiments and developmental work in the budget of the Ministry of Education. Some of these resources were allocated to educational R&D projects based in universities, but most supported development and innovation projects in schools, with the purpose of strengthening the innovation and development capacity in the education sector.

- In the legislation of the CVUs, it is envisaged that they are 'research affiliated' and this is ensured through co-operation agreements between CVUs and relevant research institutions in Denmark (or other countries) on applied research projects or on professional development of CVU staff. The Danish Pedagogical University has a specific duty to help CVUs to be included in R&D projects. The teacher training colleges, which are part of the CVU sector, receive funding these activities from the Ministry of Education. The purpose of the 'research affiliation' of the CVUs is to ensure that CVUs have ready and on-going access to recent research-based knowledge, to develop the qualifications of CVU teaching staff, and to build bridges between 'scientific research' and 'applied research and development'. It is foreseen that the Ministry of Education will also fund 'knowledge centres' at the CVUs from 2005 at the level of 40 million DKK, but this sum is shared among all short and medium term higher education institutions including the CVUs. Furthermore, municipalities launch development activities in schools supported by consultants and researchers financed at the local level. Activities of this kind might very well include assistance from teacher training colleges.

1.4 Challenges to educational R&D in the recent past

8. Over the last ten to fifteen years there has been a greater political interest, both in the government and in the Parliament, to use educational R&D as one of the tools for addressing problems identified in the education system. The background report to this review describes a series of governmental initiatives to strengthen Danish educational R&D in general or in specific fields. Many of these initiatives have their roots in identified problems in education.

9. The new R&D initiatives in the fields of reading and natural sciences[5] may thus be related to the lower than expected results of Danish pupils' performance in international reading and science literacy surveys

[5] The Centre for Reading Research, The Centre for Research into Learning Mathematics and the Centre for Educational Development in University Science are such initiatives.

such as e.g. the OECD PISA (Programme for International Student Assessment) survey. The establishment of the Centre for Educational Development in University Science may be related to the fact that few students are studying natural sciences and engineering at a tertiary level and that this might have negative consequences for Denmark's competitiveness in the knowledge economy. The low levels of student interest in natural sciences and engineering (together with the lower than expected performance of Danish pupils in international tests of science literacy) might be related to the fact that up to a quarter of science teachers in the Danish primary and lower secondary school did not receive training in science during their initial teacher training or in their later in-service education and training.

10. Two major organisational initiatives have been taken during the last five years to strengthen educational R&D in Denmark.

11. First, the Danish Pedagogical University (DPU) was established by merging the Royal Danish School of Educational Studies, the Danish School of Advanced Pedagogy and the Danish Educational Institute. The aim was to create a leading international research university in education. Giving the DPU a stronger research mission implied that it no longer had responsibility to provide in-service training for teachers in primary and lower secondary schools. This responsibility would be assigned to the teacher training colleges at the CVUs. It is too early for us to judge the success of the DPU in becoming a leading research university in education: it takes time to merge three preceding institutions with different purposes and cultures into one and to generate sustainable and high quality research.

12. The second initiative was the creation of an independent R&D centre entitled Learning Lab Denmark (LLD). LLD aims to address societal problems related to learning through experimental and practice-oriented research and developmental activities. It tracks R&D across disciplinary and sector-specific borders. (As with the DPU, it is too early to judge the extent to which LLD has been able to fulfil its mission, which differs from that of a traditional research institute.) LLD became a formal part of DPU in 2001, but retains an independent Board.

13. The two initiatives are not, however, the result of a co-ordinated strategy for educational R&D in Denmark: they are individual governmental initiatives triggered by political responses to perceived problems in education or the educational R&D system, rather than part of a common national strategy or policy. Nevertheless they are of evident strategic importance.

1.5 The nature of educational R&D in Denmark

14. Much of the Danish educational R&D can be characterised as applied research that seeks solutions to practical questions in education, with less emphasis on developing, testing and advancing theory. Hammerhøj and Schmidt (1999) concluded that there is a general lack of basic research and, in particular, theoretical educational research in Denmark. Most research draws on theories and concepts from a broad range of academic disciplines, but is dominated by psychological and didactic/subject-specific disciplines. The spheres of political science, economics and law are much less in evidence.

15. There is a strong tradition of experimental and development work in schools as a route to innovation. This allows the Ministry of Education to pursue political priorities and reforms by targeting funding at such projects. Educational researchers are in many cases involved in the conceptualisation and evaluation of these initiatives. In Denmark the school system is highly decentralised. It provides substantial autonomy for local municipalities to manage schools and for individual teachers to decide the content of their teaching within a broad national curriculum. This may explain the review team's impression that there are few systematic mechanisms for accumulating and sustaining the knowledge gained from these developmental initiatives at the national level.

16. There are few examples of large scale educational R&D projects in Denmark. As already noted, the typical R&D project is small scale.

17. In contrast to many other OECD countries, the initial training of teachers in teacher training colleges in Denmark does not provide regular contact between trainee teachers and researchers. The curriculum for initial teacher training in Denmark does not include any systematic training on interpreting or applying research evidence - as is also the case in most other countries. This is an area for debate, since there is a distinct and highly significant trend within OECD countries to shift attention from inputs and processes to understanding what actually happens as a result of investments in education. Countries are now more concerned with the outcomes of education and how to measure them. The OECD Pilot review of the Quality and Equity of Schooling Outcomes in Denmark[6] points to the need for an 'evaluation culture' in Danish schools with larger emphasis on monitoring and evaluating the outcomes of the education systems. It is therefore important that teachers have skills in systematic reflection and interpretation of their teaching practices and outcomes. Training in such skills and the involvement of teachers in educational research and evaluation projects might be a step towards achieving this.

[6] OECD (2004): 'Pilot review of the Quality and Equity of Schooling Outcomes in Denmark,' Examiners' report, June 2004.

2. A GENERIC TEMPLATE OF EDUCATIONAL R&D

2.1 The need for a generic template

> The purpose of this activity is to review the extent to which the education R&D system within a country is functioning as a repository of knowledge on which practitioners and policy-makers can draw. The aim is broader than a traditional educational R&D review focused on the quality of the research delivered. The focus will rather be on an evaluation of the contribution of educational R&D to the knowledge base of education in the emerging learning society.
>
> ***OECD/CERI, September 2002***

18. Educational R&D may be understood as the production, distribution and application of knowledge in order to improve the education and training system. From this perspective, a review of educational R&D consists of an examination of how well these knowledge processes are managed. In most, perhaps all, countries educational R&D is not treated as itself being a system, one that is routinely documented and evaluated: it is, rather, the combined product of other explicit systems - institutions of higher education, teacher education and training, government programmes, school-based developments, teacher union activities, etc. A review of educational R&D thus entails an analysis of the different contributions these systems make and an evaluation of their overall quality and value.

19. There are now in existence many models for the evaluation (or self-evaluation) of schools. No equivalent models of educational R&D exist, mainly because it is not treated as distinct system in its own right. To remedy this, a generic template of educational R&D is outlined here. It does not prescribe the form an educational R&D system ought to take. Rather, it outlines the main dimensions of an R&D system and suggests the questions that such a system needs to answer if it is to be effective.

20. This generic template has three sources. It was devised by the reviewers during their visit to Denmark and many of the issues were directly sparked by discussions with the Danes about their educational R&D. The three previous OECD/CERI reviews of educational R&D - New Zealand, England and Mexico - were a rich source of comparative materials. The reviewers also brought to the task their own experience, grounded in three different countries and different specialist interests.

21. In this section, the generic template is sketched in broad outline without reference to Denmark (or to any other country). This should allow readers to judge the quality, relevance and coherence of the template. In the third section, the template is applied to Denmark. On this basis it should be possible to judge the value of the template as an evaluative tool, one that highlights strengths on which to build as well as weaknesses that might require attention and action.

22. Ideally, the template might usefully be applied to any country, and not merely to Denmark or to the other three countries that have participated in the OECD/CERI reviews. The template could be used in at least three different ways:

- as part of an internal review of a country's educational R&D, conducted by a team drawn from the various stakeholders, in preparation for the development of a national policy or strategy for educational R&D;

- by a external team invited to give a dispassionate appraisal of a country's educational R&D;

- within a regular 'knowledge audit' of educational R&D, as described below.

2.2 The approach to a generic template

23. From a knowledge management perspective, educational R&D may be seen as the means by which a system responds to a key question, with seven elements, who:

1. needs what knowledge
2. created by whom
3. for whom
4. for what purpose
5. in what time frame
6. at what cost
7. ?

24. R&D in this perspective is, in contrast to some traditional formulations, consumer-led rather than producer-led. Some person, group or institution needs some new knowledge for a particular purpose, in either policy and/or practice, and it will be required in a particular time-frame. Here is a specific version of the question in which a central authority commissions knowledge production by university-based researchers.

25. The Ministry of Education wants to know how science teaching in lower secondary schools might be improved and has commissioned a University research centre to provide the materials and in-service training guidance for science teachers within two years.

26. But the question may be specified in very different ways. For example, it might be professional researchers seeking knowledge from other researchers, not necessarily in the same country, in order to build up a sound knowledge base. Or it might be researchers asking for knowledge creation by teachers who document their practices to provide evidence both for the researches and for fellow practitioners. The developmental activities of teachers in schools are undoubtedly a form of knowledge creation, but they may not meet the normal definition of 'research' knowledge as understood by social scientists.

27. The value of the question is that the R&D process is not merely a matter of production and consumption but is always affected by the purposes and timeframes of the participants. The purposes are not always explicit and consensual: researchers may want to advance the knowledge base and test theory, for example, whereas policy-makers or participants may want knowledge that is actionable to improve education. Similarly, the time-frames sought by policy-makers and practitioners may be much shorter term than those considered appropriate by researchers. Conflicts in expectations among the participants and stakeholders are relatively common in educational R&D.

2.3 The generic template

28. The template consists of ten elements, each of which is framed as a set of questions. Usually there is a 'core' question (printed in bold) to which a series of more specific, subsidiary questions are appended.

2.3.1. What is the extent and quality of a country's knowledge about its current educational system?

29. Since educational R&D consists in the production, distribution and application of knowledge to improve the education service, the enterprise is in part founded upon knowledge of current provision. Indicators of a strong knowledge base might include:

- one or more respected sources for baseline information and trends;
- important policy indicators defined by a broadly participative process, with consistent, agreed-upon definitions of terms and methods of measurement;
- active use by policy officials and by practitioners of research-based knowledge on teaching and learning;
- ongoing efforts to maintain and improve the value of the knowledge base;
- frequent, scheduled dialogues on what is known and what gaps exist in knowledge.

30. If the key participants in R&D (policy makers, practitioners and researchers) are ignorant about what is currently done in education, then it is more difficult to specify what new knowledge needs to be created by whom for what purpose. In order to know what they know, and equally important to know what they do not know, the participants may need to conduct a *knowledge audit,* as an essential feature of an educational R&D system. In such an audit, an overview is taken of what the principal actors believe they know with confidence, and also where they are ignorant but new knowledge would improve what they do. The knowledge needs of teachers and policymakers are of prime importance in such an audit, for one of the principal functions of research is to improve their knowledge-base. The audit, which in practice might consist of several audits directed to particular areas of knowledge and/or a specific category of actors, could be commissioned by one or more ministries and undertaken by researchers in consultation with teachers.

Subsidiary questions

- Who is collecting what knowledge about the operation of the education service?
- In what form is such knowledge made available?
- Who has rights of access to such knowledge?

2.3.2. Is there a national policy or strategy for educational R&D, with a clear understanding about what counts as 'research' and as 'development'?

31. Most countries, perhaps surprisingly, do not have a national policy or national strategy for educational R&D, but instead have a diffuse system of loosely coupled elements with multiple players and stakeholders. In part, this lack of policy/strategy may reflect a suspicion about a policy or strategy becoming a centralised imposition, not least on institutions of higher education, where most research takes place, and which jealously guard their relative autonomy. In federal systems, where responsibilities for

education are usually devolved to a lower level, states or municipalities may seek to determine their own directions for educational R&D in response to local preferences. The alternatives to a centralist-determined policy are difficult to conceptualise and organise, largely because of the large number of players and stakeholders, whose interests are often divergent or even in conflict with one another. The price paid for this lack of national policy or strategy is that educational R&D systems are often relatively anarchic and inefficient, and very slow to respond to pressures for educational improvement. It is in part the fact that so many countries are now engaging in rapid and often fundamental reforms in education that the weaknesses in educational R&D system become exposed.

32. If there is to be a more organised educational R&D system, and if the core questions are to be open to answers, then there needs to be an explicit and broadly agreed understanding about what counts as 'research' and as 'development' – despite the fact that there is no explicit international agreement on such definitions within educational R&D. The knowledge management approach would suggest that it is useful to think of both as forms of knowledge creation and use.

33. Research is usually defined as knowledge creation that conforms to agreed scholarly standards in its production, ones that warrant its validity and trustworthiness. Research knowledge may be created for multiple purposes, including for its own sake, as well as for application to policy or practice. Research is sometimes differentiated into *basic* (or 'blue skies') research, which is driven by curiosity and an inherent interest in a phenomenon or problem, with no regard to application, and *applied* research, which is designed to solve a problem in policy or practice and may be commissioned for this purpose.

34. Developments, by contrast, are usually forms of knowledge creation designed to change practice with the goal of improvement: the knowledge created is practical knowledge of how to change practice from one state to another. Sometimes developments are teacher-led and consist of enquiry-based activities within schemes for the professional development of teachers.

35. Although some research is conducted with little regard to any implications for policy or practice, and some developments are launched without any formal research elements, many R&D projects mix the two in complex ways. Teacher-led developments that are devised within Master's degree and PhD courses, especially where this takes the form of 'clinical research', are prime examples.

36. At the same time, some teacher developments tend to fall outside what is normally considered to be R&D. For example, many teachers improvise and experiment at an informal level in order to improve their practice. Sometimes this is considered to be 'good practice' or 'best practice' which is worth disseminating and transferring to other teachers. This is undoubtedly a form of knowledge creation and should be treated as part of the R&D system, though there may not be any repository for such knowledge and any obvious procedures for its transfer to others.

37. Traditionally, models of R&D have tended to be linear. That is, research is initiated by academics in higher education institutions which can later, and separately, be usefully applied by others in an educational context. In many sectors, such linear models have been found wanting: the research does not, in fact, get usefully applied. More recent models have focused on interactions between the participants with an orientation to problem solving. This fits a knowledge management perspective, since in these models the participants have to agree the problem that has to be solved and work together to provide the knowledge to solve it, which requires many interactions and feedback loops.

Subsidiary questions

- Is there a need to develop a national policy or strategy for educational R&D? If so, in what ways might this best be developed?

- Is there agreement among the participants and stakeholders about what is to count as research and development?

- Are there explicit criteria for what should count as 'good' and as 'best' practice of what teachers do in educational institutions and settings for training?

2.3.3. Are the models of R&D held by participants and stakeholders excessively linear?

How are R&D priorities determined?

38. None of the participants and stakeholders can have all their demands for knowledge met. Those who seek knowledge and create it inevitably set priorities, that is, some R&D projects are assigned greater importance and/or urgency than others. Some participants may enjoy high autonomy to determine their own priorities. For example, academic researchers may make individual decisions about the topics on which to conduct research, just as teachers in classrooms may shape their own development activities in the light of their own preferences. This can be done in both cases without reference to priorities being developed elsewhere in the research or practitioners communities respectively.

In short, how the needs of education service are formulated and how these are matched against the various competing R&D preferences tend to be processes that are obscure and incoherent in many countries.

Subsidiary questions

- How are the knowledge needs of the education system identified?

- How much diversity is there in the perceived priority of these knowledge demands? Is it desirable to seek agreement on value, importance and urgency of R&D possibilities among the participants and stakeholders? If so, how is it achieved?

2.3.4. How are R&D priorities supported and funded?

39. R&D priorities may be determined by those who fund the activities in terms of the time and money needed. Control over funding, for example by research councils, universities, central and local government, private foundations and charities, or headteachers, may constitute control over the direction of R&D. For many developments at teacher level, the key resource is not so much money as time in which to engage in developmental work free from routine teaching and administrative duties.

40. Given that participants and stakeholders will differ in their preferred priorities, the way R&D is funded will permit some participants and stakeholders to ensure that their preferences take precedence over the views of others.

41. Funding councils may fund basic or applied research, or a mixture of both, and may act in a responsive mode, awaiting applications from researchers and awarding grants on merit, or they may initiate broad programmes of research, awarding grants on merit but judged by relevance and contribution to the programme. Achieving an award from a research council is usually regarded as prestigious by academic researchers.

Subsidiary questions

- Which R&D priorities get funded and on what basis and rationale?

- What modes of funding are adopted by research councils with what justification?

- Does the funding system ensure that the best mix of priorities is supported?

- Is there a system of co-ordinated funding so that unintended overlaps and gaps are avoided in the R&D programme as a whole?

2.3.5. How are the various R&D activities distributed and co-ordinated?

42. Distribution of R&D activities ideally ensures that the appropriate knowledge producer(s), namely the one(s) with the relevant knowledge and skill, are assigned the activity and have the capacity to carry it out in the chosen time-frame. It also means, where the activity follows an interactive, problem-solving rather than linear model, that the appropriate partnerships, with planned opportunities for interaction and feedback, are established.

43. Most areas of educational R&D have a weak knowledge base because the volume of activity on a particular theme is too small to yield a robust knowledge base on which changes in policy or practice are warranted. Programmes of R&D that involve multiple players may avoid the danger of initiating changes in policy or practice on too fragile an evidence base. Such programmes are preferable to isolated, small-scale projects, but they demand careful co-ordination from the planning stage through to completion.

44. Co-ordination often requires the construction of networks between researchers/ developers and other stakeholders, both within a country as well as externally, since many networks are international. In the absence of networks, the continuing interaction between researchers/developers and others becomes difficult to sustain.

Subsidiary questions

- Have R&D programmes adopting interactive, problem-solving models been commissioned where these are likely to provide a more robust knowledge base for policy and practice than isolated projects using a linear model?

- Is there co-ordination between R&D activities to ensure the accumulation of a trustworthy evidence base for policy-makers and practitioners?

- Are appropriate R&D networks in place? Is the knowledge of how to establish and operate an effective network available to support R&D initiatives?

2.3.6. Has the R&D enterprise forged appropriate international links?

45. Very few countries can afford to cover the whole range of educational R&D that is sought by stakeholders. Most countries, especially relatively small ones, depend to some degree on the outcomes of R&D that was initiated elsewhere. On most educational topics there is already a significant literature across the world, and sometimes this has already been analysed and reviewed: very little research or development is so innovative that there is no relevant experience elsewhere.

46. It is, however, true that often the international literature fails to report the lessons learned by practitioners or policy-makers, which reduces the value for potential policy transfer. Although there are difficulties in policy transfer from one country to another, some topics are less culture-loaded than others and in these cases transfer may be relatively successful. In all cases of transfer, preliminary pilot studies in the new context are in order to test the degree of transferability.

47. All this implies that every country regularly should scan the horizon of educational R&D across the world. Such scanning takes two main forms: first, there is scanning for studies elsewhere on topics that are already being developed in one's own country; secondly, there is scanning for R&D fields in which there is little current interest in one's own country. The second approach to scanning clearly requires more planned effort at knowledge capture: it requires a curiosity to ask why another country is pursuing an interest that has little apparent relevance at home. It might be possible to conduct such activity within an education observatory, which would also explore future trends, scenarios and foresight exercises by which to influence the direction of educational R&D, and in particular the process of setting priorities, at a much earlier stage than is usual.

Subsidiary questions

- Is there adequate information about R&D activities in other countries available to stakeholders?
- Are R&D outcomes from other countries being tested (or modified) for replicability in one's own country?
- Is there some form of observatory to scan other countries for new or neglected areas of R&D?

2.3.7. How effective is the communication and dissemination of research findings - or what, from a knowledge management perspective, is called knowledge transfer?

48. To speak of the communication of research finding or outcomes tends to presuppose a linear model of R&D in which researchers report their findings at the end of the project. There are well established mechanisms for such communication, notably international refereed academic journals as well as more popular magazines and newsletters. These forms of communication do disseminate the research findings, that is, make them available to a wider audience. But successful communication does not necessarily mean that the audience attends to the message; and even if it is received, it may not be acted upon by the recipient by doing something different as a result. Indeed, it is probably true that the conventional means of communicating research findings are very weak methods of ensuring some *impact*, if by that term is meant a change in behaviour.

49. Interactive R&D models are better placed in this regard, in that knowledge creation is rooted in continuing dialogue between the various participants and stakeholders, so the ground for potential impact is much better prepared. Where potential users are involved in setting the priorities for R&D, in designing the R&D, and in being co-producers of the knowledge, they are much more likely to treat the outcomes as trustworthy and relevant and thus a basis for change.

Subsidiary questions

- To what degree are R&D projects following linear or interactive models?
- Is sufficient attention being paid to impact rather than just communication of outcomes?

2.3.8. How is the R&D embedded in provision for the education and training of teachers?

50. Much - but by no means all - educational R&D has direct or indirect implications for what teachers/trainers do in schools, colleges and universities as well as settings for training and other forms of lifelong and community learning. Although there may be some direct impact on teachers and their schools/colleges - as a result of involvement in the R&D or exposure to R&D communications - in most

cases impact will be indirect, mediated by initial teacher training and the various forms of in-service education and training and continuing professional development of serving teachers. Indeed, although it is common to suggest that R&D demands modification to courses of initial teacher education and training, this is inevitably a very slow way of influencing the profession. In the case of most advances or reforms, implementation within a reasonable timescale means that teachers need to be exposed to the new ideas or practices, and adopt them.

51. For the most effective knowledge transfer, school leaders need both to adapt school policies in line with the new ideas and practices and to offer active support as teachers learn to abandon old practices and gain confidence and experience with the new practices.

Subsidiary questions

- How effective are the mechanisms for moving R&D outcomes into initial teacher training and the various forms of in-service education and training and continuing professional development?

- What systems are in place to educate school leaders in R&D developments and provide teachers with active support to engage with new ideas and practices?

2.3.9. What quality assurance procedures are in place for educational R&D?

52. The quality of a knowledge management system depends on its effective transmission of knowledge to user communities. Results of research must routinely inform practice and provide useful guidance to policy makers. A critical support for such a system is found in the process it employs for quality assurance.

53. While norms of scholarly research are an important element of quality assurance, the evaluation of a knowledge management system also extends to the ways that research results are translated into practice. Several principles drawn from established quality assurance practice in both academic and business settings are readily applicable to R&D systems, including procedures offering openness and transparency, use of periodic external review, and continuing attention to improvement.

54. For a problem-oriented R&D system, openness calls for the active participation of users, especially when key decisions are made on what research priorities and practice settings are chosen and how research is translated and disseminated. Openness and transparency are also affirmed through procedures that monitor and evaluate the various components of the R&D system. Information should be routinely available on the extent to which dissemination processes (including print and online media and different forms of professional development) are efficient, timely and appropriate. User surveys or other feedback devices should be employed to understand who is receiving information and how they assess its usefulness and relevance.

55. Following international practice, periodic external review is also important to a respected process of quality assurance. External review teams should assess the overall effectiveness of the R&D system, asking questions especially about the mechanisms for translating research results into useful and actionable guidance for policy makers and practitioners. At the same time, various internal systems should be in place that regularly identify important gaps in knowledge and emerging needs. In a strongly interactive system, such information might be obtained as part of ongoing feedback processes, for example through teacher-led dialogues about how new research results are applicable to various settings, age-levels and content areas.

Subsidiary questions

- To what extent are existing channels for disseminating research results serving their purpose? Are there regions, subpopulations or settings that are not served well?

- Are there opportunities for regular review of ways that information is disseminated? Do these opportunities also identify emerging issues and gaps?

2.3.10. Is there adequate capacity building for educational R&D?

56. There is little point in conducting a knowledge audit to determine what knowledge is needed, and then formulating priorities to meet the need(s), if there is then too little capacity to undertake the necessary R&D. Different research questions, deriving from a wide range of questions and concerns among policy makers and practitioners, have to draw on a wide range of research methods and associated skills, both quantitative and qualitative. There thus needs to be regular audit of the knowledge and skills of all who conduct R&D and a readiness to make provision for, and allocate resources to, means of developing and enhancing research skills.

57. To be able to use the research knowledge, teachers need to be familiar with, and have some understanding of, the main research methods. If this is provided during their initial or basic training, they will have access to and be able to evaluate new contributions to educational research. However this requires that new teachers be given opportunities to work with experienced researchers who can act as mentors to them. At the same time such basic training in the use of research methods increases the profession's capacity for knowledge production, as teachers engage in clinical research and thereby contribute to the overall professional knowledge-base.

58. Teachers are an important, but not the only, source from which educational researchers are recruited. If some teachers are, at a later stage in their career, to develop into professional researchers, there needs to be opportunities, in terms of both relevant courses and financial support, for further training through advanced qualifications in research. Recruitment into full-time research and the retention of such professional researchers will be hampered unless there is a career structure for researchers, with appropriate incentives and rewards.

59. International collaboration among researchers can contribute to a collective research capacity on which all can potentially draw.

Subsidiary questions

- Have research needs and priorities been assessed to allow a judgement to be made on adequacy of research capacity?

- Has appropriate action been taken to develop, and where necessary expand, research capacity?

- Do researchers have an attractive research career structure?

- Who is responsible for monitoring and managing research capacity?

- To what extent do the initial or basic programmes for teacher education prepare new teachers to understand the main methods used in educational research and the reports of educational researchers?

- Are there opportunities for experienced teachers to join research training programmes?

3. EDUCATIONAL R&D IN DENMARK: A REVIEW

3.1 Introductory overview

60. In many respects, Denmark already has many of the needed elements of a knowledge management system for education and its associated research and development. Several of its universities and research institutes are engaged in research on educational issues and receive government funding for their educational research projects. Many university researchers are engaged in long-term educational research projects that involve many institutional settings and practising teachers. The Danish Pedagogical University (DPU) and Learning Lab Denmark have been launched. Research councils, organized on a discipline basis, employing peer review and responsive to field-initiated proposals, are respected sources of competitive research grants. Initial teacher training and professional development for continuing teachers are well-organized and both functions are based primarily in the practitioner-oriented CVUs. Professional development workshops and other activities organized by teacher training colleges within CVUs are complemented by the active support of teacher unions. Teachers regularly convene in working groups to discuss pedagogical issues and engage in shared problem-solving. The two government ministries responsible for education and its associated research have a substantial amount of statistical information to work with and routinely contract for analysis of data to inform policy problems. The recent reform legislation for upper secondary schooling offers a good example of policy development that was based on substantial research, debate and commissioned projects over several years. In this connection the Institute for Upper Secondary Pedagogic (DIG) at the University of Southern was established.

61. As in most countries, however, research and dialogue on educational matters in Denmark is organized along traditional lines. Research priorities are largely determined by individual researchers, or groups of researchers. Research funding responds mainly to traditional discipline-oriented norms. New thinking about a more pro-active approach to knowledge management is found in many places as e.g. Learning Lab Denmark but, as yet, has not developed into a fully systematic and effective pattern. In short, much of the infrastructure for an R&D system that is able to respond well to external challenges, such as PISA and other forms of international comparisons of student achievement, is already in place.

62. The overall conclusion is, however, that there remains no explicit national strategy for educational R&D in Denmark that is understood by all the relevant participants and stakeholders. In this regard Denmark is in the same position as most other countries. There is, in our view, much to build on, but it needs systematic and coordinated direction. There is a need for clear leadership on R&D policy from the two ministries, working in open and explicit partnership with one another and with principal actors, including the DPU. The declaration of a vision for educational R&D by ministers might be an essential first step in achieving the change of direction that will capture the undoubted energies that currently often remain latent in the system.

63. Several related areas of development seem to be especially promising:

- achieving clarity on respective roles among various parts of the system;

- strengthening priority-setting on what research is needed, and giving greater weight to 'use-inspired' research;

- developing new mechanisms for interaction between researchers and practitioners.

Clarifying roles.

64. At present, several key educational institutions in Denmark are still taking shape in response to recent government policy initiatives. The Research Councils are being reorganized and are establishing new strategic research councils. The Denmark Pedagogical University (DPU), based on the merger of three institutions and designed to become an internationally recognised centre for educational research, is at the early stage of its development. The Learning Lab, formed to offer innovative approaches, has now completed its third year. While our visits offered evidence that each of these new initiatives has made good progress with new roles, it was also clear that there was overlap among them and lack of clarity among practitioners - school leaders, classroom teachers, municipal officials - on whom to turn for what information, advice and assistance.

Priority-setting.

65. A number of mechanisms exist to set priorities for research, including competitive review of proposals by the research councils, performance contracts between the government and individual universities, contractual arrangements made by municipalities, competitive bidding processes for conducting analysis needed by ministry officials, etc. What is needed, however, is a way to set priorities that allow for knowledge to accumulate systematically on major, agreed-upon problems. Careful selection of priorities is essential to the creation of a sound knowledge-base: for a small country to attempt to cover the whole R&D landscape, and thus to spread limited resources too thinly, is to invite mediocrity. Two examples of problems needing such systemic attention, where coordinated research studies might generate reliable and practical results, were described in our visits: the development of core student competencies, especially at the upper secondary level; and reducing the rate of non-completion at the university level. On both problems, many studies exist; what is needed is coordinated work that accumulates knowledge, one study deliberating building on another's results or testing a study's findings in a different setting.

Building interactive networks.

66. To cover the essential R&D terrain, Denmark has to rely on partnerships and networks to achieve two outcomes: to learn from external R&D what cannot be afforded internally; and to co-ordinate internal R&D to ensure maximum efficiency. More will be gained from international networks if they are built upon a strong internal network infrastructure among Danish researchers, policy makers and practitioners.

67. Our visits provided numerous instances of productive exchange between various actors on matters of education. Just as often, however, we were given accounts of specific initiatives or local meetings by individuals who were unaware of other, even nearby, resources. Much more networking, and more systematic support for such networks, is needed. Contemporary understanding of effective communication flows suggest that at least three different types of network are especially needed.

68. First, networks for problem-identification, in which practising teachers and other educators help to shape research. Forums allowing a series of day-long network dialogues could help researchers understand certain problems and formulate responsive research approaches likely to be useful at the classroom level; such dialogues could also help interpret research findings and explore alternative explanations or implications for classroom practice. Valuable experience might be gained by establishing networks to

address the problems already mentioned, i.e. core student competencies and reasons for university non-completion.

69. Secondly, networks for distributed innovation, by which the work needed for devising and testing new developments is shared among multiple actors who engage in the co-production of new knowledge.

70. Thirdly, networks for dissemination and knowledge transfer. Research findings need to be 'translated' into practical terms if they are to inform classroom teaching and learning, yet that translation is best accomplished through dialogue between researchers and practitioners, aided by skilled specialists in developing teaching materials that will match agreed-upon goals.

71. Such networks require strong leadership. Denmark is a country rich in social capital and rightly proud of its high level of social cohesion. These qualities are crucial ingredients of successful networks.

3.2 Application of the R&D template to Denmark

In this section the core questions in the generic template are used to inform analysis and discussion of educational R&D in Denmark.

3.2.1 What is the extent and quality of a country's knowledge about its current educational system?

72. Our visits gave evidence that many sources of relevant information exist in Denmark, although information seems to be 'locally known' rather than being 'universally accessible' – e.g., analysis and information provided to a government ministry by consultant firms; information emerging from a specific project and shared with a small network attached to the project; or findings from a research study that have been shared with a few other researchers. This is a task that might useful be addressed by the KL, the association of municipalities.

73. Hitherto it has not been part of Danish tradition to collect detail on student achievements that then permit comparisons in performance between schools and municipalities. Clearly countries that have devised such systems are able to monitor educational outcomes more closely. At the same time, such systems have disadvantages in that they may narrow the goals of education to measurable outcomes and thus bias the accountability of schools and teachers to the test performance of students at the expense of broader outcomes for which easy metrics are unavailable or even undesirable. The challenge for Denmark is whether it can create a deeper and richer knowledge of the performance of the education service, and of individual municipalities and schools within it, without incurring the disadvantages and distortions that have occurred in some other countries.

74. The OECD Pilot review on the Quality and Equity of Schooling Outcomes in Denmark (OECD, 2004) also draws the attention to the lack of an efficient culture of evaluation in the Danish school system. The Ministry of Education has accordingly taken steps to establish four focus groups: 1) Attainment targets at the local school, current evaluation and quality of teaching; 2) Everyday life at school, competences and roles of the principal, cooperation with parents; 3) In service training and further education of teachers; and 4) Better opportunities for bilingual students and students with learning disabilities. One of the desired outcomes from the groups is ways to improve evaluation and leadership in Danish schools.

75. It is too early to know whether these four new initiatives can build the necessary consensus for an "evaluation culture" in Danish schools. It is the review team's impression that consensus has not been developed so far on key definitions relevant to the practice of teaching, nor on what policy indicators should be rigorously monitored. Recent progress has been made in defining student competencies in the sciences, but much more is needed. There are significant gaps in available information – e.g., little

information on student achievement is available on a school-by-school basis. Such information is needed for any strong evaluation research and is needed, too, for school leaders.

76. Indicators need to be relevant to each country's experience but it can also be beneficial to adopt definitions and approaches that allow the country to compare its experience with that of other countries and systems. Precedents exist in recent OECD work, EU projects, and several US and UK reform initiatives. Partnering with certain countries may be an effective way for Denmark to benchmark its educational system on key outcome measures.

Some issues for Denmark to consider

- Might some of the local knowledge audits be usefully combined to provide a national audit of what is known and what remains to be investigated?

- Might the annual testing of students in Grade Nine and international surveys of student performance generate data that could be treated as a rich resource for researchers, practitioners and policy makers?

- Might a mechanism be developed to build consensus on priority problems that require widely known, closely monitored information, based on agreed-upon definitions and data sources?

- Might a mechanism be developed to disseminate such monitoring information so that there can be wide awareness among all stakeholders on the education system's status, and progress, on key indicators?

- How much national agreement is there among stakeholders over responsibilities for making relevant knowledge readily accessible to particular groups?

3.2.1. Is there a national policy or strategy for educational R&D, with a clear understanding about what counts as 'research' and as 'development'?

77. Most of the people we met averred that there is no explicit national policy or strategy for educational R&D in Denmark, though many of what would be the features of such a policy/strategy exist. It is not clear to us whether Danes think that it would be desirable to develop such a policy/strategy and whether it could be achieved without damaging the professional and local autonomy that is so highly valued in Danish tradition and culture.

78. Models from industry are frequently offered in Danish discussions of educational R&D, with calls for research to inform user practice and help improve the international standing of the country's educational system. We also heard many reports about efforts of researchers to share their findings with various 'user' groups. Despite these reports and the wide use of R&D terms, in actual practice there appears to be a substantial separation between research and development. As in other countries, research results are shared primarily with other researchers. Classroom teachers generally learn about research through occasional professional development workshops and through publications sponsored by teacher unions. This 'disconnect' between research and development seems to us to be more serious in Denmark than in some other countries, but the fact that this situation is widely acknowledged and deeply deplored indicates the general willingness to do something about it.

79. Another problem is that 'development' appears to be equated too often with 'dissemination', that is, the packaging of information derived from research. Equating the two terms neglects the complex, and often lengthy, task of interpreting research findings and exploring their implications for practice, with special

attention to their implications for different settings and for different sub-populations of students. This latter process, which can be called 'applied' research, needs more systematic attention and effort in Denmark.

80. We detected a genuine commitment to development among practitioners, but have the impression that there are insufficient mechanisms for co-ordinating this work.

81. Denmark might wish to address several of these concerns by establishing a National Education Research Forum, which could hold regular meetings (annually, or two or three times a year) for researchers, teachers and policymakers to share ideas on education issues and needs. Similar models in other countries – including a National Education Research Forum in England (see OECD/CERI (2003) for more details about NERF) and a Business-Higher Education Forum in the United States – could offer ideas for how such a Forum might be organized and what its products might be. The Forum could select one or more thematic issues for each meeting and combine sessions where researchers report on relevant studies (in Denmark or in other countries) with other sessions where policymakers, teachers and researchers engage in open dialogue on how an issue is experienced.

Some issues for Denmark to consider

- Might a National Education Research Forum of stakeholders (researchers, teachers, policy makers, and funders e.g. private foundations), as developed in several other countries, serve a useful purpose in Denmark?

- How could Denmark create regional bodies, where teachers, school leaders and researchers are represented, working in close contact with the teacher training colleges (CVUs) and universities that are expected to produce new educational knowledge? This would establish a good nation-wide framework to ensure that educational R&D is both based on practical as well as on theoretical considerations.

- Is there scope for enhancing the scale and scope of 'innovation networks' that would help in the co-ordination and dissemination of teachers' developmental activities?

- Might incentives be developed to encourage and support efforts by researchers to share research findings so that they reach a wider audience of practitioners?

- Might a substantial programme of applied research be developed and systematically linked to the development of teaching and curricular guidelines?

- Are interactive, problem-solving alternatives to linear R&D projects being developed and evaluated?

3.2.3. How are R&D priorities determined?

82. Educational debate in Denmark over the last few years has achieved much consensus on the importance of strengthening science education. From reports we received, the process was broadly participatory. It also was respectful of research evidence, in part due to the influence of international benchmarks of student attainment in science and related areas. Similarly, the establishment of the Learning Lab Denmark suggests that general policy debate led to a consensus that more innovative approaches to education were needed.

83. These recent experiences have not been followed in educational research and practice more generally, however. Priorities for research tend to be developed by individual researchers or research teams. As a

result, significant gaps in the research agenda persist. It was suggested to us, for example, that areas with limited bases of research knowledge include vocational education and special needs education.

84. In Denmark little attention seems to have been given to empirical research where larger statistical samples are used to help the country to illuminate the variation of quality among schools and among municipalities. Denmark disposes reliable personal registers that can be coupled with achievement data. There are therefore good possibilities for instance to use existing data about the achievement of individuals and link them together with further life histories. The data collected yearly by the Ministry of Education on the achievement of the ninth graders as well as data collected within larger international comparative studies, e.g. PISA, could be used for this kind of analysis. The Danish authorities could offer interesting analysis options to university institutions and CVUs, giving them access to the rich information and the different actors could make bids that a research forum or a research council could chose among.

Some issues for Denmark to consider

- What process could be developed to identify overall research priorities, especially priorities that are responsive to significant gaps in knowledge about effective classroom practice?
- Would the creation of a National Education Research Forum be of value in this regard?
- Aside from science competency, what other curriculum areas and aspects of student achievement might be identified on which substantial research and development are needed?
- Is the reform of upper secondary education being assigned the right priority status?
- Should research on vocational education and special educational needs be expanded?

3.1.4. How are R&D priorities supported and funded?

85. We learned of two main different mechanisms for funding education research and development in Denmark: competitive grant proposals and university support funds. Educational research topics can be supported by research grants awarded by research council for the humanities or the social sciences, via a competitive proposal review process. Such proposals are initiated by the researcher, and the councils do not suggest priority areas for research. From reports we received, educational research topics seem to have a low success rate with submissions to either of the two relevant councils.

86. The second source of funds is found in agreements reached between the government ministry and individual universities as part of their overall funding and performance contracts. In particular, government policy has recently identified one institution – the Danish Pedagogical University – to be a concentrated centre for educational research. Similarly, the Learning Lab Denmark (linked administratively with the DPU) has been identified for special funding in support of education research.

87. Denmark spends a large part of the national budget on education compared to other OECD countries, but uses only a relatively minor portion of the resources for research and development within the educational field. The review team have noted that there are no specific part of the different research councils that are specially directed towards educational research. In Sweden, the Swedish Research Council that consists of three main councils, one for humanities and social sciences, one for medicine and one for natural and engineering sciences has added a specific committee for educational science to its programme. The Committee for Educational Science in Sweden spends around 120 million SEK (about 13 million €) per year to support educational research of a wide range.

Some issues for Denmark to consider

- Should a separate research council or a specific committee for educational research be considered? If not, what mechanisms are there to ensure adequate oversight of the development of educational research and its funding?

- Should research councils develop statements of priority areas within education and learning, i.e., topics or broad themes on which research is to be actively encouraged?

- Could general university agreements be made more effective in producing high quality educational research?

- How will the various stakeholders in education be able to judge whether an appropriate mix of R&D projects is being funded?

3.1.5. How are the various R&D activities distributed and co-ordinated?

88. A current issue in Denmark involves the way that research activity is divided between the universities and the CVUs. One formulation we heard is that universities are responsible for the "R" – basic research – and the CVUs are, in partnership with schools, responsible for the "D", the developmental activities. These demarcations are tenuous in any circumstances but seem to be especially difficult today in Denmark; universities reported to us about many projects to bring applied research and good practice ideas to practitioners, for example. In our view, achieving the right partnership between the universities, especially the DPU, and the CVUs is critical to the development of an effective R&D system in education.

89. Co-ordination is also a problem, as researchers develop their own research agendas without a wide knowledge of what others – at other Danish institutions or at other institutions around the world – are planning. For a small country, the prospects of producing new knowledge on even a few specific educational questions would be greatly enhanced if greater agreement could be achieved among researchers on (i) what Danish research must be done because of some distinctively Danish problems or features (ii) what knowledge developed in other countries might, with some adaptation, usefully be applied in Denmark, and (iii) what research conducted elsewhere might be tested for its applicability in a Danish context.

90. Co-ordination within Denmark should remain a priority. The creation of the DPUfrom several predecessor institutions has created a real opportunity to co-ordinate research activities and outputs in a more systematic way, as well as to serve as a broker across the R&D spectrum. In principle, the DPU can play a crucial leadership role in the mergence of an educational R&D system in Denmark. At its best, the DPU can channel research into the developmental activities of the CVUs as well as – in our view of equal importance - receiving input into more basic research from the developmental priorities, activities and achievements of CVUs and schools.

91. To further support a strengthening of education research, collaborative research networks might be encouraged, especially through competitive grant funding on high-priority issues. In the United States, for example, a Consortium for Policy Research in Education (CPRE) links researchers across several universities to conduct funded research projects on school reform. In England, the Teaching and Learning Research Programme, managed by the Economic and Social Research Council, has developed in a similar way. The continuing collaboration over time, by now on a series of funded studies, has been stimulating for researchers and effective too for user communities because research results more often build on each other. A collaborative research network in Denmark might also be linked to networks we propose (under section 3.vii, following) that could bring school leaders, teachers and researchers together.

Some issues for Denmark to consider

- What are the best arrangements for distributing research responsibilities between the universities and the CVUs?
- Might a mechanism be developed among researchers at separate institutions to improve coordination in research agendas?
- How clear is the role of the DPU in relation to developmental work in the CVUs and schools?
- How robust is the knowledge base on those aspects of education in Denmark that are seen by the stakeholders to be of the highest priority?
- What action might be taken to enhance the capabilities of R&D networks within Denmark as well as of international networks? To what extent do industrial examples within Denmark, such as 'Plan 2001' in the Aarhus region, serve as models?

3.1.6. Has the R&D enterprise forged appropriate international links?

92. Our experience was that individual researchers and administrators demonstrated an awareness of international research and discussion on educational matters, but we were not aware of any systematic mechanism within Denmark that reports information on major international or European developments in educational R&D. News media, including magazines sponsored by teacher unions, offered the most widely available resource for most classroom teachers. We believe that the country of Tycho Brahe, and his Uraniborg Observatory, has a natural talent for observing the wider world and what might be learnt from it.

93. We gathered evidence of a commitment to developing internal and international networks of researchers and practitioners. Denmark is well placed to lead as well as participate in international networks in Scandinavia as well as in the English-speaking world. In our view Denmark could attract more scholars of international standing to spend some time as visiting scholars and consultants within such networks. It should be recognised, however, that networks need to be resourced, especially during their early development, and that networks prosper only when they are of evident added value to their members.

94. One approach to consider is the development of a clearinghouse on education. Various international models exist, especially in large countries and sophisticated systems for Internet-based electronic communication. In the United States, for example, the federal government has funded development of numerous clearinghouses and, as a result, detailed specification of subject classification and inquiry systems is available. Such models offer strong efficiency in identifying a wide range of relevant international work on topics that each user might request, but the approach may need to be adapted to a smaller country such as Denmark. Other models for operating a clearinghouse might also be considered, including small-scale efforts in which a limited list of education issues are identified each year – whether by a collaborative network of researchers or, instead, by participants in a proposed National Education Research Forum – and succinct literature reviews and summaries are prepared on those issues and then distributed widely. The reviews could be prepared by academic staff and advanced students at DPU or by others researchers. In this context, it might be worth having a close look at the work and experience gathered at the EPPI (Evidence for Policy and Practice Information and Co-ordinating) Centre in England on a systematic approach on reviewing evidence-based work in education and the Campbell Collaboration, which is an international researcher collaboration to prepare, maintain and disseminate systematic reviews of studies of interventions in the social, behavioural and educational arenas.

Some issues for Denmark to consider

- Might a means be identified to offer regular reporting on significant educational research, as well as reviews of educational research, from other countries?

- To what extent might it be of practical value to researchers and practitioners to explore the lessons that have been learned in other countries from the recent implementation of educational reforms?

- What might be learned from the What Works Clearinghouse (USA) or the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre) (England)?

- Might there be value in establishing an educational observatory in Denmark?

- Leadership has been a much higher priority for R&D in other OECD countries. Can Denmark learn from this?

- How can classroom teachers and school leaders gain better access to

- international research findings on topics of interest to them?

3.7.7. How effective is the communication and dissemination of research findings - or what, from a knowledge management perspective, is called knowledge transfer?

95. Based on our visits, we were impressed that municipalities and other local units take an active role in arranging for and supporting professional development of teachers in their schools. The CVUs are well placed to link the findings of research and R&D projects to the initial education and training of teachers and to the in-service training and continuing professional development of experienced teachers. It seems, however, that many activities follow the conventional model of one-way communication, that is, meetings or materials convey research findings to teachers and expect them to accept and implement the findings and their implications.

96. It might be possible to develop local forums of teachers and researchers/ developers so that more projects become a genuine partnership representing a balance between the real needs of teachers and the concerns and expertise of the research community: there is considerable scope for the further development of 'clinical research' along such lines. The more teachers are able to participate in such knowledge production, the more they will be open to examining and developing their professional practice through ideas emerging from more basic research.

97. It is well known that the most trustworthy source of new practices for teachers is fellow teachers. There is scope with the CVU activities for the establishment of stronger peer-to-peer networks, which are an essential complement to attempts to influence practice directly through communications from researchers to teachers.

98. The current necessity of responding to new reforms for upper secondary education offers new opportunities for better approaches to communication about effective approaches to teaching and learning. Discussions over the reforms, and their implications, might be designed to be more interactive, that is, encouraging experienced teachers to share their insights with researchers and, as a result, gain better understanding for both parties. Upper secondary reform, where there will be deep and difficult transitions to new forms of pedagogy, could be an opportunity for initiating new modes of researcher-practitioner relationships.

99. There is also a need for educational researchers to come together in networks in Denmark, both to disseminate their findings and to develop better theories. Most researchers participate in international networks, but are not strongly involved in national networks. Such interaction that takes place in networks that contains both school leaders, teachers and researcher are usually more effective in knowledge development than when the different parties work in isolation.

Some issues for Denmark to consider

- Are there centres or institutes that could design and deliver new, interactive approaches to the discussion of educational issues and educational R&D?

- How can researchers participate more effectively in professional development activities designed to implement the new reforms of upper secondary schooling?

- Is there scope for more studies on the impact of research on practice, with feedback loops into the research community?

- What initiatives will be taken from the central level to establish and support networks of educational R&D in which teachers, school leaders and researchers cooperate?

3.1.8. How is R&D embedded in provision for the education and training of teachers?

100. Although we learned that a variety of educational institutions conduct professional development for teachers, the CVUs are the major players in teacher education in Denmark; they have the exclusive role of initial teacher training, and they have substantial professional development responsibilities, often through arrangements with their municipalities and nearby locations. This arrangement undoubtedly offers many benefits, including a clear institutional commitment to this training role. It requires, however, that staff of the CVUs have strong ties to university-based researchers or, instead, have access to some other mechanism for learning about relevant research evidence on important topics. We learned of informal ties but not of any systematic arrangements for co-ordination between the two types of institution.

101. Questions can also be raised about the extent to which teachers have been trained to look to research to gain insight on their questions about the practice of teaching. Whether in initial training or later in professional development settings, it is important that teachers gain perspective on how to access and evaluate research information. It may be that schools and teachers need to be provided with incentives, including financial incentives, to engage in 'clinical research' and other kinds of R&D projects.

Some issues for Denmark to consider

- What are effective models for separate tasks but appropriate co-ordination between universities and CVUs in developing guidance for practicing teachers?

- Since roles for institutions and individuals in educational R&D are bound to overlap, what action might be taken to ensure complementarity of function?

- At what point can teachers receive advice and information to help them be more aware of how to access and evaluate research findings for classroom use?

- What incentives are there for school leaders to involve their schools in R&D activities or to encourage their staff to be involved?

3.1.9. What quality assurance procedures are in place for educational R&D?

102. Denmark has several mechanisms that offer a means for reviewing the effectiveness of educational research. Research studies are generally published or compiled in research reports available to other scholars. Universities have requirements for annual reporting of research activity and research plans. Periodic evaluation studies of the teacher colleges and the DPU are undertaken as well, including studies conducted under request by the Danish Evaluation Institute. Final reports are generally required as part of grants awarded by research councils. As in other countries, such forms of review often emphasize process, i.e., whether proper procedures were followed and promised products were produced. Typically, too, reviews are conducted for individual studies or projects, not for entire topics or issues.

103. If the whole spectrum of educational R&D is to be covered, however, it is essential that educational research in universities and research institutes be expected to include strongly applied elements and not be judged exclusively in terms of its contribution to basic research. Research that has a powerful impact on school quality, teacher effectiveness or student achievement should carry as much prestige as a significant contribution to basic research that has no short-term practical applications.

104. Denmark would be well served by a new effort to develop mechanisms to conduct periodic reviews of what is actually accomplished by research, possibly focused on a sustained body of research over a number of years. Special reviews could be organized on priority research and policy topics to assess what is known and unknown on each topic, and to suggest important areas for new research.

105. Other review mechanisms should also be actively employed. External visiting committees should visit and evaluate the work of all major research departments or centres that conduct educational research. Feedback from users/stakeholders should be obtained through surveys of classroom teachers about what they understand on important educational issues.

Some issues for Denmark to consider

- Could mechanisms be developed to assess the effectiveness of educational research on certain important thematic areas in education?

- Is sufficient prestige accorded to those who produce applied research of outstanding quality and impact?

- What methods might be developed to allow teachers to give feedback on ways that research results have affected their teaching?

3.1.10. Is there adequate capacity building for educational R&D?

106. An area of uneven capacity, reported to us by several persons we interviewed, involves the need for a range of research methods and skills when approaching educational research issues. It appears that qualitative research methods are currently the predominant approach among Danish researchers in education. A better balance is needed, and attention should especially be given to development of capacity for good experimental studies, for multivariate analysis of complex data sets, and for analysis of education issues with econometric methods. These methods have become increasingly necessary to international research discourse on educational reform. The problem of the supply of researchers versed in quantitative methods in Denmark is shared by New Zealand, England and Mexico.

107. If there were more staff of the CVUs with experience in educational research, there might be a better knowledge flow between practitioners and researchers and more practitioners might be recruited into

R&D projects. To be able to meet the new expectations that they will contribute to the systematic construction of educational knowledge, the CVUs as well as the universities need more staff that hold a research degree. The country needs to take immediate action to ensure a supply of staff appropriately qualified in educational research skills for both the CVUs and the universities. One possible strategy that has been profitable in other countries to increase the capacity of staff with research background has been to establish research schools. A research school can be kept together physically on one university, but gathers students from many corners of the country, who would return to their home institutions after ending their stay at the research school.

108. Teacher capacity to interpret and use research is another area for possible attention. We spoke with only a few teachers and representatives of teacher groups but our general impression is that most teachers learn about research from journalistic sources, not from research-based sources. Although journalists offer helpful information, important details are generally not covered that, in fact, might be quite useful to practising teachers. Recent initiatives in other countries have added components to professional development workshops on 'action research' or classroom research, both of which offer tools that teachers can use themselves to assess their own teaching. Both have also been praised for giving teachers greater awareness of the elements of good research.

Some issues for Denmark to consider

- Are there incentives or programmes that can be developed to build a wider array of research skills available for conducting educational research?
- What action needs to be taken now to ensure an adequate supply of researchers trained in quantitative methods?
- What mechanisms are desirable to maintain and, where necessary, expand research capacity?
- What might Denmark learn from the investigations and initiatives undertaken in other countries to deal with research capacity?
- In what areas might Denmark arrange research schools whereby the amount of research competent tutors working in universities and CVUs could raise?
- What might be learned from other countries about ways of providing career structures for educational researchers?
- How might practising teachers be given skills in understanding and interpreting research that might help them be more effective teachers?

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