Official Norwegian Reports NOU 2015: 8

The School of the Future

Renewal of subjects and competences

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Report from the committee appointed by Royal Resolution on 21 June 2013.
Submitted to the Ministry of Education and Research on 15 June 2015.

To the Ministry of Education and Research

In the Royal Resolution dated 21 June 2013 the Government appointed a Committee to assess the subjects in primary and secondary education and training in terms of the requirements for competences in future working life and society. The Committee refers to its interim report NOU 2014: 7 *Pupils' learning in the school of the future* [Elevenes læring i fremtidens skole][1], and hereby submits its main report.

Oslo 15 June 2015

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[1] A summary is available in english on http://blogg.regjeringen.no/fremtidensskole/mandate-in-english/.

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Primary and secondary education and training shall contribute to developing the knowledge and competences of pupils so they may become active participants in an increasingly knowledge-intensive society. School must also support pupils in their personal development. Today's and tomorrow's society has and will have new requirements when it comes to participating in a number of settings like work, organizations, home and leisure. Individuals and society also face local and global challenges relating to social, cultural, economic and technological development, and to how we can ensure sustainable development.

School as a communal arena is gaining greater importance than was previously the case. School is an important institution in society where pupils interact with each other, and with teachers and other resource persons to develop knowledge and competences that will enable them to participate and contribute productively in the various arenas of life. Values, norms and attitudes are undergoing continuous change. School must support but also influence the values and norms that are the foundation of society.

School must help to develop pupils' potential as individuals. They must be able to share the key aspects of our cultural heritage. In today's society, knowledge is changing its content and form – in scientific disciplines, in new emerging knowledge fields and in working life. If the potentials of pupils

are to be realised, the subjects must be renewed and school must be developed. This is how new conditions for pupils' learning can be created and how competences for the future may be developed.

The development of pupils in school is an important aspect of social development, and school actively interacts with the surrounding communities. Different arenas offer different learning opportunities that pupils may use for their own development and to become active citizens in society.

In this report the Committee provides knowledge on this issue and proposes choices we as a society should make when it comes to competences for the future and renewal of subjects. This will lay the foundation for creating good lives for Norwegian citizens and for creating a productive society that can contribute in a globalised world.

1.1 Summary

The subjects in school need to be renewed to satisfy future competence needs in working life and society. If school is to enable pupils to master life as private persons, citizens of society and members of working life, it must cooperate with parents to help pupils develop many different competences and a good understanding of what they are learning.

The goals for pupils' learning must reflect the values underpinning school as expressed in its objects clause, society's needs and research-based knowledge. The rationales for the Committee's recommendations are based on these considerations.

The Committee's mandate was to assess and report on what pupils will need to learn in school in a perspective of 20 to 30 years. The main questions asked in the report are the following:

- Which competences will be important for pupils in school, in further education and working life, and as responsible members of society?
- Which changes must be made in the subjects if pupils are to develop these competences?
- What will be required by the various stakeholders in primary and secondary education and training if renewed subjects are to lead to good learning for the pupils?

The recommendations in the report apply to the content of the Norwegian and Sami schools.

Box 1.1 The chapters in the report

Chapter 2 *Competences in the school of the future* describes the competences the Committee recommends that pupils should develop in the school of the future. The Committee proposes four areas of competence as the basis for setting priorities for the school's activities.

Chapter 3 *Renewal of the school subjects* describes and propose how the subjects may be developed to focus on the areas of competence described in Chapter 2. The Committee recommends renewal of the subjects in school that will ensure the breadth of the competence concept.

In Chapter 4 *Curriculum model,* the Committee recommends frameworks for the design of national subject curricula and national support and guidance resources.

Chapter 5 *Teaching and assessment* discusses how the recommendations relating to competences in the school of the future will change the requirements for teaching and assessment practices, and how assessment schemes may support the goals in renewed subjects.

In Chapter 6 *Implementation* an implementation strategy is recommended with different phases and parallel processes. Planning, dialogues and embedding, school-based competence development and local curriculum work are key parts of the implementation.

Chapter 7 *Financial and administrative consequences* explores the cost and administrative aspects of realising the committee's recommendations.

1.1.1 The four areas of competence

As shown in the interim report NOU 2014: 7 *Pupils' learning in the school of the future,* several trends point in the direction of a society that has greater diversity, a high degree of complexity and rapid changes. Changes in society include rapidly changing communication and media technologies, challenges related to sustainable development, demographic changes, both locally and globally, with ethnic, cultural and religious diversity, urbanisation, growth in consumption and a knowledge-based and internationalised working life. These trends are not new, but developments in all these areas are changing society at a rapid pace, influ-

encing societal life locally, regionally and globally to a much higher degree than ever before.

Bearing these trends in mind, the Committee recommends four areas of competence as the basis for renewing the content of school:

- subject-specific competence
- competence in learning
- competence in communicating, interacting and participating
- competence in exploring and creating

Pupils develop competence by working with the subjects. The Committee therefore recommends renewal of school subjects to reflect that pupils in Norwegian and Sami schools will need to develop competences from these four areas – subject-specific competence, being able to learn, being able to communicate, interact and participate, and being able to explore and create.

A broad concept of competence which involves both cognitive and practical skills and social and emotional learning and development is reflected in all the four areas of competence. Social and emotional competences include engagement in and attitudes relating to the subjects and one's own learning in the subjects, persistence, expectations for one's own mastering, the ability to plan, carry out and evaluate one's own learning processes and being able to communicate and interact with others. If these aspects of pupils' learning are to be given priority in the day-to-day school, they must be part of the subjects' objectives.

School's social responsibility comprises more than competence objectives in subjects. School must also support the pupils' identity development, facilitate good interpersonal relationships and work systematically with the social environment in school.

In the proposal by the Committee, school's social responsibility, competences for the future and renewed subject curricula constitute a comprehensive whole, as illustrated in Figure 1.2.

Subject-specific competence

In the future, pupils will need to develop competence in key disciplines, such as mathematics, natural science and technology, languages, social sciences and ethics, and practical and aesthetic subjects. This will give the pupils a foundation for making educational and vocational choices. Primary and secondary education and training shall allow the pupils to choose education and vocational studies based on their interests and abilities, and thus ensure recruitment to all areas of society and its working life.

Subjects and disciplines are changing more rapidly than previously. Robust knowledge on the most important methods and ways of thinking, and the concepts and principles the subjects consist of will give the pupils insight and skills in the subject that will continue to be relevant over time. The report uses the principle of building blocks for important content and key competences in the

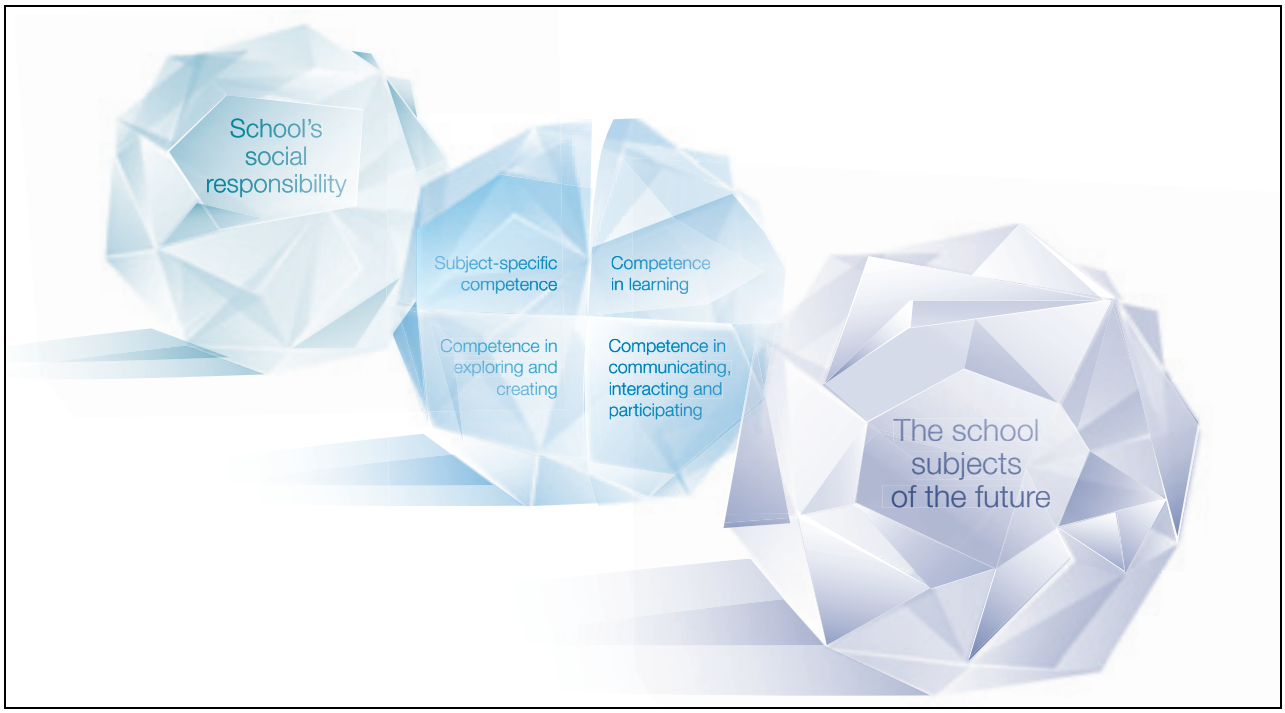

Figure 1.2 Subject renewal

disciplines. The Committee emphasizes that the methods and ways of thinking in the subjects are particularly important parts of the building blocks, including the ability to think critically and resolve problems – practically and theoretically, professional problems and everyday problems. In all the subjects the building blocks are of both a practical and theoretical nature. Practical subjects and vocational subjects have a knowledge base, and all theory subjects have a practical aspect.

The Committee recommends that mathematics should be strengthened in school, and also that it should be made more important in subjects where mathematical competence is an important aspect of the subjectcross-curriculum competence, particularly in social studies and natural science. In light of the increase in globalisation and an internationalised working life, strengthening the language subjects is recommended. Technological developments affect all subjects, a fact that means digital competence must be present in all school subjects.

Being able to learn

Metacognition is the term used when pupils are able to monitor and reflect on the purpose for what they are learning, what they have learnt, and how they learn. Pupils who develop awareness of their own learning, who learn about learning and think about how they learn are better equipped to solve problems in a reflected manner, both on their own and with others. Being able to use various strategies to plan, carry out and assess one's own learning and work processes is part of this concept. Self-regulation is the term used to describe when pupils learn, in cooperation with their teachers and co-pupils, to take initiatives and work purposefully to learn, and learn to regulate their own thinking and their own actions and emotions. The Committee recommends that metacognition and self-regulated learning should be emphasized in all subjects.

Being able to communicate, interact and participate

The pupils will need to master different forms of communication in working life and society to a higher degree than has been the case earlier. They must be able to communicate verbally and in writing with different purposes and recipients. The Committee believes that reading, writing and oral competence must continue to be part of all subjects. How these work together to form the underpinning for pupils' learning should be made clearer than in the current subject curricula. It is also recommended that collaboration and participation should be included in all subjects, focusing on cooperation on problem-solving and participation in discussions relating to subject content. A key goal for pupils' learning must be that they are able to interact in a number of social arenas, not least when it comes to democratic participation, tolerance and social responsibility.

Being able to explore and create

This area of competence includes critical thinking and problem-solving, i.e. being able to reason and analyse, identify relevant issues and apply relevant strategies to solve problems. The ability to judge claims, arguments and evidence from various sources is part of this competence. The ability to use scientific methods also comes under this competence. Critical thinking and problem-solving are linked to creativity and innovation. Creativity is understood as being inquisitive, persevering and willing to be imaginative when solving problems, alone and not least in cooperation with others. Innovation includes key aspects of creativity, but also means being able to take initiatives and transform ideas into action.

To contribute to new ideas, innovation and restructuring in working life, and to deal with future societal challenges, the Committee emphasizes school should help pupils to develop the ability to explore, see new possibilities and develop new solutions. Having the competence that enables one to be creative, alone or with others, is important for each person, in school, in working life and in other arenas. Creativity, innovation, critical thinking and problem-solving are key competences in many subjects.

Figure 1.3 illustrates the competence areas.

1.1.2 In-depth learning and progression

In-depth learning

The most important point of a competence is its application, in other words, the capacity to use and apply knowledge and skills to master challenges and solve problems. The knowledge and understanding pupils have of what they have learnt, how they can use what they have learnt and when to use it, play an important part in acquiring competence. Thus the development of competence and in-depth learning are closely linked, the acquisition of competence requires in-depth learning.

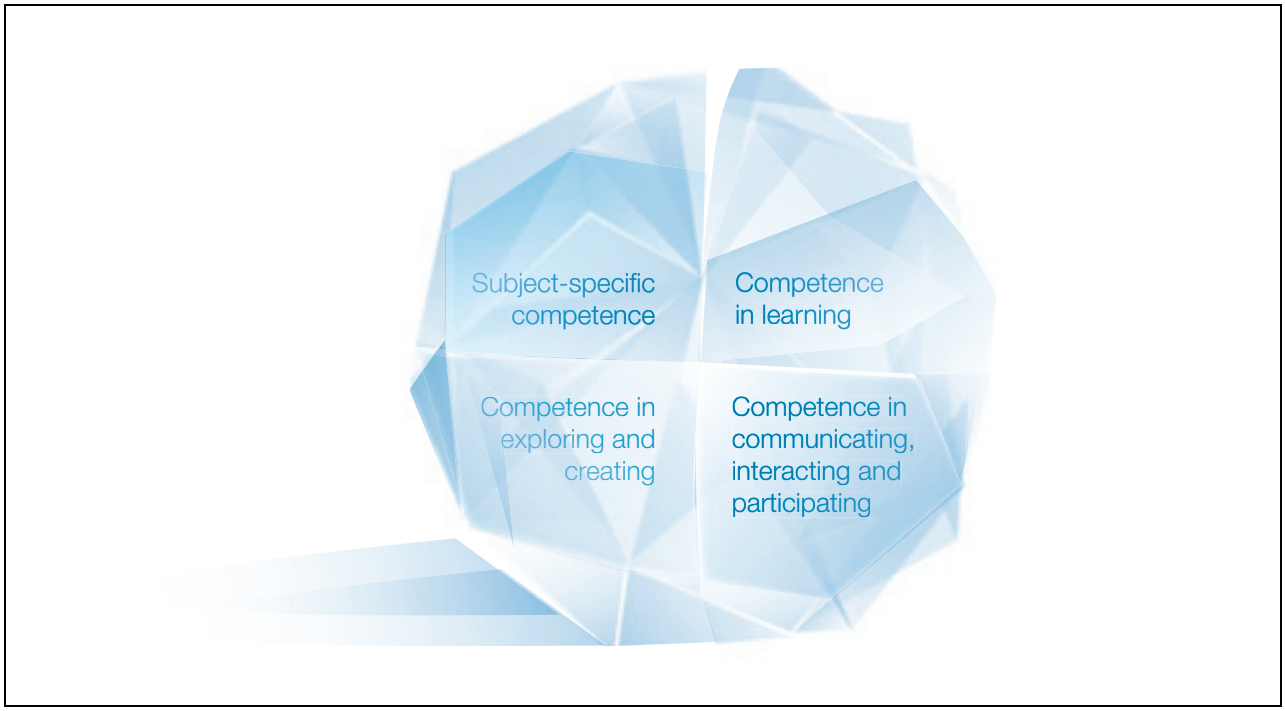

Figure 1.3 The four competence areas

Developing understanding in a discipline or across disciplines requires that pupils acquire knowledge and skills, reflect on what they learn and place it in context with what they know and can do from before. Learning something thoroughly and with good understanding demands active participation in one's own learning processes, the use of learning strategies and the ability to assess one's own mastering and progress. Hence in-depth learning is closely connected to learning competence.

Learning new competencies is just as important for theoretical knowledge areas as for areas demanding practical skills. In-depth learning is equally important for developing competence in all subjects, in primary and lower secondary education as well as the common core subjects and programme subjects in upper secondary education. Learning and mastering the methods and ways of thinking are essential for all school subjects – mathematics and natural sciences, languages, social studies and ethics, the practical subjects and aesthetic subjects. When the teaching is adapted to each pupil, they will have different needs in terms of what they study in depth and how. To be able to study in depth in individual topics the pupils have to have the opportunity to make choices.

Learning content thoroughly rather than superficially requires the pupil's active involvement, but it is the school's responsibility to provide conditions for good learning. Sufficient time for in-depth study, challenges adapted to each pupil and the level of the group of pupils, as well as support and guidance, are key concepts for the teachers' work. The teachers' work in promoting in-depth learning assumes varied teaching methods.

The Committee argues that in-depth learning in school will help the pupils to master key elements in the subjects better, and make it easier to transfer learning from one subject to another. Understanding of what the pupil has learnt is a requirement for and consequence of in-depth learning. Schools that provide better learning processes that lead to understanding may help strengthen the motivation of their pupils and their sense of mastering and relevance in the day-to-day life in school.

Progression

Progression refers to development in pupils' learning and is closely connected to in-depth learning. In the report, progression has a learning-psychological aspect relating to how pupils' understanding develops over time, seen as learning progression in a subject area. In the subject curricula, learning progression will be expressed by the fact that the key concepts, methods and relationships in a subject will be connected to students' development.

Figure 1.4 Illustration Chapter 1

The Committee recommends clearer progression between the main levels in the subject curricula. Clear descriptions of expected progression give teachers and the teaching staff support in following up the pupils' learning within areas in the subjects over time. This will be useful for planning teaching and learning progression for individual pupils and for a whole class, and for being able to adapt the teaching to each pupil's level during the learning process. It is also important in terms of assessment and being able to determine where the pupils are in their understanding of the subject, and being able to give both relevant advice about what to work on and a relevant and fair final assessment.

To help pupils on their way to the expected progression in the subject, the teachers must determine and reflect on whether their teaching contributes to the learning of each pupil and the group of pupils. Thus flexible teaching is required, where teachers are able to make changes if the methods or work forms they have chosen do not give the desired results in their pupils' learning outcome. The Committee recommends that national guidelines should be developed for learning progress in the subjects. This will clarify the expectations for progression in pupils' learning. It should also be assessed how the subject curricula for school years that have a final assessment can provide descriptors for different levels of achievement. An important consideration to make here is whether criteria for final assessment should be rendered as part of the statutory subject curricula or in guidance documents.

1.1.3 Subject renewal

Pupils mainly learn by working with the subjects. The Committee finds that the competence areas form the point of departure for a future renewal of all school subjects. This will contribute to better coherence between the school's objects clause and the subject content in school than is the case today.

In the interim report the Committee attaches importance to the fact that curriculum overload in school, i.e. the problem that arises from bringing new themes and new competence into school without removing anything from what is already there, is a challenge when school is to provide good learning processes and lasting understanding. The subjects must be developed to help pupils study in depth. Research show that it takes time for pupils to develop understanding. This raises the question of how many disciplines it would be realistic for the school subjects to have.

If the subject curricula are to be efficient governing documents and tools for schools and teaching staffs, the content should be connected to the central methods, ways of thinking and contexts of the subject. The Committee argues that by prioritising key building blocks, combined with clearer descriptions of progression in the curricula and guidance material, better conditions will be established for good learning. These measures will make it easier for the teachers to prioritise their work at school.

When the subjects are to be renewed, goals must still be set for the pupils' learning through competence objectives. This will place pupils' learning in the centre of the school's activities. The Committee recommends a reduced number of competence objectives, and that they should be more uniform than they are today. To ensure that the subjects are renewed in a systematic and knowledge-based manner, it is recommended that renewal should be based on

- the abilities and aptitudes for pupils' learning,
- pedagogical, didactic, subject-didactic and learning research,
- relevant disciplines and competences for the future,
- horizontal and vertical coherence in the Core Curriculum, and
- the breadth of the school's objects clause.

The Committee recommends continuous development of subjects and competences in school, which takes into consideration that subject didactics knowledge and knowledge about pupils' learning and productive teaching practice are in ongoing development.

Subject renewal through the disciplines

The Committee recommends that subject renewal should not begin in individual subjects, but rather in disciplinary areas:

- mathematics, natural science and technology,
- languages,
- social studies and ethics, and
- practical and aesthetic subjects.

When the competence areas are to be emphasized in the subject curricula, the different subjects in each discipline must be considered coherently. In part, the subjects may reinforce each other by having goals for pupil competence in important areas. This means emphasising the common responsibility of the subjects. The subjects may also be developed with a higher degree of work division. Not all competences need to be present in all the subjects.

The Committee argues that an increase in the flexibility in the distribution of subjects and allocation of teaching hours per subject may be considered as a measure to stimulate learning activities across subjects in the disciplines. This may provide good opportunities for spending a sufficient amount of time on the priority areas.

The Committee argues that three interdisciplinary topic areas are particularly important in the future and must be clear in the subject curricula: Sustainable development, the multicultural society and public health and well-being. These three topic areas must have competence objectives in the subjects across the disciplines.

The Committee also argues that the common core subjects in upper secondary education must be renewed in accordance with the same principles as the subjects in primary and lower secondary education, and must build on the competence achieved by the pupils in primary and lower secondary education. The four competence areas must be emphasized in all the subjects, and must open for good progression through the entire learning trajectory. To achieve stronger relevance in the common core subjects, particularly in vocational study programmes, it is recommended that subject curricula are prepared in the common core subjects to fit the various education programmes, and which may function together with the programme subjects. A reduced number of competence objectives in the common core subjects may contribute to reducing curriculum overload in the subjects.

1.1.4 Teaching and assessment practices

Teachers' planning and their teaching are of great importance if pupils are to develop the recommended competences. It is very important for pupils' learning that schools work systematically to develop productive learning environments, where pupils dare to try and fail, and learn to share the responsibility for the social climate in the school. The social and emotional development of pupils is important for their own learning in the subjects, but is also important when it comes to the responsibility everyone has to create and have impact on a good school, class and learning environment. A productive social environment is essential for an individual to succeed, but it is also important for the school community to function and to be experienced as a safe and good place for all. In the opinion of the Committee it is of great importance that the pupils learn the value of meaning something to others, and that they stand up for and assume responsibility for others, also considered in the light of the individualisation of society.

The teaching and assessment practices must be developed to deal with the renewed subjects, and will demand a long-term effort to develop teacher competences. Formative assessment should be given emphasis as an integral part of the teaching practice in the subjects. The competences recommended by the Committee require that the pupils have an active role in the teaching. The pupils must develop awareness of their own learning process, and should be challenged to apply what they learn in the subjects.

In a future curriculum renewal the Committee recommends that greater importance should be attached to the professional responsibility of schools to choose subject content, work methods and organisation that are based on research, are relevant for what the pupils are to learn and are adapted to the group of pupils in question. The professional autonomy teachers have means having the responsibility for making reasoned and research-based choices of methods in their teaching.

The Committee argues that formative assessment, overall achievement grades and exams may be developed so that they support and reflect the content of the school of the future. Formative assessment is an important measure for promoting pupils' learning, and through the overall assessment grades the teachers have the opportunity to assess the breadth of their pupils' competence. There will be a need to develop these

Box 1.2 Key concepts in the main report

Competence

Competence means being able to master challenges and solve tasks in various contexts, and comprises cognitive, practical, social and emotional learning and development, including attitudes, values and ethical assessments.

Knowledge, skills, attitudes and ethical assessments are all requirements for and part of developing competence. To display competence, pupils must often apply different types of knowledge, skills and attitudes in context.

Four areas of competence

The Committee recommends that these four areas of competence should be the focus in the future school:
- subject-specific competence
- competence in learning
- competence in communicating, interacting and participating
- competence in exploring and creating

Subject-specific and cross-curricular competence

The report distinguishes between *subject-specific and cross-curricular* competences. Subject-specific competences are related to science subjects and other subjects or knowledge areas that school subjects build on. Cross-curricular competences are relevant for many subjects and knowledge areas. Subject-specific and cross-curricular competences must be integrated in subjects and together constitute the competence in a school subject.

In-depth learning

In-depth learning refers to pupils' gradual development of understanding of concepts, concept systems, methods and contexts in a discipline. It also refers to understanding topics and problem formulations across subjects or knowledge areas. In-depth learning means that the pupils use their ability to analyse, solve problems and reflect on their own learning to construct a robust and flexible understanding.

Progression

Pupils' understanding develops over time in a learning progression in a particular discipline. Progression creates development processes that enable in-depth learning.

schemes and the competence and practice of teachers, particularly with a view to the challenges that arise when assessing a broader competence concept in the subjects. A long-term, knowledge-based development is recommended, where the point of departure will be the renewed subject curricula.

1.1.5 Implementation

The Committee recommends that a comprehensive strategy is made for the introduction of new subject curricula where the various phases of the implementation work are described, and where this includes what is expected of the stakeholders on the national, regional and local levels. The Committee recommends that the national education authorities should provide for goal-oriented and systematic work over time, and that good structures should be established for meeting places and dialogues that will be used throughout the implementation process. Clear goals and expectations and good support from the national authorities are important for realising school policy on the local level. The key aspects of the implementation strategy proposed by the Committee are
- dialogue and anchoring,
- coordination of resources and measures,
- building capacity and developing competence,
- strengthening the local work on the subject curricula,
- necessary changes in the Quality Assessment System and
- research-based evaluation.

One of the measures in the strategy is to formulate a plan for building capacity and the develop-

ment of competence which has a strong focus on the four areas of competence and the renewed subject curricula. Competence development in the form of continuing education and school-based competence development programmes will be important measures for creating changes in school practices. To make changes, the teaching staff and school leaders must be actively engaged, involved and motivated to organise and develop the school's practice. School leaders and school owners have responsibility for the quality of the teaching and must provide frameworks for the teachers' work, and it is necessary to support their capacity and competence during the implementation process.

The Quality Assessment System should be developed according to the changes in the content of the subjects, and the measures recommended by the Committee must be examined, studied and evaluated by researchers.

The Committee would like to point out that the capacity and competence that have been developed through the introduction of the Knowledge Promotion Reform [Kunnskapsløftet] provide a solid foundation for the future development work because the recommendations in the report are advancements of the competence-oriented subject curricula we have today.

1.2 About the Committee and its mandate

This section discusses the composition of the committee, its mandate, the interpretation of the mandate and how the Committee has worked to satisfy it.

1.2.1 Composition of the Committee

The background for the Committee is described in Report to the Storting no. 20 (2012–2013) *On the right way – Quality and diversity in the comprehensive school* [På rett vei – Kvalitet og mangfold i fellesskolen] and has been described in the interim report.

On 21 June 2013, the Stoltenberg II Government appointed a committee to assess the degree to which the content of school covers the competences pupils will need in the future society and its working life.

The Committee is composed of the following members (plus region of residence):
Sten Ludvigsen, Professor, Head of the Committee, Oslo
Eli Gundersen, Chief Municipal Education Officer, Stavanger
Sigve Indregard, journalist, Oslo
Bushra Ishaq, social commentator, Oslo
Kjersti Kleven, Chairperson of the board of The Federation of Norwegian Industries, Ulsteinvik
Tormod Korpås, Head of a Upper secondary school, Sarpsborg
Jens Rasmussen, Professor, Copenhagen, Denmark
Mari Rege, Professor, Stavanger
Sunniva Rose, Ph.D candidate, Oslo
Daniel Sundberg, Professor, Växjö, Sweden
Helge Øye, Project manager, Gjøvik

1.2.2 Mandate for the Committee's work

The Committee's mandate is to assess the subjects[2] in primary and secondary education and training in accordance with the requirements for competence in the future society and its working life.

The Committee shall submit an interim report within 1 September 2014 presenting a knowledge base and an analysis of:

- the historical development in the subjects in primary and secondary education and training over time
- the subjects in primary and secondary education and training compared to countries it is natural to compare Norway with, including structure, grouping and content
- reports and recommendations from national and international stakeholders on the future competence requirements which are relevant for primary and secondary education and training

The Committee shall submit its main report within 15 June 2015 with assessment of:

- the degree to which today's subject content covers the competences and the basic skills the Committee finds pupils will need in the future society and its working life
- the changes that should be made if these competences and skills are to be incorporated within the content of the education
- whether today's subject structure should continue to form the foundation for the edu-

[2] This is here limited to all subjects in primary and secondary education and training and the common core subjects in upper secondary education (Norwegian, mathematics, natural science, English, social studies and PE).

cation, or whether the content of the education should be structured differently, and
- whether the content of the objects clause for primary and secondary education and training adequately reflects the education and training's subject content

At least one of the Committee's proposals for change should be able to be realised within the current resource framework.

The Committee's has been instructed that the objects clause currently in force for primary and secondary education and training is to be maintained. The proposals must be based on the idea that pupils leaving compulsory school will still be able to choose from among all the education programmes in upper secondary education. The Committee shall not propose a concrete distribution of subjects and allocation of teaching hours.

The Committee must assess the need to hire additional expertise to support its work, and should open for representatives of relevant organisations and research communities to present their points of view and problem formulations. This could, for example, be done through a reference group. When the Committee finds the need to interpret or delimit its mandate this shall be addressed to the Ministry of Education and Research. The ministry will arrange for secretariat services for the Committee.

1.2.3 The Committee's understanding of its mandate

The Committee has emphasised the following in its work on the main report:

The relationship between the interim report and the main report

The Committee has in general chosen to deal with the division between the main report and interim report as outlined in the mandate. The interim report NOU 2014: 7 *Pupils' learning in the school of the future* comprises an important knowledge base for the main report.

Research and report-based knowledge foundation

The Committee propose that the content of school should be developed according to a strong knowledge base. Trends in societal developments, knowledge from different research fields and school's social responsibilities are key premises for the assessments and recommendations in the main report.

Results from research on learning and subject didactics and didactics research have been given special focus.

Various international organisations, education authorities in a number of countries and comprehensive research and report projects have contributed perspectives on which competences will be especially important in the future. The Committee has examined the knowledge from these fields and included it in its assessments in the report.

In the main report the Committee provides a number of examples from schools which today are doing productive work on key aspects of what the Committee recommends should be strengthened in the school of the future. The report also has some examples of what form subject renewal may have. The purpose of the various examples has been to shed light on some key dimensions or illustrate some important matters. The Committee is responsible for the interpretation and use of the examples.

The main report builds on the interim report. The Committee refers to the interim report for a description of the knowledge base.

A broad competence concept

The Committee bases its findings on a competence concept that has a wide breadth. Competence is connected to school's broad "*bildung*" and qualification responsibility, as described in the objects clause and the main curriculum in their entirety. This means that the competence concept comprises academic knowledge and skills, social and emotional learning and development, attitudes, values and ethical assessments.

A system with coherence

The subject curricula are both governing and pedagogical tools for planning and implementing teaching. The content and form of the curricula thus impact school practices. How the intentions behind the subject curricula are realised is, however, closely connected to other circumstances around them, including systems for pupil assessment and quality assessment. All changes in school are dependent on the teachers' practices and on teachers and school leaders becoming engaged and involved in the implementation work.

Figure 1.5 Illustration Chapter 1

1.2.4 Openness and involvement

The Committee has chosen an open work form to include a broad target group, both in the school sector and other sectors in society. An important measure has thus been to establish the blog https://blogg.regjeringen.no/fremtidensskole/.

The blog contains information about the Committee's mandate and composition, case documents from all Committee meetings, as well as blog posts from Committee members, researchers, school stakeholders, organisations and others. It has been possible to enter comments in the blog, and other input has been sent in writing to the Committee.

The blog was launched in December 2013. It has had an average of 2400 readers had 6000 hits a month. At the time this report is going into print, the blog has had more than 30 000 visitors and more than 80 000 hits.

The Committee has invited a number of organisations and research environments to meetings and to provide input on key issues in the Committee's work. There have been regular meetings with the Union of Education in Norway [Utdanningsforbundet], the Norwegian Association of Heads of School [Skolelederforbundet], the Norwegian Union of School Employees [Skolenes Landsforbund], the Norwegian Association of Graduate Teachers [Norsk Lektorlag], the National Parents' Committee for Primary and Secondary Education [Foreldreutvalget for grunnskolen], the School Student Union of Norway [Elevorganisasjonen], the Norwegian Confederation of Trade Unions [LO], The Confederation of Norwegian Enterprise [NHO], employer organisation for local and regional authorities [KS], a Norwegian Employer's Organisation [Spekter], the Confederation of Vocational Unions [YS], the Enterprise Federation of Norway [Virke], the confederation of employee organisations [Unio], the Federation of Norwegian Professional Associations [Akademikerne], the Sami Parliament [Sametinget] and the National Council for Teacher Education [Nasjonalt råd for lærerutdanning], who have offered input to the Committee's work.

The Committee has also had meetings with a number of experts and research groups in different fields, such as the national centres, various national associations for school subjects and a number of research environments in universities and colleges. Several of these have provided important input for the Committee's work. The Committee has additionally been in contact with a number of NGOs. Much of the input to the work is available on the blog website.

The Committee has assessed the subject curricula, research and experiences from a number of other countries and been in contact with education authorities in Sweden, Denmark, Finland, Scotland, the Netherlands and New Zealand.

To ensure the quality and long-term effect of our work a researcher group and sector group were established as external readers of drafts of the report. See the blog website for a list of members of these groups.

The Committee invited interested parties to a conference when our work commenced, where many academic and research groups and organisations participated.

The Committee has had very good experiences from being open and involving others throughout our work. The level of interest, engagement and input to the Committee work has helped us to increase the quality and relevance of our work. The open work form may also contribute to good processes for the consultation process and implementation processes.

The Committee has had ten meetings during the committee period.

Chapter 2
Competences in the school of the future

Figure 2.1 Illustration Chapter 2

The Committee was asked to assess the competences pupils will need in the future society, working life and their own private lives in a 20-30 year perspective. These future competences needs will form the point of departure for assessing how the subject content of school should be renewed.

In this chapter the Committee assesses and gives rationales for which areas of competence should be emphasised in the school of the future. The rationales the Committee finds important are the content of the objects clause, key trends in societal development and knowledge from various research fields. The second part of the chapter provides definitions of the competences, and some aspects of these are discussed in depth due to their importance for the school of the future.

Several trends suggest a society characterised by complexity, greater diversity and a more rapid pace of change. The societal trends the Committee finds most important have been pointed out in various international and domestic reports and research work.[1] The societal features reflect to a large extent the local, national and global communities the pupils are part of, as well as the working life they will join later in life.

[1] Erstad et al. 2014

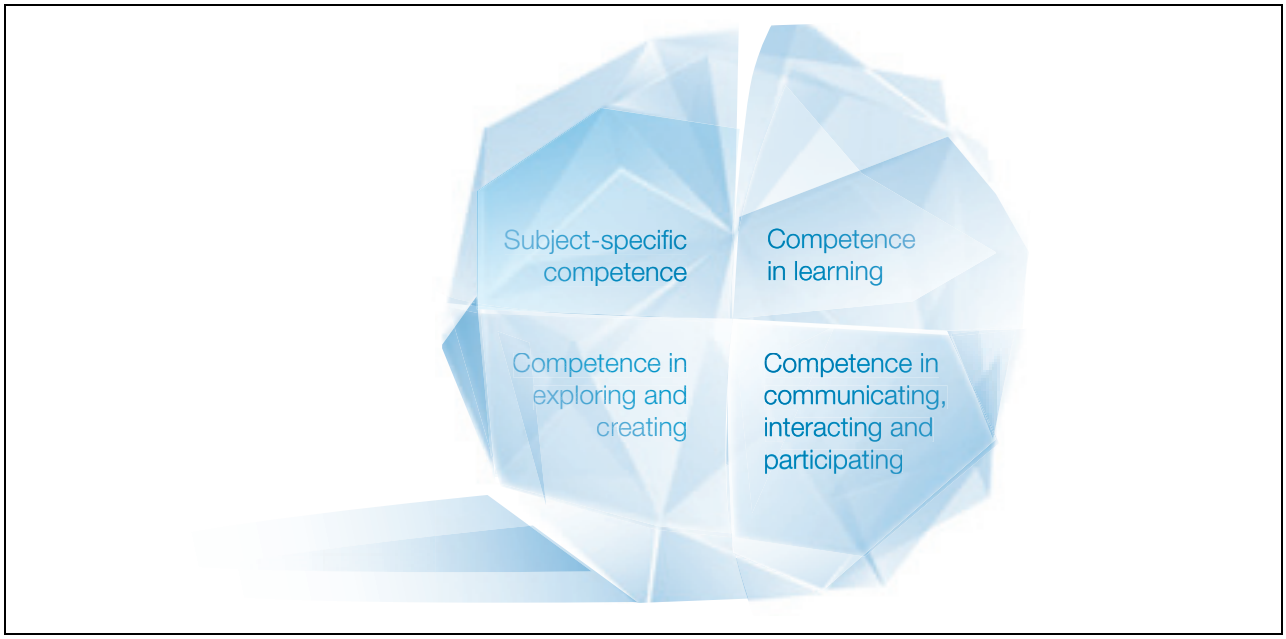

Figure 2.2 The four competence areas

The Committee recommends that the following four areas of competence should be given emphasis in the subject content of school in a perspective stretching from 20 to 30 years:

- subject-specific competence
- competence in learning
- competence in communicating, interacting and participating
- competence in exploring and creating

The Committee point out that pupil's development of competence in key subjects and disciplines will also continue to be important in the school of the future. Pupils will need to acquire new knowledge and develop what they already know and can do, and school should therefore develop their competence in learning. Pupils' ability to learn to communicate, interact and participate is becoming more and more important, both for the society and each individual, and will be an important part of creating a good learning environment in school. School should also contribute to teaching pupils to explore and create. This is important if pupils are to be able to contribute in working life and society and are to contribute to exploring and finding solutions to new challenges.

In sum, these areas of competence will reflect the school's societal mission. As illustrated in Figure 2.2, each competence area is important on its own in a school for the future, but they are also interconnected and will be developed in collaboration with each other. The Committee attaches importance to how pupils should develop competence through their work with the school subjects, and Chapter 3 assesses how today's school subjects may be renewed so that the competence areas will influence the education more than is the case today.

2.1 The competence concept in school

In school, competence refers to goals for pupils' learning and development. The use of the competence concept puts focus on what pupils should learn, and which competence they should develop through their education. Pupils' development of competence is a process stretching across the entire educational pathway. Knowledge is decisive in a school aiming to develop pupil competence, but the competence concept reinforces the fact that the pupils must learn how to use the knowledge and skills they acquire.

The Committee recommends continuing with the competence concept in today's school, but wants to put more focus on defining competence broadly, see Box 2.1. This means that when the pupils develop competence, they will develop their thinking and practical skills, and they will also develop socially and emotionally. Competence also means being able to reflect on and assess what a situation or task requires, what is ethically acceptable and understanding what the consequence of an action are. The need for the broad

Box 2.1 Definition of competence

Competence means being able to master challenges and solve tasks in various contexts, and comprises cognitive, practical, social and emotional learning and development, including attitudes, values and ethical assessments. Competence can be learnt and developed and is expressed through what a person does in different activities and situations.

Knowledge, skills, attitudes and ethical assessments are requirements for and parts of developing competence. To demonstrate competence, pupils must often apply various knowledge, skills and attitudes together.

competence concept is found in the complexity of the challenges the pupils will encounter in school and later in life, and this idea is also supported by research on learning and development and the school's societal responsibilities.[2]

2.1.1 Subject-specific and cross-curricular competence

The report distinguishes between *subject-specific and cross-curricular* competences. Subject-specific competences are connected to the science subjects and other subject/knowledge areas the school subjects build on. Cross-curricular competences are relevant for many subjects and areas of knowledge. The Committee finds that both subject-specific and cross-curricular competences should be integrated in the school subjects, and that pupils' learning occurs through working with the subjects. It is important to bear in mind that learning a subject requires cross-curricular competences, and that the relationships between what is subject-specific and what is cross-curricular will change over time when a school subject is renewed and developed. These concepts are necessary analytical tools for the development and implementation of subject curricula so we can assess how they contribute together to renewing and changing the content of a subject.

2.2 Competences for the future – rationales and considerations

2.2.1 School's social responsibility

School's social responsibility comprises goals for both society and each pupil. The objects clause states that pupils are to develop knowledge, skills and attitudes to master their lives and to be able to participate in working life and society. They must be allowed to experience and show the joy of creativity, engagement and the desire to explore.

The activities in school must reflect the objects clause. The Committee therefore attaches importance to how, in sum the competences recommended for the future must reflect school's social responsibility. School's social responsibility will also comprise more than the sum of the competence objectives in the subjects. School should, for example, support the identity development of the pupils and assume responsibility for the interpersonal relations and the social environment in school.[3]

2.2.2 Important trends in societal development

Today's Norwegian society is characterised by stability and good living conditions. Compared to many other countries in the world, Norway has a well-functioning democratic system, comprehensive welfare programmes, a high level of education, competitive business and industry and high employment. This is an important point of departure for creating a school and a society where the pupils can realise their opportunities and live productive and safe lives.[4] However, there are also inequality in Norway. School has an important duty to make it possible for all pupils to master their lives and participate in work and the social community. At the same time, Norway is also part of a world dominated by major challenges.

Globalisation is a dominate development trend, and it is probable that this development will increase and continue. People, ideas, capital, goods and services are being moved across national borders more than ever before, and contact and influence between people from different countries are on the rise. Norwegian economy and welfare depend on comprehensive financial, cultural and political cooperation, both with the European sphere and other regions of the world.

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2 NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future]

3 Section 9a-3 of the Education Act: The psychosocial environment.

4 Malik 2013

Norway is part of the international migration picture, where the immigrant proportion of the population appears to be increasing. This contributes to a growth in ethnic, religious and cultural diversity in the Norwegian society.[5] Urbanisation is a developing feature in Norway that impacts where people live and the type of work they have, and also impacts our attitudes and the way we choose to live.[6] Cultural diversity and multilingualism enrich society and create new resources. We also see that cultural complexity in society creates tensions that may lead to conflicts between groups.

Common challenges, such as climate change and the conflict level in the world impact society locally, regionally and globally, and require solutions that must be found together where one of the aims is to promote social responsibility. In the future, climate change will increasingly impact nature, the environment and people's living conditions. It has been estimated that migration due to climate change will increase towards 2050.[7] Some of the aims of a democratic society are that its inhabitants are willing to support key social values and principles and that the various groups in society participate in organisational life and elections, and are involved in their society. Societal changes arising because of globalisation, increased diversity and individualisation make it important to concentrate on democratic participation and what it means to co-exist in society.[8]

Society is changing at an increasingly rapid pace, and this means that knowledge has to be renewed on a continuous basis. Investment in human knowledge and competence is the most important underpinning for future welfare and economy, and it is highly important that the individual has the opportunity to realise him/herself. Research, innovation and technological development are important contributors to Norwegian business and industry's competitiveness and are important when dealing with national and international societal challenges. Today a large proportion of Norway's income stems from oil and gas-related industries. Due to climate emissions and the fact that in the long run oil and gas reserves are non-renewable resources, it is important to stimulate innovation and the development of business and industry in other fields.

Technological development creates new forms of communication, collaboration and cooperation in working life and society at large. Today's working life has high demands for competence, education and the ability to restructure and cooperate across professional and vocational fields. It is probable that the number of jobs that demand complex problem-solving and communication will increase in the coming years, whereas a number of monotonous and manual jobs will be taken over by technological solutions.[9] Demographic changes will impact working life in the future. For example, the workforce will probably have to cope with heavier demands on their provider responsibilities.[10]

Societal development is placing greater demands on each individual. Access to information is extremely comprehensive, and the information that is available to each individual through media and other channels is often complex and stems from different types of sources. It will therefore be important for pupils to be able to process complex information and assess information critically. Each of us must make considered and deliberate decisions in many fields, for example, personal health, social relationships, sustainable consumption and personal finances. When society in many fields is characterised by individualisation, this may provide great freedom to make individual choices, but this may also demand more of each individual.[11]

In sum, the trends offer a picture of a future society that will typically feature rapid changes, development of technology and knowledge, diversity, complexity, major social challenges and opportunities for development.

2.2.3 Relevant research

The interim report describes various research fields which help to illuminate what is important for pupils to learn in school. Recent research on what creates conditions for learning is in focus here. Learning occurs in an interaction between cognitive, social and emotional aspects of pupil's learning. Research supports the idea that a learning environment which is perceived as safe and is

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5 Meld. St. 6 (2012–2013) *En helhetlig integreringspolitikk. Mangfold og fellesskap* White paper: [A comprehensive integration policy. diversity and community]

6 Fløtten et al. 2013

7 IPCC, UN's Climate Panel 2014

8 Meld. St. 6 (2012–2013) *En helhetlig integreringspolitikk. Mangfold og fellesskap* White paper: [A comprehensive integration policy. diversity and community]

9 Autor et al. 2003, Levy 2010, Frey and Osborne 2013, Pajarinen et al. 2015

10 Fløtten et al. 2013

11 NOU 2003: 19 *Makt og demokrati* [Power and democracy], Beck 1992

based on good relationships is decisive for supporting pupils' academic, social and emotional learning and development. Furthermore, productive cooperation between the home and school is important for pupils' learning and development.

Social and emotional competences which earlier were considered to be stable personal features can be developed and learned, and have impact on academic learning. The Committee underlines that when the teaching stimulates the pupils' development of metacognition and self-regulation, this promotes learning in the subjects.[12] As the ability to learn is so important in school, working life and society in general, metacognition and self-regulation will be important competences for the pupils to develop.

In a learning context the concept of self-regulated learning means that the pupils learn to take initiatives in their own learning processes and to work purposefully to learn in the subjects. Self-regulated learning occurs in collaboration with others. In the interim report the Committee also attaches importance to a psychological understanding of self-regulation, which means the ability to manage and take control of one's own actions, emotions and thinking.[13] Being able to work purposefully, resist distractions and adapt in collaboration with others are examples of self-regulation. Self-regulation and the ability to act reliably and responsibly are important for pupils' learning in school and how they later cope with working life and their own lives.[14]

2.2.4 Competence needs

The Committee has considered key aspects of social developments, relevant research and the content of the objects clause. In sum this supports the idea that pupils in the Norwegian school will need to develop subject-specific competences and cross-curricular competences that are important in many subjects, such as the ability to learn, communicate, cooperate, participate, explore and create. A broad competence concept which involves thinking, practical skills and social and emotional learning and development should be reflected in the competences.

The pupils will need to develop competence in the disciplines of mathematics, natural science and technology, languages, social studies and ethics, as well as in practical and aesthetics subjects. This will give them the foundation from which to make further choices about their education and vocation. These disciplines are important for creating welfare and a good community to live in, and for ensuring innovation and competitiveness in Norwegian business and industry. Knowledge about society and the surrounding world will contribute to personal development, critical reflection and an informed well-functioning democracy.

The complexity of society, and the duties and challenges pupils will encounter, means that pupils must learn to use knowledge and skills in different ways. As knowledge is continuously renewed, pupils must be able to develop and refine what they learn in the subjects later in life. Learning the scientific methods of the subjects, the ways of thinking, concepts and principles may give pupils competence which will be relevant over time, and provide tools for understanding how specialised knowledge changes. Digital communication tools and other technologies will be involved in a high number of situations, so pupils need to develop digital competence as part of their subject competence.

To acquire new knowledge and deal with changes and restructuring in working life and other arenas, pupils need competence in learning. This means that they must develop awareness of what they actually can do and know, and how they can use it, and that they master relevant learning strategies. It is important for further learning and for the learning environment in school that pupils have a positive view on learning and their own mastering.

It is of great value socially, culturally and financially that school contribute to developing pupils' competence in being exploring and creative. Society has a great need for innovation, research and competence to deal with complex duties and challenges. Thus the pupils need to learn creativity, innovation, critical thinking and problem-solving. It is also a very important value for society that there is competence in creating artistic and cultural expressions. The open and experimental approach to being creative in art and culture may enrich the individual's life, and society as a whole.

If citizens are to find their way in a complex society and make informed choices in their lives, they will need the ability to make critical assessments and be good at problem-solving. Already during their primary and secondary education

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[12] NOU 2014: 7 *Elevenes læring i fremtidens skole*, [Pupils' learning in the school of the future] Durlak et al. 2011, OECD 2015b

[13] Baumeister and Vohs 2007, Mischel and Ayduk 2004

[14] Mischel and Ayduk 2004, NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future]

and training pupils need to practise asking exploratory questions, analysing and solving problems with others, in addition to developing and implementing ideas.

The need for creativity, innovation, critical thinking and problem-solving is not restricted to academic professions and professions with theoretically oriented job descriptions. Skilled workers will also need to make critical assessments as part of their practical work, and will need to find solutions and implement ideas in practice.

School is a society in miniature, where the pupils learn, interact and participate in and with various communities. Research indicates that strategies for cooperation, daring to speak up and to understand that one's own participation means something to others, can be learnt and developed and should be given greater attention in school. In school, in working life and in various social arenas the pupils must be able to communicate, interact and participate. Trends such as increased diversity and individualisation create the need to understand democracy, to respect differences and to have positive attitudes to co-existence in a community.

Massive and complex access to information, digital communication technology and the large amount of written information in society result in the need for sound competence in reading and writing. Pupils must be able to understand various types of texts, collate information from different sources, assess the credibility of sources, have the ability to judge digital sources and be able to communicate according to various purposes and target groups. In the future, society will also place high demands on the individual's ability to orient him/herself in society, cope with everyday life and make good decisions in his or her own life. Critical thinking, ethical assessment, mathematical competence and knowledge about the body and movement are examples of competences that are important for making choices about personal health, lifestyle, consumption and one's own financial situation.

Pupils' motivations, emotions, attitudes and collaborations with others have intrinsic value in school and for individual personal development. The importance of communication and participation is increasing in society, and the social and emotional competence of pupils impacts subject learning and their later life.[15] The Committee argues that this makes it even more important than before that school should work systematically on supporting pupils' social and emotional learning and development in the subjects. Practical skills have great value in school, in working life and in everyday life, and there is a potential in pupils' learning to apply knowledge and skills practically in many subjects.

In the working life of the future there will probably be fewer jobs for those who have neither vocational training nor higher education. Therefore it will be important for each individual and society that pupils develop good competence, motivation and the will to learn in school, and that they complete and pass the education.

2.2.5 Four areas of competence

Bearing all this in mind, the Committee recommends that the following areas of competence will be important in the school subjects in the future:

- subject-specific competence
- being able to learn
- being able to communicate, interact and participate
- being able to explore and create

Box 2.2 Four areas of competence

1. Subject-specific competence in
   - mathematics, natural science and technology
   - languages
   - social studies and ethics
   - practical and aesthetic subjects
2. Being able to learn
   - metacognition and self-regulated learning
3. Being able to communicate, interact and participate
   - competence in reading and writing and, verbal competence
   - collaboration, participation and democratic competence
4. Being able to explore and create
   - creativity and innovation
   - critical thinking and problem-solving

Scientific methods and ways of thinking are dealt with as part of the disciplines in section 1 and section 4. Digital competence is dealt with in section 1, and also in section 3 and section 4.

[15] NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future]

Box 2.3 Social and emotional competences in the competence areas

The following aspects of the pupils' social and emotional learning and development are found to be important:

Subject-specific competence: ethical assessment ability, engagement, attitudes to subjects and to one's own learning in the subjects.

Being able to learn: Persistence, expectations for one's own mastering and being able to plan, implement and evaluate one's own learning processes.

Being able to communicate, interact and participate: Being able to speak up and contribute, to take the community into consideration by regulating one's own thoughts, emotions and actions, recognising that collaboration and participation are based on mutual dependency, and respecting and seeing the value of the points of view of others.

Being able to explore and create: Curiosity, persistence and being open to see things in new ways, and the ability to take initiatives.

Competence is developed in the subjects

The Committee finds that all the areas of competence are developed through the pupils' work with their subjects, and that they accordingly should be included in the subject curricula. This applies to both the competences that are subject-specific, as the first competence area, and the other three areas of competence, which are more cross-curricular. Thus the subjects of the future will have competence objectives that have both subject-specific and cross-curricular competences.

Social and emotional competences as part of the areas of competence

The broad concept of competence used here means that social and emotional competences are key elements in all the areas of competence. In the interim report, the concept of social and emotional competences is defined as a person's attitudes, behaviour, emotions and social skills, and relationships.[16] Box 2.3 shows which social and emotional competences are important in each competence area.

Elaboration of the areas of competence

Box 2.2 shows how various competences the Committee finds crucial can be connected to the four competence areas. Several of the competences will be relevant for more than one competence area. For example, reading and writing competences are dealt with under the section on communicating, interacting and participating, and the rationale for this is that the purpose of reading and writing is generally to understand and communicate. Reading and writing also contribute to learning in the subjects, and are thus also related to competence in learning.

In sections 2.3–2.6 the competence areas are elaborated on through descriptions of the competences connected to these areas. Grounds are given as to why it is important to focus on these competences in school and how they may be defined. Moreover, aspects of the competences are described which the Committee wants to highlight as important for pupils in the future society and its working life. The competences will be relevant for several of the areas, but will only be described under one of them.

2.3 Subject-specific competence

Today's school subjects are based on different science subjects and subject traditions. The Committee argues that in the future it will also be important for the pupils to develop competence in the most important disciplines found in today's school. All the disciplines are important to give the pupils a foundation they may build on when making their choices of education and vocation. The disciplines also contribute to a liberal education by increasing knowledge, understanding and possibilities for participation in society.

What characterises the competence in science subjects and other disciplines will be developed on an ongoing basis, which should impact the content of the school subjects. See Chapter 3 for more details about subject renewal. Learning scientific methods and key concepts, principles and contexts can supply pupils with resources that are relevant over time. Technological development and digitalisation will lead to changes in the content and methods in the disciplines. The Committee finds that digital competence will be an integral

[16] Skolverket (Swedish National Agency for Education) 2013: *Betydelsen av icke-kognitiva förmågor* [The importance of non-cognitive abilities]

Box 2.4 Mortensnes School: Social and emotional competences as the basis for better learning outcomes

Mortensnes School, located in the municipality of Tromsø in Troms County, is a primary school with pupils from Year 1 to Year 7.

Social and emotional competences promote a productive learning environment and are closely linked to pupils' competence in learning in their subjects. The goal for the project the school has participated in has been that the development of the pupil's social and emotional competence would enhance the learning environment and contribute to improving their learning in the subjects.

Working with social and emotional competences in subjects

The school has prepared definitions and learning objectives for the social and emotional competences. These learning objectives are divided into three development stages expressing the progression and learning process of the pupils in the areas of *cooperation, responsibility, self-control, empathy and self-assertion.*

Examples of progression in cooperation are *I will raise my hand and wait to speak until permitted* on the lowest development level, *I will work with others even if we are not close friends* on the middle development level, and *I will participate actively when we are planning common activities* on the top development level.

The pupils must train in these social competences in the same way they work on learning subject-specific competences. In Mortensnes School it has therefore been important that the pupils understand what to do to develop their social and emotional competences. The learning objectives are so concrete that they can be part of the pupils' learning and work plans.

In all the period plans the pupils are assigned subject and social and emotional learning objectives. The pupils train and develop their competence when they work with the subjects.

Time for subject learning

The project has had much focus on the knowledge and attitudes of the adults in the school. If there is something the pupil is unable to do or understand, the teacher must ask herself/himself what can be done to help the pupil to progress. The school's goal is that it should at all times be able to map, implement and evaluate necessary measures to enhance the pupils' learning environment.

The staff at Mortensnes School point out that working with the social and emotional competences of the pupils is a good use of time because it gives better quality time and more time for subject learning. The teachers are now focused on how and what they do impacts learning outcomes. Good communication and a good learning environment are decisive for pupils' learning. Succeeding in the work with social and emotional competences will give more opportunities to develop subject competence, particularly for pupils with low achievement.

part of what pupils should learn in the disciplines mentioned here.

2.3.1 Disciplines

The main disciplines in Norwegian school are
- mathematics, natural science and technology
- languages
- social studies and ethics
- practical and aesthetic subjects

Here the need is described for the pupils to develop competence in these disciplines. Mathematics is part of the discipline mathematics, natural science and technology, but is given special mention because it also is part of other disciplines.

Mathematics, natural science and technology

Mathematics, natural science and technology are important in a number of vocations, in various social areas and for an individual's coping with day-to-day living. Society needs competent labour and innovation in such fields as medicine, nature management, engineering and technology. Important parts of Norwegian business and industry are based on mathematics, natural science and

technology. This discipline will also be decisive in the search to find solutions to global challenges in terms of sustainable development, for example when it comes to global warming. Each individual needs competence in mathematics, natural science and technology in their everyday life, in many vocations and to understand and become involved in important societal issues.

Mathematics competence

Mathematics is an independent science subject which the school subject mathematics builds on. Moreover, other fields of mathematics are included in other subjects, such as processing numbers, statistics and various forms of representation.

There is broad agreement that there will be a need for mathematics competence in the years ahead.[17] Knowledge development in other science subjects depends on mathematics to ensure the competitiveness of business and industry and innovation in a number of fields in society. Many will need mathematics in education and work contexts.[18] Everyone needs mathematics in day-to-day life, for example to consider numbers and statistics that support various types of information, to be able to assess facts and to deal with social issues critically and with reflection. This is important for an informed and well-functioning democracy. Mathematics competence is also necessary for dealing with personal finances.

In school, mathematics competence is generally dealt with through the mathematics subject. Moreover, numeracy has been given importance as a basic skill in all subjects. Similar examples are found internationally where *numeracy, or mathematical literacy, is defined as skills across subjects, both in the* subject *curricula and in the development of tests.*[19]

See section 2.7 for proposals for changes in today's basic numeracy skill.

Languages

The need for advanced competence in languages and communication and the ability to master several languages become even more important due to the globalisation and internationalisation of society, working life and business and industry. Pupils with bilingual or multilingual competence are a resource for Norwegian culture and society, and they should be given the opportunity to develop their linguistic competence. This applies to pupils with Sami, Finnish/Kven language backgrounds, as well as pupils with other minority-language backgrounds.

English is an international language, and the media are more internationally oriented than was previously the case. European integration continues to create the need for Norwegian pupils to learn European languages. Globalisation is also a reason for pupils to choose languages from other regions of the world. Languages are important for the individual's ability to express him-/herself and develop identity. Linguistic competence must in particular be considered in conjunction with being able to communicate, interact and participate, see section 2.5.

Social studies and ethics

It is important today to understand and analyse historical, cultural, geographical and socio-economic aspects of our society, and this will continue to be important in the future. The general conflict level in the world and economic difficulties impact society globally, regionally and locally. This highlights the need for pupils to understand various aspects of the local, national and global society they belong to.

In a more international world the pupils must learn about different geographical regions and cultures. Knowledge about and reflection on different religious and cultural values and norms are important elements in a multicultural society. Understanding ethical issues and the need for action are important in different areas, for example in connection with conflicts in the world. Knowledge about democratic principles and forms of government will be important in the coming years. Social responsibility and attitudes relating to democracy are related to this. The Committee finds democratic competence to be especially important, see section 2.5.2 on collaboration competence.

Practical and aesthetic subjects

The term practical and aesthetic subjects refers to a broad group of subjects, in today's school represented by the subjects of arts and crafts, physical education and food and health. Practical and aesthetic disciplines broaden the competence pupils

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[17] Input from important organisations to the Ludvigsen Committee in NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future], Binkley et al. 2012

[18] Bjørkeng 2013

[19] Scottish *Curriculum for Excellence*, OECD 2013b

Figure 2.3 Illustration Chapter 2

must develop in school as the basis for further education and participation in working life and society. Working life needs a number of competences which the practical and aesthetic subjects in school offer.

Aesthetic subjects can give pupils different artistic forms of expression and they may learn to express themselves and communicate through various art forms. Artistic and aesthetic forms of expression may promote reflection on the society we live in and on different cultures. This may be very important in a multicultural society. Experiencing and contributing to creating artistic expressions may be important for individual development of identity, knowledge development and the ability to express oneself. These subjects help to develop another type of understanding than scientifically oriented subjects do, and give room to explore and experiment where the goal is not necessarily to achieve an outcome that is the "correct answer".[20]

The Committee emphasizes that it will be more important for pupils to learn how to take adequate care of their own lives, bearing in mind physical and mental health, lifestyle, economy and consumption, often called life skills or everyday competence, and which include the ability to make informed decisions and ethical considerations.

2.3.2 Scientific methods and ways of thinking

The Committee emphasizes that scientific methods and ways of thinking are a particularly important part of the disciplines described under section 2.3.1. The Committee for Quality in Primary and Secondary Education in Norway and a number of international projects have suggested that scientific methods and ways of thinking are relevant for the future, and this is considered in the context of the need to think critically and solve problems.[21]

Increased specialisation and on-going knowledge development in the scientific subjects have created the need to reassess which specialised knowledge pupils need to learn in school. If pupils learn the important scientific methods and ways of thinking, concepts, and principles in different disciplines, this may help them to understand how knowledge is changed, and how to acquire new knowledge.[22] Pupils will thus acquire tools so they can use their knowledge and skills later in life.

However, it will be necessary to consider the importance of scientific methods and ways of thinking in various subjects in school. See Chapter 3 for a more detailed discussion on how concepts from various disciplines, principles, methods and ways of thinking may promote in-depth learning in the subjects.

On the one hand, putting emphasis on scientific methods and ways of thinking in the subjects will be connected to analysis and understanding of how knowledge comes about. On the other hand, practical skills, such as carrying out experiments and finding knowledge through observations and dialogues with others, may also be part of what the pupils need to learn.

2.3.3 Digitalisation and digital competence

The Committee finds that digital competence is an important element in the disciplines in school. Technological development and the use of digital technology have major impact on how we live our private lives, and how we are in school, working life and society. Today, digital competence is necessary if we are to participate in various forms of learning and education, and participate actively in working life and society.[23] Digital competence is an integral part of different disciplines in school and education, and is decisive for innovation and technological development in business and industry and in public enterprises.

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[20] Winner et al. 2013

[21] NOU 2003: 16 *I første rekke* [In the first row], Pellegrino and Hilton 2012, Björnsson and Hörnqvist 2014b, Binkley et al. 2012

[22] NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future]

[23] Input from central organisations in NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future], Erstad et al. 2014

Digital competence integrated in the disciplines

Technological developments, including digital technology, create change in science subjects and in other fields.[24] This will have an effect on the kind of digital competence the pupils should develop in the school subjects. For example, it will vary from one subject to the next as to which types of digital and other technological tools are relevant to use, and what the pupils should use these tools for as part of their subject competence.

Digital competence can be defined in several ways. Often the distinction is made between *ICT competence or technological competence* and *information and media competence*. ICT competence comprises the use of digital tools and technology, understanding of technological systems and acting ethically when using technology. Information and media competence focuses on the use of technology for different purposes and in different contexts, and includes learning about technology and media.[25]

Digital competence across subjects

Digital competence is also considered to be a cross-curricular competence that is relevant across the disciplines. The competence to use a diversity of tools and competence connected to safety and security are examples of digital competence without any immediate connections to any of today's school subjects. Tool competence refers to the practical use of universal digital units and systems, such as using a computer and established software for word processing, and processing numbers, presentations and images. Security refers to learning to protect one's own digitally-stored information.[26] It is proposed in Chapter 3 that such competence should be integrated in one or possibly a few subjects, with clear assignment of responsibility.

Digital competence is also part of other cross-curricular competences, such as being able to think critically and to communicate and collaborate. Critical thinking will today generally be about assessing information which is accessible digitally, see section 2.6.2. Mastering digital tools and surroundings is an important part of communication and collaboration, see section 2.5.

[24] Erstad et al. 2014, Hultin et al. 2014
[25] Erstad et al. 2014
[26] Hultin et al. 2014

2.4 Being able to learn

The Committee argues that pupils in the future school will need to learn and develop their own competence, in school and in other arenas later in life. The Committee finds pupils' development of metacognition and self-regulated learning as essential for further learning and underlines that these areas are developed in collaboration with teachers and co-pupils. A knowledge-based society and working life demand that the individual must develop his or her own knowledge and study new knowledge areas throughout life. By developing metacognition and self-regulation pupils learn to be involved in a way that will promote in-depth learning. This may also promote motivation for learning in school and in other arenas. Being able to plan, implement and evaluate one's own work may give pupils good work habits in school and in further education and working life.[27]

2.4.1 Metacognition and self-regulated learning

Metacognition refers to being able to monitor and reflect on one's own thinking and learning. In a learning context this means that pupils reflect on why they learn, what they have learnt and how they learn. Metacognition also means being able to apply ways of thinking and learning strategies actively and purposefully to promote one's own learning. Pupils will need knowledge about relevant learning strategies in each subject, but they must also be able to use them and assess when their use is relevant. The development of metacognitive competence should be connected to work with individual subjects/disciplines because the pupils will need various strategies and approaches depending on what is to be learnt.[28]

In school and in working life metacognition is important for being able to plan, implement and evaluate one's own learning and work processes. For example, pupils need to assess the level of difficulty of an assignment and to assess how to master the task while working on it.

Metacognition means reflecting on one's own thinking in different contexts, not merely in connection with learning processes. Being able to reflect on one's own thinking and actions is important when solving complex problems or performing tasks and activities.

[27] Paris and Paris 2001, NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future]
[28] Pellegrino and Hilton 2012

Self-regulated learning means that pupils over time learn to take initiatives and control parts of their own learning process.[29] This requires that they learn strategies for planning, tracking and evaluating their own learning process, and for motivating their own effort. In many contexts, particularly early in their learning trajectory, pupils do this together with others. Throughout their learning trajectory pupils should increasingly learn to make their own assessments and to work independently in the learning process. School is responsible for facilitating pupils' learning and helping them to act independently and with co-responsibility within these frames.

Self-regulated learning and metacognition are requirements for learning in all subjects, and should therefore be developed as an integrated part of learning in the subjects.

To develop competence in learning, pupils must also develop their social and emotional competence. Pupil persistence, expectations for their own mastering and being able to plan, implement and evaluate their own learning processes are key aspects. Learning demands persistence, for example when learning processes take time, are perceived as dull or when assignments or subject matter are challenging. Learning strategies for progressing when something is difficult is part of developing persistence. Pupil motivation to learn, the will to reach goals and the sense of autonomy and relevance will also influence pupils' learning. Moreover, pupil expectations for their own mastering will impact motivation, effort, persistence and the goals that they set, and are therefore related to learning competence. Pupil motivation for learning and expectations for mastering are influenced by different matters, including previous experiences of mastering or failing, the knowledge pupils have in a subject and the support they are given in the learning environment.[30]

Pupils' learning and reflection on their own learning processes are formed in a social environment. In school, working life and other arenas pupils will exercise metacognition and self-regulated learning together with others in various contexts. Pupils should acquire strategies for learning together with others, for example, asking for help when they need it and experiencing that they also learn by explaining subject matter to others.[31]

In previous curriculum reforms (Reform 94 and Reform 97), *responsibility for own learning was a key concept*. Even if this was not the intention, many understood this to mean that more of the responsibility for learning something should be placed with the pupils, giving the teacher a more withdrawn role. Experience garnered from these reforms in the 1990s show that it must be communicated clearly that even if the pupils are practising at working independently, school and the teachers are still responsible for facilitating the pupils' learning processes.

2.5 Being able to communicate, interact and participate

Being able to communicate, interact and participate is an important area of competence in the future school. Communication, collaboration and cooperation are often considered together, both in research and in reports on competence for the twenty-first century. The abilities to argue and debate, to work in groups and communicate through different media and to different target groups are seen as important future competences.[32] The Committee considers communication and collaboration as a common area of competence because they are inextricably linked to each other. In the context of communication, reading, writing and verbal competence are also mentioned. Under collaboration competence we find collaboration, participation and democratic competence. The collaboration concept points out the importance of social responsibility and relationships to others. It also shows the connection between cooperation in school and working life and society's need for collaboration and democracy on the local, national and global levels.

2.5.1 Reading and writing competence and verbal competence

The importance of communication in society and its working life is increasing, where society needs employees and citizens who can deal with a complex diversity of information and texts, and who can communicate and interact with others. For individuals, reading, writing and the ability to communicate verbally are important requirements for having a good learning outcome at school and from education, for participating in working life and for orienting oneself and impact-

[29] Pintrich 2000

[30] Marsh et al. 2005, Bandura 2012

[31] Greeno 2006, Håkansson and Sundberg 2012, Pellegrino and Hilton 2012

[32] Dede 2010

Figure 2.4 Illustration Chapter 2

ing the society around them. Moreover, reading and expressing oneself are important parts of the personal development of pupils. Pupils in the future school will need to learn to master many forms of communication, whether they are verbal, written or digitally based. This means that in the school for the future pupils should to an increasing degree practise in genres they will encounter in arenas outside school and later in life.[33]

Common features of reading, writing and verbal competence

Literacy research is an important contributor to understanding reading and writing competence and verbal competence. Today the literacy concept is used to point out that academic, social and cultural contexts place different requirements on reading, writing and communicating verbally. The pupils must therefore learn to read, write, speak and listen with different purposes in different contexts.[34] The development of digital media has led to new communication cultures, genres and complex forms of expression which the pupils must be able to understand and use.

What the relevant competences for reading, writing and speaking are will differ from one subject to the next. Which concepts have to be understood, how one reads texts and how important principles and ways of thinking are presented are closely related to the subject-specific content. As subject terminology and subject matter become more complex, greater demands will be placed on pupils' reading, writing and oral competences. It is important today and will continue to be in the future that school focuses on the relationships between these competences.[35]

Reading competence

Developing reading competence refers to being able to understand, use, reflect upon, critically assess and engage in the content of texts. As is the case today, pupils must be able to deal with access to much and varied information, and be able to read multimodal texts that have varying purposes and are taken from various contexts. Texts include everything that can be read in different media, not just words, but also illustrations, symbols or other means of expression. The understanding pupils have of mathematics impacts how they understand mathematical representations in texts. When reading digitally, pupils must deal with more complex expressions than previously. Finding information, interpreting, collating information from various sources and reflecting and assessing information critically will be an important reading competence in the school of the future.[36]

Knowledge on and the use of strategies are important aspects of reading. Text diversity and the complexity of texts pupils encounter will mean that they have to be able to reflect on the text message and content and compare this with the content of other texts. Such in-depth strategies may increase in importance because much of the digital reading of pupils in today's as well as tomorrow's society is superficial and vulnerable to distractions. Research shows that pupils' development of subject competence and their development of reading are processes that occur parallel to and influence each other. For example, pupils' understanding of concepts and background knowledge in a subject or topic area has an impact on their understanding of a text.[37] It is extremely important for learning in all subjects that the teaching supports pupils' reading development.

A broad understanding of reading refers to how pupils gradually develop knowledge, skills, strategies, attitudes, motivation and ability to interact with their surroundings. Motivation and interest cause pupils to engage in the reading in a way that promotes understanding, and are therefore considered part of the pupils' reading competence. Together, reading and writing are seen as important tools for expanding one's own horizon

[33] OECD 2010, Aasen et al. 2014, Berge et al. 2014
[34] Barton 1994, Berge 2014, Skaftun 2014
[35] Alexander 2012, Shanahan and Shanahan 2008, Skaftun 2014
[36] Alexander 2012, Bjørkeng 2013, Bråten and Strømsø 2009
[37] Skaftun 2014, Alexander 2012

of understanding and giving knowledge and motivation to participate in different societal arenas.[38]

Writing competence

The dependency on written matter in society has increased, particularly due to digital communication tools and social media. The importance of mastering written communication and collaboration is on the rise. Being able to write means the ability to express oneself understandably and appropriately on various topics, and being able to communicate with others. Writing is also a tool for developing one's own thoughts and learning.[39]

Writing refers to mastering different writing actions which take place in various contexts and with different purposes. Being able to write convincingly and reflectively gives the basis for expressing one's own opinions and for one's own thinking and identity development. Writing can also be used to organise one's own knowledge and develop new knowledge. Being able to use relevant concepts and structures adapted to the context is closely interwoven with learning in the subjects. The pupils must be able to apply grammar and language norms and write in a logically coherent manner across subjects and situations.[40]

Being able to plan, design and edit texts that are adapted to the content and purpose of the written text is part of being able to write. In working life, society and organisational life, and in personal day-to-day affairs, it is important for pupils to develop writing strategies. Receiving and giving feedback on texts and producing texts in cooperation with others will be important competences in school and working life in the future.

Verbal competence

In the future, pupils will continue to come to school with a wide range of language experiences. Learning to communicate orally with different purposes is important in school as preparation for participation in working life, for stating opinions and for mastering communication situations in everyday life. Developing the ability to express personal thoughts and opinions will, just as today, be an important part of the identity development of pupils.

Verbal competence may be defined as creating meaning through listening, speaking and conversing.[41] This means being able to present messages with different purposes to different recipients. Being able to listen means understanding and processing what is said, giving a response and being aware of the understanding of the recipient when speaking.

All pupils have an everyday language they use with family and friends, and developing this has an effect on their personal development. In school pupils must learn to use the language in genres that are relevant in various social and work contexts, for example, by giving presentations or participating in discussions. The pupils must obtain knowledge about and training in relevant patterns of action, concepts and expressions that are demanded in various situations.[42]

School must give the pupils a metalanguage for verbal communication. This means being able to use strategies to plan what to say in various contexts and being able to reflect on their personal verbal communication, for example when taking part in dialogues.[43]

Attitudes are a key aspect of verbal competence, such as showing respect for the person one is speaking with or listening to. In a diverse and democratic society, being able to listen to and acknowledge points of view and perspectives is an important competence. The Committee points out that verbal competence must be considered together with collaboration competence.

2.5.2 Collaboration competence

The need for collaboration and participation is rising in many arenas. In Norwegian school and working life cooperation is a widely used work method, and participation, co-determination and democracy are important values. Collaboration across different backgrounds, values and points of view have major significance in a diverse society when it comes to religion, culture and values. For the individual it is important to be able to participate in different arenas, express opinions and enter into positive relationships with others. Being able to carry out activities and perform tasks with others is important in working life, and many will need to cooperate on solving complex problems, often across vocations or disciplines.[44]

[38] Alexander 2012, Skaftun 2014, Berge 2014, OECD 2010, Rychen and Salganik 2001
[39] Berge 2014
[40] Berge 2014
[41] Svenkerud et al. 2011
[42] Bakhtin 1998
[43] Gee 2012
[44] Dede 2010, OECD 2005

Cooperation, collaboration and active participation may contribute to motivating, activating and involving pupils and promoting learning.[45] Cooperating, feeling confident and having good relationships in the learning environment are also highly significant for the self-efficacy of pupils and their relationships to others.

Collaboration and participation

Pupils in the school of the future will need to learn strategies and methods for performing duties and achieving goals together. Being able to plan, implement and assess work together and adopt different roles in a cooperative process will be part of this. Another relevant competence is to be able to give and receive feedback on one's own work and that of others in a constructive manner.

It is important that pupils learn to express themselves, and learn to participate in and contribute to the community, both in school and in different arenas later in life. In school the pupils may develop the confidence and courage to speak up and state their opinion. Both being able to assert one's own opinions and to consider that one's personal contribution to the community is important are part of this competence. In collaboration with others, pupils must also learn to consider those around them by regulating their thoughts, emotions and actions.[46] This means, for example, waiting for one's turn, allowing others to be heard, accepting majority decisions and making compromises.

Developing pupil attitudes and actions in connection with personal and social responsibility is part of collaboration and participation. This refers to feeling that it is valuable to contribute to the community and being able to show respect and care for co-pupils. Developing the cooperation competence of the pupils is related to school's work to create and maintain a good psychosocial environment where it is important that the pupils are assigned co-responsibility for the school environment and learn how they can help create a productive school environment for others.

Being able to participate in discussions, dealing with conflicts and interacting across differences in views are important.[47] Pupils need to practise taking part in discussions and cooperation processes where they have to investigate different points of view and test arguments against each other. Principles for unbiased argumentation, tolerating disagreement and criticism and being able to present constructive criticism of the arguments of others are important. Being able to resolve conflicts when they arise and enter into compromises are part of interactive and democratic competences.

Being able to listen to others, endeavouring to adopt the perspective of others and considering matters from several angles are important in a diverse society, as well as being able to reflect on and reassess stances when encountering new perspectives, and accepting that there will be differences of opinion.

Democratic competence

Democratic competence is an important aspect of collaboration and participation competence. Democratic competence refers to being able to live together and deal with challenges together. Common challenges such as climate change and the conflict level in the world reveal the need for social responsibility and cooperation on common solutions on a global scale.

Democratic competence comprises knowledge about the political system, human rights and being able to participate in elections and other democratic decision-making processes. Democratic competence is also connected to democratic co-citizenship, which is about living together in a community and participating and contributing in different social arenas. Co-citizenship is important for creating support for common democratic principles, promoting understanding across the different backgrounds and values people have and stimulating people to be active participants in local communities. In diverse communities it is important to promote harmony and understanding, but also to deal with conflicts if they arise.[48]

Being able to interact with others is part of democratic competence, for example being able to state one's opinion, participate in discussions and listen to and show respect for the opinions and views of others. Attitudes such as understanding the value of togetherness and respecting differences, and allowing the opinions of others to be heard are important in this context. Understanding that participation means there are mutual obligations between people may also be defined as a part of democratic competence.

Democratic competence also includes performing democratic actions in practice, such as

45 Greeno 2006
46 Mischel and Ayduk 2004
47 OECD 2005
48 Stray 2011, Nussbaum 2012

being able to chair discussions, allowing everyone to be heard and reaching agreement and compromises.[49] School shall be a place that gives pupils experience of various forms of participation in democratic processes in its daily activities and representative bodies.

Democratic competence also refers to understanding and demonstrating social responsibility. This may mean understanding the situation of others and making ethical assessments of the consequences of one's own actions and those of others.

2.6 Being able to explore and create

The Committee recommends that creativity, innovation, critical thinking and problem-solving are competences the school should help pupils develop. The Norwegian and international societies depend on creative individuals who can contribute in working life and society, create new enterprises and find solutions to demanding social challenges. A knowledge-based society and working life require scientific methods and ways of thinking, critical thinking and an exploratory approach to knowledge. The creation of aesthetic and cultural expressions has great value for society. For individuals it is meaningful to be able to contribute to creating things through work and other activities. The ability to undertake critical assessment, problem-solving and creativity may help individuals to cope with various events in life.

The Committee finds that these competences can be learnt and developed, and that they are important parts of all the disciplines in school. Curiosity, persistence, openness to seeing things in new ways and the ability to take initiatives are important aspects of the competences. Young people are by nature inquisitive and exploring, but curiosity must be stimulated to be developed.

Creativity, innovation, critical thinking and problem-solving are here described as different competences. However, they also have common features, and in many situations the pupils will need to apply the competences in concert to be able to explore and create. Complex problem-solving, for example in a work context, may demand innovation, critical assessment of information and the ability to choose relevant problem-solving strategies.

[49] Stray 2014

2.6.1 Creativity and innovation

Creativity and innovation refer to being innovative, curious, inventive, and capable of thinking outside the box and taking initiatives. Other concepts connected to the competences are idea development, risk assessment and being able to transform an idea into action. The concept of entrepreneurship is often used in connection with innovation competence in working life and in school.[50]

Developments on knowledge and technology and high expectations for being able to solve complex problems have made creativity and innovation important competences in society and in working life in the years ahead. Creativity and innovation are found to be important for the development of the economy and the competitiveness of Norwegian business and industry.[51] Creativity and innovation in the form of aesthetic and artistic expressions have great value for society, and it will be important in the future that cultural expressions reflect the increased diversity in society. Most people will need to be creative in performing their jobs, and the ability to be innovative and take initiatives may create opportunities and ensure the quality of life for the individual and for others.

Creativity and innovation as competences share many common elements, but the concepts stem from different traditions, respectively aesthetic subjects/performing arts, and business and working life.[52] A definition of creativity is that it is about being curious, persevering, imaginative, and having the ability to cooperate and work in a disciplined way. These elements are described as follows:

- *Inquisitive:* Having the ability to wonder and ask questions, the ability to explore and investigate and challenging assumptions
- *Persistent:* Sticking with difficulty, daring to be different and tolerating uncertainty
- *Imaginative:* Being able to develop imaginative solutions and opportunities, playing with different possibilities, making connections and using intuition

[50] Björnsson and Hörnqvist 2014b, Erstad et al. 2014, European Commission 2008

[51] Pajarinen et al. 2015, Kereluik et al. 2013, NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future]

[52] Binkley et al. 2012

Box 2.5 Binde School: Competence in innovation as practice for the working life of the future

Binde School, located in the municipality of Steinkjer in the county of Nord-Trøndelag, has pupils from Years 1 to 7.

The school is putting extra effort into training in innovation, using the classroom and the local community as a training arena for all pupils at each year level. Through systematic work to develop innovation competence the school intends to prepare its pupils for life as adults. The goal is that the pupils should learn to think creatively, and that they practise seeing themselves and their opportunities as contributors to society and the working life of the future.

Application of innovation

The school has developed a teaching programme where the pupils learn and apply competence in other education arenas. The aim is that the pupils will see how knowledge may be applied innovatively, and that they should gain insight into the need for innovation in various businesses. The pupils visit and cooperate with businesses in the local region, and draw on local resource persons with innovation competence. This teaching is linked to goals in the curriculum.

Ever since the launch of this training in entrepreneurship in 2005 all the pupils in Year 7 have taken part in establishing their own pupil enterprises as part of the teaching in the various school subjects. Working with entrepreneurship gives the pupils knowledge and skills that can be connected directly to the competence objectives in a number of subjects.

The pupil enterprises use local mentors and find start-up capital themselves. Since the pupils are trusted and receive guidance through the mentor programme, they have established agreements with local businesses. The teachers function as guides for the pupils and the businesses throughout the school year, in connection with both product development and the creation of a good corporate culture.

When the pupil enterprises are wound down, the pupils in Year 7 share their experiences with the pupils in Year 6, giving the next group of pupils a good start when new pupil enterprises in the school will start in the autumn. The school has also introduced a special "fund" that is fed by taxes paid by the pupil enterprises. These funds may be used to buy equipment for future pupil enterprises.

A good start to working life

In the classroom and in the other education arenas the teachers help the pupils as they learn to cooperate, take initiatives and responsibility, and become creative and confident. To promote the acquisition of these competences the teacher asks questions while expecting the pupils to reflect, propose solutions to the challenges and practise thinking creatively. The pupils are challenged when it comes to what is possible, and how to present their ideas. For the school it is important that the pupils learn how to contribute by proposing solutions to the challenges of others when the teachers ask questions.

Innovation competence is developed by putting trust in the pupils, placing demands on them, encouraging creativity and having them contact businesses. The school's overriding goal is to make the pupils aware that everyone has competences it is important to use because society needs reflections, ideas and labour in the future.

- *Collaborative:* Sharing a product, giving and receiving feedback and cooperating appropriately
- *Disciplined:* Developing techniques, being able to reflect critically and to craft and improve[53]

The definition has been developed as part of a framework for assessing creativity across subjects, and is presented in Figure 2.5.

Creativity, an important competence in most subjects and disciplines, is closely connected to subject-specific content and is developed through working with the subjects. In some cooperative situations persistence and the ability to cooperate with different people are requirements for creativ-

[53] Spencer et al. 2012

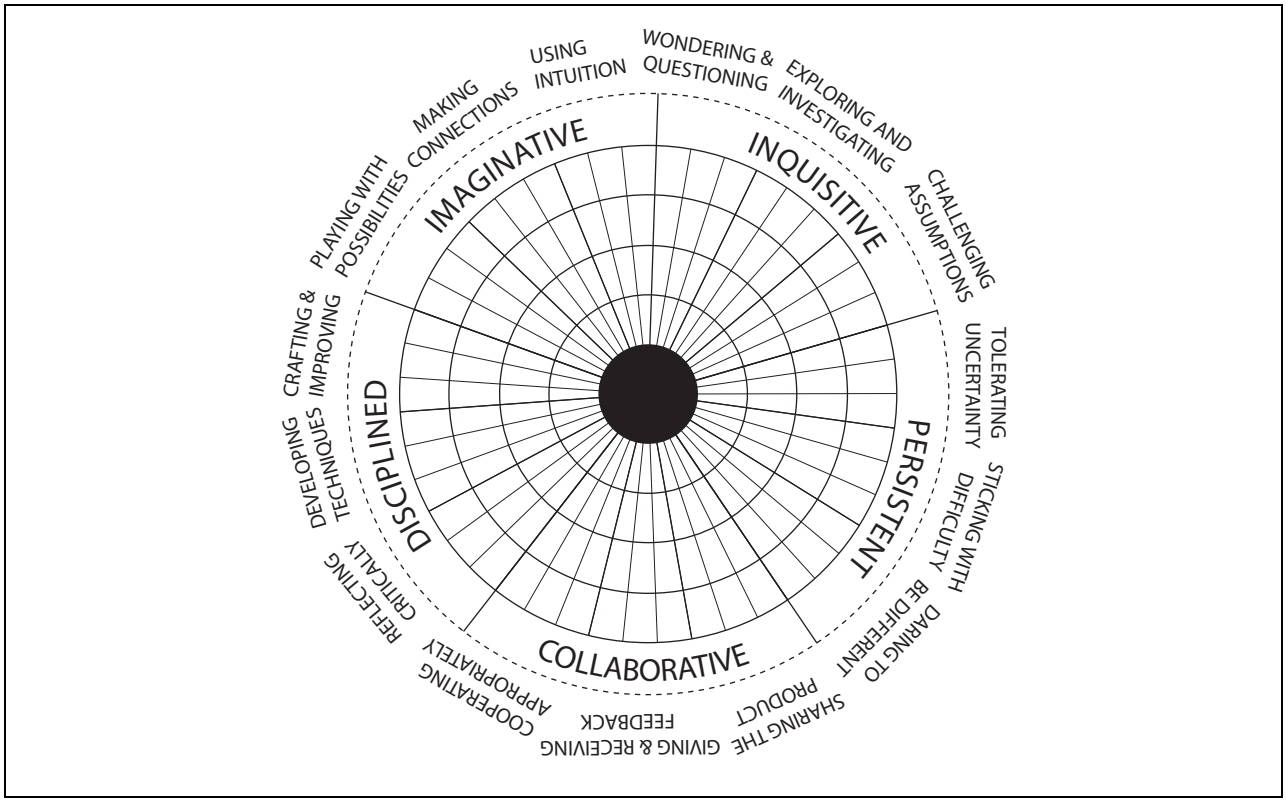

Figure 2.5 Definition of creativity

Source: Spencer et al. 2012

ity and innovation.[54] As creativity is defined above, the ability to think critically and explore to find solutions is part of this competence.

Innovation may be defined in a similar manner as creativity, for example that it includes practical skills and skills relating to thinking, being creative, curious and able to see relationships, and having imagination and being able to deal with uncertainty. Social skills, such as communication, cooperation and persistence are also seen as important.[55] While creativity refers to developing ideas, innovative competence also includes being able to transform ideas into action and taking initiatives.[56]

Innovation is important for society and for companies and enterprises, and pupils may be able to develop innovative competence in higher education and working life. Creativity as it is described here covers important competence in the future society and its working life. The Committee has nevertheless chosen to use the concept innovation in addition to creativity to point out that pupils will need to learn to take initiatives and transform ideas into action.

Entrepreneurship is often used together with or instead of the innovation concept, and many see entrepreneurship as a competence school should contribute to developing and as an important working method in school,[57] see Box 2.6. The Committee has chosen to use the innovation concept, but recognize that in part it overlaps with the idea of entrepreneurship competence.

2.6.2 Critical thinking and problem-solving

Critical thinking and problem-solving are often considered together and refer to being able to reason and analyse, identify relevant issues and being capable of using relevant strategies for complex problem-solving. It also refers to the ability to assess claims, arguments and evidence from various sources in complex and unknown situations.

[54] Sawyer 2012, Erstad et al. 2014, Kaufman and Sternberg 2010

[55] OECD 2015a

[56] European Commission 2014

[57] Input from organisations to the Ludvigsen Committee in NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future], the Ministry of Education and Research 2011, European Commission 2008

Box 2.6 Entrepreneurship

Entrepreneurship is a key concept in the business world and means the initiative and ability to create new business. In school, entrepreneurship is defined in a number of ways. One definition is that the pupils must learn to establish and operate an enterprise, for example by working with a pupil enterprise. Other definitions see entrepreneurship as both a competence the pupils should develop and a method and way of working. One example of this approach is that entrepreneurship training should help develop creativity and cooperation, strengthen pupils' learning, their self-confidence and motivation, and encourage more young people to start up their own companies.

Entrepreneurship as a working method in school attaches importance to pupil initiatives, problem-based learning, practical work and cooperation with the local community. Such work methods may lead to a varied and practical education and inspire pupils to learn.

Source: Johansen and Støren 2014, Spilling et al. 2015

The ability to make rational choices and decisions and to use scientific methods is also connected to these competences.[58]

Critical thinking and problem-solving are important today, and some aspects of the competences will gain in importance in the coming years. The complexity of society and the access to vast amounts of information will demand that each individual is able to undertake critical assessments and deal with various issues and problems, at work, in society and in ones' private life.

Due to digitalisation and the broad access to information, the ability to think critically and to judge sources has changed and become more important. Information that is available digitally has been quality assured to varying degrees and may be published or posted by individuals or organisations with other purposes than the dissemination of correct information. Being able to critically judge information and to understand decisions made on one's own or others' behalf constitute an important competence in a democratic perspective. Being able to think critically is also important for making good decisions and choices in one's own life, for example when it comes to health.[59] Many vocations will need to use research-based knowledge and will require understanding of scientific methods and ways of thinking.

Critical thinking means using scientific methods and ways of thinking to assess the validity of information and arguments. Being able to undertake ethical assessments and exercise one's judgement is part of the critical assessment ability pupils should develop. This is important for the pupils in school, working life and leisure activities. Critical thinking is also a key part of reading and writing competence, see section 2.5.1.

Problem-solving means that pupils must learn to analyse a problem and assess the relevance of knowledge and methods. They must also be able to test and explore different solutions and evaluate and make necessary adjustments while working with an assignment. Pupils must learn to accept that they may often be unable to find the solution to a problem immediately. Problem-solving and critical thinking may also be connected to how pupils learn strategies to work in an investigative manner. This means being able to ask questions, test, gain experiences and obtain more knowledge, a process that will then be the springboard for asking new questions.[60]

Society is dominated by complexity and demanding global challenges, and the need for complex problem-solving will most likely increase in working life.[61] Therefore, pupils should have experience of solving problems and dealing with situations where it is not obvious which strategies and methods they should use to arrive at a solution. Such complex problem-solving requires that pupils learn to apply several competences together, including metacognition, creativity, innovation, critical thinking and problem-solving.[62] See section 2.4.1 about metacognition. Complex issues will often require that pupils will be able to collate and apply knowledge and skills from different subjects.[63]

Pupils will need to learn problem-solving strategies that are relevant to each subject, and must be systematically trained to use subject knowl-

[58] Pellegrino and Hilton 2012, Björnsson and Hörnqvist 2014b, Binkley et al. 2012

[59] Pellegrino and Hilton 2012

[60] Dewey 1938, Bruce and Bishop 2002, Linn et al. 2011

[61] Autor et al. 2003, Pellegrino and Hilton 2012

[62] Funke and Frensch 2007, Mevarech and Kramarski 2014

[63] Funke and Frensch 2007, Pellegrino and Hilton 2012

edge and skills to undertake critical assessments and solve problems in their subjects.[64]

2.7 Reformulating today's basic skills

The rationales for giving priority to the basic skills in the Knowledge Promotion Reform were that these are necessary requirements for learning and development in school, society and in working life. They are considered to be decisive for each individual's ability to master working life and participate as a critical and reflexive citizen. The Committee finds these rationales to be as important in the school of the future.

Bearing in mind the assessments in this chapter, the Committee finds that changes in today's model for basic skills are needed. The work with basic skills has been a major development activity for schools, school owners and for development of the national subject curricula and the national tests. It will be important to build on the good work that has been done to ensure continuity in school's work and to learn from experiences.

2.7.1 Change of concept

The definition of basic skills in the Knowledge Promotion Reform is broad and connected to literacy, i.e. being able to communicate and participate in different societal and cultural contexts. This closely resembles an understanding of competence, and supports the idea that in the future one should use the competence concept instead of the skill concept.[65] Even if the concept *basic* expresses that the skills are requirements for learning in all subjects, the term does not express clearly that the skills develop continuously throughout the students' learning trajectory. The evaluation of the Knowledge Promotion Reform showed that in many cases the basic skills have been understood more narrowly than originally intended, as elementary skills that are most important for the pupils during the early stages of education.[66] Discarding the concept of basic skills and rather using the competence concept may make it clearer that competence is developed continuously throughout one's learning trajectory.

Moreover, the Committee wants to focus on a number of competences as important across subjects in the school of the future. Therefore there might be some confusion if the concept "basic skills" were to be carried forward for some of these, while others are referred to as competences.

Even if we step away from the generic term for today's basic skills, it will be important to point out the common features and collaboration between reading, writing and verbal competence, and digital competence and mathematics competence where it is relevant.

2.7.2 The different skills

Reading, writing and verbal skills

Reading, writing and verbal competences constitute an important requirement for learning in all subjects, and will in different ways be parts of the competence in the subjects. Therefore the Committee recommends carrying forward today's principle that these areas should be present in all subjects. The manner in which the competences are integrated in each subject should be developed. For example, some teachers have understood reading as a basic skill as something "alien" which comes from the outside, and not as clarifying what kind of reading that is relevant for the pupils to learn in their subject. How the competences can be made even more visible as part of the competence in the subjects should be assessed in a future curriculum process.

The Committee attaches importance to how different social and cultural situations demand the ability to read, write, speak and listen, and that these competences to some extent should be considered together. Communicating, interacting and participating are underlined as a common area of competence. This means that reading and writing, and verbal competence, should be considered together with collaboration competence.

Numeracy

The Committee has pointed out that mathematics competence is important in the school of the future. The Committee emphasizes that mathematics competence should be developed in the mathematics subject and in other subjects where it is a relevant aspect of the competence. This has consequences for today's basic numeracy skill. One of the purposes of giving priority to numeracy as a basic skill was that it is important for developing competence in all subjects. Importance was also attached to how the pupils need

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64 National Research Council 2000

65 NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future]

66 Aasen et al. 2012

numeracy skills to understand, interpret and use information so that they can be informed citizens and participate actively in society.[67] An example of how numeracy is integrated in social studies is that pupils must learn how to use concurrent and conflicting information from statistics to discuss a social studies issue, and calculate incomes, prepare a household budget and assess how life situations, savings and loaning money impact personal finances.[68]

The introduction of numeracy as a basic skill makes it clear that the progression in the curriculum revisions in 2013 and not least the national test in mathematics have made it clear that all teachers have responsibility for pupils developing numeracy skills in all subjects. However, it has proved to be challenging for schools to work systematically with numeracy in all subjects.[69]

The Committee emphasizes that the purpose and content of numeracy as a basic skill may be maintained as well within a competence concept, and that what is designated as numeracy today may be seen as part of mathematics competence.

One objection against the concept of numeracy is that there is no clear distinction between what numeracy is and what mathematics competence is, and there is no correspondence between how numeracy is understood in the mathematics subject and how it is defined as a basic skill in all subjects.[70] The concept of numeracy has over time been embedded in school, so in the event of a future change it will be important to clarify what the change in concept means. In developing the curriculum it may help to see competence in the mathematics subject and mathematics competence which is relevant for other subjects as a "common" competence to ensure coherence and a clear division of responsibility between the subjects.

Experiences from curriculum development and the work in schools with numeracy as a basic skill indicate that it is not as relevant to make numeracy visible as a part of the competence in all subjects. An example of this is the language subjects, where, for example, a competence objective relating to being able to count in English has little to do with numeracy. In other subjects numeracy and other aspects of mathematics are an essential part of the subjects, such as in natural science and social studies. If some subjects are given greater responsibility for mathematics, including what today is understood as numeracy, it may clarify the division of responsibility between the subjects and make it easier for schools to work with the mathematics competence where relevant.

Digital skills

Today's basic skills put too much emphasis on the tool aspect of digital competence and are not sufficiently clear in terms of how digital tools and media are an integral part of what the pupils must learn in the subjects and across subjects. It varies from one school to the next and one subject to the next as to how much the digital tools are part of the education.[71]

The Committee emphasizes it is more important to assess how technological and digital developments influence the competence in each subject than it is to focus on the common features of digital skills across subjects. As digital competence involves many dimensions, there is a need to distinguish more clearly between different aspects of the competence than the digital skills do today. It will be important to consider which digital tools and situations are prominent in each subject, and thus are important for what the pupils should learn in the subject. Moreover, digital competence should be shown as part of other cross-curricular competences. Today, much communication occurs digitally.

Coherence between different competences

Today's basic skills in reading, writing and verbal language comprise elements of several of the competences the Committee has highlighted in this chapter, including metacognition, self-regulation, learning strategies and critical thinking. However, these are not a systematic part of the subjects. In a future subject renewal there will be a need to draw boundary lines and establish coherence between the content of the cross-curriculum competences, particularly in terms of how the competences are present in each subject.

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67 Cf. the concepts *numeracy and literacy*, see Report to the Storting no. 30 (2003–2004) *Kultur for læring* [Culture for learning]

68 Curriculum in social studies

69 Grønmo 2014, Aasen et al. 2012

70 Grønmo 2014

71 Erstad et al. 2014

Figure 2.6 Illustration Chapter 2

2.8 The Committee's recommendations

In this chapter the Committee has assessed what kind of competences will be important for society, working life and individuals in the future and which of these school should help pupils to develop. The assessments of the Committee have been made according to the school's objects clause, important trends in societal development and relevant research.

Pupils in the school of the future will need to develop subject-specific competences and competences that are important in many subjects, such as being able to learn, communicate, cooperate, participate, explore and create. Assignments and challenges the pupils will encounter demand that they develop thinking, practical skills and social and emotional competence in an collaboration.

The Committee therefore recommends four areas of competence as important in the school subjects of the future. These competence areas are considered to be important for pupils, society and its working life in the years ahead. The Committee believes that pupils should develop subject-specific and cross-curriculum competences by working with the various subjects in school. If the areas of competence form the point of departure for renewal of the subjects, it will contribute to better coherence between the objects clause and the subject content than is the case today.

The Committee recommends the following:

- A broad competence concept should be used as the underpinning for the school subjects of the future. Competence means that pupils should be able to master challenges and solve problems in different contexts, and comprise cognitive, practical, social and emotional learning and development, including attitudes, values and ethical assessments. Social and emotional competences should be integrated in the subjects as part of the recommended areas of competence.
- The following areas competence should serve as the foundation for a future renewal of the subjects in school:
  - subject-specific competence
  - competence in learning
  - competence in communicating, interacting and participating
  - competence in exploring and creating
- Competence should be developed through work in the subjects. In a future subject renewal process the four areas of competence must be present in all the disciplines in school.
- The following competences are connected to the areas of competence:
  - subject-specific competence in mathematics, natural science and technology, languages, social studies and ethics, and practical and aesthetic subjects,
  - metacognition and self-regulated learning (being able to learn),
  - reading, writing and verbal competences, collaboration, participation and democratic competence (being able to communicate, interact and participate), and
  - creativity, innovation, critical thinking and problem-solving (being able to explore and create).
  - Today's basic skills in reading, writing and spoken language should be reformulated as competences. Numeracy should be designated as a mathematical competence. Digital skills will be connected more closely than today to subject-specific competence in the subjects, in addition to digital competence being integrated with other cross-curriculum competences.

Chapter 3
Renewal of the school subjects

Figure 3.1 Illustration Chapter 3

While Chapter 2 discusses and describes the competences pupils should develop in the school of the future, in Chapter 3 the Committee assesses and gives reasons for how the subjects can be developed to promote these competences. The subjects in the Knowledge Promotion Reform and the Knowledge Promotion Sami Reform need renewal to meet the future requirements for competence in working life and society.

For schooling to help pupils as private individuals, citizens and workers/professionals, school must support them in their development of a deep understanding of what they learn in subjects and across subjects. The knowledge foundation in the interim report indicates that learning that leads to in-depth understanding and which pupils can also transfer to other contexts, will increase in importance in the future. In this chapter some principles are recommended for renewal of the subjects. The aim is that the renewal should be knowledge-based.

If the subject curricula are to be productive governing documents and tools for teachers and teaching staffs, the content must be connected to the key building blocks in the subjects, which means the important methods, ways of thinking, concepts, principles and contexts in the subject that the pupils need to learn. The Committee rec-

ommends that the renewal should start in the disciplines in school. The four areas of competence presented in Chapter 2 will be part of all the disciplines in school.

3.1 Subject renewal

This section elaborates on why subject renewal is necessary, and which important considerations should underlie the rationales for the subjects. Following this, principles will be recommended for the renewal of the subjects.

When subjects are to be renewed grounds must be given according to the needs for competence in society, and according to how they will help realise school's social responsibility and in-depth learning and advanced progression in the pupil's learning. Sections 3.1.1–3.1.3 elaborate on these three considerations.

The social responsibility of primary and secondary education and training comprises objectives for society as well as the individual pupil. In sum, the objects clause and the objectives of the main curriculum have goals for the pupils' academic, social and personal learning and development. It is a challenge today that a number of the competences that are concentrated on in the main curriculum generally are described in the Quality framework, the Core Curriculum and the objects clause. Objectives for the social development of the pupils are not, for example, a systematic element in the school subjects. The Committee has been asked to assess the degree to which the content of the objects clause is adequately reflected by the subject content in primary and secondary education and training. The Committee recommends renewal of the school subjects where the ability to learn, ability to communicate and interact and the ability to explore and create are highlighted together with subject-specific competence. The Committee argues that if this recommendation forms the basis for a future renewal of the school subjects, they will reflect the objects clause better than today.

3.1.1 Competences for the future

The Committee recommends that some of the competence areas should be included in all subjects and others in some of the subjects. This will be explained in more detail later in the chapter. An argument for the presence of some competences in *all* subjects is that they are crucial requirements for learning. Another argument may be that the competences are so relevant and important in society and working life that the pupils should work with them in different ways throughout their entire learning trajectory.

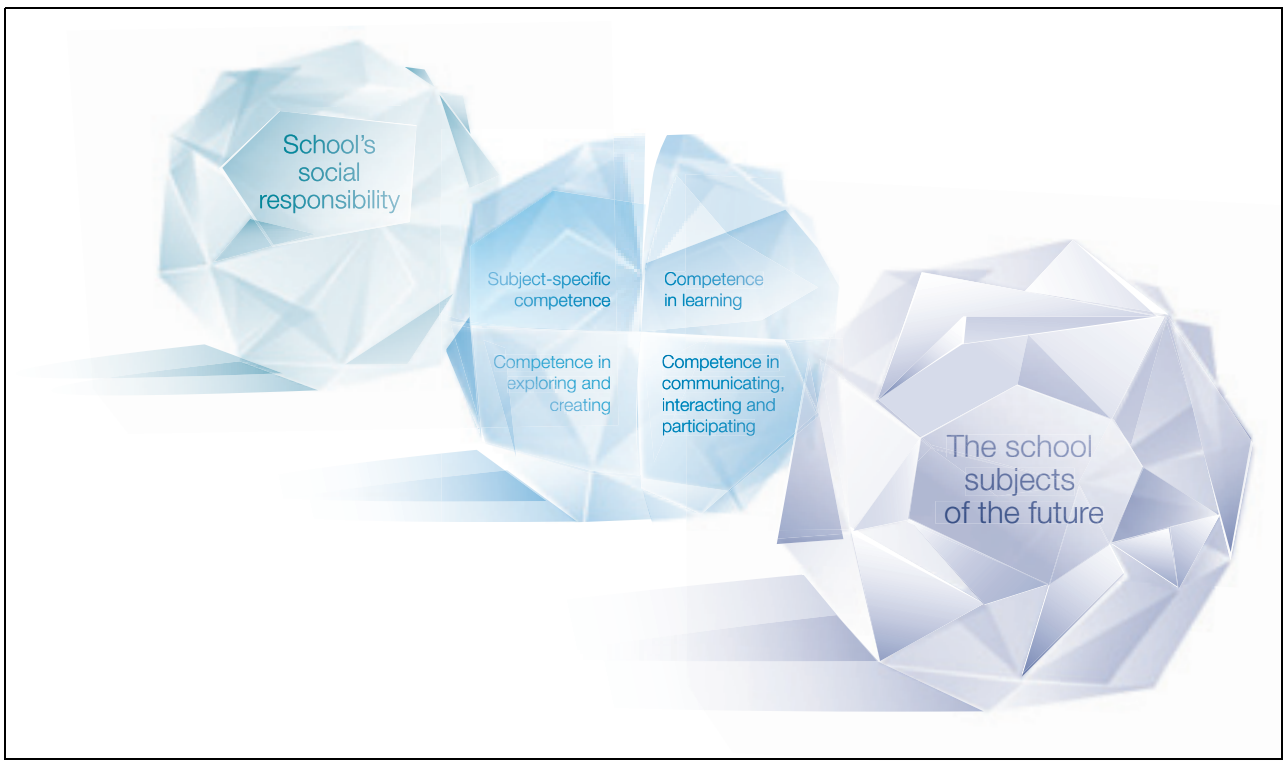

Figure 3.2 Subject renewal

Including a number of cross-curriculum competences in the curriculum can add breadth to the subjects if nothing is removed. This shows that the relationship between breadth and depth in school's content may be a challenge. The desire to highlight a theme, a competence or an area of study by allowing some or all subjects to have some responsibility may increase the breadth of the subject curricula at the expense of a pupil's opportunity to undertake in-depth studies in individual topics.

The balance between breadth and depth is one of the many dilemmas a future curriculum development will have to address to find optimal solutions. But it is not immediately possible to equate breadth in the subjects with superficial learning in the subjects. In might be necessary for pupils' understanding and in-depth learning to have insight into the breadth of a field of knowledge. They will also learn to work in accordance with thematically cross-curriculum knowledge.[1] Optimal solutions for this dilemma may be found by combining insights from learning sciences and subject didactics. Designing a curriculum will then involve connecting development and learning sciences to the key concepts, principles and contexts in a subject that the subject didactics builds on.[2]

The four areas of competence from Chapter 2 are an answer to the need to set priorities in subjects when the body of knowledge is endless and rapidly changing. The Committee proposes attaching greater importance to central building blocks in the subjects. Cross-curriculum and subject-specific competences constitute building blocks in the subjects, but how they will be expressed in the competence objectives will vary from one subject to the next. See more about highlighting the four areas of competence in section 3.2.

In the Committee's overall proposal, social responsibility, competences for the future and renewed subject curricula constitute a comprehensive whole as illustrated in Figure 3.2.

3.1.2 School's social responsibility

To realise school's social responsibility the subjects must be relevant. The relevance of the subjects is connected to rational arguments as to why a particular content must be an element of a school subject. From school's social responsibility, as defined in the objects clause, it follows that the content the pupils encounter in primary and secondary education and training is not only an objective in itself, but that it must also satisfy a number of social requirements. The subjects must be relevant in the sense that they have value for society and working life, and also are adapted to the experiences, abilities and aptitudes for pupils' learning.

Choosing relevant content in school is connected to prioritising subject content and areas of competence that are important for the personal development of the pupils, future vocations and professions and participation in society. It is part of the Committee's mandate to examine the school subjects in a perspective stretching 20 to 30 years into the future.

Pupils experience relevance if they can connect what they are learning to what is deemed to be important knowledge in social and working life, and to what they are personally interested in and personally consider valuable. If the experiences and aptitudes for pupils' learning are considered when the subjects are to be renewed, this may give pupils experiences of mastering and motivation in their school work. The belief that the content in school subjects must also be chosen with a view to the experiences pupils already have gained has been an important consideration in pedagogy and didactics for a long time. The experiences pupils have, and the knowledge and skills they have developed through these provide the point of departure for further learning.[3] The content of school must reflect the fact that pupils are living in the here and now, have a history and have hopes and ambitions for the future.[4]

Traditionally school subjects have had broad rationales based on *liberal education* and *utility*, but with varying degrees of importance.[5] A liberal education in primary and secondary education and training means that school should have validity for all, for those who will be working in vocations later in life and for those who will pass on to academic subjects in university.[6] In a school for all, a liberal education may be considered to comprise a certain minimum of general knowledge, cultural understanding and cultural ways of thinking that are considered to be important for all members of a society. That compulsory school

1 Håkansson and Sundberg 2012
2 National Research Council 2012
3 Dewey 1996
4 Dewey 1916, Erstad et al. 2014
5 Aase 2005
6 The Ministry of Education, Research and Church Affairs (1993), Common Core Curriculum *(L93)*

Box 3.1 Grounds for natural science's place in school

Why should all pupils learn natural science?[1]

The economic argument: Natural science is a beneficial preparation for a vocation and education in a high-technology and science-based society.

The utility argument: Natural science is important for practical mastering of day-to-day life in a modern society.

The democracy argument: Natural science knowledge is important in order to have informed opinions and to be a responsible member in a democracy.

The culture argument: Natural science is an import part of human culture.

This list illustrates that school subjects are based on many considerations, and when these are to be explained, a number of these considerations interact and their importance is seen in relation to each other.

[1] Sjøberg 2009

has a general liberal function means that it must stimulate pupil participation in social life and leisure time, regardless their personal interests and whether they will be taking higher education or are entering a vocation. If pupils are to be able to choose education and jobs based on their interests and abilities, and in a way that also ensures that school can recruit people to all areas in working life and society, school must give the pupils a broad basis in a wide range of practical, theoretical, ethical and aesthetic disciplines. The social responsibility of primary and secondary education and training thus requires a range of different subjects.

School as a social institution contributes to a liberal education through organised and purposeful processes, and here the subjects play important roles because all in all they help to create knowledgeable citizens who can be active participants in our culture in different ways. The school subjects are not, however, static quantities. They live in a field of tension between tradition and renewal.

The utility perspective for the subjects is based on the idea that what pupils should learn in school is primarily valuable for achieving a number of goals, for example relating to working life, the economy, business interests or research interests in the science subjects. Utility also means that knowledge and skills in a number of subjects may help individuals to master day-to-day life, both in nature and the man-made world in a modern society, and is thus connected to school's broad mandate. When renewing the school subjects, the utility aspect, as well as the liberal education aspect, must be made relevant in a perspective that takes the individual, working life and society into consideration. In subject didactics, systematic attempts have been made to give grounds for the place subjects have in school. For an example of this relating to natural science see Box 3.1.

3.1.3 Facilitating in-depth learning and advanced progression

In-depth learning

The consequences of societal developments for the individual, as outlined in Chapter 2, are an increase in the demand for the acquisition of new knowledge and competence throughout one's life and the need to use what one learns in new contexts. The knowledge foundation in the interim report indicates that lasting learning which the pupils may transfer to other contexts will be even more important in the future. This means that school has to lay the groundwork for better development of the pupils' comprehensive and lasting understanding in a subject or across disciplines, i.e. in-depth learning. This means that there is a need for renewal of the subjects in school with in-depth learning in focus.

The goal for pupil development of competence in subjects is that they should be able to *apply* it, i.e. that they should be able to use knowledge and skills to solve tasks and master challenges, cognitively, practically and in communication with others. Knowledge about when one can use what one has learnt and skills relating to how to do this are a result of in-depth learning. Hence, in-depth learning and competence development are closely linked. In many cases, acquiring competence requires in-depth learning.[7]

Developing competence that can be used is equally important for theoretical knowledge fields as for practical-demanding skills areas. In-depth learning is equally important for developing competence in all subjects, subjects in primary school as well as common core subjects and programme

[7] Pellegrino and Hilton 2012

subjects in upper secondary education. It is important to learn and master the subjects' methods and ways of thinking in all subjects in school. With an education more adapted to each individual, the pupils will have varying needs for what to study in depth, and how. In-depth learning does not mean in depth in everything for everybody. Studying in depth in individual topics assumes that the pupils have the opportunity to make choices.

In the interim report the Committee finds that curruculum overload challenges the school's aim of providing learning and understanding that will last, more specifically, the challenge that arises when new subject matter is added without something else being removed. The subjects must be developed in ways that will make in-depth learning possible. Research shows that it takes time for pupils to develop understanding. This raises the issue of how many disciplines it is realistic that the school subjects should consist of if pupils are to have the opportunity to develop robust understanding during a given learning trajectory. If the subject curricula are to be productive governing documents and tools for schools and teaching staffs, the content must be connected to the key building blocks in the subjects. The competence focus in the subject curricula may function as a way of reducing curruculum overload as the issue is not whether any material from a subject should be removed when something new is included, but rather which subject matter and which ways of working should be chosen to promote the desired competence.

Progression

In the report, progression has a learning science aspect which refers to how pupils' understanding develops over time throughout the learning in a discipline. Progression also has a subject didactics aspect relating to how the building blocks in the subject can be described according to a progression from one stage with descriptions of objectives to the next in the subject curricula. The Committee emphasize that by applying learning sciences and subject didactics together it will be possible to clarify the desired progression in pupils' learning. Learning progression will then be about connecting development and learning sciences to the key concepts, methods and contexts in a subject.

Traditionally the development of subject curricula has been oriented towards deliberate choices relating to which skills are to be trained, which knowledge is to be taught and in which school year this should take place. Curriculum development has at times attached less importance to how the knowledge and skills actually are learnt by the pupils. Close collaboration between learning sciences and subject didactics will have a positive effect as it will make the desired progression clearer for pupils' learning.

To facilitate good progression in the learning a good subject didactics understanding of probable learning trajectories in a subject is required. Some teachers will have this competence, while others, who may not have sufficient subject or subject didactics competence, may need support to be able to guide the subject development of pupils. The concept of *taxonomy* is often used, meaning systematisation of how knowledge or competence is constructed in a discipline. A pupil's learning trajectory is a dynamic process, something which is not covered well by the taxonomy construct. A taxonomy is a classification/categorisation of different types of cognitive functions, expressed in varying situations, and therefore cannot be seen as stable abilities in pupils.

Taxonomies may, however, be useful in the development of the subject curricula. In didactics research they are used to identify the degree of expected cognitive complexity.[8] To put it in a simpler way, it may be claimed that surface learning is on a low taxonomy level, while in-depth learning will be on a higher/high taxonomy level. These taxonomies may also be connected to social functions, such as a pupil's capacity to participate in complex problem-solving, which may refer to the knowledge and social competence needed to participate in demanding activities. The SOLO taxonomy (*Structure of Observed Learning Outcome*) is thus interesting. This describes increasing levels of complexity in pupils' understanding of subjects, and endeavours to state something about the quality of their learning.[9]

See more about progression in the subject curricula and pupils' learning progressions in Chapter 4.

3.1.4 Principles of subject renewal

A consequence of the knowledge foundation in the interim report is that renewal of the school subjects is necessary, and that the renewal must be especially focused on subject-specific and cross-curriculum competences, in-depth learning and progression in pupils' learning trajectories.

[8] See for example Andersen and Krathwohl 2001
[9] Biggs and Collins 1982

Box 3.2 Eiksmarka School: With problem formulations as the point of departure for in-depth learning

Eiksmarka School, in the municipality of Bærum in Akershus County, is a primary school with pupils in Year 1 to Year 7.

Each year in school, all the pupils from Year 2 to Year 7 work on a project where they use a recognised research method. They are allowed to choose which discipline they want to work with, and must then formulate a hypothesis connected to a problem formulation or research question. The class works together to develop, choose and implement surveys to test the hypotheses. On completion of the project the findings will be assessed, the pupils have to summarise and draw their conclusions, and finally present their findings in a written report.

When working to find the answer to the research question they have chosen, the pupils must use subject-specific competences and competence in learning and communicating. The teacher must support the pupils in their planning and implementation of the project and the pupils must cooperate to arrive at a good result. This is also an excellent method for teaching the pupils that day-to-day life and the school subjects are interconnected.

In-depth learning over surface learning

The pupils learn how to find their way to new knowledge and how to present it, and they gain understanding of the field they have been working with in a way that they will remember for a long time. Moreover, teachers and pupils will experience that finding the answer to a hypothesis often leads to new questions. In-depth study of an issue contributes to better understanding and to giving the pupils the urge to learn more. Spending time on a project allows the pupils to improve the results through the work process.

Asking questions to find answers

In the lower school years the teachers put much work into teaching the pupils to ask questions, also when not involved in project work. The pupils may, for example, be required to prepare questions for a text. When they have learnt to ask good questions, they must learn how to find the answers. The pupils learn both how to find the answers and how to give reasons for them. Where can we obtain knowledge about this? Who can we ask?

The pupils learn from asking experts outside school. How should we formulate our question to get an answer? How can we write this so that others will understand what we mean? The pupils learn that it is important to present their findings using their own words, even if what they have found may be difficult to present to others.

For many pupils these projects have taught them that it is important to decide what the most important elements are to include in an assignment. What is it actually that we are trying to find out? What will the reader expect to find information about in the report? What is less important information this time around? Can we use humour to make the report more exciting to read?

Asking questions and finding answers has become part of the pupils work method, and is a good way of training in various academic approaches so that both pupils and teachers can start thinking in another way. For example, the pupils ask themselves more questions: Can I solve this more quickly? Are there other answers?

Important competences for later in life

If they are to obtain the best possible results, the pupils understand that it is not sufficient to carry out the assignment they have the main responsibility for. They must help each other. When the report is finished, they see that working together gives a better result than if they had done everything alone.

The pupils must make proposals, give grounds for these and dare to discuss. They must cooperate to achieve a common result, and they also learn to compromise. The school is working to give the pupils tools that will allow them to deal with disagreements in a good way. This is an important competence for them to have when they are to solve the challenges of tomorrow.

The pupils also learn that persistence is important. Answers do not always arrive out of the blue. These are experiences and competences the school hopes the pupils will use throughout their whole lives.

Future needs and findings from learning research cannot, however, stand alone as rationales for choosing content in the school subjects. In particular it will be important to combine learning sciences and subject didactics research. If the subject renewal is to take place in a systematic and knowledge-based manner, it is recommended that it is based on

- the pupils' expectations for learning,
- pedagogical, didactic, subject didactic and learning research,
- the relevant disciplines and competences for the future,
- horizontal and vertical coherence in the curriculum and
- the breadth of the school's objects clause.

Requirements for learning

The content of school must be adapted to the cognitive, mental, social, cultural and academic abilities and aptitudes of the pupils. The general point of this principle is that the development of the school subjects requires that the various disciplines and stakeholders are updated on research-based knowledge on pupils' learning and development. The Committee attaches particular importance to the possibilities for in-depth learning and progression in pupils' learning trajectories. Research tells us that pupils' development of understanding takes time. The choice of content and planning of progression must take this fact into consideration.

Pedagogical, didactic, subject didactic and learning research

Subject curricula are didactic texts, and curriculum development must build on research-based knowledge from pedagogy and didactics. As a field of study, didactics deals with the *what* of teaching (content – what the pupils must learn), *the how* (teaching forms – how learning should take place) and the *why* (objectives and grounds – why they should learn this or that).[10] Furthermore, questions such as *when* and *where* may be added to emphasise context perspectives that are important for learning. Schemes and forms of pupil assessment in subjects are also part of didactics. Subject didactics, such as mathematics didactics and social studies didactics, works with didactic questions in the school subjects, and also complies with the science tradition(s) that are the underpinning of the school subject in question. When subject curricula are developed, subject didactic arguments may be connected to issues relating to determine the most important concepts, principles and contexts in what pupils are to learn. Are there aspects of a school subject that are more fundamental than others? What is appropriate progression in the subject when taking how pupils learn into consideration? Are there aspects of the subject that are particularly useful to consider in conjunction with other school subjects?

Relevant subjects and competences for the future

Trends in society and working life must be included in the considerations when choosing the competences in the school subjects. The interim report deals with this through the priorities and choices of cross-curriculum and subject-specific competences. The digitalisation of society is a natural example of a development trend demanding renewal of the content in the school subjects. The language subjects must for example include new digital text forms, genres and purposes of writing.[11] Digital calculation tools lead to substantial changes in the content of the mathematics[12] school subject and other natural science subjects.

Horizontal and vertical coherence in the curriculum

This principle refers to strengthening the connections between the various sections of the curriculum to make it appear holistic and consistent, both internally in subjects and across them.[13] For example, vertical coherence may mean that the plan for the progression of pupils' learning is clear between the various stages and years in the subject curricula. Horizontal coherence means connections across the curricula, for example, where multi-subject themes and research questions have goals in several subjects, an approach that can build bridges between subjects so they can reinforce each other in important areas.

The school's objects clause

The relevant content of the school subjects must be chosen in light of the breadth of the school's objects clause. The core values the Norwegian school is founded on are expressed in the objects clause.

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[10] Gundem 1998

[11] Hultin et al. 2014

[12] The Directorate of Education 2014

[13] Muller 2009

Box 3.3 Systematic use of resources and learning arenas outside school

The purpose of the *Lektor2-scheme* [a lektor in Norway is a teacher with a full 6 year university degree] is to strengthen parts of the teaching in natural science and increase pupil motivation for natural science subjects in lower secondary school and upper secondary education. This will be accomplished by implementing teaching programmes developed in cooperation between teachers in school and experts from industry and other areas of working life outside school. By involving experts from working life directly in the teaching as a "Adjunct teacher " (teachers 2), the purpose is to give the pupils insight into how what they learn in school is useful in working life. In the evaluation of the scheme the pupils assessed the teaching with their "Adjunct teacher" as more positive and interesting than other teaching in the natural science subjects. The teachers in the school gained better insight into the competence requirement of the companies, while the companies gained better insight into the day-to-day business of school and the competence required there. In sum, this strengthened the relationships between school and working life.[1]

The natural school rucksack is a national programme to promote curiosity and knowledge about nature and society, awareness about sustainable development and increase the involvement in environmental issues of pupils and teachers in school. The evaluation of the programme showed that pupils and teachers generally found that practical teaching in outdoor learning arenas motivates learning. Pupils in upper secondary school were more motivated than younger pupils by the more exploratory ways of working, such as looking for answers to questions they had made themselves. The schools pointed out the subject didactics benefit from participating, which refers to the teachers' competence-raising in the use of more practical, varied and exploratory teaching in learning arenas outside the school/classroom.[2]

[1] Sjaastad et al. 2014b
[2] Sjaastad et al. 2014a

3.1.5 Consequences of applying the principles

Renewal of subjects must be a systematic process where the principles are considered together. Making the subjects taught in school more relevant for the future may mean assessing the subjects according to various types of challenges. Different assessments must be made in the different subjects, based on the nature of the subject and what responsibility it has in school. Below are some examples of such assessments.

Reviewing a subject may mean that *new competence objectives must be embedded in the subject,* or that the phrasing of the competences requires more precision. The reason may be that the subject must respond to particular challenges in societal development, or that research has changed the subject. For example, the music area of study has changed its content substantially due to technological developments.[14] The subject has been expanded with the topic area of music technology.[15] This challenges the framework of the content of the music subject in that digital competence is given a place,[16] which then creates the need for subject didactics development work.

Subjects as well as society change over time. What is most important for children and young people to learn in a subject is not necessarily the same today as ten or 20 years ago. Renewal of a subject may mean *another prioritising of competence areas in existing subjects*. The subject curricula are often the result of academic and political compromises, and in many ways represent a summary of long subject didactics traditions and developments. The need for other priorities may demand that academic environments and curriculum developers must reconsider their own priorities.[17]

Subject renewal may also mean *restructuring the distribution of subjects*. Restructuring subjects may mean other compositions of disciplines, merging subjects or new formation of subjects. Chapter 2 points out that knowledge about physical health, mental health, nutrition, lifestyles and

[14] Hultin et al. 2014
[15] Kvidal 2009
[16] Savage 2005
[17] Espeland 2014

personal finances is important for mastering life in today's society. Several of these topics are present in the current subject curricula, but they could be made more visible. See more about this in section 3.2.3.

The subjects may also be renewed through the *use of other learning arenas*. Linking the competence in subjects to different arenas, for example outside the classroom or school, may increase the relevance of school for pupils. Productive cooperation between school and other learning arenas may have impact on pupils' understanding of subjects and have positive influence on motivation for learning. Some development work has taken place in this field in recent years. The examples in Box 3.3, the *Lektor2* scheme and *The natural school rucksack* [Den naturlige skolesekken] are not about choosing school content on an cross-curriculum level, but rather about planning and implementation of teaching and organising the day in school. However, these projects may inspire school to make the curriculum objectives open for the use of resource and learning arenas outside school.

3.2 Renewal of the subjects in school

In Chapter 2 it is recommended that the following four areas of competence should be the basis for choosing priorities when renewing the subjects:
- subject-specific competence
- being able to learn
- being able to communicate, interact and participate
- being able to explore and create

This section describes the Committee's recommendations as to how the four areas of competence may be made more visible in the subjects. Subject-specific competence will constitute the foundation in disciplines and subjects, even if there must be renewal here as well. When it comes to cross-curriculum competences, some should be present in all subjects, while others may be given a stronger focus in selected subjects.

The Committee recommends that a future subject renewal should be undertaken in close collaboration between the subjects and disciplines in the school:[18]
- mathematics, natural science and technology
- languages
- social studies and ethics
- practical and esthetic subjects

The Committee recommends that the subject renewal should start in the disciplines in school, and not in individual subjects. This recommendation means that the various subjects in each discipline must be considered together when highlighting the areas of competence. This means, for example, that if language learning and communication are to be strengthened in the language subjects, the development of the subject curricula in Norwegian, English and other languages must take place concurrently and be closely connected. The Committee argue that a requirement for a strong subject curricula coherence between the language subjects is that their formulations of objectives and progression must be mutually supportive in areas they have in common.

Common responsibilities and division of responsibilities are both keywords for good curriculum coherence between subjects that have many areas in common. The division of responsibilities will refer to finding methods, ways of thinking, concepts and principles the subjects have a common responsibility for in school so that they can jointly support pupils' learning. When having greater focus on the common building blocks, the subjects in each of the school's disciplines may be developed with more in-depth orientation by either having common responsibilities or shared responsibilities.

3.2.1 Common building blocks and closer cooperation between subjects

Building blocks

One answer to how the pupils may develop subject knowledge when the amount of knowledge is endless and changing rapidly is to put more focus on the important building blocks in the subjects. Learning in school generally occurs by working on the school subjects. If the everyday school is to be focused on pupils' learning and development of cross-curriculum and subject-specific competences, they must be given a prominent place in the subjects. The most important work when the subjects are to be renewed will be to prioritise the competences in the subjects. Cross-curriculum and subject-specific competences may both constitute building blocks in the subjects.

The term "building blocks" refers to the most important methods, ways of thinking, concepts, principles and connections in a subject or disci-

[18] In accordance with section 2-3 Content and assessment of lower secondary education of the Norwegian Education Act

pline. The Committee emphasize that the subjects' methods and ways of thinking are a particularly important part of the building blocks, including the ability to think critically and solve problems – practical and theoretical, academic problems and everyday problems. The building blocks in all the subjects are of both a theoretical and practical nature. Practical subjects and vocational subjects have a knowledge foundation, and all theory subjects have a practical performance aspect.

The importance that scientific methods and ways of thinking can have in the various school subjects will vary. The school subject of social studies, for example, is connected to various science disciplines. What is considered important in the current curriculum is that the pupils must interpret, discuss, explain, describe and compare various matters that concern society and politics. In learning in social studies, pupils depend on different building blocks, such as scientific concepts and methods. The subject includes such concepts as values, norms, institutions, power, bureaucracy, democracy and the global society. Such key concepts are the gateway to learning about society. However, at the same time, many of these concepts are ambiguous. This makes social studies into a reflection and interpretation subject where pupils must train in assessing information and interpreting different presentations of reality. Reflecting on values, attitudes and various definitions of concepts will thus also be some of the important building blocks in the subject. The quantitatively oriented section of the social studies subjects and social research give us new knowledge about how society functions, which may be used as the underpinning for social planning and policy design. The methodological basis for this type of information and knowledge is part of the building blocks in these disciplines.

Closer collaboration between the subjects in the disciplines

The Committee argues that a more clearly defined division of responsibility and work between the different subject curricula can reduce the problem of curruculum overload because there will be less overlapping between the subjects and it will be clearer as to what each subject should contribute to. This may free up time which teachers and pupils can then use to work on areas over time and in depth, and thus help to increase understanding and lasting learning for pupils. The Committee therefore recommends that subject-specific and cross-curriculum competences in each subject should be integrated within the framework of the discipline where the subject belongs. See more about recommendations connected to subject development under section 4.3.

3.2.2 The areas of competence

Here follows a review of how the four areas of competence may be made emphasized in the subjects.

Subject-specific competence

The Committee points out that the disciplines described in 3.2.4 will be important in the coming years.

Methods and ways of thinking are an important part of the subject-specific competence. In the subject renewal, the importance of scientific methods and ways of thinking must be assessed for each subject. For example, there will be differences between subjects clearly building on natural science or linguistic and communication science, and subjects that have weaker or more complex connections to science subjects.

Digital competence must be closely integrated in the content of the school subjects and must continue to be a part of all the subject curricula. The information and communication technologies are so closely interwoven in all human activity that the various aspects of digital competence should be expressed in a subject context in school. If school is to keep pace with the digital day-to-day life of pupils and the digital environments used at workplaces they will encounter after their schooling, digital competence must be worked with and developed in subjects in ways that are relevant for the pupils. If this is to be done successfully, digital competence will have to be explicitly present in the competence objectives in all the subject curricula.[19] The Committee acknowledges that the Norwegian school put digital skills in all the subject curricula as one of the basic skills at an early stage. For future curriculum development it is recommended that the various aspects of digital competence must be expressed as part of the competence in all subjects, but without continuing today's scheme of basic digital skills.

Technological development leads to changes in all the subjects. But there are aspects of digital competence that are not connected to a particular subject, such as learning general aspects of using computers as tools. One consequence of

[19] Hultin et al. 2014

this may be confusion in the everyday school when it comes to which subjects should assume responsibility for the pupils' learning and development of basic "operational" digital skills. The Committee proposes that responsibility for the teaching in this area should be placed with a particular subject, possibly several subjects, where the responsibility is clearly formulated and clearly assigned.

The Committee emphasize that digital competence must be learnt as part of being able to read, write and communicate verbally in the subjects. This will be decisive in working life, society and one's daily life in a perspective of 20 to 30 years. Reading, writing, verbal competence and digital competence are all integrated in the current curriculum, but the collaboration between them could be much clearer.

The Committee emphasize that competence in mathematics should be strengthened in school, and proposes that this should be accomplished by making mathematics clearer in subjects where it is a key aspect of the competence. This should be done by strengthening mathematics in the subjects where it is most relevant. A good way of helping pupils to learn more mathematics is to have them work with mathematics in a number of relevant subject contexts. The Committee recommends that today's design with numeracy as a basic skill in all subjects should be changed, see section 2.7. It will nevertheless be best to build on the experiences of numeracy as a basic skill in the Knowledge Promotion Reform.

Natural science and social studies are two subjects where strengthening mathematics competence would be important. Natural science, for example, applies maths by using concepts, measuring instruments, measurement units, formulas and graphs. This is in relation to comparing, assessing and arguing for the validity of calculations, results and presentations. In social studies, mathematics may be used to compare, analyse and present statistical material which illuminates a social-science topic.

Being able to learn

Metacognition and self-regulated learning are significant competences in themselves, while also being requirements for the pupils' learning in the subjects. Therefore metacognition and self-regulated learning should be part of all subjects. Today learning strategies are focused on in the Quality Framework and in the competence objectives in some subjects, including English, but metacognition and self-regulated learning are not systematically integrated in the subjects.

Metacognition and self-regulated learning mean that the pupils learn to reflect on what, how and why they learn in the subjects, and learn to use learning strategies to focus on their own learning. Knowledge about when one can use what one has learnt, and how, is important for achieving competence and understanding of how one learns. Pupils should develop awareness on the development of their own competence in the subjects, and learn to reflect on why and how the competence they are developing may be relevant and lasting. Developing self-regulated learning and metacognition in school will generally occur in collaboration with others.

When metacognition and self-regulated learning are to be made visible in the subjects, they should be closely connected to the content of the subject. Pupils will, for example, need different learning strategies in different subjects. The competence should also be closely connected to progression in the subject. The requirement for using relevant learning strategies when reading natural science texts will increase, for example, when concepts and subject matter become more advanced.

Involvement in and reflection on the learning work and the objectives in the subjects are important for training the pupils in taking charge of their own learning processes. In each of the school years the teachers may involve the pupils in reflection on their own learning, as long as this is adapted to the ages and levels of the pupils.

An illustration of how competence in learning can be addressed can be found in the current curriculum for foreign languages. The plan on all levels has an objective which states that *the pupil shall be able to describe and assess his or her own work on learning the new language*. This consistent competence objective focuses on having insight into one's own language learning and language usage. Competence in learning is about developing the capacity to use appropriate learning strategies, such as defining one's learning needs, formulating goals, choosing ways to work, using learning aids and assessing the work process and goal achievement individually and in cooperation with others.

Being able to communicate, interact and participate

This area of competence includes reading, writing and verbal competence, as well as being able to interact.

Figure 3.3 Illustration Chapter 3

It is recommended that all the linguistic competences should be included and developed in the subject curricula for all the subjects. The goal for pupil development of reading and writing competence and verbal competence in school must be that they should learn and master a diversity of communication situations. The Committee emphasize that the focus of the subject renewal should be to make aspects of reading, writing and verbal skills that are important parts of the competence in the different subjects clearer than is the case today. Reading natural science texts, for example, is part of the competence that must be prioritised as part of the subject. When developing the subject curricula, the connections between the progression in subject competence and reading should be assessed. This could for example refer to how complex subject terms and complex subject matter require increasingly complex understanding.[20] In many subjects the development of competence in reading requires that pupils read often and a large amount of text, and that they should work systematically on reading strategies that are suitable for the purpose of the reading, and with different types of texts in the subject. The development of reading competence progresses from basic decoding and understanding of simple texts to understanding, interpreting, reflecting on and assessing increasingly complex texts from different genres. The subject curricula must reflect this.

The Committee recommends that verbal competence should be developed in all the subject curricula. For various reasons, the verbal use of language is the part of language competence that is least clear in the current subject curricula, and it is therefore here that the need for development is greatest. This development may mean putting more emphasis on the receptive, productive, listening, speaking and rhetorical aspects of verbal communication. This means that the situations the pupils are to communicate in must be varied, focus on the purpose of the use of language in different communication situations and have relevance outside school. The Committee point out that verbal competence must be considered together and turned in the direction of collaboration.

Chapter 2 has promoted competence in collaboration and participation and democratic competence. Today collaboration/participation is mentioned in most of the subject curricula, but the Committee finds that this should be done more thoroughly than at present, including in the competence objectives. The relationship between the Core Curriculum and the subject curricula can be clearer in this area. The Committee believes that competence in interacting, collaboration and participating should be part of all subjects. First, cooperation is important for learning in the subject. Second, it will be so important for pupils to master collaboration and participation in school, working life and society that they should train in this competence in all subjects.

It will be relevant to include several aspects of collaboration and participation in all subjects. Pupils will need to learn and collaborate in subjects and to develop positive attitudes to working with others. For example, collaboration in the subjects may mean development from speaking in turn in conversations, giving feedback to others, following up the input of others in cooperation on a subject and developing input from others. Collaboration may also mean to contribute input, to exchange experiences and knowledge and to create meaning when working with others. Choosing relevant strategies for collaboration together and interacting flexibly and efficiently in different situations will also be aspects of this competence that may be relevant in many subjects.

The Committee argues that it is relevant to attach importance to democratic competence in a selection of subjects, for example in the discipline of social studies and ethics. Democratic competence is part of these disciplines today, but the coherence between the subjects could be strengthened, see sections 3.2.3 and 3.2.4. Particular attention is given to democratic citizenship and knowledge of the political system and democratic decision-making processes. Part of school's core values and objectives is that it must promote collaboration, cooperation and democracy, and

[20] Alexander 2012

this is thus embedded in the objects clause, the Core Curriculum and the Quality Framework.

In Chapter 2 the Committee emphasises social, emotional and attitudinal aspects of collaboration, participation and democratic competence. An example of such a goal from the current curriculum in Norwegian is that after Year 7 pupils should be able to express and give grounds for their points of view and show respect for those of others.

Pupil development of collaboration and participation in individual subjects must be supported by the school's work with the psychosocial school environment and the breadth of the objects clause. Respect for others and responsibility for the community are values one should work with in all subjects. In the opinion of the Committee it is very important that pupils should learn the value of meaning something for others, standing up for others and assuming responsibility for others in light of the individualisation of society.

Being able to explore and create

Being able to explore and create comprises creativity, innovation, problem-solving and critical thinking. The objects clause states that pupils must learn to think critically, and that the education should promote a scientific way of thinking. Creativity and innovation are also embedded in the objects clause, where it says that the pupils should be able to demonstrate the joy of creating.

The Committee emphasize it is necessary to strengthen critical thinking and problem-solving in all subjects. Pupils will need to learn to think and assess critically, apply different problem-solving strategies and reflect on how they solve a task or approach an issue, and this is relevant in all subjects. Critical thinking and problem-solving includes the ability to assess claims, arguments and evidence from various sources, and to apply relevant procedures and strategies to carry out an assignment or solve a problem. In today's subject curricula, critical thinking and problem-solving are connected in particular to scientific methods in natural science and mathematics.[21]

Critical thinking and problem-solving will play varying roles in the different subjects, and the terminology will also vary. In subjects such as natural science, Norwegian and social studies pupils will learn to interpret research, statistics and other information critically to enable them to draw logical/valid conclusions about issues, for example what the consequences of global warming might be.

In the current subject curricula the subjects of arts and crafts, music and food and health are the ones that promote creativity and creative work. In Chapter 2 the Committee finds creativity and innovation to be important competences in most subjects and disciplines, and that these should be developed through working with the subjects. Developing creativity is a process which often requires work with a subject or discipline over time. In-depth understanding and robust skills in a subject are a requirement for composing subject knowledge in new ways or applying knowledge and skills in new contexts.[22] The Committee recommends that creativity and innovation should be systematically emphasised in all the subjects in ways that are relevant in the subjects. One example is that pupils must learn to think creatively and test different solutions to be able to master complex problems in maths.[23]

3.2.3 Interdisciplinary themes

When pupils are working with research questions or themes that require competence from a number of subjects, we call this interdisciplinary work. For example, pupils' understanding of research questions relating to climate challenges requires knowledge from the natural sciences, mathematics, social studies and ethics. The Committee believes that three interdisciplinary topics are particularly important in the school of the future and must be clear in the curriculum:[24]

- sustainable development
- the multicultural society
- public health and well being

For these three topic areas the Committee recommends objectives across the disciplines. The interdisciplinary organisation of key competences may be a way of ensuring in-depth learning in the sense of understanding relationships and connections.

Climate, environment and sustainable development

Sustainable development has been placed on the agenda on all levels of education through international obligations on the initiative of the UN sys-

[21] Hörnqvist and Björnsson 2014b

[22] Sawyer 2012, Erstad et al. 2014

[23] Mevarech and Kramarski 2014

[24] Cf. Klafki 2001: *Om tidstypiske nøkkelproblemer* [On key typical time problems]

tem.[25] There is an emerging recognition that school must raise topics relating to the existence of our globe more prominently than today. Sustainable development means that we need to think and act locally, nationally and globally.

Competences connected to sustainable development in the subject curricula have three main dimensions: the social environment, economics and the natural environment. These three fields are connected and give room to deal with the topic in an interdisciplinary way.

Topics that may be relevant in the social environment area include human rights, living conditions, health, culture, diversity, equal rights, education, working conditions, justice and responsibility. Topics that may be relevant in the economics area include reducing poverty, fair distribution of resources, national and global market economy, work and income, and financial security. Topics that may be relevant in the environment area include preserving nature and using natural resources and land areas in a sustainable manner. Sustainable development must be illuminated according to different considerations and interests, for example, what this means for the primary industries, such as agriculture and reindeer herding, and biological diversity, reducing climate change and preventing natural and environmental disasters, and assessing uncertain knowledge and precautionary measures.[26]

The teaching of children and young people here means developing robust understanding of the risks inherent in climate and environmental challenges. It is also just as important that they recognise that each one of us has responsibility for taking active and informed initiatives for a better environment. They must be motivated for climate-conscious choices today and in the future, and they must be given the ability and opportunity to act. Sustainable development is embedded in natural science, but is also interdisciplinary in nature and demands an interdisciplinary approach. The Committee believes that sustainable development should be strengthened in the curriculum and integrated in a number of subjects, particularly social studies and the natural sciences.

The multicultural society

Ethnic, cultural and religious diversity is not only a global issue but also part of the day-to-day life for a large number of pupils in Norwegian schools. In the wake of local and global demographic changes it will be important to be able to live together in a society and world with differences, particularly in a perspective of 20 to 30 years. The Committee emphasize that this must have an effect on school's responsibility for pupils' development of their ability to interact, and their communication competence, tolerance and responsibility. School can counteract unwanted unsocial behaviour and undesirable attitudes by creating a good collective setting dominated by security, trust and respect and where being different is considered to be positive.[27] In both the interim report and the main report the Committee finds that social and emotional competences should also be included in the curriculum and be worked on in all the subjects.

Cultural diversity in society and school is an example of a development trend which demands that the subjects are renewed. School has pupils who are indigenous people (the Sami) and pupils from national minorities, and has for decades also had pupils from many ethnic groups from other countries. The diversity of pupils is increasing and more geographically distributed than ever before. In the school of the future more attention will have to be paid to diversity and a positive approach to what different cultures can contribute to school and society. School has an important role in building identity and a sense of the collective community in the population. But this does not mean maintaining a narrow register of cultural expressions as representing "the Norwegian". School's role must be understood dynamically, meaning that it is under the obligation to facilitate a constantly expanding diversity of cultural forms of expression.[28] These perspectives must be apparent in the subjects.

As an interdisciplinary topic area, the multicultural society may be connected to democratic competence. The social studies subject has responsibility for knowledge about various forms of democratic participation. First, democratic participation is about understanding and participating in the representative democratic system, for example by voting in elections. Second, it is about having the abil-

[25] IPPC UN's Climate Panel 2014: *Femte synteserapport* [Fifth Synthesis Report]

[26] Isnes 2015

[27] The Ministry of Education and Research 2011a

[28] Cf. NOU 2013: 4 *Kulturutredningen 2014* [The Culture report]

Box 3.4 Frederik II Upper Secondary School: Environmental research [Miljøforsk] – science subjects with emphasis on interdisciplinary aspects and competences for the future

Frederik II Upper Secondary school is located in Østfold County. The school leaders wanted to focus on science subjects as an arena where they would be able to develop the school's ideas about learning and competence. In this school they have long aimed to shift attention from teaching to learning. Planning of learning should start with the question: *What contributes to effective learning for an individual pupil in a social setting?* The result was *Miljøforsk,* a class in Year 1 of upper secondary school in the education programme for specialisation in general studies and the science subjects.

Interdisciplinary subjects, new teaching arenas and cooperation with resources outside school

Miljøforsk is a science subject programme that focuses on interdisciplinarity. The class will work with interdisciplinary projects, teaching arenas outside school and education in cooperation with other resource people. The goal is that the pupils should have knowledge and curiosity about, understanding of topics/problem areas across the subjects. If the pupils are to learn, they must be allowed to spend time on the topics to obtain good understanding of what they are working on and be given the opportunity to learn subject-specific and cross-curriculum competences that are in demand in working life.

The subject for one of the projects the pupils have worked on is a small brook in the neighbourhood where agriculture has caused significant pollution, but where the local authorities now wish to include it in their urban planning. The learning programme started with basic concepts, and then allowed the pupils to actively apply their knowledge by observing, analysing, planning, implementing and reflecting. The pupils worked on such topics as urban planning, ecology, technical functionality, local climate and values connected to health and the quality of life. Towards the end of the project the pupils participated in a meeting on the zoning plan with the local authorities. The aim of the project was to stimulate the pupils' appreciation of nature, create an understanding of the subjects and how they are developed, and give the pupils good insight into natural science work methods, democratic processes and presentation of knowledge.

In the course of the year the pupils have also worked on a number of other interdisciplinary projects. They have helped in the building of a hydroelectric power plant, solar collector and solar cell vehicles in cooperation with the wood processing plant Borregaard, and windmills in cooperation with the Inspiria Science Centre. They have also worked on sustainable and ethical consumption in cooperation with the University of Oslo and Ostfold Research [Østfoldforskning] and with marine ecosystems in cooperation with Ytre Hvaler national park and the Tjærnø marine biology research station.

Competences for the future

Building windmills, power stations and electric bicycles requires a high degree of competence in science subjects, but also places demands on the pupils' ability to think critically, solve problems and cooperate, and on metacognition and creativity. In *Miljøforsk* such competences are trained through concrete assignments and guidance from the teachers. For example, the pupils work on their critical thinking when the tasks require them to plan, prioritise and act on given criteria.

The pupils experience that the competence they are developing in these projects is in demand in working life.

Requirements for succeeding with Miljøforsk

For these projects to succeed and contribute to pupils' learning, sufficient time has to be allocated so the pupils have the opportunity to also use the cross-curriculum competences and have time to reflect on what they have learnt, in the projects and after their completion. Seeing the competence objectives as interconnected has been an important condition for finding time for in-depth study. This places demands on the way teachers work because it requires a joint analysis of the curriculum and interdisciplinary cooperation. Working in an interdisciplinary way may create productive conditions for pupils' in-depth learning.

When using new learning arenas there is a need for more resources, for example, equipment and material, and transportation expenses. Some of the equipment has been loaned to the class by the local authorities. Several of the projects have been funded by applying for project grants. To move around in the neighbourhood to visit companies and undertake fieldwork the class has had the use of a fleet of bicycles. For the teachers it has been demanding and exciting to use different learning arenas and resources. This practice has been developed along the way, and they have found it necessary to dare to try new things. But they have been confident that what they are doing has been anchored in knowledge about pupils' learning, and that what they are doing is improving the pupils' learning.

ity to engage in and being willing to participate in local clubs and associations. Third, democratic participation is about understanding and recognising what it means to participate with one's voice in public, digitally or not, in a civilised manner.

The history subject also deals with competences in this field. Knowledge about events that have occurred in an anti-democratic and totalitarian spirit, such as genocide and ethnic cleansing, is important knowledge for the pupils to have.

The Committee argues that competence connected to living in a multicultural society should be strengthened in subjects where this is relevant and appropriate.

Public health and well-being

In light of the growing individualisation of society and the easy access to information, the Committee finds that competences connected to making responsible choices in one's own life are important. Knowledge about one's own body and health, including mental health, lifestyle, personal finances and consumption is an area that needs to be strengthened in school. The Committee recommends that importance should be attached to a public-health and life-science perspective in subjects where this is relevant and appropriate.

School shall help pupils to develop movement competence and give children and young people the opportunity to develop their individual motor-physical movement competence. This impacts pupils' personal development, general education and give them a long-lasting positive relationship to movement. It is important for self-regulated learning, reflection and metacognition that pupils learn the importance of exercising their bodies and learn to understand what is happening in their bodies.[29]

Increasing health challenges such as obesity and mental disorders show the importance of helping children and young people to learn to take care of their own health and have knowledge about food and nutrition. Moreover, features of social development, such as individualisation, are relevant for pupil motivation and mastering in connection with taking responsibility for one's own life.

3.2.4 The disciplines

This section outlines what closer collaboration, shared responsibility and division of responsibility may mean in the disciplinary areas in school.

[29] The Norwegian School of Sport Sciences 2015

Languages

Due to the increase in globalisation and internationalised working life and business, the Committee emphasize that language subjects must be strengthened in school. They should be strengthened by being more open for in-depth learning of what the language subjects have in common. This particularly refers to learning a language and communication. It is possible to develop the language subjects with more in-depth orientation if these common areas are considered more in connection with each other.[30]

The subject curricula for languages appear to offer few descriptions of what they have in common when it comes to the goals and aims for learning a language and communication. The exceptions are the subject curricula for Sami as a first and second language and the subject curriculum for Finnish as a second language. These subject curricula have emphasised the collaboration between each of these plans and the curriculum for Norwegian so that they can supplement each other and strengthen the language learning. In the systematic work on subject renewal, a clarification of what the subjects have a common responsibility for may strengthen the teaching of languages. At the same time, some of the cultural and literary aspects of the subjects can be made less comprehensive. The review of the subject curricula in Norwegian, English and foreign languages in the interim report shows that the total the language subjects cover a very wide area.

Renewal in the language subjects should start with a description of what is common in the subjects. Even if all the subject curricula for the languages subjects have a language learning part, a skills part and a culture, literature and social part, thus appearing to have been made according to the same model, they are quite different as language subjects.

When a language is taught, a system of concepts is used, such as phonetics, syntax and morphology.[31] Different language subjects use different terminology for the same concept. Even at the level of textual linguistics it is not uncommon to have different terms for more or less the same thing. One example is the literary term "genre" and the text linguistics term "text types", which to some

[30] Norwegian National Centre for Foreign Languages in Education [Fremmedspråksenteret] 2015. The Committee is responsible for the interpretation and use of input from the Foreign Language Centre.

[31] Helland 2014

extent have the same meaning. A common system of concepts in all the language subjects is important if the pupils are to understand the different linguistic categories, and if experience of previous language subjects is to be used when the pupils set out to learn a new language. Previous experience may help them sort through new material.

Pupils learn in different ways. It is important for the pupils to develop a repertoire of learning strategies to support them when they are learning a new language. It must be made clear for the pupils that vocabulary learning strategies, strategies for reading and writing, and competence in understanding other cultures can be transferred from other languages or subjects they have learnt.[32]

The Committee recommends that other foreign languages should be introduced earlier in the educational pathway. The term "foreign languages" refers to all languages except Norwegian/Sami, Danish, Swedish and English. Foreign languages are today offered from Year 8. It is up to the school owner to decide which languages are to be offered, but one of the traditional languages German, French, Spanish or Russian must be part of the programme. As of today it is not possible to choose a foreign language in vocational education programmes. A pilot project has been conducted where a foreign language is introduced in Year 5, which has been successful.[33] There is also reason to assume that an earlier start would strengthen in-depth learning because learning which leads to understanding, and the opportunity of the pupils to apply what they have learnt, takes time.[34] If we consider other countries, good reasons can be found to support the idea that the point in time for starting a foreign language should be on the primary-school level, as has been done in Denmark, for example.

Closer collaboration between the language subjects may mean that the total hours taught in the language-subject area may have to be somewhat reduced, while the language teaching for the pupils will in practice be strengthened, particularly if other foreign languages start at the primary-school level.

Social studies and ethics

In the interim report the Committee finds that the current social studies curriculum has such a breadth of content that it may be challenging to facilitate pupils' robust understanding, also when considering the number of teaching hours in the subject. A curriculum development in the social studies and ethics area that starts with the common concepts, methods and connections in social studies and religious and ethical education (Norwegian acronym RLE) could for example take democratic competence and the multicultural society as its point of departure, cf. section 3.2.3. By using democratic competence as a common building block, the subject curricula could examine majority and minority issues in society from various points of view with the same progression and increasing complexity in the different subjects. The advantage of establishing common building blocks may be that the division of work between the subjects will become clearer. This may have consequences for the breadth of the subject curricula: It will no longer be necessary to include everything.

Practical and aesthetic subjects

In the long term, the practical and aesthetic subjects must be strengthened in school. The compulsory school must give pupils experience of and opportunities for development in a wide range of disciplines, whether they are aiming for higher education or a vocation. It cannot be expected that pupils will choose practical and aesthetic subjects if they do not encounter these subjects in primary and lower secondary school. Working life needs a high number of competences which the practical and aesthetic subjects in school offer. In order to summarize, the practical and aesthetic subjects represent a broad concept of competence which the subject renewal must reflect. Keywords such as physical activity, craft skills and understanding of food culture show how complex this discipline is.

The interim report concludes that, all in all, the profile of the practical and aesthetic subjects may be detrimental to pupils' opportunities for in-depth learning because the subject curricula cover too wide an area. Being forced to "manage everything" impact the possibility of conducting in-depth learning. In the music subject the performing aspects of the subject may appear to dominate over the experience and knowledge dimensions of the subject. The food and health subject appears to have become both more of a general studies and more of a vocational education programme. In the arts and crafts subject the main aim appears to be to embrace the breadth of the subject, but this may limit the opportunity for in-depth learning in individual topics.

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[32] Haukås 2014
[33] Mordal et al. 2013
[34] Delord 2014

The Committee emphasize that the interim report clearly shows that the subject curricula in the practical and aesthetic subjects are ambitious. An important first step to take in the renewal of these subjects would be to agree on how on the overriding level they should assume responsibility for the four areas of competence. There needs to be a thorough discussion on which place and function this discipline should have in the school of the future, and this discussion should examine issues relating to subject structure, purpose and content. The aim of the subject development must be to strengthen the practical and aesthetic subjects in the compulsory school so they will be relevant in a perspective of 20 to 30 years. The Committee argues that compulsory school, as well as the discipline environments, will benefit in the long term from a deep and thorough development in this discipline. Given the assignment to reduce and simplify, focus and clarify will encourage the discipline environments to prioritise.[35]

An example of subject development in the practical and aesthetic discipline may be to strengthen the public health perspective by creating a new subject based on well-being competence in how to master life. Knowledge about physical and mental health, lifestyle, personal finances and consumption are areas where it is necessary to improve what pupils should learn in school. The overriding rationale for the subject may be seen as being able to make responsible choices in one's own life, and that capacity in this field can be learnt and developed in collaboration with others.

Health challenges such as obesity and mental disorders show why it is important that children and young people learn to take care of their own health and acquire knowledge about nutrition. As individualisation is a societal trend, it is relevant to provide a subject that gives pupils motivation and mastering experiences when it comes to taking responsibility for their own lives. Such a well-being subject can enable pupils to develop their competence in self-regulation and cooperation. Furthermore, critical thinking and problem-solving will be strengthened, for example in connection with assessing the plethora of at times conflicting health and dietary advice. If parallel topic areas in several subjects can be coordinated into a new subject, there will be better opportunities for creating learning processes leading to in-depth understanding.

[35] Espeland 2014

Mathematics, natural science and technology

In a future renewal of science subjects the overriding goal should be to improve the competence of all children and young people in mathematics, natural science and technology. The committee recommends strengthening the position of natural science in primary and lower secondary education. The natural science subject in Norwegian primary and lower secondary school has a lower number of teaching hours than the subject has in very many other countries. Based on the importance of natural science competence for democratic participation and problem-solving in working life, the Committee finds that today's number of teaching hours is too low. The teaching in the natural sciences at the primary-school level is particularly vulnerable due to the low number of teaching hours and the teachers' low level of formal subject and subject didactics competence.[36] The Committee recommends that the number of teaching hours should be increased in natural science corresponding to the reduction in the total number of hours in the language subjects. The Committee's recommendation to strengthen the natural science subjects in compulsory school is supported by a new report that has reviewed the natural science subjects in Norwegian school.[37]

Mathematics, statistics and informatics will be more and more prominent in the classical natural science disciplines, such as biology, physics, chemistry and the geosciences.[38] The natural science subjects in school can highlight mathematics competence, and natural science is also an important arena for practising mathematical skills. A change in the competence objectives will be required to link maths closer to the natural science and technological subjects that require mathematics.[39]

3.2.5 The common core subjects

While the pupils generally encounter common core subjects during all the ten years they are in primary and lower secondary school, they have more choices in upper secondary education. After the right to upper secondary education was introduced in 1994, and general and vocational studies were given equal status in the upper secondary

[36] Cf. Bergem et al. 2015

[37] The Directorate of Education 2015b

[38] Isnes 2015

[39] For a more detailed analysis of mathematics, natural science and technology see Bergem et al. 2015

Figure 3.4 Illustration Chapter 3

structure, the extent of the common content in upper secondary education has been a recurring topic of debate among politicians, teachers, pupils and others. Pupils choose an education programme which either prepares them for university/college or vocational training, but still they also have subject curricula with competence objectives that are the same or similar up to a certain level in the subjects Norwegian, mathematics, English, natural science, social science and physical education. These subjects have curricula that cover the ideal learning trajectory from primary school through upper secondary school. The common core subjects have a general educational function in which they aim to stimulate pupil participation in social life and their leisure time regardless which vocation or education they choose.

There have been two rationales for why these general education subjects are also important for pupils who choose a vocational education programme. First, the common core subjects are important for the vocational education as such and for the vocation. For example, many will need good skills in English. Second, the common core subjects will make it possible for a pupil to change his or her mind in the system and then take supplementary studies to qualify for higher education.

The discussion of the common core subjects has primarily been in terms of the vocational education programmes. The intention of vocational orientation and relevance in the common core subjects has been clearly stated in the governing documents since Reform 94. This was initially formulated as a requirement that teaching in the common core subjects must be adapted to pupils' education programme, and later defined so that subject matter, learning methods and vocabulary as much as possible should have relevance for individual practice of an occupation.[40] Research shows that the understanding and practice in upper secondary education varies between teachers and schools, but in general there is a lot of productive solutions in practical adaptation for vocational orientation in the schools. The fact that there is structured cooperation between teachers teaching common core subjects and the teachers who teach programme subjects is seen as an advantage, but the most decisive factor for vocational orientation and higher pupil achievements is well structures classroom management and teachers who have solid common core subject knowledge.[41]

The Committee is aware that the structure of common core subjects and their content has been singled out by many as part of the reason for poor pupil achievements and high dropout rates in the vocational education programmes. The structure of upper secondary education is not part of what the Committee shall assess under the mandate here, but the content of the common core subjects must be assessed in the same manner as the subjects in primary and lower secondary school.

As mentioned above in this chapter, renewal of the common core subjects will follow the same principles for subject renewal as the subjects in primary and lower secondary school. The four areas of competence must also be emphasized in these subjects, and the subjects must allow for in-depth learning and good progression. Fewer competence objectives should contribute to reducing the amount of curriculum overload in the subjects. The common core subjects will be different from today's subject curricula if the Committee's proposal for subject renewal is accepted.

Another consequence of the subject renewal is that pupils can be expected to have better learning outcomes in primary and lower secondary school. The Committee finds that pupils in the school of the future will be more aware of their learning activities, that their progression in the subject will be clearer in all subjects and in all school years, and that they will have a higher reflection level than today because they will have had the opportunity to undertake more in-depth studies. These are important premises for the broadly composed curriculum groups that will be given the task of developing the subject curricula of the future for

[40] NOU 2008: 18 *Fagopplæring for framtida* [Vocational training for the future]

[41] Iversen et al. 2014

Box 3.5 The common core subjects

The subjects *Norwegian, mathematics, English, natural science, social studies and PE* have subject curricula that cover the whole learning trajectory, from primary school up, and are common for all pupils in upper secondary education, regardless the education programme. These subjects are completed at different stages in upper secondary education and training, but may be continued as programme subjects in some education programmes. All these subjects, with the exception of physical education, are part of the requirements for qualifying for higher education.

Through the common core subjects, pupils in vocational education programmes qualify for admission to universities and colleges in English and social science, while they must supplement their competence in Norwegian, mathematics and natural science if they to want to qualify for admission in these subjects.

the common core subjects, cf. the discussion on curriculum models in Chapter 4.

The general education qualities of today's common core subjects are also valid in the school of the future, and the Committee believes that it should continue to be possible for pupils to change their direction within the system. The Committee finds, however, that the common core subjects can be opened to the various education programmes and be made more relevant than is the case today, particularly for the vocational education programmes. The subject curricula in the common core subjects can be developed so that they give better support for the competence objectives in the programme subjects than is the case today, and thus help motivate the pupils for learning in all the subjects. This will require that the renewal of the common core subjects will maintain a high ambition level in the subjects, and that the competence objectives will be assessed as being of equal value, even if they are not the same. To create the desired horizontal coherence in the main curriculum, in the long term it will be necessary to revise the programme subjects in upper secondary education pursuant to the same principles for subject renewal as the common core subjects and the subjects in primary and lower secondary education. Then the common core subjects and the programme subjects will together form a more solid foundation for pupils' learning and stimulate higher completion rates in primary and secondary education and training.

Pursuant to its mandate, the Committee shall assess neither the structure of upper secondary education and training nor the content required to prepare pupils for higher education. But it is important to point out that realising the Committee's proposal for subject renewal will also have an effect on the content of the supplementary studies qualifying for higher education for pupils from a vocational education programme.

3.2.6 Elective content in school

In primary and secondary education and training almost all subjects are common core subjects in the sense that all the pupils have the same subjects. This has been one of the main tenets listed under school's responsibility as a holistic education arena preparing children for the future and giving them equally good opportunities to succeed, regardless their background. Primary and lower secondary school must, moreover, ensure that all paths to further education and vocations are accessible to all pupils, and thus primary and lower secondary school must give the pupils a foundation in many disciplines.

For several decades, and particularly in lower secondary school, there has been a discussion about the degree of common content as opposed to the need to allow the pupils to choose some of the content according to their interests and aptitudes. The right to upper secondary education and training, which was introduced in 1994, determined that the pupils needed the highest level possible of common competence to have high learning outcome from upper secondary education and training. Due to this, the elective subjects that had long been a feature in lower secondary school were removed. In the Knowledge Promotion Reform the pupils have possible electives in the languages discipline, as they may choose one of a number of foreign languages and choose either a foreign language or in-depth studies in a language, and an option has been introduced to choose mathematics instead of languages. Some schools also offer opportunities for students to get work life experiences.

The electives in lower secondary school were re-introduced in 2012 as a stage in increasing the motivation of pupils in lower secondary school.[42] The electives have national subject curricula, are interdisciplinary and are assessed with grades.

The elective subjects have recently been evaluated, and the main impression is positive.[43] The evaluation finds that pupils appreciate the electives because they are practical and varied, as they may choose something they are interested in.

The subject renewal proposed by the Committee comprises all the subjects in primary and lower secondary school, including the elective subjects. The requirement relating to better in-depth learning and progression, the work with the four areas of competence across subjects and flexibility in the number of teaching hours within the framework of subject groups will together change school's approach to the content of the subjects. The Committee finds that there will be much less need for elective subjects as a measure for motivation of pupils and to promote practical and relevant work than is the case today.

3.2.7 The Sami main curriculum

The principles underlying the subject renewal will also apply to the Sami main curriculum. The Sami Parliament is an important participant in the development of the subject curricula under the Sami main curriculum, as it is responsible for the curriculum in the Sami languages and *duodji* (traditional Sami arts and crafts). It is therefore important that the Sami Parliament is involved in the process of embedding the principles for subject renewal at an early stage in the process.

The main curriculum for the Sami Knowledge Promotion Reform has some subjects that are different from the ordinary curriculum for the Knowledge Promotion Reform (Sami and *duodji*), some subjects that are identical (mathematics and English) and some subjects that are parallel and equal. This means that they build on the subject curricula in the Knowledge Promotion Reform, but feature some special Sami elements and competence objectives (social studies, natural science, RLE, music, food and health).

Sami pupils have both Sami and Norwegian as their learning languages. They may have Sami as a first-choice language and Norwegian as a second-choice language, or the other way round. Some pupils also have a curriculum for both languages as first-choice languages. The subject curricula in Norwegian and Sami have been developed to supplement each other, and are thus good examples of how subjects in a discipline can cooperate on subject objectives. The ambition is that the pupils will become functionally bilingual. The distribution of subjects and teaching hours in the Sami Knowledge Promotion Reform provides a few more teaching hours than the ordinary curriculum to make room for both languages.

3.3 Examples of subject renewal

Earlier in the chapter the Committee recommended a set of principles that should be part of a systematic review of the school subjects to make them relevant in a perspective ranging over 20 to 30 years. It is recommended that a future renewal of the subjects in school should comply with these principles.

This section presents two illustrative examples of how curriculum developers might think and proceed when subjects are to be renewed. Neither of the examples cover the entire subject. Each of the examples rather examines particular aspects of developing a subject in accordance with the Committee's recommendations: The four areas of competence, in-depth learning and progression. The purpose of the examples is to shed light on some important dimensions or to illustrate some important points.

The examples should not be understood as the Committee's recommendations for how the subjects actually should be renewed. This is the responsibility of the expert communities, curriculum developers and the education authorities.

The example in 3.3.1 shows important building blocks in mathematics where *engagement* in the subject is one of them. Progression in the pupils' development of engagement in the subject is outlined.

The example in 3.3.2 illustrates how the pupils' social and emotional learning and development can be given a central place in the school subject of music, and how the competence can be assessed.

3.3.1 Mathematics

The example outlines a curriculum for the future with an in-depth learning perspective. It displays important building blocks in the subject and how engagement is one of these.[44] The Committee's

[42] Meld. St. 22 (2010–2011) *Motivasjon – Mestring – Muligheter* [Motivation -mastering- opportunities]

[43] Dæhlen and Eriksen 2015

[44] The example is based on a submission to the Committee from the Norwegian Centre for Mathematics Education, see Valenta et al. 2014 and Valenta et al. 2015. The Committee is responsible for any interpretation and use of the input.

Figure 3.5 Illustration Chapter 3

ambition for the mathematics subject, stated in the interim report, is to examine in more detail how the subject may be developed with more in-depth orientation.

In this outline the relevance of the mathematics subject is related to a working-life perspective: The subject has links to many important areas in society, such as medicine, economics, technology, communication, energy administration and construction enterprises. Solid competence in mathematics is therefore important to qualify the pupils for working life and for strengthening Norway's competitiveness. This relevance is also seen in a social perspective: A vital democracy needs citizens who can study, understand and critically assess quantitative information, statistical analyses and economic prognoses.

Components and topics in the subject

Competence in mathematics can be described by using five components.[45]

Understanding means building conceptual structures and seeing the relationships between concepts, ideas and procedures. Understanding is also about interpreting, understanding and applying different representations, and switching between representations based on what may be useful for a given purpose.

Calculation refers to the ability to carry out various mathematical procedures accurately, flexibly and appropriately. Pupils who carry out procedures flexibly may switch between different procedures and choose the procedure or procedures that would be most appropriate in a given situation, and they understand why it is valid.

Application (strategic thinking) means the ability to recognise and formulate mathematical problems, represent them in different ways, develop a solution strategy and assess how reasonable the solution is. Mathematical problems refer to both problems from daily life and society where mathematics may be applied, and also abstract mathematical problems and questions.

Reasoning refers to the ability to explain how one is thinking, to follow logical reasoning and to assess the validity of the reasoning. Reasoning also means the ability to see and give grounds for connections between different concepts, qualities and procedures, to argue for the validity of a hypothesis by forming reasoning based on known facts and to build the way to what is unknown and should be examined.

Engagement means being able to see mathematics as reasonable, useful and valuable, and includes believing that it is possible to acquire competence in mathematics, and that effort contributes to learning.

These five components are closely interwoven, dependent on each other and supportive of each other. Pupils must develop all five in parallel. The connection between the different components will then be reinforced, and pupils will have the opportunity to develop a mathematics competence that is lasting, flexible, useful and relevant.

In the development of the curriculum in mathematics one may envision collaboration between the components of competence in mathematics and topics in the subject: Numbers and algebra – measuring – geometry – statistics. One should work explicitly on the different components and topics, but it is also important to work with the connections between them.

Algebraic thinking and engagement

Below is an outline of how the competence *engagement* may be expressed in the topic of *algebra*. The outline shows how to envision the development of mathematics competence when focusing on algebraic thinking. Algebraic thinking means processes connected to generalisation, reasoning about "the general", structure, patterns, connections and formalisations of these.[46]

Year 2

Engagement in algebraic thinking on the Year 2 level refers to looking for and using connections

[45] Kilpatrick, Swafford and Findell 2001

[46] Kaput 2008

between numbers and operations as useful and interesting. Pupils should see the usefulness of representations of numbers, operations and various connections in different ways. They should also see the value of developing several approaches to the same type of problem.

Engagement also means that pupils should experience that it is possible to understand something eventually, even if it may appear difficult initially. What is needed is that pupils are willing to make an effort, and that they work with what is difficult.

Year 5

Engagement in algebraic thinking in Year 5 means seeing the value of representations of numbers, operations and various relationships in different ways, particularly using algebraic notation. This is also about finding it meaningful to see relationships between different quantities, and discovering structures and patterns.

Engagement also means believing that it is possible to understand (concepts, symbolic expressions, procedures) and learn to think algebraically, and to work with algebra if one makes an effort.

Upper secondary education Year 1

Engagement on the upper secondary level generally refers to being open, curious and inquisitive to algebraic issues, structures and expressions. It is about being open to exploring the algebraic landscape, and being willing to accept that one must invest time and make an effort to become acquainted with the concepts one is working on.

A metacognitive perspective on algebraic thinking, or pupils' awareness about their own thinking processes, is important here. Then working with mathematics is not only about something foreign, but rather about the collaboration between personal cognitive development and the mathematics subject.

Summary of the example

In a development of the mathematics subject, as outlined in this example, the pupils can develop their attitudes and their engagement in the subject. The model itself with the subject components – understanding, calculation, application, reasoning and engagement – requires that pupils and teachers work with metacognition and self-regulation both within topics in mathematics and across them.

3.3.2 Music

The example shows how pupils' social and emotional learning and development can be given an important place in the subject of music in primary and lower secondary school, and how this competence can be assessed. The example illustrates how interplay between the areas of competence in the subject may facilitate in-depth learning. Focusing on the relationships between areas of competence also has consequences for progression in the subject.[47] The example does not cover all aspects of the subject, but rather outlines two areas of competence in the subject, *creating music* and *experiencing music*. Other important areas are performing music and analysing music.

Creating music

Creative activity in the music subject, for example by composing or producing music, may contribute to both development of knowledge about music and skills and to the development of creative thinking.[48] Through creating music pupils may gradually gain greater understanding of the basic elements, styles and expressive possibilities of music. Creating music is also related to a flexible, open, spontaneous and free attitude to efforts to solve a problem.[49] Creating music refers to the abilities and opportunities to create something new from something old, i.e. applying knowledge, skills and experiences to expand the already known or respond to new problem formulations. In pupils' creation of musical ideas, in their communication of the ideas and their active response to the ideas of others (stance-taking), their improvisational and compositional competence and production competence may be developed from an everyday, explorative and play-like activity into more conscious subject knowledge.

Emotional aspects of creative music activities impact the identity formation of children and young people. Music is for better or worse an essential identity marker.[50] Through creative work the pupils reveal themselves as and practise

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47 The National Council for Music 2015. The Committee is responsible for any interpretation and use of input submitted by the National Council for Music

48 Hickey 2003

49 Kaufman and Sternberg 2010

50 DeNora 2000, Ruud 2013

Table 3.1 Example of competence objectives in music

	Competence objectives
Years 1–4	Shall be able to comply with simple instructions and practise and perform with co-pupils Shall be able to follow the path of the music or the instructions of the director Shall be able to remain focused in concerts, and on the teacher and co-pupils
Years 5–7	Same as Years 1 to 4, and also: Shall be able to work, practise and perform independently with music alone and in groups
Years 8–10	Same as Years 1 to 7, and also: Shall be able to contribute to establishing cultures for practice that are dominated by confidence and trust. Must be able to accept the musical initiatives of others

at being vulnerable, and they also take chances and express their own opinions, emotions and ideas. The pupils may experience the appreciation of their peers and social mastering through material and work forms the music subject can offer.

Progression and coherence can be expressed by means of

- increasing levels of complexity in the musical expression, as well as methods and the use of technology in the creative process
- increasing levels of stance-taking on the expressive aspects of creating
- increasing levels of independence, responsibility and cooperation in the creative process

Experiencing music

Experiencing music is an important part of the performing and creative work in music, and in the analysis and contexualisation of music. The experience of music is a complex multisensory and bodily phenomenon, and may involve much more than just listening.[51] Experiencing music may give valuable encounters with familiar and unfamiliar cultures and may contribute to pupils' understanding of themselves and others.

Major portions of children's musical repertoire, interests and preferences are acquired outside school.[52] This preparation for musical interest is not necessarily homogenous, particularly in societies with increasing cultural diversity. Pupils who recognise "their" music in school may have their personal identity confirmed. Music may unite but also confirm and reinforce differences and splits in society, not only during the adolescent years but also among children of day-care institution ages.[53] The music subject may contribute to creating common musical experiences and a shared musical repertoire among the pupils.[54] Such a sense of community may be very important and include forms for in-depth learning of music and interpersonal relationships.

Progression and coherence may be expressed by means of

- experiencing music typical of historical and cultural diversity, through listening, dancing and other forms of experiencing
- developing the ability to listen, both auditively and through the body, in one's own performance and creating
- increasing the ability to encounter music by means of analytical and contexualising concepts

Assessment of the social and emotional learning and development of the pupils

The competence concept applied by the Committee may bring important social and emotional aspects of musical competence to the foreground as part of the basis for assessment. Under the Knowledge Promotion Reform the competence objectives were designed with few social and affective dimensions. Formative assessment occurs continuously in the activities, in the form of feedback from the teachers and pupil self-assessment. Teachers may also assess the relationships between reflection and process.[55]

Table 3.1 offers an example of competence objectives for practice and performance, which are also subject and social objectives.

[51] Jensenius 2009, Godøy and Leman 2010
[52] Folkestad 2006
[53] Vestad 2013
[54] Ruud 2013
[55] Eisner 1985

Figure 3.6 Illustration Chapter 3

Summary of the example

The example illustrates that social, practical and emotional aspects of the competence concept provide opportunities to point out important aspects of the music subject in compulsory school. As a performing subject, a creative subject and an experience subject music deals with practical, social and emotional aspects of pupils' learning and development in several ways.

3.4 The Committee's recommendations

The content of the school subjects must be renewed to satisfy the future competence needs in working life and society, and to open for better understanding and learning that pupils may use later in life. The Committee believes that the most important consideration when the subjects are to be renewed is that the four areas of competence in Chapter 2 form the basis for making priorities and choices.

Research shows that pupils' development of understanding *takes time*. This raises the issue of how many disciplines it is realistic that the school subjects should consist of, if the pupils are to have the opportunity to develop robust understanding in a given learning trajectory. If the subject curricula are to be productive governing documents and tools for the teaching staff, the content should be connected to important building blocks in the subjects, i.e. the key methods, ways of thinking, concepts and connections in the subject that pupils need in learning to develop a competence that will enable them to use what they have learnt.

The Committee recommends that the subject renewal should start in the disciplines in school and not in individual subjects. This means that the different subjects in each discipline must be considered together when the competences are to be focused on. Attaching greater importance to the key building blocks in the subjects in each discipline may eliminate some of the curruculum overload.

The Committee recommends a set of principles for renewal of the subjects in school. The purpose is to lay down premises to ensure that a future choice of competences in the subjects is undertaken in a systematic and knowledge-based manner.

The Committee recommends the following:

- A future renewal of the subjects in school should follow the principles
  - the expectations/conditions for pupils' learning
  - pedagogical, didactics, subject didactics and learning research
  - relevant disciplines and competences for the future
  - horizontal and vertical coherence in the curriculum
  - the breadth of the school objects clause
- The four areas of competence shall be used to set the priorities in the subject renewal and should be highlighted in all the disciplines: subject-specific competence, competence in learning, competence in communicating, interacting and participating and competence in exploring and creating.
- Subject renewal should start in the disciplines in school, and not in the individual subjects.
- The subject renewal must focus on a close collaboration between learning sciences and subject didactics, and must facilitate in-depth learning in the subjects.
- Principles must be established for strengthening the vertical and horizontal coherence in the subject curricula, for example to clarify the expected progression in pupils' learning.
- Mathematics competence must be visible in subjects where applying mathematics is an important aspect of the competence in the subject, and mathematics competence must be strengthened particularly in the natural sciences and social studies subjects.
- A second foreign language should be introduced in primary school.
- The subject renewal includes that interdisciplinary themes, such as the multicultural society, public health and life science, as well as

challenges connected to sustainable development, should be addressed in curricula for several subjects in a systematic manner.

– The common core subjects in secondary education should be renewed in accordance with the same principles as the subjects in primary and lower secondary school, and build on the competence achieved by the pupils in primary and lower secondary school. To achieve stronger relevance in the common core subjects, particularly in vocational education programmes, it is also recommended that curricula are also made for the common core subjects that fit the various education programmes, and which can fit together with the programme subjects for better learning for pupils.

Chapter 4
Curriculum model

Figure 4.1 Illustration Chapter 4

Chapter 3 discusses and describes how the school subjects can be renewed to satisfy future competence requirements in working life and society. In Chapter 4 the Committee assesses and gives grounds for how competence-oriented subject curricula focusing on pupils' learning as the core school activity can be developed.

The new subject curricula should have fewer and more uniformly designed competence objectives. Overriding national curricula objectives which have clear priorities and indicate clear directions are important if we are to have good education adapted to different pupils, pupil groups and learning contexts. This will give school leaders, teachers and other educational staff the autonomy to make professional assessments. The Committee recommends clearer progression in the subject curricula and descriptions of pupils' learning progression in support/guidance resources. The Committee believes that the subject curricula will be better tools and clearer governing documents if they are combined with the nationally designed guidance resources. This will help teachers and teaching staffs to make priorities in the everyday school. This chapter recommends some frameworks for how the national curricula and guidance resources should be designed and how they can interact.

4.1 Development of a model for subject curricula

The school subjects must be renewed in order to meet the needs for future competence requirements in society and its working life and to guarantee good learning for pupils. The question is which model for competence-oriented subject curricula will be most effective when the competence areas from Chapter 2 are to be integrated into subjects, and when cognitive, practical, social and emotional aspects of pupils' learning are to be put in focus. In this section the Committee recommends how the current curriculum model can be developed. The curriculum model must apply to both the Knowledge Promotion Reform and the Sami Knowledge Promotion Reform.

4.1.1 Curriculum coherence

Several analyses have indicated that there is a lack of coherence and consistency in the current main curriculum.[1] Further development of the curriculum documents should ensure coherence in the main curriculum.[2]

An analysis of the main curriculum for the Knowledge Promotion Reform found that the view on learning, pupils, teachers, knowledge/competence and general education in general is expressed implicitly and not dealt with in a consistent manner, with the exception of the teacher and the teacher's role.[3]

Curriculum research uses the term *curriculum coherence*– exploring whether there is coherence between the elements of the curriculum and the content. This may refer to the fact that the curriculum in its entirety is a logical entity, and that the content does not have conflicting elements across subjects and school years.[4] This could also refer to whether there is coherence between the various elements of the curriculum, for example between the subject curricula and assessment systems.

Coherence within and between subject curricula refers to vertical coherence, which means that expected progression in pupils' learning is clear from one year to the next. Vertical coherence may also mean coherence between the Core Curriculum and subject curricula. Horizontal coherence means coherence across the subject curricula, for example when cross-curriculum competences or interdisciplinary topics have objectives in several subjects so that they can interact with and reinforce each other in important areas. Curriculum development means finding a system that ensures horizontal and vertical coherence, both within and across subjects. Striving to ensure that the subject curricula constitute a whole may be important for their quality as governing documents and tools, when, for example, bearing in mind the desired progression in pupils' learning.

The evaluation of the Knowledge Promotion Reform showed that there was a lack of coherence between the Core Curriculum, the Quality Framework and the subject curricula.[5],[6] The reason is that when the Knowledge Promotion Reform was introduced in the 2006/2007 school year, the previous Core Curriculum was retained because it functioned well and was popular among teachers. In the Report to the Storting *On the right path* [På rett vei] the Ministry of Education and Research proposed to renew the Core Curriculum.[7] Bearing this in mind, in 2014 the Ministry began work on renewing the Core Curriculum so that it will better reflect social developments and the modified objects clause from 2008.

The Committee recommends that the Core Curriculum should be developed so that it will support the Committee's priorities for the content of school. Its design should be based on a solid foundation of knowledge about pupils' learning. One goal should be that the Core Curriculum forms a framework for understanding and operationalising the subject curricula. If in general the curricula are to express a holistic picture of pupils' learning, the competence areas that are recommended in Chapter 2 and the breadth of the competence concept should be clearly visible consistently throughout the entire main curriculum. It is recommended that importance should be attached to making vertical and horizontal coherence an important consideration each time parts of the main curriculum are revised.

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1 Aasen et al. 2014

2 NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future]

3 Björnsson and Hörnquist 2014a

4 Muller 2009, Schmidt and Prawat 2006

5 Dale et al. 2011, NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future]

6 The (LK06) National Curriculum for Knowledge Promotion in Primary and Secondary Education and Training comprises two general parts - The Core Curriculum and the Quality Framework - which describes overarching goals and frame the Subject Curricula.

7 Meld. St. 20 (2012–2013) *På rett vei* [On the right path]

Figure 4.2 Illustration Chapter 4

4.1.2 Focus on competence

Based on research and experiences gained from the Knowledge Promotion Reform and from other countries, it is recommended that the subject curricula should be renewed with a stronger focus on competence. This will contribute to pointing out that the most important aspect of the school's day-to-day activities is to focus on pupils' learning. The Committee recommends

- fewer and more uniform national competence objectives
- areas of competence instead of main areas

Fewer and more uniform competence objectives

Analyses of the Knowledge Promotion Reform indicate that several of the subjects have a large number of objectives. It has also been found that the subject curricula do not distinguish between objectives that require advanced application of knowledge and skills, and objectives that are easier to achieve.[8] One way of developing the curricula may therefore be to reduce the number of objectives. Several countries have moved in this direction. Having few and clear objectives was an important premise in the development of subject curricula in Sweden and in the Danish primary school reform of 2014.

It is a challenge for school when new subject matter and new areas of competence are added to the subject curricula without taking anything out. Curriculum overload, in the form of many and comprehensive objectives, may make it difficult for schools to prioritise, i.e. choosing the essentials and dropping some elements. Fewer and more uniformly designed objectives may contribute to solving the problem of curriculum overload in school. At the same time, having fewer subject curricula objectives will mean having more overriding objectives, and this could be perceived as making the schools' and the teachers' jobs more demanding. The Committee nevertheless emphasize that concentration on the important ways of thinking, methods, concepts and coherence in the subjects, and progression in the subjects, will make the priorities clearer. The most important work when renewing the subjects will be to make priorities so that the subjects' building blocks are clearer. This direction in the development of the subjects will give room for local pedagogical assessments. The Committee finds that the subject curricula must be designed so that they allow the teachers the professional freedom to make decisions on the choice of content, ways of working and organisation.

Several of the subject curricula in the Knowledge Promotion Reform have overlapping competence objectives. These overlaps are in part the expression of the wish to open for an interdisciplinary approach. However, an unintended result has been that the subjects are too broad.[9] It is therefore proposed that competence connected to interdisciplinary issues should be expressed more systematically than is the case today. Overlapping objectives can be removed from one or more of the subject curricula, or formulated in new ways so they support each other. The interdisciplinary topics that the Committee recommends should be strengthened in school are described in Chapter 3.

Areas of competence instead of main areas

In the Knowledge Promotion Reform the competence objectives direct school's work on the pupils' learning. They are also formulated within the framework of content-oriented main areas of the subjects. The social studies curriculum, for example, is divided into the three disciplines, history, geography and social science, in addition to the main area *The explorer* [Utforskaren], which includes methods in the social studies subjects. Content-oriented main areas may challenge the teachers' autonomy and professional judgement-when it comes to choosing which subject matter to teach. The Committee argues that using the competence areas as structuring elements in the

[8] Dale et al. 2011, Hodgson et al. 2012, Björnsson and Hörnquist 2014b

[9] NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future]

subject curricula will give the subject curricula a stronger competence focus as the question to ask will then be about which subject material should be chosen to promote the desired competence. With a division into competence areas the social studies curriculum will, for example, focus on how knowledge in social science is built and established, and may comprise discussions, critical assessment, arguments, grounds for conclusions and presentation of the subject to a stronger degree than is the case today.

With areas of competence in the subject curricula, the subjects will be developed so they have a structuring function for the content of school. Subject matter and methods will still be structured according to how they contribute to developing pupils' competence. The Committee proposes that the description of the main areas in today's subject curricula should be replaced by a similar description of the competence areas. Moreover, descriptions may be made on the discipline level in connection with the four areas of competence. The objective of the subject should continue to frame what the pupils should learn, and place the subject in a larger context.

Other models for competence-oriented subject curricula

Today the subjects structure the content in school, but there are other ways of organising the content than according to subjects.[10] A purer competence-oriented curriculum model might consist of only competence objectives or competence areas. This could contribute to putting important competences even more in focus in the teaching and learning activities. An advantage of such an organisation would be that what the pupils should learn might be related to several disciplines at the same time. Models of this type may be relevant in a longer perspective, but as of today there is no knowledge base or experiences that would legitimise such solutions.

Another example of how overriding descriptions of objectives may be designed is the National Framework for Lifelong Learning (Norwegian abbreviation: NKR).[11] Here competence is operationalised in knowledge, skills and general competence. The NKR model shows how knowledge and skills are part of the competence, and also comprises progression over school years and levels.

The future design of a main curriculum must be based on a model that makes it clear which competences the pupils should attain. A new model must make the subject curricula into educational and governing tools which support the competence focus in school and strengthen the work performed locally.

4.1.3 Clearer progression

Clearer descriptions of expected progression give the teacher and teaching staff help to follow up pupils' learning within particular areas of the subjects over time. From the evaluation of the Knowledge Promotion Reform we know that schools and school owners have different needs for support.[12] It is necessary to examine in more detail different ways progression can be expressed in the subject curricula to support the teachers' work.

The national subject curricula must set clear objectives, but it must be left to the schools to decide how to achieve these goals. There are many different ways of learning that lead towards a goal. The competence objectives in the national subject curricula should not be so detailed in their description of progression that they do not allow for different learning progressions for pupils or restrict local priorities or the school's opportunities to give their pupils adapted teaching. This consideration is one of the main reasons why the competence objectives in primary and lower secondary school today are formulated according to main levels and not according to each school year. The Committee recommends that this should be continued as one of the main principles.

Expected progression in pupils' learning may be expressed in different ways in the subject curricula and support material – by expressing progression between main levels more clearly, by means of guiding descriptions of the pupils' learning trajectories and through goal attainment descriptors.

Clearer progression in the competence objectives

A direct further development of today's curriculum model will be to make the progression from one year to the next clearer with competence objectives covering all the 13 school years (the learning trajectory). The evaluation of the Knowledge Promotion Reform has shown that progres-

[10] See for example Fadel 2014

[11] The *Ministry of Education and Research* 2011b: *Nasjonalt kvalifikasjonsrammeverk for livslang læring (NKR)* [the National Framework for Lifelong Learning]

[12] Aasen et al. 2012

sion from one year to the next is not equally clear in all the subjects.[13] It would be an advantage to clarify how the progression is envisioned, bearing in mind both teachers' planning for pupils' learning in an area of the subject, and for enabling assessment and feedback on pupils' development in the subject. The Committee believes that the subject curricula objectives should make it clearer what characterises progression in each subject.

The Danish subject curricula from 2014 have phase goals, i.e. goals that lead towards the competence objectives. For each competence objective, goals have been set for a number of phases corresponding to the number of school-year levels there are before reaching the competence objective, but without being connected to particular school years. The phase goals are level-based, not year-based, and they are envisioned as an aid for the teachers' work to prepare operative learning objectives when planning and carrying out teaching. It has proved difficult to set goals for pupils' learning that can lead to a competence objective that lies many years ahead, and the phase goals are an answer to this. They help to ensure that locally designed learning objectives have an appropriate progression in the subject.[14] The Committee notes that phase goals are a way of highlighting expected progression in the learning that comes in addition to the progression in the competence objectives. The committee adds that the progression goals must be based on a balance between an empirical basis and what is stipulated prescriptively/normatively, because the pupils will have different learning trajectories.

Descriptions of learning trajectories

Descriptions of pupils' learning trajectories are also a way of showing progression. Such descriptions have pupils' actual skill development and cognitive development in the subjects as the point of departure for designing learning trajectories. In the US, such descriptions of learning trajectories have been made within some limited areas in natural science and mathematics. The descriptions are based on empirical research on how the pupils' learning trajectories develop in practice.[15]

The purpose of describing learning trajectories in this way is to support teachers when planning and observing pupils' learning and development in the subjects. This is useful to enable planning the teaching for a whole class and for individual pupils, and for adapting the teaching to the levels of the pupils while they are learning. This is particularly important when it comes to assessment as it will be possible to determine where the pupil is in his/her understanding of the subject, to give relevant advice on further work adapted to each individual and to give a fair final assessment. The descriptions of learning trajectories show the key concepts or building blocks in the subjects.[16]

Research connected to the learning progressions based on the learning trajectories has considered relatively limited areas in subjects, thus the research basis is so far limited. However, there are examples of descriptions of learning trajectories in the subject curricula of several countries. In Scotland, guiding progression descriptions of different disciplines have been developed, and are based on knowledge and consensus on the learning trajectories within a subject.[17]

The aim of the descriptions of learning trajectories must be to support teachers in their work on planning the teaching and learning. Pupils will have different learning trajectories in the subjects, and teachers must adapt their teaching to their pupil group. If the descriptions are to avoid placing too rigid restrictions on the teaching, the Committee finds that it will be most appropriate if they have the status of guidelines. Guidelines, not regulations, will also give greater opportunities for revision according to testing and new knowledge.

The description of learning trajectories should be based on knowledge and consensus on expected progression in subjects, and should be developed by considering learning sciences, didactics, subject didactics and pedagogical research and practical experiences together. It is therefore necessary that the development work should be planned as cooperation between expert communities and school practitioners. The descriptions should be tested in practice, as has been done in an on-going research project which is developing standards for assessment of learning to write.[18] A systematic form of testing is important so decisions can be made on an informed basis and so that solutions that function well in practice can be found. The Committee recommends that descriptions should be developed of learning progression in guidance resources,

[13] Dale et al. 2011
[14] Rasmussen 2015
[15] Mosher 2011
[16] Mosher 2011
[17] Education Scotland 2015
[18] Berge et al. 2015

Box 4.1 Tjensvoll School: Pupils' progression in a subject

Tjensvoll School, in Stavanger in Rogaland County, is a primary school with pupils from Years 1 to 7. They work systematically with the learning and development of each pupil. The school has special reading and mathematics supervisors who support all the school's teachers.

Knowledge about the pupil as the point of departure for further learning

The school has good results in reading. They have a binding syllabus where they map the pupils to determine whether they achieve their goals. The supervisors contribute to school's follow-up of individual pupils. The school has for several years worked systematically with pupil reading and writing in all subjects.

The basis for the work is a common plan for the school's efforts in reading and writing competence that is used actively by the staff. It includes a description of what reading and writing means in all subjects and the school's framework for teaching each school year. The plan contains reading strategies and general learning strategies the pupils must learn in each school year. Moreover, the plan describes what the school needs to map to be updated on the pupils' progress in reading. The school uses the results of these surveys to obtain information about how individual pupils have developed their competence. If the pupil does not achieve the desired competence, the school immediately takes the initiative to determine why, and to find out what the pupil needs in his or her further learning process. Such measures may be adapted teaching, special follow-up by the teacher, guidance from the reading supervisor, special teacher or a person from the school's resource team and cooperation with the home.

The school's mapping is the key to obtaining information about what the pupils have learnt and how they can learn more. This applies to pupils who are lagging behind and to pupils who need extra challenges. The school's leaders have established a good framework that contributes to better learning for each pupil. The supervisors follow up pupils and classes in all the school years. They inquire about and observe the development of the pupils. The supervisors have contributed to making the whole staff more aware of and willing to discuss the learning and development of each pupil.

and that this development activity should start parallel to the curriculum development.

Support for final assessment

In competence-focused subject curricula the objectives are the basis for assessment of a pupil's competence. In some countries, such as Norway and Denmark, the objectives and the levels they indicate form the point of departure for assessment. Some subject curricula have also formulated standards or descriptors for achievement which make it clear what it means to have achievement on a certain level, for example to achieve grade 5. The standards are often connected to particular grade or competence levels. An example is the Swedish subject curricula, where the *knowledge requirements* describe three different grade levels for each stage, or the Finnish subject curricula, which have assessment criteria for what characterises high achievement in all subjects.

The standards for final assessment are developed to support teachers' and examiners' final assessment with a grade. The descriptors indicate the requirements for the different grades. In years without grades and/or no final assessment such descriptors may give the teachers a basis for assessing how the competence of the pupils is developing from a lower to a higher level, and thus support the planning of the pupil's learning progression.[19] However, such level descriptions may lead teachers and pupils to focus attention on the level the pupil "belongs" to, instead of progress and process.[20]

Teachers and school leaders have called for national criteria which can contribute to valid final assessment and common national guidelines for the assessment work. Guiding national descriptors for achievement after Year 10, which have

[19] Throndsen et al. 2009
[20] Mosher 2011

been developed in five of the subjects in Norway that have learning pathway from Year 1 to Year 10, have been well received.[21] The descriptors indicate the quality of competence in a subject. The Committee recommends that a future curriculum process must assess how competence objectives in the subject curricula in years with final assessment may indicate the different levels of achievement more clearly or be supplemented with descriptors for different levels of achievement.

The relationship between objectives and descriptors must be clearly indicated, and the descriptors must be described on a national level so they will not interfere with the teachers' autonomy to make pedagogical decisions. The descriptors must be based on the competence objectives in such a way that they must be used together with the subject curricula to give meaning, and so that there will be room for local realisation and adaptation. Cooperation between colleagues on competence objectives and descriptors may contribute to common understanding and shared language about what the pupils should learn, and what characterises different levels of achievement.

It is important to consider whether standards for final assessment should be highlighted as part of the statutory subject curricula or in guidelines. An argument for the statutory requirement is that control is necessary so that the grades pupils receive on their diploma are set on the same basis across schools and individual teachers. An argument for the guidelines status is that statutory standards may create an ambiguous dividing line between what should be focused on in the teaching, and what should be the basis for the assessment.

4.1.4 Emphasising cross-curriculum competences

Pupils' learning in school generally takes place by working with the subjects. In the interim report the Committee finds that cross-curriculum competences should be integrated in subjects in a systematic manner.

Systematic integration in subjects

Subject-specific and cross-curriculum competences must be made clear in each subject. This is decisive if they are to be given priority in the learning activities in the day-to-day school activities. For example, creativity must be developed by having the pupils work with subject content, such as natural science issues or artistic forms of expression. A number of the cross-curriculum competences are generally requirements for learning in the subjects. This applies, for example, to reading, writing, persistence, motivation and being able to plan, implement and assess one's own learning processes.

All the cross-curriculum competences described in Chapter 2 are developed through working with the subject content and must therefore be integrated in competence objectives to make it clear what the pupils must learn in the subjects. Experiences of integrating the cross-curriculum basic skills in the Knowledge Promotion Reform have shown that it may be demanding to integrate competences that are relevant in several subjects in a clear manner. Fewer objectives and more cross-curriculum competences will put further demands on curriculum development. The Committee finds that the proposal relating to work division between the subjects in the disciplines is an answer to this challenge, see sections 3.2 and 4.3. When the subjects are developed with a greater degree of work division, not all the competences will need to be present in all subjects. If curriculum development involves setting priorities through the key building blocks in the subjects, the new subject curricula will be less complex.

Fewer curriculum objectives with more integrated cross-curriculum competences will also place demands on the local work with the subject curricula. The Committee believes that giving priority to key building blocks with clearer descriptions of progression in the subject curricula and support material will facilitate pupils' in-depth learning in the subjects. Fewer and more cross-curriculum objectives may alleviate the problem of curruculum overload. These measures may make it easier for teachers and teaching staff to set priorities in their work at school.

Making cross-curriculum competences in the subjects visible means that the subject curricula will be different because the subjects are different. But it appears that the dissimilarities in today's subject curricula are greater than what can reasonably be claimed according to the actual differences, nature and different purposes of the subjects. An analysis of the current subject curricula points out that there does not appear to be good systematism behind the way in which the competences that are important for many of the subjects are integrated into each of those sub-

[21] Gjerustad et al. 2014

jects.[22] This leads to a lack of horizontal coherence in the subject curricula and give unclear governing signals.[23] Research findings suggest that the quality of the curriculum coherence in the subject curricula impacts their quality as governing and support documents.[24]

The breadth of the competence concept

The Committee recommends four competence areas as the basis for setting priorities in the content in school. Pupils' learning in all areas means collaboration between cognitive, social and emotional aspects of the learning. Integrating the breadth of the competence concept in the subject curricula raises some questions, such as those on assessment, cf. Chapter 5.

In the Knowledge Promotion Reform social and emotional aspects of pupils' learning have not been integrated in the subjects' competence objectives. The social and emotional development of pupils must be assessed in a dialogue between the pupil and the teacher in light of the Core Curriculum and the Quality Framework. A possible consequence of this is the lack of coherence between the national documents and the objectives in the subjects.[25]

Committee fins that integrating the breadth of the competence concept is an important aim. Aspects of the social and emotional competences must also be part of the subject learning, for example, engagement in and attitudes to the subjects and one's own learning in the subjects, persistence, expectations for own mastering, being able to plan, implement and evaluate one's own learning processes and the ability to interact with others. In the renewal of the subject curricula, part of the development work will be to find good solutions to how the social and emotional competences can be expressed in the form of competence objectives.

The Finnish curriculum reform (LP2016) has examples of how the breadth of a competence is expressed in objectives that are in focus in several subjects. In the new Finnish subject curricula the following competences across the subjects are given a high priority: The ability to think and learn, cultural and communicative competence, everyday competence, multi-literacy, digital competence, working-life competence and entrepreneurship, and the ability to participate, influence and contribute to a sustainable future. The aim is to support a pupil's development as a human being, as well as to promote expectations for participation in a democratic society and a sustainable way of living. An example is how objectives for pupil motivation and interest in mathematics are connected to self-confidence and the perception of mastering.

The social and emotional development of pupils generally takes place in collaboration with co-pupils and teachers, and not all aspects of pupils' learning in this area are relevant to formulate or assess as objectives in the subjects. For some social aspects of learning there may be good reasons to formulate some process objectives for school's work with the social environment, where the assessments of achievement take place on the system level, rather than formulating the goals as individual objectives for the individual pupil. The Core Curriculum may, for example, have objectives that deal with the expectations for common responsibilities for the school environment, for all to experience a sense of belonging and for interpersonal relationships. The Education Act establishes that school must contribute to a good psycho-social environment for all pupils and to good relationships between pupils.

The Committee emphasize that common objectives on the school level and a greater degree of process-oriented objectives in the subject curricula are two solutions for strengthening the objectives for the social and emotional learning and development of the pupils. Coherence internally in the main curriculum should be made clearer in a new Core Curriculum by showing how objectives for the pupils in the subject curricula are linked to common objectives for school.

4.2 The subject curricula and guidance resources

With more overriding subject curricula the need for supporting resources increases. The Committee emphasize that there is a need for a curriculum concept that includes statutory national subject curricula and guidelines for the national subject curricula. It is recommended that the Norwegian curriculum model should be developed with a closer and more dynamic collaboration between subject curricula and guidance material for these curricula. The experiences from the Knowledge Promotion Reform and from other countries indicate that good coherence between governing doc-

[22] Björnsson and Hörnquist 2014b
[23] Aasen et al. 2012
[24] Sinnema 2011
[25] Engelsen 2008, Björnsson and Hörnquist 2014b

Figure 4.3 Illustration Chapter 4

uments and guidance documents requires that the guidance documents are part of the curriculum model. However, experiences of previous subject-curricula reforms show that it is difficult to maintain an overview over a large volume of guidance resources from national bodies and they may therefore not be used as much as was intended. It must be clear what the guidance principles of the main national curriculum implies and what the other supporting resources are. A three-part model is suggested:

- statutory national subject curricula
- nationally designed guidance resources
- other supporting material

Research indicates that the local work with the subject curricula under the Knowledge Promotion Reform has contributed positively to development, professionalization, variation in work forms and methods for and attention on adaptive teaching.[26] Studies show that schools working systematically with subject curricula analyses and assessment in the subjects over time change the participants' understanding of the curricula.[27] Research also show that teachers are struggling when it comes to preparing manageable learning goals and giving direction to the weekly and monthly learning activities of the pupils. There are also examples where the learning activities become fragmented when the competence objectives are broken down into learning objectives that are detached from the subject body they are a part of.[28]

To realise the content of the subject curricula there must be good coherence between the national and the local work on them. It is recommended that the education authorities should give better support for the local work on the subject curricula through guidance resources. The curriculum concept the Committee advocates includes statutory national subject curricula and guidance sections for the national subject curricula. If available knowledge about the subject curricula and the practical day-to-day affairs of school is used as the point of departure, it appears appropriate to develop national guidance resources that are connected to.

- the cross-curriculum competences and
- descriptions of the pupils' learning trajectories in the subjects

The Committee recommends that the guidance resources should be made at the same time as the subject curricula.

4.3 Framework for designing national subject curricula

If the four areas of competences are to serve as the basis for prioritising the content of the subjects, a renewal of the subject curricula is necessary. Below a framework for the curriculum development is outlined.

4.3.1 Openness and dialogue

In Chapter 6 the Committee points out that common understanding among all the stakeholders in the sector is decisive if the development work in primary and secondary education and training under the auspices of national authorities is to succeed. An overriding recommendation is therefore to have clear objectives, explicit rationales and key concepts that are foregrounded and explained in all the subject curricula and guidance resources.

Another overriding recommendation is to attach importance to treating curriculum development as open and dialogue-based processes, where the stakeholders in the system influence each other. The opposite approach would be top-down curriculum development, where the authorities would present complete and finished solutions. The most constructive development work will most likely take place by testing various approaches in practice, and then adjusting them on a knowledge- and experience-based foundation.

[26] Sivesind 2012
[27] Throndsen et al. 2009, Sandvik and Buland 2013
[28] Hodgson et al. 2012

4.3.2 Leadership and decision-making

It is recommended that the development work should have an open, inclusive and dialogic form. To ensure coherence and consistency in the curriculum, the work must be launched, led and completed by the national education authorities, where the final conclusions are made at the central level. The Sami Parliament is an important partner in the development of new subject curricula, both when it comes to contributing to verifying knowledge about Sami matters for Norwegian pupils, and to contributing to relevant subject curricula for the Sami school.

The subject curricula for school subjects are designed in a process where social changes, political ambitions and pedagogical considerations play important roles during various phases of the process. The Committee prefers to have knowledge-based curriculum development where expert knowledge about making a curriculum has the most weight in the decision-making process. It is recommended that all the national subject curricula for compulsory school should be established by the same public agency that organises and leads the work after the political guidelines have been given early in the process.

4.3.3 Renewal of the subjects within the disciplines

The Committee does not recommend that the subject renewal should start with each subject but rather with the selected disciplines in school, see section 3.2. The development process must rely on systematic cooperation between the subjects in each discipline and between the subjects across disciplines where needed. In a future design of the subject curricula, the development of objectives for pupils' learning and provisions for how pupils' competence should be assessed should be a common process. This section proposes some frameworks for the curriculum development.

Framework for cross-curriculum competences

The Committee emphasize that there is a need to develop a framework for curriculum developers that will highlight the cross-curriculum competences in the subject curricula. Groups of experts who receive a mandate from the education authorities to develop the national subject curricula must have a common understanding of the competences that are to be integrated in the subject curricula. The framework must be designed independently of the subjects, must define the cross-curriculum competences and must describe their function and progression.

The framework will be important in the renewal of the subject curricula, serving as the underpinning for the groups on the discipline and subject levels to ensure that objectives are created for what the pupils should learn. It must be used as the basis for systematic integration of the competences in the disciplines and in subject curricula. The framework will initially be a tool in the national curriculum development. Based on expert assessments it will be up to the groups to decide how the competences can be made clear as part of the discipline/subject.

It is recommended that the framework should be made before the curriculum groups start their work, and that sufficient time should be allocated for this development work.

The Committee finds it important that the understanding behind the cross-curriculum competences is also shared by those people who are to adopt and use the subject curricula. The framework may be further developed into a guidance resource as a tool for local work with the subject curricula.

Curriculum groups within the disciplines and subjects

The subject curricula are to be renewed by curriculum groups, i.e. groups of experts mandated by the national education authorities to develop the national subject curricula. The Committee recommends that a curriculum group should be appointed for each discipline, and that the subject renewal and curriculum development should start in these groups. Close cooperation between the subjects within each discipline should ensure that the responsibility for subject-specific competence, cross-curriculum competence and interdisciplinary topics which the subjects have in common is divided into a systematic, academically grounded and knowledge-based manner. The Committee recommends that the curriculum group for each discipline complies with the principles for subject renewal in Chapter 3. Two particularly important considerations are that the work must be based on close collaboration between learning science, didactics and subject didactics, and that it ensures horizontal and vertical curriculum coherence. The most important work of the curriculum groups will be to prioritise key ways of thinking, methods, principles, concepts and coherence in the subjects. The building blocks of the subjects include subject-specific and cross-curriculum competences.

When the competence areas are to be put in focus in the subject curricula, the different subjects in each discipline must be considered together. The goal for the development on the discipline level must be that the subjects reinforce each other by several of them having objectives for pupils' learning in important areas and with a progression between the school years that correspond to each other. Such common responsibility will ensure vertical and horizontal curriculum coherence. The subjects can also be developed with a greater degree of work division. This means that not all the cross-curriculum competences must be present in all the subjects or disciplines, but that they are integrated where it is most relevant and appropriate.

The Committee recommends that a curriculum group should also be appointed for each of the subjects to be renewed. The curriculum for each subject must be designed within the framework decided by the curriculum groups for each discipline. The mandate for the curriculum groups for each subject should include making a foundation describing how the subject is relevant in a future perspective, the building blocks of the subject, and which competences the subject must assume special responsibility for and in which ways. Such a foundation should also assess the boundaries between other subjects, in addition to the subject's responsibility for interdisciplinary topics. Close cooperation is recommended between each discipline group and the appropriate subject groups throughout the subject curricula-development process.

Each curriculum group must be composed with such a wide range of experts as the subject renewal requires for Norwegian and Sami pupils. The traditional science disciplines should not be the only determiners of the premises for the choice of content in school. This means, for example, that the curriculum group in mathematics may need a statistician and an economist, that the curriculum group in Norwegian may need a media and communication researcher or that a technology expert is needed in the natural science group. Only some examples are mentioned here from some subjects, but they make a point that must apply to all the subjects and disciplines.

For competences connected to the interdisciplinary topics of climate change, the multicultural society and public health and life science, it is recommended that the subject curricula should show the connections across the disciplines.

Flexible distribution of subjects teaching hours per subject within the disciplines

It is recommended that the close cooperation between the subjects within the disciplines should be followed up through corresponding cooperation in the schools when working with the subject curricula locally. The Committee finds that increased flexibility in the distribution of teaching hours per subject in the disciplines mathematics, natural science and technology, languages, social studies and ethics and practical and aesthetics subjects will provide good opportunities for enabling in-depth learning and good progression in the pupils' learning. Cooperation across the subjects may help to reduce the problem of curriculum overload in school and help pupils to understand the connections so they can apply knowledge and skills in various subject contexts.

However, a flexible distribution of teaching hours per subject does not appear to be a sufficient means to ensure interdisciplinary cooperation. From 2000 to 2005, a pilot project in Sweden looked into the effects of giving schools greater flexibility in organising the distribution of teaching hours locally. The intention was to improve the possibility of interdisciplinary work by moving away from allocating time for each subject to stipulating time for reaching an objective. Studies of the project show that it is not sufficient to assign time for local prioritising of interdisciplinary work. The intentions of the interdisciplinary work must be connected to overriding goals and be legitimised through dialogue and embedding on the different levels in the sector.[29] If interdisciplinary work is to be done in systematic ways in the day-to-day school activities, the responsibility for it must be assigned in terms of leadership and subject coordination.

In Norway, the national authorities have traditionally been focused on ensuring a minimum of time for each subject. Strong state control of the distribution of teaching hours per subject has been a key measure for achieving this. National distribution of teaching hours per subject has also been an element in the idea of the comprehensive national school, where a uniform school programme for all pupils has been seen as important. This does not mean that today's scheme is without flexibility. The subjects have a total amount of time assigned for the main levels, and the local authorities are responsible for allocating the teaching hours for each school year. The primary

[29] Sundberg 2005

Box 4.2 Myklerud School: With concept learning as the point of departure for in-depth learning

Myklerud School, located in the municipality of Nesodden in Akershus County, has pupils from Year 1 to Year 7.

The school wanted to work more systematically with pupils' learning and believed it would be possible to exploit pupils' potentials in a better way. As a step in this process it was therefore decided that the entire staff needed to be more systematic. The overriding goal was to ensure good quality of learning and teaching in all classrooms.

Systematic teaching of concepts and procedures

The school wanted to focus on a small number of key concepts in the subjects over time. The concepts should contribute to good understanding of the content and processes in the subjects. Understanding concepts is also important for further learning in the subjects.

The school has introduced concept learning in natural science as a prioritized area. Here they have concentrated on such concepts as evidence, substances and observation. They have prepared a concept wall in the classroom on which they write key concepts and what they mean. The pupils have raised their awareness of concepts and procedures. Instead of stating: "It was warm," they may now say "I observed a change in temperature". They have also become more aware of the fact that concepts mean different things in various subjects and in colloquial language. When they have to do things several times they learn in a better way, and in the next session they can start on a higher level than where they last were.

In-depth learning

To develop good understanding of concepts the pupils must use these concepts over time and in various ways. In Myklerud School the pupils practise concepts by reading, speaking, writing and carrying out practical exercises. This means that the concepts stick, and the pupils learn them better.

Pupils who have developed robust understanding by being familiar with concepts and procedures are ready for more challenging tasks. Pupils who work with understanding the basics of a subject have benefited from several repetitions, and this has improved their capacity to express what they have learnt. They all feel it is motivating when the teaching is connected to practical projects and pupil activity. To increase the pupils' activity level, they are often asked questions where they initially must consider the answer, then speak with their neighbour, and later share what they have been speaking about with the whole class. Because the school focuses on learning concepts, the pupils have improved their articulation and their ability to ask relevant questions in a subject. This makes it possible to confirm that they have understood, or correct them if they have misunderstood something.

The school would like to expand the model from natural science to other subjects and school years. Focusing on important concepts in the subjects has helped in the development of goals and good criteria, while the criteria have made it easier to plan the teaching around the important topics.

school level comprises seven years and one main level. Five-per cent flexibility has recently been introduced for the local level. This means that schools/school owners may reallocate up to five per cent of teaching hours between the subjects, both in primary and lower secondary school and upper secondary education and training. This scheme is so new that it is not possible to refer to experience of it, and no studies have been conducted on how it works.

4.4 The Committee's recommendations

The Committee recommends that the subject renewal should start with the disciplines in school, mathematics, natural science and technology, languages, social studies and ethics and practical and aesthetic subjects. In the development process, systematic cooperation between the subjects is necessary within each discipline

Figure 4.4 Illustration Chapter 4

and between subjects across disciplines where this is needed. The close cooperation between the subjects in the disciplines must be followed up by corresponding cooperation in the everyday activities in school when working with the subject curricula locally. The Committee recommends assessing whether to increase the flexibility in the distribution of subjects and teaching hours between the subjects in each discipline as a measure to stimulate learning activities between subjects that have a clear division of responsibility and common responsibilities. Increased flexibility between the subjects in the disciplines will give good opportunities for enabling in-depth learning and progression in the pupils' learning.

Based on research and experience of the Knowledge Promotion Reform, and experience from other countries, it is recommended that the subject curricula should be further developed with a stronger focus on competence. The Committee recommends fewer and uniformly designed objectives and competence areas instead of main areas. Additionally, there is a need for clearer progression in the objectives between the main levels. The provision of other types of descriptions of progression in the subject curricula can also be assessed. The combination of clearer progression in the subject curricula and descriptions of the learning trajectories in supporting material are measures that will make it easier for teachers and teaching staff to plan, implement and evaluate the teaching.

Developing a framework for the cross-curriculum competences is recommended, initially to be used as a tool for the work in developing the national subject curricula and then as part of the guidance resources which inform the sector in a good way and can be used on all levels in primary and secondary education and training.

The Committee recommends the following:

- The focus on competence should be developed in the subject curricula, with fewer and more uniformly designed objectives for pupils' learning than is the case today, and structured into competence areas in the subjects. The collaboration between subjects within disciplines must be made clear in the subject curricula.
- The curriculum model should be developed through closer collaboration between the subject curricula and the guidance resources for the curricula. The interaction between the documents must be thoroughly considered and have rationales, so it will be clear how they can be used together. The guidance resources must be developed at the same time as the subject curricula.
- A framework must be developed for the cross-curriculum competences as a tool in the curriculum development to ensure a shared understanding and system in the integration of these competences. The framework may at a later stage be developed into guidance resources for the sector.
- Progression in the competence objectives between main levels must be described better than today. The progression in the subject curricula should be made clear by developing guiding descriptions of pupils' learning trajectories in the subjects.
- The progression descriptions in the guidelines must support the teacher's work on adapting teaching to individual pupils and groups of pupils. Development of the descriptions must take place parallel with development of the curriculum.
- It should be assessed how competence objectives in the subject curricula for school years with final assessment can indicate a clearer achievement level or be supplemented with descriptors indicating different levels of achievement. It will be an important consideration whether standards for final assessment should be made clear as part of the statutory subject curricula or in guidelines.
- The distribution of teaching hours between the subjects in the disciplines mathematics, natural science and technology, languages, social studies and ethics, and practical and aesthetic subjects should be made more flexible to better enable work across subjects.
- Expert considerations of the curriculum must be given importance in the decision-making

process. All national subject curricula in primary and secondary education and training must be decided by the same public agency which organises and leads the work to develop the subject curricula.

– The work on renewing the Core Curriculum must be considered together with the Committee's proposal. A new Core Curriculum should constitute a transition between the objects clause and the subject curricula, and should express a view of learning and subject-specific learning and cross-curriculum competence that is consistent with the subject curricula.

Chapter 5
Teaching and assessment

Figure 5.1 Illustration Chapter 5

Chapter 3 and Chapter 4 discuss and describe how the subjects and the subject curricula in school can be renewed to meet future competence needs and facilitate pupils' in-depth learning and progression. The Committee finds that teaching and assessment must support the objectives in the Core Curriculum. In this chapter the Committee assesses how teaching and assessment practices, regulations and assessment schemes may be developed to realise the Committee's recommendations.

The competence and practice of the teaching profession are decisive for whether the pupils will develop competence for the future. The Committee emphasize that teachers will need to strengthen their didactics and subject didactics competence and further develop methods for teaching. Cooperation and collaboration between colleagues on pupils' learning is necessary to ensure that planning and implementation of the teaching are based on research and experiences and are adapted to pupils' learning needs. Pupils must have an active role in the teaching and must be able to practise mastering challenges in a safe and cooperatively oriented learning environment. The Committee believes that formative assessment is an important part of a teaching practice when the aim is to promote pupils' learning. It is

recommended that final assessment and examinations should be developed to provide reliable and relevant information about the competence of the pupils in the school of the future.

Teaching practice must be developed along with the development work that is already being done, but it is important to allow for the fact that renewal of the content of school will require long-term and dedicated efforts to raise competence and ensure continuous professional development.

5.1 Teaching that promotes learning

The interim report describes a knowledge foundation relating to what conditions in the learning environment and the teaching that contribute to learning. Learning environments that promote learning are characterised by the following:

- the pupils are actively involved in their own learning and understand their own learning processes,
- the pupils works collboratively and engage in communication and cooperation with peers and teachers,
- the pupils are able to develop in-depth understanding and receive help to understand connections,
- the pupils are given challenges which make them exert themselves,
- the teaching is adaptive to the pupils' different prior knowledge and experiences,
- the pupils encounter clear expectations about what they are to learn, and receive feedback and advice about further learning,
- the pupils relationships, motivation and emotions are taken into consideration in the teaching, and
- the teachers use varied methods, work forms and organisation adapted to what the pupils are to learn and to individual pupils and pupil groups.[1]

Research confirms that these aspects of the learning environment contribute to learning in different subjects and in different competence areas. Teaching practices and learning environments that build on these principles form the basis for developing competences that children and young people need in the future working life, society and their private lives.[2] The Committee considers the principles to be decisive for the pupils' development of the competences the Committee recommends and the competence concept that is used.

The Committee finds that in-depth learning in the subjects is decisive if pupils are to use what they learn in school later in life. This means that pupils gradually and over time develop understanding and skills in different disciplines. Teachers can facilitate in-depth learning in the subjects by allowing pupils sufficient time to study in depth and by giving them challenges, guidance and feedback adapted to their academic level.[3]

Principles for formative assessment are an integral part of a teaching practice which promotes pupils' learning. Formative assessment means obtaining and interpreting information about learning and progression on an ongoing basis in the learning process, and that teachers and pupils use the information to find out what pupils understand, where they are going and what they should do to get there.[4]

5.1.1 The teachers' professional work

The competence and professional qualities of the teachers are decisive for realising the content of the school of the future. Teachers are responsible for planning what the teaching should include and how it should be organised if pupils are to be able to achieve the objectives in the main curriculum. The professional assessments of teachers must build on research and experience-based knowledge about what promotes learning in the subjects. Teachers must also use their knowledge about the group of pupils and individual pupils when they plan, implement and assess the teaching. Cooperation between colleagues on pupils' learning is important to ensure that the teaching is knowledge-based and adapted to the knowledge and experiences of the group of pupils in question.[5]

Coherence between teaching and pupils' learning

The Committee proposes that the competence focus in the current subject curricula should be continued, and that objectives in the national subject curricula should provide room for the teachers' professional assessments and choices. This

1 NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future]

2 Dumont and Istance 2010

3 NOU 2014: 7 *Elevenes læring i fremtidens skole* [Pupils' learning in the school of the future]

4 Earl and Timplerley 2014, Baird et al. 2014

5 Timperley 2012, Walshaw and Anthony 2008

Figure 5.2 Illustration Chapter 5

means that teachers will continue to be responsible for planning and assessing subject content, and for deciding which structures, organisation and work methods can contribute to pupils' learning in the subjects. The teachers must also decide how to use formative assessment to obtain knowledge about the progression of the pupils and give feedback that will help them to take further steps in their learning. Didactics and subject didactics competence, including assessment competence, will be decisive elements that ensure good planning and implementation of the teaching.

Teachers plan with various time horizons, from year and half-year plans to planning of shorter teaching periods and individual classes. An advanced curriculum understanding is required to interpret the subject curricula and design a learning trajectories that reflects the long-term objectives in the subject curricula. Experience from the Knowledge Promotion Reform has shown that it may be demanding to prepare tasks and assessment situations that challenge the pupils to use their knowledge and skills, rather than just showing what they have acquired. There are also examples where teachers to a large degree focus on giving concrete objectives that are simple to measure rather than giving more complex objectives for pupils' learning. This applies to the dialogues in the classroom, pupils' work plans and tasks and the tests that are given.[6]

For the teaching to systematically build on the knowledge and learning needs of the pupils it is necessary that plans are used flexibly, and that they allow time and space so the teachers can adapt for their pupils. Adaptation here means making purposeful choices of methods and work forms based on the learning requirements of the group of pupils or individual pupils in question. The coherence between teaching and learning is strengthened when the teachers assess whether the teaching has contributed to pupils' learning, and undertake necessary changes and adaptations in the further teaching based on this.[7]

Renewed subjects will require that the teachers develop and change the methods and action repertoire they use in their teaching. When the four competence areas are to be emphasized in the subjects, this will have an effect on the subject matter, work methods, organisation and assessment methods that will promote pupils' learning. The broad competence concept in the subjects will demand that teachers consider pupils' motivation, self-regulation and social competence in their planning and implementation of the teaching. This creates the need to develop practices, and places more demands on teachers to vary their methods according to the academic, social, emotional and cultural backgrounds of the class/group.[8] Pupils must also receive feedback about how they are developing social and emotional aspects of their competence in all subjects.

Teacher training and continuing education must give the teachers support in the development of a relevant method and action repertoire. It will also be necessary that the teaching staff tests and develops new approaches and methods for teaching and assessment. Working in a knowledge-based way and with the pupils' learning in focus will require that the teaching staff cooperates on finding solutions and developing methods that are adapted to groups of pupils and individual pupils. Studying new research and reflecting on and sharing experiences of personal practice are part of such a way of working.[9] The Committee's proposal to highlight areas that several subjects have in common increases the importance of teachers cooperating when they are planning teaching and following up the pupils' learning. The school leaders and school owners must prepare frameworks for teachers' planning activities, see Chapter 6 on implementation.

Facilitating pupils' progression in the subjects

Some of the teachers' planning work consists of deciding how the teaching should support the pupil's learning trajectories in different subject

6 Sandvik and Buland 2014, Hodgson et al. 2012
7 Timperley 2012
8 Walshaw and Anthony 2008
9 Timperley et al. 2007

areas. Teachers must be able to interpret the progression in the subject curricula, relate it to where the pupils are in their learning trajectories, and adapt the teaching to their learning needs. The Committee recommends that the subject curricula and accompanying guidance resources should give more support for this work. Guiding descriptions of the learning trajectories may support the teachers' work to facilitate good progression in their pupils' learning.

Principles relating to formative assessment will also be important for facilitating pupils' progression. Teachers must identify their pupils' understanding and misunderstanding to decide what they should focus on in the further teaching. Research shows that feedback that contributes to learning is given frequently, immediately after something has been completed, points towards further learning and focuses on what the pupils should work with more and how.[10]

Clear expectations and an active pupil role

For pupils to develop solid subject knowledge, the teachers have important roles as presenters of subject knowledge and as classroom managers. The teaching must be well planned and structured, and the teachers must be clear about the purpose of the learning activity and what is expected of the pupils.[11]

The competences the Committee recommends also require that pupils have active roles in the teaching. Pupils must be able to practise using subject knowledge in various contexts, alone and with others. Collaboration, communication and investigative and experimental ways of working in the subjects may promote pupils' active participation. Such ways of working may also help pupils to develop the competences the Committee recommends. Pupil-active work methods require thorough planning and follow-up by the teachers.[12]

To be able to use what they learn in various contexts, pupils must develop awareness of what they know and are able to do, what the purpose of what they are learning is and which learning strategies will be relevant in the subjects. This requires that pupils are involved in different phases of the learning process, both in the planning and assessment of the teaching, and in the assessment of their own learning and competence. Both self-assessment and joint discussions on what characterises advanced work in the subjects may help develop pupils' metacognition abilities and self-regulated learning. When metacognition and self-regulated learning are in focus, the teachers may increasingly use their pupils as resources for mutual learning.

5.1.2 A productive learning environment

The Committee argues that the recommendations for subject-specific and cross-curriculum competences will require school leaders and teachers to work systematically with the psychosocial school environment and the pupils' learning environment. All pupils shall have the opportunity to experience well-being in school and mastering in their subjects, and shall have a good relationship to other pupils and teachers. A productive learning environment has intrinsic value but also contributes to pupils' learning. Learning is promoted when pupils have the courage to show what they do not know or cannot do, and when it is appreciated that everyone masters things and has good progress in the subject according to their expectations, aptitudes and level in the subject.[13]

Education that helps the pupils develop academic, social and emotional competence in collaboration must build systematically on collaboration and cooperation between teachers and pupils and between pupils. This demands good relationships and a safe psychosocial environment, which most schools work systematically on. When putting emphasis on such areas as self-regulation, collaboration and participation, it is even more important that pupils have the courage to use their abilities and experience the school culture and their relationships to teachers and peers as supportive and trusting.

When the learning environment is characterised by tolerance, curiosity and positive attitudes to cooperation and participation it contributes to learning. Safe relationships are the foundation from which teachers can give pupils academic challenges, and from which pupils can challenge each other.[14] This is important for all learning, but will increase in importance when the focus shifts more to how pupils should learn to explore and create and interact with others.

The social and emotional learning and development of pupils is a resource in school's work

[10] Hattie and Timperley 2007, Gamlem and Munthe 2014
[11] Håkansson and Sundberg 2012
[12] Greeno 2006, Dumont and Istance 2010
[13] NOU 2015: 2 *Å høre til* [Belonging]
[14] Timperley 2012

Box 5.1 Orstad School: With metacognition as the basis for learning

Orstad School, located in the municipality of Klepp in Rogaland County, has pupils from Year 1 to Year 10.

For the pupils to become aware of their own learning strategies and learn to reflect on their own learning, they must train this continuously and in all subjects. The school's overriding goal is thus that the pupils should train in this every day.

Acquiring advanced learning strategies is a goal in itself and a tool for subject learning. Reflections and strategies are also important for the pupils when they are to cooperate and interact with others.

The school leaders have given priority to this over time. The school has a special action plan for working with metacognition and learning strategies, and these are given priority in the work done by the teaching staff on the subject curricula. Metacognition is part of the learning objectives the teachers make for the pupils.

Teaching practice that facilitates metacognition

The school works systematically with the pupils' learning strategies, and the teaching staff have together drawn up descriptors for the teaching. This has been a topic in internal meetings, where importance has been attached to how they can develop their pupils' metacognition in all the subjects. The teachers have shared examples of how they help their pupils train in metacognitive reflections, and they have discussed various ways they can facilitate metacognitive insight.

The teaching staff have also discussed how self-assessment, assessment of each other, checklists and clear assessment criteria are important for developing their pupils' awareness of their own learning, and when in the process the pupils should receive feedback.

For the school leaders it has been a clear choice that working with learning strategies is a collective process in the staff.

The good dialogue and good discussion as the point of departure for reflection on one's own learning

Developing pupils' metacognition will have an effect on the teaching in the classroom. The good dialogue and the good discussions help the pupils' to acquire the various strategies, and they are challenged to reflect on their own competence and learning when the teachers facilitate their involvement and open for dialogues. In their teaching, teachers endeavour to show their pupils good examples, in writing and verbally, so they gain good understanding of the goal for the dialogues and reflection.

A measure to promote reflection on one's own learning processes is to open for self-assessment. This may be done both verbally and in writing. For example, after a work session pupils may be asked to assess their own point of view, and discuss this with the teacher. The pupils can also cooperate on deciding how to progress in their work with the subject. They may also be asked to fill in a self-assessment form, either on their own or with the teacher. In mathematics they could be asked such questions as: Did you do all the tasks? Did you make many mistakes? Have you shown how you calculated? How did you feel you mastered the tasks? The self-assessment form is a good point of departure for reflecting on how pupils have solved the tasks, and what they felt was challenging.

Often pupils will discuss in pairs. In the subjects they will use various tools to reflect on connections, similarities and dissimilarities in what they learn. At times they will also discuss in class. What did we learn? How did we learn this?

An important part of the school's work is to guide the pupils so they can reflect on and see things in context. One goal when prioritising metacognition and reflection in pupils' learning is to help them see connections between subjects and their own learning processes, and help them connect what they are learning to today's society.

with the psychosocial environment. When pupils train in expressing themselves, contributing to the community and respecting the views of others through their work with the school subjects, they can assume more and more co-responsibility for the learning environment.

5.1.3 Support for the teachers' work

Developing a teaching and assessment practice which gives pupils relevant competence for the future requires a long-term effort, where the national authorities, teacher-training institutions, teaching staffs, school owners and school leaders work towards common long-term goals. Teacher-training institutions and continuing education are very important contributors to building teachers' professional competence in their subjects, in addition to national competence development initiatives and development activities in the professional environment in the schools are also important.

Formal teacher training forms the basis for the professional development of teachers' and student teachers' understanding of teaching and assessment, an understanding that is developed further through practising as a teacher. In working with the subjects and subject didactics and in the education science subject, the teacher-training institutions have a major responsibility to give their student teachers knowledge about what promotes learning in a teaching situation, and how they as teachers must reflect on their own practice to improve, both on their own and with colleagues. The subject of education science and pupil-related skills was introduced with the new division into levels and subjects in teacher training in 2010. This subject was intended to form the basis for the teaching competence of the teachers-to-be, and more than the earlier education science subject it was to be focused on the profession.[15] The evaluation of this new subject shows that it has not become increasingly oriented towards the profession, but that it is characterised by curriculum overload.[16] The Committee emphasize that the intentions of this subject must be followed up in a new Master's degree education programme. The subject should have a clear larger emphasize on competence in the profession, including how to facilitate in-depth learning and pupil progression, related to the four competence areas the Committee prioritises. The Committee also finds it important to point out that the education science subject in a new teacher-training education cannot assume the entire responsibility for professional competence. The subject didactics course and the practical training must focus on supporting the teaching profession to master the challenges in the school of the future. Continuing education and school-based competence development must contribute to teachers continual development of professional competence and understanding of the subject curricula.

The subject curricula must give the teaching profession room to use their adaptive expertise. Under the Knowledge Promotion Reform the concept "freedom to choose methods" was used in some contexts, in particular to underline that the subject curricula should not lay down guidelines for particular ways of working, as they had done earlier. Teachers' planning and teaching must build on research and experience-based knowledge and on knowledge about the pupil group in question. The Committee argues that the subject curricula and other national governing measures must maintain the idea that teachers have the space to act. At the same time, with a curriculum renewal, more importance should be attached to how teachers have a professional responsibility to choose subject content, ways of working and organisation that are based on research relevant for pupils' learning and adapted to the particular group of pupils. This means that teachers' professional autonomy involves a *responsibility* for making well-reasoned and research-based choices of methods and approaches in their teaching.

Both national and local competence development measures that are aimed at the development of teaching and assessment practices should have a focus on earning and teaching research.[17] There are examples of national programmes that have concentrated on the use of research, and there are schools and school owners who work systematically with research as the basis for school development. The Committee, however, recommends that the national authorities need to be more systematic than today at providing updated research on learning, teaching and assessment which may be used in the local school development work. As part of this, research-based knowledge summaries of adaptive teaching and assessment practices in the

[15] Report to the Storting no. 11 (2008–2009) *Læreren, Rollen og Utdanningen* [The teacher, the role and the training]

[16] Følgegruppa for lærarutdanningsreforma (The panel for the teacher education reform), Report no. 5 2015

[17] Timperley et al. 2007

Box 5.2 Firda Upper Secondary School: With collaboration on the agenda

Firda Upper Secondary School, located in the county of Sogn and Fjordane, offers the programme for general studies.

The school believes that the pupils should develop collaboration competence because being able to interact is important for them in their learning and for the social environment in school.

With good relationships as the point of departure for learning

Cooperation between the teachers, between the pupils and between the teachers and the pupils is a priority area for the school. The school's leaders want the school to give priority to collaboration, good relationships and a good learning environment. Collaboration has been a topic in the school's general meetings and in the pupil council. Each class has their own rules that the pupils and teachers collaborate on. These are used as the point of departure for good discussions and important reflections.

The teaching staff also discuss how to build good relationships in their cooperation and shared time. The school is highly aware that the staff must be good role models for the pupils by showing good cooperation in practice.

With collaboration as the basis for subject learning

The school is working on promoting collaboration competence by arranging debates. The pupils are assigned various roles in advance, independent on their opinions about an issue. Some pupils serve as chairpersons, others debate. They are also informed of the assessment criteria for the debate, and receive feedback as part of the subject assessment. The topics are taken from one or more subjects. In groups the pupils must find knowledge and arguments that support the points they will be arguing for. The goal for the debates is that the pupils should use subject-specific competence, communication and collaboration. Another aim is that through debating the pupils learn to make reflected decisions with rationales. In a debate the pupils must use subject matter independently, collect and assess information from various sources and must be able to listen to opponents and respond to their arguments. The pupils find working in this manner motivating.

Sufficient time is allocated to promote more advanced cooperative competence in the subjects. Cooperation is practised, for example, when the teacher makes it possible for the pupils to discuss concepts and issues with each other. This type of work method promotes learning because the pupils learn to say out loud what they have learnt and because they can confirm whether they have understood what they have learnt or whether they have more work to do. It is underlined that the academic discussion and the ability to reflect on the subject matter are just as important as presenting factual knowledge. The teacher's role is to guide and ask questions.

Collaboration in projects

The school has a series of events and activities where the pupils participate and create something together. The school has access to dance halls, concert halls, a library and a large sports facility. In these learning arenas the pupils learn collaboration by producing and performing concerts and organising various events. This is an important part of building relations in the school.

subjects should be developed. It is important that such resources are updated according to new research, and that they should be easily accessible to the schools so they can use them.

Chapter 6 looks into the type of competence development the Committee recommends as part of a coherent implementation strategy for the Committee's recommendations.

5.2 Assessing pupils' competence

Assessment of pupil competence in subjects today has two purposes: Formative assessment to promote pupils' learning and development, and final assessment to give information about the pupils' competence as the basis for certifying them for further education and work. Assessment is addi-

tionally used for systemic purposes, giving information to various levels in the school system as the basis for quality assessment and control. See section 6.4 for more on quality assessment.

The focus on the four competence areas and the broad competence concept changes the basis for assessment in the subjects and also the conditions for the assessment practices in the schools.

Today both formative assessment and final assessment are related to objectives, meaning that the pupils are assessed according to the total competence objectives in a subject. The Committee recommends that the four competence areas should be given prominence in the competence objectives in the subject curricula, see Chapter 3 on subject renewal and Chapter 4 on curriculum models.

The Committee argues that the objective-oriented assessment principle must be continued. It is proposed that the cross-curriculum competences should be integrated closely with the central concepts, principles and methods in the subjects. Thus assessment should use as its point of departure pupils' total competence in a subject, and not in individual areas of competence and cross-curriculum competences in isolation. Cross-curriculum competences and subject-specific content will be closely interwoven in the subjects. It will therefore be more important that in their assessment of pupils' competence the teachers view the different competence objectives together.

In Chapters 3 and 4 it is recommended that connections between subjects in the same discipline and between disciplines should be made clearer. Cross-curriculum competences are a main focus in several subjects, and it is an important competence for the future that the pupils are able to collate and apply knowledge and skills from different subjects. There may thus be a need for initiatives to counteract a strictly subject-divided assessment.

5.2.1 The competence areas and a broad competence concept

There is a solid foundation for claiming that teachers can use formative assessment to support pupils' development of the competences recommended by the Committee. By using different approaches and assessment methods, teachers may obtain knowledge about how pupils understand and apply subject-specific concepts, principles and methods, how they master written and verbal forms of communication and interact with each other, and how they apply subject knowledge to think critically, solve problems and develop and implement ideas. Self-assessment and involvement of pupils in the assessment activities may contribute to pupils' learning, and are closely connected to working with pupils' metacognition and self-regulation in the learning process.[18]

The Committee also emphasize that overall assessment grades set by the teachers are also very suitable for assessing pupils' competence in the renewed subjects. The teachers may collect information on pupils' competence over several weeks towards the end of a teaching period in a subject, and use information from different sources and assessment situations. The formative assessment follows pupils' progression in the subject over time and the teacher obtains information about achieved competence. The teacher may use this information in the overall assessment grades if it is considered in light of the fact that the assessment must reflect the competence pupils have achieved towards the end of the teaching period.

Assessment of pupils' social and emotional competence

The Committee emphasize the importance of a broad competence concept, and that school needs to support the social and emotional learning and development of pupils more systematically than is the case today. Pupils should, for example, develop curiosity, self-regulation and respect for the views of others. Social and emotional competences have not been assigned a systematic focus in today's subject curricula, and thus this means that the practice must be changed when this becomes a clearer element in the competence objectives in the subjects. This will create some challenges which must be dealt with in a good way in provisions for assessment and in the teachers' practice.

If assessment is to promote learning, it is important that pupils receive feedback on their social and emotional learning and development, such as self-regulation, expectations for their own mastering and attitudes to the subjects.[19] Assessment and feedback may have positive and negative impact on pupils' learning, motivation and self-efficacy. Putting more emphasis on social and emotional competences in the formative assessment therefore places more demands on the teachers' assessment competence and practice. It

[18] Wiliam 2010

[19] Wiliam 2010, Dweck 2006, Boekaerts 2010

is important that assessment of pupils' social and emotional competence should be based on clear objectives and criteria so that they do not experience that personal qualities influence the assessment they receive. Social and emotional competences refer to situational circumstances and complex qualities in the pupils. Therefore it will not be easy to assess several social and emotional competences according to a pre-defined progression or grade scale. Moreover, currently there is no sufficient knowledge base that teachers can turn to for support in the assessment of social and emotional competences.[20] There are also ethical aspects of awarding grades in the assessment of social and emotional aspects of pupil competence. Today a six-month assessment with grades in all subjects is given, starting in Year 8, and the teachers may give grades in other situations as part of the formative assessment.

Therefore dilemmas arise when assessment, in particularly final assessment, is to be based on a broad competence concept. The Committee believes that social and emotional competences should have a strong place in the subject objectives so they will be focused on in the teaching. Academic and ethical challenges will also arise when including social and emotional competences when the teachers are to give overall assessment grades. The Committee therefore recommends development activities over time to find appropriate solutions in the process of developing subject curricula and support and guidance resources. Renewed subject curricula must be accompanied by competence development and evaluation of how the curricula are to be used in school's assessment work.

A principle should be that objectives for pupils' social and emotional competence shall not be given prominence in themselves in the total final assessment, but rather that they should be seen as requirements for the competence pupils achieve in the subject. An example will be how a pupil's persistence impacts whether he or she masters a demanding task in the subject. It will then be the pupil's ability to master the task that is assessed and not his or her persistence per se.

5.2.2 Development of formative assessment

The Knowledge Promotion Reform has had a focus on competence development and capacity building related to using assessment as a tool for learning in the subjects. The following principles for formative assessment are today embedded in the regulations for the Education Act:

- the pupils shall understand what they are to learn and what is expected of them
- the pupils shall receive feedback which informs them of the quality of their work or performance
- the pupils shall be given advice on how to improve, and
- the pupils shall be involved in their own learning activities by assessing their own work and development.[21]

The Committee recommends that the subject curricula and guidance material must emphasize conditions for more advanced learning trajectories and make in-depth learning more possible than today, and the principles for formative assessment will be important for the teachers when supporting pupils' development in the subjects in a systematic manner.

Further development of practice

Under the Knowledge Promotion Reform many schools have worked on developing their assessment practice and have gained a better understanding of assessment as a tool for learning. But it varies as to how far schools have come in this work, and bearing the Committee's recommendations in mind, some areas will be important in the years ahead.[22]

It is important that teachers' assessment practices support changes in the subject objectives and the broad competence concepts. The objective-related assessment principles and the competence focus will be continued, but the broad competence concept and the importance of the cross-curriculum competences will create the need for a renewal of assessment methods.

The Committee also finds that involving the pupils in the assessment activities, for example through self-assessment, is an area that must be brought more into focus. It will contribute to learning if the pupils are given help to understand what they should learn in the subjects, to know the criteria for advanced work and to know what they master and what helps them learn. Being able to assess one's own work and own progression and reflect on the learning activities with co-pupils and teachers may help pupils to develop a

[20] Prøitz 2015, Scardamalia 2012

[21] Regulations to the Education Act, section 3-1, section 3-11 and section 3-12

[22] OECD 2011, Sandvik and Buland 2014, Aasen et al. 2012

Figure 5.3 Illustration Chapter 5

clear relationship to their own learning so that they learn to take an active role in the teaching. This is related to pupil development of metacognition and self-regulated learning. Self-assessment and pupil feedback to each other will also be relevant approaches for the teachers when establishing dialogues with pupils on developing social and emotional competences. Having pupils assess each other is an area which impacts learning and which the Committee believes will be important in the future. The feedback pupils give each other may, for example, inform the teachers about their collaboration competence.[23] Teachers need knowledge on experience of how pupil involvement can be carried out in practice, and the pupils need to learn to master active roles.[24]

Formative assessment is one of the areas where digitalisation may support the pupils and the teachers in other ways than the practice is today. Research on in-depth learning and progression, new technological platforms and digital assessment tools will be developed in the years ahead. An area such as learning analytics may be used to enhance the work with formative assessment. This means that digital tools could be used to track pupil development over time in the form of many observations and results.[25] Such technology may change the conditions for learning, teaching and formative assessment in school, and will require new teacher competence.

As mentioned in section 5.1, there will be a need for continuing education in didactics and subject didactics, and teachers will need to cooperate on developing assessment methods.

Guidance and support resources

The formative assessment in the school of the future must start with the objectives in the renewed subject curricula. Clearer progression between the goals on each main level may form a more advanced basis for an objective-related assessment practice. Moreover, support and guidance resources will be important for teachers' assessment activities and form the point of departure for discussions on pupils' learning among the teaching staff. The Committee's recommendations of guiding descriptions for the learning trajectories within areas of subjects may support teachers in assessing where pupils are in their learning trajectories, and help them to decide what the pupils should continue working on in various parts of the subjects.[26] The Directorate of Education [Utdanningsdirektoratet] has established a test bank that currently includes learning-support tests in some skills and subjects, and also contains examples of examination papers that have been assessed. The Committee recommends that learning-support tests should be developed in connection with cross-curriculum competences and other areas that several subjects have in common.

Today teachers are able to use the results of national tests and mapping tests in their formative assessment. Tests and material the school may use to map pupil competence based on the curriculum objectives will continue to be important measures in the future.

5.2.3 Developing overall assessment grades and examinations

The complexity of the competences pupils must develop in the renewed subjects suggests that the teacher-based overall assessment grade should have a prominent place in the final assessment. If there are clear objectives and criteria and teachers' assessments are supported by quality assurance processes in each school, the overall assessment grade may constitute a fair and relevant assessment of pupil competence in the subjects.

The Committee believes that with a future subject renewal it should be considered how teacher overall assessment practice and the examination system can be developed to give a fair and relevant assessment of pupils' learning outcomes in the subjects.

[23] Håkansson and Sundberg 2012, Prøitz 2015
[24] Sandvika and Buland 2014, OECD 2011
[25] Unesco 2012
[26] Heritage 2011

Strengthening the overall assessment practice

Assessing pupils' final competence in accordance with today's subject curricula is a complex matter, but the complexity in the foundation of the assessment increases when the pupils are to develop several cross-curriculum competences which are closely interwined with subject-specific content. It is decisive that teachers are given support in making assessments by having clear objectives and criteria and through guidance and quality assurance as this will help to guarantee a fair and relevant assessment of pupils' competence.[27] For the overall assessment grade to give reliable and valid information on pupils' final competence in the renewed subjects, we must place higher demands on the quality assurance systems than we do today.

Systematic differences have been found between the overall assessment grades in schools over time, both when it comes to the grades pupils receive and what the teachers focus on in their assessment. For example, teachers base their grades on academic and non-academic achievements, such as effort, motivation and progression, when setting grades. There are also differences in how overall assessment grades are set across schools and across subjects, for example when it comes to how assessment situations are prepared, the degree of teacher cooperation and the impact formative assessments during the learning period should have on the final assessment.[28] Teachers, school leaders and school owners have called for a clearer set of regulations and national criteria for what is needed to achieve the different grades in the subjects.[29]

The Committee finds the need for several measures to ensure that the overall assessment grade will give reliable and relevant information about a pupils' final competence in the school of the future. There is a need to clarify the common requirements for the final assessment that all schools must use as their point of departure. In Chapter 4 the Committee proposes that a future curriculum process should assess how the competence objectives in the subject curricula for school years with final assessment can show more clearly a competence level, or be supplemented with descriptors for various types of achievement/competence. Today there are guiding descriptors for achievement after Year 10 in Norwegian, mathematics, social studies, natural science and English in connection with the grades 2, 3–4 and 5–6. The purpose of the descriptors is to support the teachers' setting of the overall assessment grade. The Committee emphasize that an assessment should be made as to how today's model can be developed so that the subject curricula and guidance material can give good support for assessing the different competence achievements in the subjects. For example, different levels may be explained by means of more detailed supplementary textual descriptions rather than the guiding descriptors that are in use today. Another alternative may be to clarify a particular level in the competence objectives. Different models have been chosen in the other Nordic countries.

Furthermore, objectives and possible standards in the subject curricula should be supplemented by guidance and support material the teachers can use to interpret the basis for assessment. For example, examples of pupil papers or other products could be developed to show what characterises a pupil's competence on different grade levels in the subject.[30]

Reliable and valid overall assessment grades will also depend on competence, processes and systems in local interpretation communities.[31] There are experiences that can be built on from schools and school owners that have established processes for coming to a common understanding in the system and experiences from the national training of examiners and the *Norm Project,* which studies teacher expectation norms in the assessment of writing competence.[32] Today tests have been developed which aim to support overall assessment grades in some subjects.

The Committee argues that in a future subject renewal it should be assessed whether the rules and regulations should be strengthened. Today's regulations on assessment only have a small degree of requirements for the quality of the overall assessment grade or how the schools should organise the processes. Teachers, school leaders and school owners have stated that the rules should be made clearer than they are today, and processes have been initiated by the national authorities to examine this.[33] It may be necessary to clarify the responsibility of school leaders in quality assuring the assessment through collec-

[27] Harlen 2005, Wyatt-Smith and Klenowski 2014, Tveit 2009

[28] Hovdhaugen et al. 2014, Prøitz and Borgen 2010, Harlen 2005, Prøitz 2013

[29] The Directorate of Education 2015a, Prøitz and Borgen 2010, Throndsen et al. 2009

[30] Education Services Australia 2015

[31] Harlen 2005

[32] Berge et al. 2015

[33] The Directorate of Education 2015a

Figure 5.4 Illustration Chapter 5

tive processes in the teaching staff. It may also be necessary to specify the quality requirements for the final assessment. An example is a requirement as to how assessment situations should be designed to provide a sufficient basis for assessing the breadth of the competence in a subject. Changes in the rules and regulations should be based on research and experience.

Changes in the rules and regulations are not enough to develop the practices of schools and therefore must be supplemented by developmental work and competence development on the part of the school owners, school leaders and teachers. But changes in the rules and regulations can form a common point of departure for understanding this practice which the nationally initiated competence development and local development processes can then build on.[34]

Development of the examinations

The purpose of examinations is, as for overall assessment grades, to inform about pupils' competence when a subject has been completed. In subjects with examinations the pupil receives an examination grade in addition to an overall assessment grade on the diploma. Examination papers are made and examined nationally, locally or as a combination of national design and local examination/implementation.

Even if examinations have the same purpose as the overall assessment grade, there is a difference in the information they provide. An examination is a single event, takes place over a relatively short period of time and its format limits the competence objectives that are relevant to assess, for example in a written or verbal/practical examination. A single examination may thus not inform about the breadth of a pupil's competence in the same way as an overall assessment grade.

It is a relatively common practice that school owners and schools compare the overall assessment grades with examination grades in the subjects to assess whether there are systematic deviations between schools over time.[35] This means that examinations are used as quality assurance of the school's overall assessment grade practice. But such a purpose for the examinations is neither stated in the rules and regulations, nor in other governing documents. Systematic differences between an overall assessment grade and an examination grade may form the point of departure for discussing a school's assessment practice. The Committee argues, however, that the overall assessment grade and the examination grade should be considered as two different expressions of pupils' competence, and that this should be emphasised even more if the subjects comprise a broader competence concept than today.

Changes in the subject content will create the need to change examinations to ensure good validity and reliability, meaning that the examination will assess relevant competences in the subjects. The assessment situations currently used in examinations may be developed by using new technology or by testing additional approaches, such as both written and oral/practical examination formats. Under the Knowledge Promotion Reform importance has been attached to designing tasks that challenge pupils to use subject knowledge and skills and to see issues/problem formulations in contexts. Pilot projects in using the internet during examinations have been a stage in making the examination content more like the task-solving work pupils will encounter in working life and day-to-day life, and the tasks are designed so that pupils cannot simply search for facts on the net and reproduce these.

Clear criteria for what the assessment should be focused on, examination tasks in accordance with the criteria, and examiner training courses for those who are to assess pupil competences will contribute to reliable and valid examinations. Today there is a comprehensive examiner course examinations with national examiners, and examination guides are prepared that include achievement descriptors for examinations in each subject.

The Committee emphasizes there is a need for a review of how the final assessment can give reli-

[34] Hopfenbeck et al. 2013, Prøitz and Borgen 2010, Hovdhaugen et al. 2014

[35] Prøitz 2015, Hovdhaugen et al. 2014

able information about pupil competences in subjects corresponding to the competence concept recommended by the Committee. It is recommended that an expert committee should be convened to assess today's examination system and review how overall assessment grades and examinations can give reliable and relevant information about pupils' competences.

Such a committee can assess the scope of the examination system, which subjects should have examinations in which years and which examination schemes can be used in the subjects. Developing examination schemes must be considered in conjunction with a future renewal of the subject curricula.

In an implementation context, examinations may be a means to give priority to the cross-curriculum competences.[36] For example, examinations may be designed to assess pupil competence in learning or exploring and creating in connection with the different subjects. Such a type of examination could focus on the application aspect of competence where pupils apply subject knowledge and skills in new contexts. In Denmark an examination in innovation has been developed in general studies programmes where the pupils must integrate knowledge from different subjects. The Committee recommends that in a long-term perspective and in addition to the subject examination, examination schemes should be developed in accordance with the competence objectives from a number of subjects.

5.2.4 The relationship to other assessment schemes

The Committee recommends strengthening the relationship between the objects clause, the Core Curriculum and the content in the subjects. This will also impact the relationship between the assessments the pupil will receive in the subjects and other schemes for assessing pupil development.

Dialogue on pupil development in other aspects than the subjects

Today the pupil has the right to a regular dialogue with the teacher about "other development" than learning in the subjects. The purpose of this scheme is to give the pupil, teacher and parents or guardians the opportunity to enter into a dialogue on the development of the pupil compared to other objectives for the education than the subject objectives. The dialogue must be seen in the light of the objects clause, the Core Curriculum and the Quality Framework.[37]

The priority given to the four areas of competence in the subjects will contribute to making objectives and values that are in focus in today's Core Curriculum and Quality Framework clearer in the subjects, for example critical thinking, collaboration and participation. The changes in the subject objectives will have an effect on assessment in the subjects. However, the objects clause and the Core Curriculum comprise objectives for pupils' development and for the school community which cannot be expressed in their entirety through competence objectives in the subjects. It will be important for the pupil, parents and the school to have an arena for addressing such things as the pupil's personal development and social relationships beyond the objectives defined in the subjects.

Chapter 4 recommends better connections between a new Core Curriculum and the future subject curricula than we have today. Bearing this in mind, the Committee argues that it should be assessed whether the relationship between formative assessment in subjects and the dialogue on the pupil's other development should be made clearer. A clear relationship may support the idea that pupils' development of social and emotional competences in the subjects is connected to pupils' development in other arenas in and outside school. It may also point out that dialogue between the pupil and the teacher is just as important in the formative subject assessment as in other areas.

It may also be assessed whether the rules and regulations should be clearer about some of the areas the dialogue on the pupil's development should comprise. If so, this must be considered in the light of priorities in a new Core Curriculum, for example, if new process objectives are designed for the school community, see section 4.1. However, such a clarification should allow for the fact that such dialogues between pupil and teacher should be experienced as inclusive and open, and the content should therefore not be focused and regulated too strictly.

Assessment in orderliness and conduct

Today pupils are assessed in orderliness and conduct from Year 1. From Year 8 they will receive

[36] Alderson and Wall 1993

[37] Regulations for the Education Act, section 3-8

Figure 5.5 Illustration Chapter 5

six-month assessments with a grade, and from Year 10 grades in orderliness and conduct are given with the overall assessment. This scheme has been discussed in connection with several reforms, and changes have been made to the basis of assessment and to how the grades are set. In 2009 the basis for the scheme was clarified.[38] Today Sweden and Denmark have no special assessment scheme for orderliness and conduct, while Finnish pupils receive assessment in conduct every six months.

The purpose of assessment in orderliness and conduct is to contribute to the pupils' socialisation process, create a good psychosocial environment and give information about the pupils' orderliness and conduct. The basis for the assessment is the degree to which the pupil acts in accordance with the school rules that it is obliged to have. Assessment of orderliness must be based on the pupil's work efforts and work habits and whether the pupil is prepared for class. Assessing the pupil's conduct refers to how the pupil acts in relation to others in the school community. Consideration must be given to the pupil's background, and the school may include absenteeism in its assessment.[39]

The competence areas recommended by the Committee have points in common with what is being assessed in orderliness and conduct. Self-regulation, including being able to implement and evaluate one's own learning processes, is a key part of the competence in learning. This is related to work habits and work efforts, which are also part of the assessment of pupil orderliness. The Committee underlines that in their work with the subjects it is important that pupils learn to express themselves, contribute, respect the views of others and be considerate in collaboration with others. This is related to the basis for assessment of the pupil's conduct.

Pupils' orderliness and conduct are complex qualities that may have different reasons behind them, such as circumstances relating to the pupil's home background. This makes it challenging for teachers to assess with a grade that is based on clear and fair criteria. There is little systematised knowledge about the implementation and effects of assessment in orderliness and conduct, but it appears to be common practice that the teachers enter remarks into the system that may end up giving the pupil a lower grade in orderliness or conduct. A practice that assigns much importance to the grade assessment and the possibility of a lower grade may end up being a form of punishment than a means of support for pupils' development. The Committee finds it relevant to assess whether six-month assessments with grades and overall assessment grades in orderliness and conduct should be given.

School has a need for means to create a productive and healthy psychosocial learning environment for pupils. If pupils have much absence or treat others in unacceptable ways, there is a need for complex and individually adapted measures. A number of studies show that good relationships and trust between pupils and teachers are fundamental for creating a learning environment which is conducive to well-being and to academic, social and emotional learning and development.[40]

The Committee emphasize that in a future renewal of the main curriculum, the schemes for assessment in subjects and dialogues on other development and orderliness and conduct should be considered in connection with each other.

5.3 The Committee's recommendations

To facilitate pupils' development of competence for the future, the teaching must build on research and experience-based knowledge and must be adapted to the pupils' learning needs.

[38] Report to the Storting no. 30 (2003–2004), White paper: *Kultur for læring* [Culture for Learning], *Directorate of Education* 2010: *Circular 1-2010 Individual assessment*

[39] Regulations for the Education Act, section 3-2 and section 3-5

[40] NOU 2015: 2 *Å høre til* [Belonging], Dumont and Istance 2010, Durlak et al. 2011

Teachers must facilitate pupils' in-depth learning, progression and active roles in the teaching. Strong professional environments in the school are foundations for developing teaching that will support what the pupils need to learn in the renewed subjects. A long-term effort in competence development is needed, with an emphasis on teachers' planning, implementation and assessment in the different subjects. Formative assessment is an integral element of an approach to teaching practice in the subjects that promotes learning, and should be given priority in the competence development. In a long-term effort for competence development, the national authorities, the teacher training institutions, the teaching profession, school owners and school leaders have different responsibilities, but must work towards a common goal.

Overall assessment grades and examinations must be developed so that together they give reliable and relevant information about the competence the pupils are to develop in the renewed subjects. The Committee emphasize that teachers' overall assessment grades are suitable for assessing a broader competence concept in the subjects than today, and recommends strengthening this scheme. There are challenges when it comes to assessing the broad competence concept, and it will be necessary to renew the rules and regulations, the assessment schemes and practices to keep pace with changes in the content of school. A future subject renewal should therefore be accompanied with long-term development activities in the assessment field.

The Committee recommends the following:

- The teaching and assessment practices must be developed to deal with the renewed content of the subjects, including the breadth of the competence concept. This will call for a long-term effort to develop teacher competences and strengthen the professional environments in school.
- School owners, school leaders and teachers need good access to updated research on learning and teaching. Thus research-based summaries should be prepared on good teaching and assessment practices in the subjects to support the professional development of the teachers.
- Overall assessment grades should be strengthened through several initiatives. These should include clearer requirements for assessment of pupils' levels, guidance and support resources and national measures to raise competence and establish local quality assurance processes. It is also recommended that the rules and regulations should clarify requirements for processes involved in and the quality of the setting of overall assessment grades.
- Today's examination system should be developed to deal with the renewed content of school. An expert committee should be appointed to assess how today's examination system can be developed, and how overall assessment grades and examinations can give reliable and relevant information about pupil competences. Assessment of the competence of pupils across subjects should be included in the expert committee's mandate.
- Tests that support learning should be developed in connection with the cross-curriculum competences or other areas that several subjects have in common.

Chapter 6
Implementation

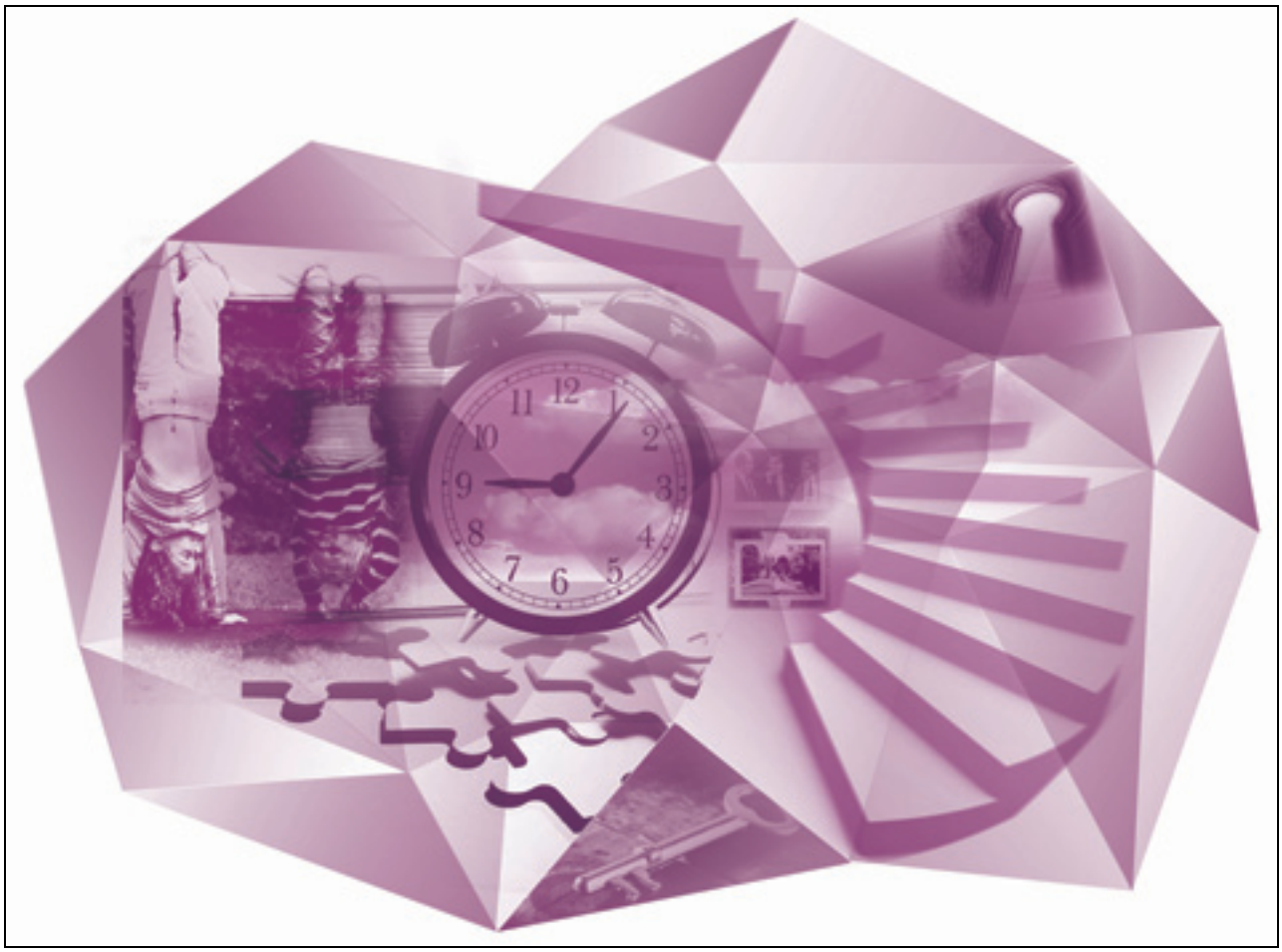

Figure 6.1 Illustration Chapter 6

In the preceding chapters the Committee describes and discusses the need to renew the content of school, and recommends how competences for the future can be the foundation for the content in school of the future and for subject renewal. The Committee finds that the changes are necessary to satisfy the competence requirements we will face in the future and also to provide better learning. This chapter describes what will be necessary to ensure that the Committee's recommendations are realised in school.

The national authorities must prepare an overriding knowledge-based strategy for the process of renewing the content of school where the focus will be on dialogue and anchoring the recommendations with the stakeholders. The Committee would like to point out that the capacity and competence that have been established through the introduction of the Knowledge Promotion Reform give a solid foundation on which the further work can be based. The strategy must take the complex structure of the various stakeholders, cultures and systems that are involved into consideration, and most also be based on the realisation that implementation will have a number of phases. Measures such as continuing education, capacity building and school based competence development projects will be included in the implementa-

tion work. The schools' work with the subject curricula must be continuous and start with how the education and training can contribute to good learning for the pupils. Quality assessment and evaluation of national strategies, local measures and local curriculum work will be necessary measures to achieve the goals.

6.1 Coherent strategy

The Committee recommends that a complete and comprehensive strategy should be developed for the implementation work. If school policy on the local level is to be realised, it is important that the national authorities provide support. A coherent strategy is a means to promote engagement, understanding and responsibility in the whole governance chain and should contribute to making the entire sector pull in the same direction. Key elements in an implementation strategy for following up the Committee's recommendations will be

- dialogue and anchoring of the processes (ownership)
- coordination of resources and measures
- capacity-building and competence development
- strengthening the local work on the subject curricula
- necessary changes in the Quality Assessment System
- research-based evaluation

6.1.1 Knowledge about and experiences of change processes

National and international research on implementation and changes provides solid knowledge about how to facilitate change processes. An implementation process succeeds best when there are clear links between goals and measures for renewal, and when the development processes embed the changes in the system where there is good dialogue across levels and stakeholders. It is important that the measures that are intended to lead to change can have effect over time and that they pull in the same direction. Capacity and competence should be built through collective learning processes and be adapted to the different levels.[1]

The evaluation of the Knowledge Promotion Reform shows that the strategy developed to implement the changes it introduced was inadequate. It was particularly found that the local level did not have the competence to work with the subject curricula as had been assumed. Many found the work to be comprehensive and demanding, and the local level experienced that it received little support.[2] The national authorities had no clear strategy for how to support the schools in the implementation of the reform. The evaluation suggests that several measures introduced in the middle of the process, such as guides for the curriculum work, should have been developed earlier.[3]

In the decade after the introduction of the Knowledge Promotion Reform development projects were carried out in many fields, for example in connection with the work on basic skills, assessment practices and competence development. Capacity and competence have been increased on both the national and local level, and several of the projects have been accompanied by evaluations. In the work with a coherent strategy to implement the proposed changes to school content this work must be used.

International research confirms that visions, goals and subject curricula are understood differently across administrative levels and schools, and also internally in one and the same school. Therefore it is not sufficient to understand change processes as hierarchical processes occurring "top down". The school system must also be understood as a "loosely connected" system consisting of various sub-systems with separate cultures, ways of acting and values.[4] The stakeholders on the various levels should experience that the expectations are addressed directly to them, and understand what the intention of the changes is, and should feel included in the process. The strategy must therefore include all stakeholders, from the Ministry to each teacher. As supporting players for pupils' learning, parents are also a target group for the strategy.

6.1.2 Different phases in the change work

The Committee underline that it will take time to implement the changes connected to the school of the future. They will occur in several phases and involve many parties across levels. To mobilise the stakeholders, processes should be established

[1] Fullan 2014, Mourshed et al. 2010, Earl et al. 2003, Aasen et al. 2012

[2] Sivesind 2012

[3] Aasen et al. 2012

[4] Cerna 2013, Nespor 2002, Aasen et al. 2012

Figure 6.2 Illustration Chapter 6

to encourage dialogues between administration levels and groups.[5] The implementation strategy should also introduce processes on the school owner level, school leader level, with teaching staffs and teacher teams, and be connected to goals and the reasons for the changes.

The first stage in the implementation work is the initiation phase where embedding the changes and creating dialogues on important principles in the renewal work will be important. The second phase concerns implementation of the changes. Here there must be room for both innovation and adjustments through dialogue between relevant stakeholders. In the third phase adjustments will be made according to evaluations and new knowledge, and measures such as competence development programmes and supporting structures can then be further adjusted for perceived needs in the sector. In the fourth phase, the renewed subject curricula will be a common goal and the basis for teaching practice, new patterns of responsibility and roles will have been established and the development work will take place across stakeholders and levels in an established structure.[6]

6.1.3 Dialogue and anchoring

Research on implementation shows the importance of networks and dialogues in creating change. The national level should have the responsibility for promoting dialogue and providing meeting-places, ensuring that supporting structures are developed and used, and ensuring that the time gap between the decision to make the changes and when they are to be introduced is adequate so they are well anchored among school owner, school leaders and teachers.

The Ministry and the Directorate should be in continuous dialogue with the school owners to ensure a good information flow and good cooperation. The County Governors can also contribute in the work on embedding the changes and carrying out local development work. The work on implementing the changes will benefit from the involvement of organisations and research/teaching environments in this process. The teacher training institutions will be an important partner throughout the process.

The Committee recognize the need for the regional and local collaboration to start in parallel with clarifications about various aspects of the process on the national level. The school owners depend on early information from the national level, clear expectations and possibilities to determine how the expectations can be satisfied, for example by establishing networks with other school owners and starting the embedding process in their own schools.

The Committee underlines the importance of the parents' role in the implementation work and school's practice. Competences will be developed and practised at school and in the home. Exchange of information, dialogues and guidance between the school/teacher and parents are important if the parents are to be in a position to support their children's learning. It will be important to strengthen school's cooperation with the parents and to continue to develop the school's procedures for school-home cooperation, particularly in primary and lower secondary school.

6.1.4 Coordination of resources and measures

The national level has various governance resources and measures that can be used when renewing the content of school. Legal, financial and educational measures are important in governing school, and these must be combined in a way that will lead them to reinforce each other. Evaluations should be applied to adjust the measures throughout the process. Financial measures and incentives are a national and local responsibility. However, studies show that in countries such as Norway, where the expenses for school are on a high level, it is just as important to consider how the resources are spent.

Coordination of measures generally concerns making different measures pull in the same direction, and with the intention of contributing to the desired changes. An example of the need for coor-

5 Earl et al. 2003
6 Sundberg 2011

dination of measures is the Committee's proposal that support and guidance material must be developed at the same time and that it should support the renewed subject curricula to contribute to changes in teaching and assessment practices.

6.2 Capacity-building and competence development

Competence development in the form of continuing education and school-based measures will be an important part of developing school and creating changes.

Strengthening the capacity of schools and school owners is important, but no guarantee that what happens in classrooms will be in accordance with the intentions behind the changes.[7] All changes in school depend on the practices of teachers and will need teachers to be engaged and involved in the implementation work. They will also have to be motivated and understand why and how they should develop and improve their teaching practice. This means that the teachers have to understand what the changes imply and are about. They must also understand that they have to improve their teaching practice and develop a research-based teaching practice.[8] The competence development measures must focus on the competences for the future, the renewed subjects and the teaching and assessment practices connected to these.

6.2.1 Teacher training

The national authorities should determine which areas have a particular need for competence-raising to satisfy the overriding objectives of the competences for the future. This work should be in the form of dialogue and common criteria made for the various levels so that the real need for competence-raising will form the basis for the measures in this area.

A combination of national efforts for teacher training, continuing education for teachers and school leaders and local work with professional development will strengthen the capacity in school. Future teacher training that includes Master's degree programmes will provide teachers with in-depth studies in subjects on all levels and years in primary and lower secondary school. The Committee's recommendations for competences for the future also impact the content of teacher training and continuing education for teachers.

In cooperation with the national education authorities, school owners and teachers, the teacher training in universities and colleges must offer relevant education programmes that can satisfy the need for competence-raising. The national centres may contribute to didactics and subject didactics development work in their fields. The measures to raise competence must be designed as school-based development measures where the schools' entire professional staff participate.

6.2.2 School owners and school leaders

Research shows that building capacity and competence development should take place in collective processes in school.[9] For school owners this may mean encouraging and stimulating the use of learning networks and collective competence-raising measures where the goal is that school owners, school leaders and the teaching profession should raise their competence together. Bearing this in mind, the school owners must focus on the fact that school leaders and the teaching staffs will need updating on research-based knowledge about pupils' learning and development, and that they will need good subject didactics competence. To plan and implement these measures the school owners must develop their competence on teaching and school and their capacity in accordance with the development work they are responsible for.

It is the duty of school leaders to plan and enable the development of necessary competence and capacity to satisfy the requirements that result from the renewed subject curricula. The teaching staff must be allowed time and space to develop together. A collective process where school leaders and teachers plan the teaching together may contribute to teachers assuming responsibility for developing their practice and individual competence in accordance with the school's continuous development, and where they will also use and participate in the collective processes.

Teaching staffs working together and sharing practices, pedagogy, subject didactics and learning sciences will have good chances to succeed.[10] Developing and using such a practice must be

7 Blossing et al. 2010

8 Skolverket (the Swedish National Agency for Education) 2013

9 Fullan 2014

10 Timperly et al. 2007

Box 6.1 Oppland County: With creative competence as the point of departure for learning

Creative partnership (Kreativt partnerskap) is a project in Oppland County which supports the schools in their work with the pupils' subject-specific and creative competences. The project also aims to contribute to more varied teaching methods and learning across the subject curricula.

Creative Partnership

Creative Partnership aims to develop and give feedback on pupil's and teachers' creative competence. The project defines being creative as having curiosity, persistence, imagination, discipline and the ability to cooperate.

Schools with classes that want to participate in the project send an application to the county authorities. When a project starts, the county authorities hire a project manager, called a creative agent. The agents are often artists who in their work are accustomed to cooperating closely with others, and are disciplined, reflected and open.

The creative agent and the teachers plan the project together:

- Which challenges does the school want to address through this project?
- Which areas of the curriculum will the project touch on?
- Which creative processes and/or artistic expressions are to be used in the project?
- Which of the creative competences need to be developed?

The cooperation with the external and creative agent gives the teachers new ideas and strategies they can use in the classroom and many teachers find that the project also helps them create change in the teaching after the project has been completed.

Hard work for lasting change

Gjøvik Upper Secondary School is one of the schools participating with several classes in the project over a period of two years. Two of these have been connected to increasing the competence in and the motivation for learning mathematics.

In one of the classes the majority of the pupils wanted to become hairdressers. The teachers and the creative agent agreed that there was a need to improve the class environment and to strengthen the vocational orientation of the mathematics subject. To accomplish this they used external competence, a person with long experience as a hairdresser and who has also worked extensively with motivation and mastering. Together they prepared a teaching programme where the mathematics teaching was connected to operating a hairdressing salon. After the project, the grade level in the class rose, absence went down and the class reported better well-being.

In another class the pupils wanted to work in a day-care institution, and also in this case the creative agent and the teachers developed a project with vocationally focused mathematics through the design of a day-care institution. A day-care institution entrepreneur was used to inform about the professional aspect of day care and an architect was employed to guide the pupils in the work to draw and design the day-care institution. In conjunction with the teachers, the creative agent and the external experts prepared a teaching programme where the pupils needed to use financial calculations and geometry in their work to design a day-care institution. In the project the pupils also found that they needed to work more on developing the competences of cooperation and persistence.

With Creative Partnership the county authorities have helped to create change in the schools. It is hard work, but it gives results.

considered continuous work and must focus on sharing practices, relevant research and collective planning of the teaching. Therefore, the school leaders and school owners must make it possible to have cooperative structures so that the schools and the teaching staffs have time and room to develop ways of working that support the renewed subject curricula.

6.2.3 The teaching profession

As described in Chapter 5, the Committee emphasize that the recommendations for the content of school will change and renew the requirements for the teaching profession and for teaching and assessment practices. The Committee finds that advanced subject competence is developed in cooperation between school leaders and teaching staffs. Professional performance based on relevant research, reflections on the subject and competent choices of methods and ways of working in cooperation with colleagues will increase school's capacity and may lead to increased learning outcome for the pupils.[11]

One part of the competence development and specialist training of teachers should be to be part of professional environments that systematically develop this type of practice, as this is competence which is built over time and through practical experiences in and outside the classroom. For example, a newly trained teacher will be able to receive guidance and participate in discussions connected to a pupil's needs for specific methods and learning strategies and thus build his/her subject didactics competence. In addition to being offered continuing education, teachers may become teaching specialists.[12] This means a teacher who over time, in his or her practice, has acquired subject and didactics specialist competence, and who is considered an expert in his or her field. In this way the teachers may assume ownership of the subject curricula and help to develop them with their own teaching in mind. The choice of content and ways of working, and the day-to-day planning and implementation of teaching, must focus on what is reasonable progression in the subjects, in the light of what the pupils learn and which subjects and competences are particularly useful to consider together.

6.3 Local work with the subject curricula

In the change processes that are an extension of the Committee's work, there is a need to clarify what is meant by the local responsibility for the work with the subject curricula. The dissimilarities in capacity and competence of schools and school owners reveals the importance of considering the subject curricula, support and guidance material, competence development and support of locally based development processes as a comprehensive whole. To realise the content of the subject curricula it is important to have good coherence between the local and national curriculum work.

The school owners have the responsibility for ensuring that the teaching in school is accordance with the main curriculum and other rules and regulations, and that the pupils receive the schooling they are entitled to. Therefore they also have the responsibility to ensure that the local work with the subject curricula is carried out in a proper way. This means assigning roles and delegating responsibilities for the development work so that it will be easy to understand and predictable for all those involved. The goal for the school owners must be to ensure development of the total academic and subject didactics competence so that the teaching satisfies the objectives in the main curriculum. The processes in future local work with the subject curricula should therefore be arranged parallel to and based on common embedded goals relating to the future competences and the content of school. The follow-up of the work done in schools by school owners will be important. This may be done in various ways, for example through dialogues on the schools' results in various areas.

The statutory subject curricula are legally binding for all schools. However, the rules and regulations do not make it clear that the school owners are responsible for providing for the processes and the quality of school development work related to the national subject curricula. The Committee recommends that such clarification must be given in the rules and regulations. The purpose is to clarify the responsibility of the school owners and ensure that all schools have access to and support in the continuous work with the subject curricula. Through such clarification in the rules and regulations, all school owners will need to assume responsibility for organising and enabling the schools' development work and competence and capacity-building in this field to a higher degree than is the case today. For some school owners this will mean continuing the good work already being done. For others it may mean using new cooperative arenas and joining networks with other local authorities to ensure quality and capacity in the work. Such a clarification must be considered together with section 13-10 of the Education Act, relating to the school owner's responsibility for having a satisfactory quality sys-

[11] Timperly 2012

[12] The *Ministry of Education and Research* 2015

tem and section 2-1 of the Regulations for the Education Act relating to school-based evaluation.

How school owners organise and implement development work in municipalities and counties has an effect on whether changes occur in the practices of schools and teachers. The work done by the school owners and schools on the subject curricula will vary, and will depend on how the schools function culturally and organisationally. The prevailing culture for development and change activities is decisive, and will determine what schools will do when working with the content of the school of the future and how they will do it.[13] Because schools differ, have set different priorities and focused on different areas, the degree to which schools must improve their practices due to the renewal of the subject curricula will vary.

For the teachers, the local work with the subject curricula means examine and explore the new subject curricula, working with them and seeing this work and teaching and assessment as interconnected, and as parts of planning the pupils' learning. The professional environment at the school will thus face new challenges. It will also receive many impulses for planning, implementing and reflecting on teaching.

6.4 Knowledge as the basis for development

Change processes building on knowledge about the current situation have more chances of success than processes that are not adapted to the current practice.[14] On all levels, in each school, on the local authority and county authority level and on the national level, the choice of measures and their implementation should build on a relevant knowledge base. Knowledge about processes and results is also important in a change process so one can assess whether the measures are leading to the stated goals and so any necessary adjustments can be made. Development of the Quality Assessment System, systematic work and assessment competence on all levels, and research-based follow-up of implementation, are central measures for change processes over time.

6.4.1 Quality assessment

The purpose of quality assessment is to establish a basis for improving and developing the quality of the teaching. There is great variation across school owners and schools when it comes to systems and competence for using results of change and development work.[15]

Since its establishment in 2004, the national Quality Assessment System has been developed so that it comprises various information sources, including user studies, standardised tests, knowledge from national inspections, available statistics and analytical tools for local use. The system is designed for development purposes and for control and accountability purposes. There is a need to clarify the objectives and criteria that assessment and evaluation can use as their point of departure, such as criteria for good teaching. In the interim report, the Committee finds the need to ensure that the Quality Assessment System should reflect the breadth of the school's objectives.[16]

The Committee recommends that cross-curriculum competences should be strengthen and emphasized in the school of the future. As it is recommended that they should be integrated in the subjects, information about pupil competence in subjects will be important. Schools, school owners and national authorities will also need information about pupil development of cross-curriculum competences if they are to help in focusing on them in the teaching.

There will also be a need to monitor how school facilitates pupils' in-depth learning and progression in the subjects. This is important for the national and local governing authorities, but primarily it is important for school leaders and teachers so they can assess the quality of their own teaching practice and the collective teacher cooperation, and its importance for pupils' learning and development.[17] This requires an approach which involves observation of and reflection on the teaching practice and the collaboration between teachers and pupils. See more about this under section 6.4.3. Research and evaluation will be able to illuminate how the teaching practices in Norwegian schools are developing.

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[13] Sundberg 2011

[14] Hayward and Hedge 2005, Fullan 2007, Mourshed et al. 2010

[15] OECD 2011, Aasen et al. 2012

[16] NOU 2014: 7 *Elevenes læring i fremtidens skole*, [Pupils' learning in the school of the future], OECD 2011

[17] Timperley 2012

Box 6.2 Drammen local authority: Competence development based on the pupils' learning

The municipality of Drammen has 21 schools. With the vision *The Drammen School, Norway's best school, a school where each pupil can reach his or her full academic potential and become a confident, active and independent person* Drammen local authority is working with continuous development activities and competence development for the teachers and school leaders. The mobilisation for competence is a common feature of all the schools, and is also adapted to the professional levels of the leaders and teachers.

Competence mobilisation

The local authority has established a development base where resource persons with cutting-edge competence are working to plan, implement and support common competence development for teachers and school leaders. The main ambition is to work continuously with plans for measures and local curriculum activities to *lift the pupils to a higher level than the living conditions index and parental education levels would indicate*.

The main measure is relevant competence development programmes with a potential to improve practices in the classroom. The local authority has three overriding priority areas:

- Leadership for development and change through distributed leadership
- Focusing on the teacher through comprehensive competence-raising
- Learning networks across all the schools in Drammen

As part of this work the schools are offered a resources that offer high quality competence, common meeting-places and guidance/support. The schools receive support to implement plans for initiatives, ensure progress in the implementation activities and facilitate a culture of sharing in schools and between schools. The development base offers relevant courses, networks, workshops, informal meeting points, observations, visiting programmes and so on.

One of the most important tasks for the development base has been to prepare common local curricula in the subjects of Norwegian, mathematics and English, with learning objectives and criteria for the entire compulsory learning trajectories from Year 1 to Year 10. The local curricula form the basis for good formative assessment and should make pupil mastering visible. All the schools, leaders and teachers have taken part in the work. The common effort has resulted in a common culture, language and attitude in the schools in Drammen when it comes to the local curriculum work, and due to this the collective competence has increased. The subject curricula were completed in 2012 and implemented in 2014–15.

The development base places all the activities into an activity calendar which is shared by all the schools. The calendar is published in early spring so that school staff know what to expect when planning for the next school year. The activity year is launched with a common kick-off for all schools in Drammen, where all the teachers and leaders come together for a day of information and inspiration.

Implementation ability

The ability to implement and sustain are two important premises for succeeding with long-term and continuous development work, which is realised via a professional support system that governs, develops systems and ensures the necessary restructuring in schools, academically and administratively. One must understand the school's structure and practical conditions if this is to succeed.

An important part of the practical approach is to allocate a day/time per week for competence-raising outside teaching time for all schools. This creates time, space and meeting-places across schools and levels. The development base opens for good balance between mobilisation and sustainability in the development work, and ensures that the efforts focus on the needs of teachers and leaders in school. Drammen local authority wants teachers to contribute to the development in their subject, and has plans and activities to deal with this in the development base. Courses and learning networks are divided into levels for beginner, experienced and specialist teachers. Thus teachers and school leaders can join competence-raising initiatives on a professional level suitable for them and build their competence up to the specialist level.

The local curriculum work builds on common mapping tools and common work with the subject curricula. Relevant research on learning is also used to help teachers in their choices of methods and didactics. The teachers and the school leaders are building their profession in collective processes, while also establishing a culture for common identity and learning.

By setting up a system which strengthens the professional development in collective processes, the local authority in Drammen has built an organisation that is able to deal with continuous change.

6.4.2 Developing the Quality Assessment System

Significant changes in school content must be reflected in the Quality Assessment System. The Committee recommends a review of the system to assess areas in need of development and which specific changes should be made. Several considerations will be important in such a review. Assessment instruments and other elements in the system should be adapted to the stakeholders' differing needs for information and should reflect the breadth of the school's objectives.[18]

Today's system gives varying degrees of information about the areas of competence the Committee recommends for the school of the future. International studies give information about Norwegian pupils' competence in individual subjects and across subjects. Through the national tests all schools and school owners and the national authorities receive information about pupils' reading and numeracy skills and skills in reading English in selected school years. Other available information about learning outcomes in the Quality Assessment System include the overall assessment grades in subjects after Year 10 and in upper secondary education and also examination grades in a selection of subjects. The pupil survey gives information about how pupils experience the teaching, the learning environment and their own learning.

The Committee underline there will be a need for various types of tools and approaches to obtain information about the learning and competences of pupils in the school of the future. Standardised tests, such as today's national tests, may give reliable and valid information about limited areas of competences and subjects. The field of test theory is being developed continuously, also when it comes to measuring areas that have traditionally not been tested in school.[19] The results of the national tests today give information about the development of all Norwegian pupils in particular school years over time.

The competences pupils should develop in the school of the future are complex and they should be able to apply knowledge and skills in different contexts. Standardised tests do not capture the complexity of the subjects and competences. Being able to communicate, interact and participate are examples of competences requiring approaches that can assess how pupils interact with others.

There are examples from other countries where the national authorities have established systems for implementing research-based studies to assess different aspects of the subject or cross-curriculum competences of pupils. Such studies may be based on representative samples of pupils, may apply longitudinal designs and combine qualitative and quantitative approaches. It is also possible to switch between different competences and subjects over time. Research-based studies and standardised tests may ensure that all in all the Quality Assessment System may supply knowledge on different aspects of pupils' learning and competence.

The Committee would like to point out that it is neither desirable nor feasible that the tools in the Quality Assessment System should cover the full competence pupils should develop. Considerations must be made according to priorities, the needs of different stakeholders and expenses. Moreover, much of the knowledge teachers, school leaders and school owners need must be obtained and interpreted by those who are familiar with the pupils and circumstances in the individual schools. The school leaders' and teachers' joint assessment of their own practices and pupils' learning outcomes, and dialogues between the stakeholders in school are relevant approaches. If collective processes connected to school self-based evaluation, local curriculum work and teacher practices with overall assessment grades ae strengthened here they could contribute to knowledge-based development, see Chapter 5. Results from the Quality Assessment System should be followed up in these types of processes.

6.4.3 School-based evaluation (self-evaluation)

The school leadership and teachers must regularly assess the degree to which the school's organisation, facilitation and implementation of the teaching contribute to achieving the objectives in the curriculum. How school plans the teaching based on the national subject curricula will be part of the school's self-evaluation, especially when it comes to the degree to which the school's planning and teaching contribute to pupils' develop of competence in the subjects.

Schools may obtain information from different sources so they can be informed about the competence achievement of pupils and the quality of the school's teaching. The use of observations, test

[18] Prøitz 2015, Newton 2007, OECD 2013a

[19] Scardamalia 2012, Spencer et al. 2012

Figure 6.3 Illustration Chapter 6

results and the opinions and views of pupils, parents and involved parties are examples of possible approaches.

The internal evaluation school employees undertake of their own practice and activities should be the core of school self-evaluation. Elements of external assessment may strengthen the school self-evaluation if they are linked to the internal processes.[20] There are examples from Norway and other countries of systems where teachers from other schools or other persons with school competence assess the practice of the schools.[21] It is also important that school self-evaluation should build on research-based criteria for good practice which is embedded in the teaching staff. Follow-up by school owners and any external evaluators should be based on criteria corresponding to the professional and research-based criteria.[22] The national authorities can cooperate with research institutions and the teaching profession to develop overriding criteria which school self-evaluation can build on. If the national inspectorate is developed in the direction of increased focus on practice in schools, criteria for school self-evaluation and national inspection should be considered together.

6.4.4 Research-based evaluation

To ensure a knowledge-based development of school practices it is important that the measures launched in response to this report are followed by research and evaluation. Parts of the knowledge basis in the interim report on Norwegian school build on research findings from the evaluation of the Knowledge Promotion Reform.

The goal for such evaluations is to gain insight into whether the measures that are introduced lead to the established goals for change. Evaluations may be connected to implementation processes and the effects of the measures.[23] Evaluations of the Knowledge Promotion Reform have led to adjustments within the implementation process, and such evaluations are important tools for learning and development in the sector.

The evaluations should therefore focus on how the measures contribute to the development of pupils' subject-specific and cross-curriculum competences, and how subject renewal, new subject curricula and school's practice support these goals. Gaining insight into teachers' work to support pupils' progression and in-depth learning in the various subjects will require a comprehensive research design. This also applies to a research design that can provide knowledge about the connection between measures and pupils' learning and that follows the implementation and development systematically over time. The Knowledge Promotion Reform was both a content reform and a governing reform. The proposals in this report are primarily connected to changes of content. The state's measures must be assessed in light of whether they are appropriate for changing the content and practices of school. The national level must plan and create good conditions for the local development work based on the content of the renewed subject curricula.

6.5 The Committee's recommendations

To realise the Committee's recommendations for renewed content in school, they must be well anchored with all stakeholders on all levels. The Committee recognises that changes in school take time, and that the implementation must deal with a complex structure with different stakeholders, cultures and systems. The implementation strategy that is to be established must also take phases and time horizons for the work into consideration and must have control over parallel processes. Planning, dialogue and embedding, school-based competence development, continuing education and local curriculum work will be decisive. Prioritised areas within competence development should be work with the local subject curricula and teaching and assessment practices.

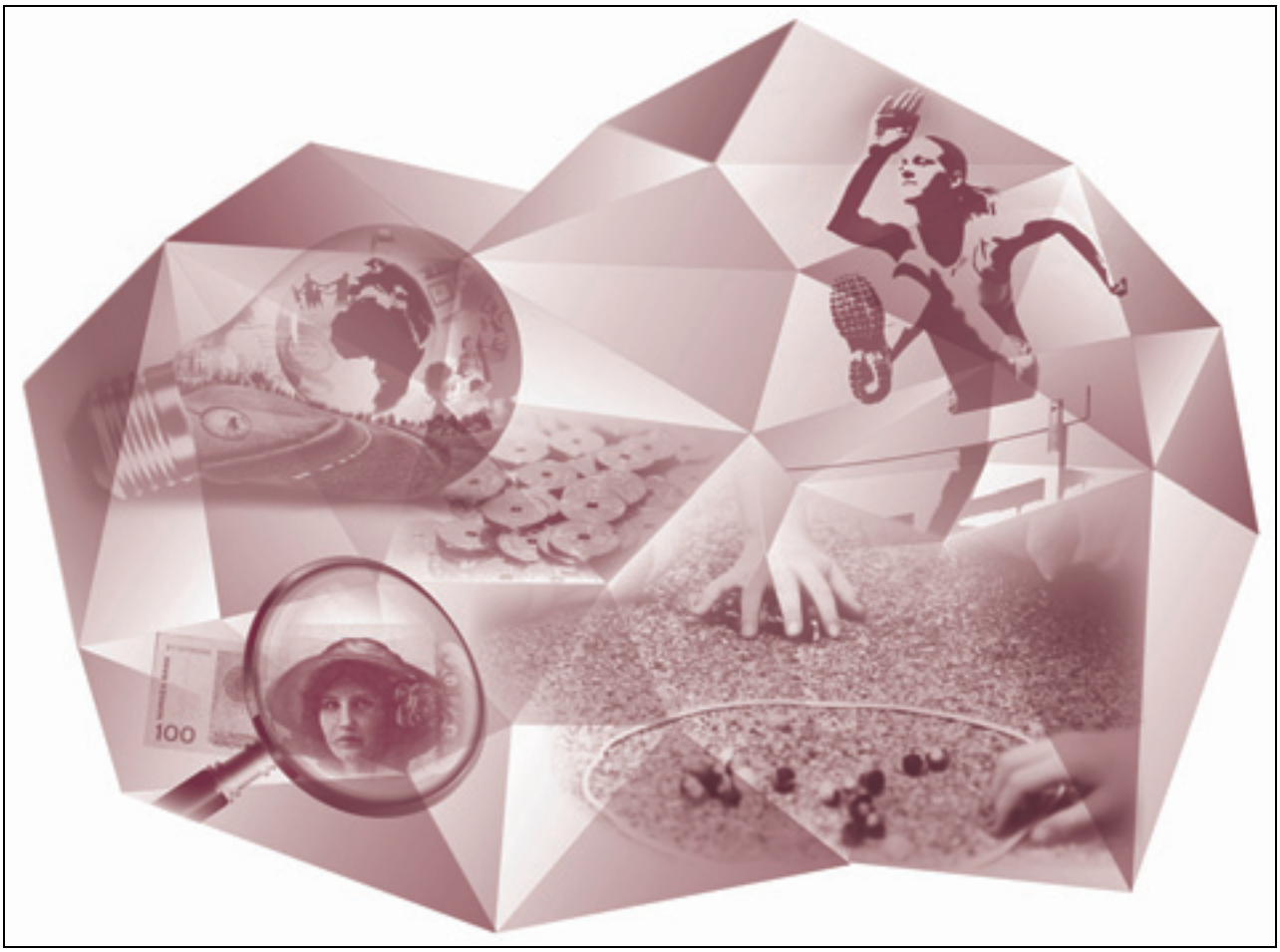
[20] Fullan 2007, OECD 2013a
[21] *Ministry of Education and Research* 2011, OECD 2013a
[22] OECD 2013a
[23] Karseth et al. 2013

The Committee recommends that the national education authorities should make it possible to take part in goal-oriented and systematic work over time, and establish structures for arranging meeting-places and dialogues throughout the process. The measures recommended by the Committee must be followed up by research and evaluation that is based on local development work on pupils' learning.

The Committee recommends the following measures:

- An overriding coherent strategy must be developed for the introduction of renewed content in school that describes the stakeholders on the national, regional and local levels and what is expected of them, and provides a schedule showing the different phases of the implementation work.
- A plan must be developed for competence development that points out the four areas of competence and renewed subject curricula.
- The competence development measures must be designed as school-based competence development and continuing education, and must be followed up on the national level.
- Research-based teaching practices in the subjects will be a prioritised area within competence development for teachers, including assessment practice connected to formative assessment and final assessment.
- The rules must be made clearer concerning the responsibility of the school owners to facilitate quality and processes in the local curriculum work.
- A review must be made of the Quality Assessment System to assess which areas need to be developed, including tools for assessing pupils' learning and supporting school self-evaluation processes.
- Changes in the content of school must be followed up by research-based evaluation.

Chapter 7
Financial and administrative consequences



Figur 7.1 Illustration Chapter 7

In the mandate the Committee is requested to assess the degree to which today's subject content covers the competences the Committee finds that pupils will need in a future society and working life and which changes should be made if these competences are to have greater impact on the content of the school. The Committee has also been requested to assess whether today's subject structure should continue to be used, or whether the content should be structured differently, and whether the content of the objects clause is sufficiently reflected in the content of the subjects.

It should be possible to realise at least one of the Committee's proposals within today's resource framework. The Committee's proposal will not increase the ordinary state or municipal operating expenses for compulsory school, and can therefore in the long term be realised within similar budget frameworks as today. However, additional expenses must be assumed during a development period.

7.1 Socio-economic consequences of education

The overall knowledge capital is the most important resource in a society and the education system

is the most important measure the authorities have to influence the knowledge capital. High quality education is in the short term a socio-economic expense, but in the long term it is an investment in the form of increased welfare for each citizen and for the society. Investments in education in Norway today are high.[1] The Committee believes it is possible to raise the quality within today's economic framework.

The Committee finds that several of the measures proposed in the report will promote pupils' learning of competences for the future in such a way that they will lead to economic savings as the aim of the Committee's proposals is to give pupils better learning. Competence-raising for teachers and school leaders that is related to changes in the subject curricula will increase their overall competence and raise the quality of the teaching and of pupils' learning.[2]

Improved quality of the teaching may lower the number of pupils in need of special teaching, for example because the competence-raising of the general teaching will also have an important effect on pupils with special needs.[3]

Measures aimed at pupil motivation and efforts and an increase in the quality of teachers are often seen as having an effect on pupil non-completion rates. Reducing the non-completion rate in school will give more pupils the opportunity to pursue more education and training and participate in working life and in this way may raise the welfare of individual citizens. This may also yield socio-economic savings through a reduced need for health, social and welfare benefits.[4]

7.2 Renewal of the school's content

The Committee recommends a renewal of the subjects in school to ensure the competence requirements of the future. This will require renewed subject curricula, development of guidance and support resources and changes in the governing documents to establish a coherent approach to the recommended changes.

7.2.1 Planning and developing new subject curricula

In Chapter 6 the Committee recommends that a national strategy should be made for developing and implementing new content in school. This will lead to administrative costs that may be considered in conjunction with ordinary operating expenses.

In Chapter 4 the Committee recommends a renewal of the subject curricula. To accomplish this, curriculum groups must be established for the subjects, groups must be formed to assess the subject curricula in light of the Committee's recommendations for competences for the future and a coordinating body must be established that will work throughout the process to direct and assess the subject curricula work on an interdisciplinary basis. The development of the subject curricula in this process should be anchored through a number of meeting points between the sector stakeholders. The administrative costs incurred from coordination may be included in the Directorate of Education's ordinary operating budget.

Based on earlier experience, costs from curriculum groups, work with competence frameworks and from having continuous meeting points for dialogues on development are estimated at NOK 13 million. The final cost for the national work on the subject curricula will depend on the composition and size of the groups, the level of sector involvement and the need for development activities during the process.

7.2.2 Developing guidance and support resources

In Chapter 6 the Committee recommends that guidance and support resources should be created parallel to the changes in the subject curricula. The administrative costs of some of this work may be considered as part of the Directorate of Education's operating budget. In addition to this, various subject groups should be established to contribute to the work. Developing guidance and support resources should have a number of meeting points between the sector stakeholders. Expenses will be incurred from the design, development and dissemination of this material. Based on experience, the costs are estimated at NOK 8 million.

In accordance with the Committee's recommendations for teaching practices in Chapter 5, the national authorities should assist the school owners and the teaching profession more than is

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1 NOU 2015: 1 *Produktivitet – grunnlag for vekst og velferd. Produktivitetskommisjonens første rapport* [Productivity - the basis for growth and welfare. The first report from the Productivity Commission]

2 Timperly 2012, Nordenbo et al. 2008, Falch and Naper 2008

3 Nordahl and Hausstätter 2009

4 Falch et al. 2009

the case today so they can have easy access to updated research on subject teaching and learning. This is estimated to cost an estimated NOK 2 million a year.

7.2.3 Coherence in the governing documents

Chapter 4 describes the importance of having coherent governing documents. Work has already been initiated to examine the Core Curriculum, and thus no extra costs will be incurred by assessing it in the context of changes in the subject curricula.

As is apparent from Chapter 5, the committee proposes changes in the Education Act and the Assessment Regulations. The Committee finds that these changes may be part of the ordinary revisions of the rules and regulations.

7.2.4 Consequences for teacher training

The Committee finds that curriculum revisions will also require changes in teacher training. A strategy concerned with raising teachers competence [Lærerløftet] proposes that a five-year Master's degree programme should be introduced to ensure that future teachers will develop greater capacity to enable pupils' learning as described in this report. Changes in the content of school as proposed by the Committee will increase demands on the content of the teacher training institutions.

The education institutions will need to develop competence due to the changes in the subject curricula, especially when it comes to the cross-curriculum competences and major changes in school subjects. It is assumed that the education institutions continuously develop the content of their education programmes so that they correspond to national guidelines for the content of school. The Committee therefore assesses that for the teacher training institutions, administrative costs will primarily be related to the Committee's proposals, and that with an adequate time horizon it will be feasible to make the necessary adjustments within the annual budget frameworks.

7.2.5 Updates of teaching aids

Changes in the subject curricula will lead to additional costs in connection with updating teaching aids. With good planning, schools and school owners may time the updates of teaching aids for when the new subject curricula are to be introduced. It is still reasonable to allocate extra funds for this work because it may lead to additional costs on the local level. In connection with the Knowledge Promotion Reform, NOK 400 million was allocated as compensation for the local authorities due to additional expenses relating to the need to replace teaching aids for the compulsory school. The Committee recommends the allocation of grants amounting to NOK 400 million in connection with the need to update teaching aids.

7.3 Competence development

The Committee has recommended changes that will require development and strengthening of the teaching profession. There will also be requirements for raising competence and building capacity in the form of locally based development measures and continuing education. Substantial expenses will be incurred from the need to develop competence if the Committee's proposals are to be realised in the form of increased pupils' learning. The Committee recommends a plan to be developed for competence development in accordance with overriding goals that includes continuing education and school-based competence development measures. An overriding strategy should ensure that measures within a designated period of time are goal-oriented in accordance with the overriding goals of the changes. The national authorities have responsibility for considering various state initiatives in connection with each other and for ensuring that these are pulling in the same direction.

7.3.1 Continuing education

The strategy *Competence for quality* [Kompetanse for kvalitet], a system for continuing education for teachers and school leaders, has been established. Notification has been given about escalating this into a continuing education programme in the strategy concerned with raising teachers competence. Competence requirements due to curriculum changes may be integrated in existing schemes so there will be no need for further funding of continuing education. This assumes that today's continuing education scheme will be aimed at renewal of the school's content, and that continuing education programmes offered to teachers will include instruction in all school subjects and emphasise teaching practice and assessment of pupil competence in the subjects. Continuing today's strategy has a budgetary frame of slightly

more than NOK 1 billion per year, but will not involve expenses beyond what is allocated in today's budgets.

National funds for continuing education are generally connected to changes in duties and the rules and regulations for school. The strategy with raising teachers competence states that funds will be allocated for competence programmes within subjects and topic areas where special challenges have been found. There will be some overlapping between competence requirements connected to the new subject curricula and competence requirements connected to special challenges, and the Committee finds that requirements for continuing education will be served by funds assigned to special challenges and through school-based competence development measures, see section 7.3.2.

7.3.2 Locally based competence development

In accordance with the Committee's recommendations in Chapter 6, efforts should be made to provide school-based development projects and continuing education of the staff to realise the Committee's proposals. This includes local work with subject curricula, determining competence requirements and raising competence, and developing teaching practice, including assessment.

Compulsory school is generally funded by framework grants from the state and tax revenues in the municipalities and counties which have the responsibility for budgeting funds for primary and secondary education and training pursuant to section 13-10 of the Education Act. The school owner's responsibility includes quality development of the compulsory school. Schools and school owners also have responsibility for working with the subject curricula. Costs connected to raising competence and local work with the subject curricula are part of the school owner's operating budget.

In the Knowledge Promotion Reform during the period 2005 to 2007, more than NOK 1 billion was allocated to reform-related competence development. The Committee's proposals may generally build on the local work done with the implementation of the Knowledge Promotion Reform. Changes in competence requirements due to the Committee's proposals and local work with the subject curricula will, however, require development work from the school owners and schools. There is variation in the capacity and competence of the school owners. To strengthen the local work, state support will be needed in the form of grants and administration. This will include support for school-based competence development, support for the local work on the subject curricula and support for competence building.

The Committee emphasize that competence-raising and local development measures are premises for accomplishing changes in practices. The Committee therefore recommends allocating NOK 200 million to school-based competence-raising measures annually for a period of five years. The measures should be initiated and followed up by the national authorities.

7.4 Knowledge as the basis for development

7.4.1 Research-based evaluation

Changes in the content of school should be followed up by evaluation and research modelled on the evaluation of the Knowledge Promotion Reform, as described in Chapter 6. In connection with the Knowledge Promotion Reform, evaluations were carried out with a framework of NOK 70 million. The evaluations covered many fields, but an equally broad evaluation process will not be required for the realisation of the Committee's proposals.

However, the evaluation of and research related to pupils' learning and the effect of various programmes and measures are complex and costly. The Committee therefore recommends a programme for evaluation and consequence research connected to the implementation at the amount of NOK 70 million.

7.4.2 Development of the Quality Assessment System

In Chapter 6 the Committee recommends a review of the Quality Assessment System. The review should particularly assess the need for system changes due to the importance of a broad competence concept and how the Quality Assessment System can give information about pupils' learning and development. The review should determine which areas are especially in need of changes to achieve the overriding goals, and should also assess how to design a system for research-based studies.

The national budget for 2004 allocated NOK 430 million in connection with the establishment of a system for quality assessment and quality development for compulsory school.[5] This is to include developing a website [skoleporten.no]

Figure 7.2 Illustration Chapter 7

and mapping of pupils. The Committee finds that it will be necessary to develop today's Quality Assessment System due to the changes in the school content, but generally this can build on the technology that has already been developed. The review of the Quality Assessment System can be implemented within the current framework. The Committee's assessment is that the operating costs in the long term will correspond to the current level, but that in the aftermath of a review expenses will be incurred for developing the knowledge base, instrumentation and development of indicators. The cost of the development of the Quality Assessment System depends on the review, and the Committee has therefore chosen to not include this sum in the total costs stated at the end of the chapter. Experience dictates that development costs can be estimated at approximately NOK 10 to 20 million.

7.4.3 Review of the examination system

In Chapter 5 the Committee recommends appointing a committee to assess development of the examination system. Based on experience the cost is estimated at NOK 2 million.

7.5 Summary and assessment of costs

The administrative costs for facilitation, organisation and coordination may be held within the administrative framework of today. Costs related to renewing the school content, including planning and developing new subject curricula, guidance and support resources and coordination are estimated at NOK 23 million.

The Committee additionally recommends an assessment of the need for compensation for updating teaching aids, here estimated at NOK 400 million.

The Committee assumes that a further effort in continuing education will be needed, which today has a framework of NOK 1 billion annually. The Committee also recommends efforts in locally based competence development measures over a five-year period estimated at approximately NOK 200 million annually.

Costs related to developing the knowledge base are here estimated at NOK 72 million. There may in the long term be a need for development costs for the Quality Assessment System.

The Committee's proposals will not increase state or municipal operating expenses for compulsory school, and may thus be realised within today's budget frameworks. The proposals also mean there will be an obligation over time, particularly when it comes to development of guidance and support resources and competence-raising.

The Committee recommends that measures connected to the renewal of the school content should be given priority within the framework for quality development in compulsory school,[6] and that costs for compensation for updating teaching aids should be allocated as a special grant.

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[5] Proposal to the Storting no. 1(2003–2004) The Royal Norwegian Ministry of Education and Research

[6] Chapter 226 Quality development in compulsory school is discussed annually in Stortinget's budget proposal from the Ministry of Education and Research.

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