Assessing Learning-to-Learn
A FRAMEWORK

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Helsinki, Finland 2002
The concept of learning-to-learn has been adopted in response to the new challenges and demands presented for educational assessment by changes due to the educational reforms made in the 1990’s. According to the new legislation in Finland since 1.1.1999, the evaluation and assessment of educational outcomes form an important tool in directing education. At the preparatory stage of the educational legislation, a framework for evaluating educational outcomes was prepared and accepted by the National Board of Education. Education is understood to be effective when it succeeds in promoting the personal growth and development of individuals, and the capacity building and development of society, culture and working life.

For concrete assessments, provided by the National Board of Education under the Ministry of Education, the concept of effectiveness is divided into five aspects:

- How do the available education services, in terms of their objectives, correspond with the educational needs in society?
- How do the learning achievements correspond with the objectives set for these studies?
- What kind of learning-to-learn skills does the education produce?
- What kind of communication skills does the education produce?
- How has the education affected the students’ motivation for lifelong learning?
Learning-to-learn is understood to be a readiness formed through good educational practices and accompanying all achievement. Learning-to-learn as an indicator in assessment is meant to provide essential information for teachers, administration, and decision makers responsible for the developing of education.

Developing tools for the assessment of learning-to-learn was understood to be a very demanding process. In 1995, the National Board of Education, responsible for developing methods used in assessment and evaluation, started co-operation with the University of Helsinki. Since that, a research group lead by professor Jarkko Hautamäki has been carrying out a project “Oppimaan oppimisen arviointi” (Assessing learning to learn) under the support of the National Board of Education.

Learning-to-learn has been understood to be a key competence for lifelong learning. It has been a great pleasure to start and support the process of developing and testing tools for the assessment of learning-to-learn. I hope that the results of this effort can be used and developed further in international co-operation with teachers, researchers and other partners responsible for developing quality of education.

Ritva Jakku-Sihvonen
Summary

The concept of learning-to-learn has been adopted in response to the new challenges and demands presented for educational assessment by changes at the macro-level of work and society, and at the micro-level of work processes. It refers to the diverse cognitive and affective factors that are central to the application of existing skills to novel tasks and to new learning. Learning-to-learn is formed through good educational practices and accompanies all achievement. Its inclusion as a distinct indicator in assessment would provide a means to analyse the relative role of the different factors affecting student achievement, and help direct schools towards practices and contents that would truly foster lifelong learning.

Learning-to-learn is defined as the competence and the willingness to adapt to novel tasks. A task is seen to activate a complex system of interrelated competencies and beliefs, leading to learning action. The adaptive and voluntary mastery of this learning action through affective and cognitive self-regulation forms the core of learning-to-learn.

Competence, in the definition, refers to the application of general procedures and the already known to new situations and tasks, i.e., to the exercise of thinking and reasoning, and to the knowing of relevant facts. The indicators for the cognitive competencies encompass such areas as knowledge acquisition, quantitative-relational comprehension, logical reasoning, text comprehension, and cultural knowledge. The cognitive learning-to-learn competencies are by necessity related to intelligence, but the criterion-referencing of the scales to the Piagetian formal operational schemata, that have been shown to be malleable, ties the assessment to factors that can be affected by good teaching.
Willingness refers to the perspective of hope. It comprises several motivational and attitudinal subsystems; both self-related and context-related. Central among the self-related beliefs are learning motivation, action-control beliefs, task acceptance, socio-moral commitment, school-subject-related beliefs, and various forms of self-evaluation. Among the context-related beliefs, at least the experienced support of significant others (parents, teachers and peers) in school- and other learning-related activities should be covered. The indicators also allow for the assessment of motivation for lifelong learning.

Learning-to-learn provides an easy to execute and cost-effective measure for the assessment of factors that have been found relevant for lifelong learning, in the transfer of learning, in reflective theoretical learning, and in the practical constitution of new knowledge. Learning-to-learn provides also a new indicator for educational evaluation, to be of use at different administrative levels. It offers a means to monitor the comparability of school reports, and could give added value to national certificate examinations. The indicator could also serve international comparisons and prospective shared achievement standards.

Combined with data on pupils’ socio-economic background, gender, etc., the different learning-to-learn indicators could provide information on more specific educational problems. Critical among these is the degree to which schools succeed in counterbalancing the role of family background in educational achievement, or in overcoming gender differences in different areas of education.

The indicators for learning-to-learn have been tried in Finland in several studies, including national representative studies of 6th-graders, 9th-graders, and upper secondary school students, in 1996, 1997 and 2000, respectively. The indicators were also used in a study of Swedish upper secondary school students in 2001, offering the first comparative data to affirm the functioning of the instrument in international comparison. The multiple-choice tasks and self-report questionnaires are available in paper-and-pencil form and in e-form, requiring 180 and 90 minutes of classroom time, respectively, and both allowing for computerised processing.
# Table of Contents

Introduction .......................................................................................................................... 9  
Assessment of education and the notion of learning-to-learn ........................................ 9  
The Finnish initiative in learning-to-learn assessment .................................................. 11

Chapter 1  
Assessing Education ........................................................................................................ 15  
Education for all, with a high standard of achievement ................................................ 15  
Prospects for the production of new competencies and motivation at school ............ 17  
A general framework for educational assessment .......................................................... 18

Chapter 2  
Learning-to-Learn: Formation and Assessment .......................................................... 21  
Developing a model of learning ....................................................................................... 21  
Building a model of learning-to-learn assessment ....................................................... 22  
Learning-to-learn and specific and general cognitive strategies .................................. 25  
Learning-to-learn and reflective abstraction ............................................................... 28  
The role of beliefs in learning-to-learn .......................................................................... 30

Chapter 3  
A framework for learning-to-learn assessment ......................................................... 39  
Defining learning-to-learn ............................................................................................. 39  
Components of learning-to-learn ................................................................................. 41  
A. Learning competencies ......................................................................................... 42  
B. Self-related beliefs ................................................................................................. 44  
C. Context-related beliefs ......................................................................................... 46  
D. A set of scales for the assessment of learning-to-learn ......................................... 47

Chapter 4  
The assessment procedure and technical details ..................................................... 49  
The assessment procedure ......................................................................................... 49  
A. Competencies ...................................................................................................... 50
Introduction

The assessment of education and the notion of learning-to-learn

During the past decade, the gradual relaxation of the centralised administration and control of education, and the accompanying increase in the autonomy of individual schools in matters of curricula, have given assessment a pivotal role in educational policy and regulation in many European countries. Educational assessment has traditionally meant the assessment of educational achievement; how well pupils master the knowledge, skills, and contents taught according to the curriculum and required as end results of, or entry requirements for, diverse levels of education. Education is, however, challenged today by rapidly-changing and forever new requirements that the transformations taking place in the sphere of work and in the world at large set for the education of the new generation. The accelerating development of technology and the seemingly limitless growth of information has established the requirement for lifelong learning, and made the continuous education of the workforce – and of the citizenry as a whole – a necessity.

This development has precipitated the need for new foci and methods for the assessment of education – assessment that would go beyond the boundaries of existing curricula. As a consequence, international organisations in the fields of economics and education, as well as national administrative offices and educational research organisations, have opted for collaboration with scholars from the educational departments of universities in the development of new strategies for educational assessment, and in deliberating upon the varied functions, conditions, advantages –
and possible disadvantages – of assessment and evaluation. The objective behind this new generation of assessment, meant not to replace but to supplement traditional methods, is to allow for the more comprehensive examination of the diverse factors behind the performance of individual pupils at different levels of the educational system. The intention is also to allow for new and relevant information about the functioning of education both at the level of individual schools, and at the communal and national levels of educational planning and regulation.

This approach to the assessment of education and educational achievement has put the newer concept of learning-to-learn on a level with the basic concept of learning. The term is used to emphasise the new focus on the analysis of learning and the subsequent expansion of the field analysed. The focus in learning-to-learn has shifted from the subject-specific knowledge aspect of today’s assessed learning to the diverse cognitive and affective factors that guide pupils’ learning and life at school. These factors not only direct the learning process and performance in different subjects at school, but they are also reflected in the way in which pupils are capable of applying their learning to novel tasks presented to them. The cognitive and affective factors in question could be seen as a product of, or at least as strongly affected by, the educational process. At their base lies the diverse cognitive requirements crossing and permeating the different school subjects, and the common attitudinal requirements the undertaking of daily school tasks poses for the pupil.

Learning-to-learn competencies, both cognitive and affective, are taught and instilled as a non-separable part of education, embedded in the different subjects taught at school. They play a decisive role – though not always in unison – in pupils’ learning, in their school performance, and in their achievement in different types and levels of subject-confined assessment. However, even if the different learning-to-learn competencies play a decisive role in the forming of pupils’ subject-related knowledge, curriculum-tied assessment does not suffice to reveal the actual role the different factors play in their performance. Over- and under-achievement, for example, indicate that ordinary assessment does not succeed in exposing uniformly all knowledge or competencies acquired by pupils. It could be assumed that the different factors that affect their success – or failure – at school affect the performance of different pupils, or groups of pupils,
in different ways due to their favourable – or not so favourable – interaction. This interplay could be expected to have different implications for their success not only at school, but also in later learning situations, and in life after school. The new perspective the notion of learning-to-learn offers on educational assessment is proposed as a response to the analysis of the working mechanisms and possible consequences of these varied cognitive and affective factors and their interplay.

The goal of the assessment of learning-to-learn competencies is thus twofold. The first objective is to establish the factors that lie behind school success and the variation between pupils revealed by subject-confined assessment. The second objective is to find out what is the relative role of the different factors in the success of individual pupils.

The identifiable factors that lie behind the performance of pupils in different areas of school attainment fall into two theoretically independent but functionally closely-interacting areas – cognitive competencies or skills on the one hand, and conative and affective attitudes or beliefs on the other. The successful managing of any school subject, or supposedly of any cognitively challenging task, could be claimed to be an interactive process in which both the cognitive and the affective domains or factors have a role to play. However, only longitudinal studies will reveal the permanence of the different modes of action of any individual, and show whether the effect of the different factors revealed will be the same for the success of the pupil at different levels of education – and in later life.

The Finnish initiative in learning-to-learn assessment

The somewhat fuzzy notion of cross-curriculum competencies has become one of the foci of international interest in recent attempts to widen educational evaluation within both the OECD and the EU. There are at least three major lines of approach to be discerned, with existing initiatives for: 1) the definition and selection of competencies (DeSeCo), 2) metacognition and learning-to-learn, and 3) problem solving. Despite the differences in foci and in the level of connection to actual educational practice, these initiatives are all related and can be seen to work within the same conceptual domain. It is also to be expected that their possible
empirical indicators will resemble each other, or at least be correlated to each other in one way or another. The broader and even fuzzier notion of life-long learning and motivation will probably also come relatively close to this conceptual scope.

The National Board of Education, the University of Helsinki Department of Education and the City of Helsinki Education Department set up a joint research project in 1996 to investigate the possibility of developing an essentially new type of national educational assessment in Finland. The objective was to create a set of indicators and subsequent tests to allow for the assessment of pupils’ potential, or readiness, for learning besides the traditionally assessed level of the already attained, in order to provide pupil- and school-level information for the further evaluation and development of education at the national level. In order to do this, the Centre for Educational Assessment created a model, and a subsequent series of tests, for the measurement of the two-dimensional composition – cognitive skills and affective attitudes – of learning-to-learn.

The tests comprised the measurement of diverse non-subject-oriented performance activated in learning and other task situations, and of the relevant guiding systems. The performance tasks were all in the form of pencil-and-paper tasks, and the guiding systems were examined using self-report questionnaires. The subsequent large-scale studies of 6th 1 and 9th 2 graders and of the 17+-year-olds at upper secondary school (high schools and vocational schools) 3 , executed in 1996, 1999 and 2000 respectively, have shown that focusing on pupils’ guiding systems, or beliefs and attitudes, alongside their performance in different types of cognitive tasks, yields valuable information about the role the affective and emotional factors have in, and of the mechanisms by which they affect, their performance in those tasks.

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The National Board of Education in Finland, in collaboration with the Helsinki University Centre for Educational Assessment, organised two experts’ meetings in Helsinki in 1999 funded by the EU (Socrates programme). The Finnish research was introduced to the representatives of the participating EU member countries for discussion, and to help establish mutual understanding in the establishment of common European indicators for learning-to-learn competencies. The developed instrument for their measurement and the results of the first studies were presented as one solution for the assessment of these competencies and for the evaluation of a nation’s educational system in providing and fostering them. The Finnish research has since been presented in other international forums as well, both policy-oriented and scientific. The Finnish model and the results of the large-scale studies have aroused keen interest at the different forums, although some reservations, both technical and more principled, have also been voiced.

The National Board of Education and the Centre for Educational Assessment are now presenting this revised framework for the Finnish assessment model, and an outline for the necessary measuring instruments with some technical specifications.

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4 For example, at the meeting in Paris, in December 1999, of EU educational experts, and in Bremen, in October 2000 at the OECD/CERI/INES Project Meeting. The scientific forums that can be mentioned include the EARLI conference in Athens, 1998; the IAAP conference in San Francisco, 1999; the Activity Theory Conference in Aarhus, 1999; the European Council for High Ability Conference in Oxford, 1999; the International Union of Psychological Science Conference in Stockholm, 1999; and the EARLI conference in Gothenburg, 2000.
Chapter 1

Assessing Education

Education for all, with a high standard of achievement

Education is part of human socialisation (Cole 1996; Gardner 1991; Moll 1990). It has a shared socio-historical base, but the concrete form it takes varies according to historical and political conditions, revealing diverse national variations. Formal education is, however, simultaneously part of the process that helps create the tools with which the constraints presented by social and economic life are overcome. Luria (1976) remarks that the processes of education, and its psychological or cognitive core – abstraction and generalisation – are not invariant at the different stages of socio-economic and cultural development, but are themselves products of the processes of cultural development. The notion of learning-to-learn, as a construct based on the core notions of learning and development, can be seen as one such phenomenon or process that gained in stature with the changing premises of schooling at the end of the twentieth century.

A new type of problem has been created for formal education in the comprehensive school, where instruction is offered to the whole age cohort in shared settings with no differentiation based on prior abilities. If curriculum standards are simultaneously set on a high level or, in Piagetian terms, close to the formal operational level (Adey, Shayer, 1994), the successful attainment of the curricular goals is a difficult task due to the heterogeneity of the student population, e.g., the existing variety and individual differences in an age cohort. The arising problem and the related attempts to solve it could be called the problem of educability (Häyrynen, Hautamäki, 1977). The analysis and assessment of the many constituent factors of learning-to-learn could be seen as one approach to the evaluation
of socially constructed models of education and of their role in creating and maintaining the educability of the nation’s future generation. The socio-historically conditioned notion of educability thus functions to direct our attention to the problem of securing both the adeptness and the psychological well-being of the future generation in the present and in the future society.

One way of defining schooling in relation to the tasks of assessment and evaluation is to use the two axes, the coverage of education and the content of education (Hautamäki, 1993). Coverage indicates the portion of an age cohort who enjoy formal education. In most modern societies, the theoretical coverage is one hundred percent, but there is, in practice, a lower or higher drop-out rate at different levels of education. The content can be deemed to display a low or high standard. A low standard means knowledge coverage that is not very comprehensive, and a high standard means, for example, the level needed for successful studies at university. In any educational system learners comprising the lowest quartile, or possibly just the lowest ten percent of the cohort, pose an educational problem. In a system aiming at a high standard, however, they not only do that, but face an especially high risk of drop-out. One important goal for the assessment of learning-to-learn or, as it could be expressed, the epistemic identity and mentality of the pupils, is to be able to diagnose more closely the factors involved in this process.

It is also possible to approach education and the school using the following four frames as a metaphor: the Adaptive School, the Open School, the Humanistic School and the Thinking School (Hautamäki, Kärkkäinen, Räty-Sarko, 1998). The two first-mentioned types or aspects of school refer to its organisation and management. The Adaptive School stresses internal adaptation to individual pupils or groups of pupils, to teacher collaboration, and to other measures aimed at increasing the internal coherence and functioning of the school. The Open School refers to borders between the school as an institution and other institutions, such as the family, the social services, police and work life.

More relevant for learning-to-learn are the two content-related types or aspects of school, the Humanistic School and the Thinking School. The main task of formal education is to guarantee the formation of thinking and intellectual processes. This is the meaning behind the Thinking
school. The Humanistic school relates to the moral and value-forming or value-supporting aspects of schooling. Martha Nussbaum (1997) refers to these two aspects of education, stating that reason and moral capacity are the two fundamental ingredients of humanity to be taken into account in any form of modern schooling. These, then, are the two conceptual frames which have been applied and further explored in the two major components of the learning-to-learn construct – reason and moral capacity, or commitment-to-thinking and the perspective-of-hope.

Prospects for the production of new competencies and motivation at school

Education could be understood as a tool to overcome certain constraints. The solutions it offers – like many of the constraints it aims to overcome – are socio-historically determined and they change in relation to changes in the socio-political circumstances. In addition to the partially socio-historical constraints of educability there are, on the level of the individual learner, two more types of constraints: universal constraints of plasticity, and objective constraints of teachability. The human nervous system is bound by universal biological laws. Work tasks and other objects of learning, such as the different subjects taught at school, require some key objective skills and prior pieces of knowledge. Using the concept of the teachability of various contents and areas of knowledge marks this fact. The socio-historical nature of educability has already been mentioned, and we will return to this when discussing the contexts of learning and support.

The process of education is continuous. It depends upon, and is affected by, society at all levels, and receives different types and forms of feedback at the different levels. It is part of the long-term civilising process, of family socialisation, and of educational technologies with their respective influences in the educational system in general and in schooling specifically. The most germane feedback is given by the nation as a whole, as both the provider of comprehensive education and the recipient of the new generation of educated youth or young adults with their skills, abilities, beliefs and forms of motivation. In addition to this general national level, labour and political markets instigate their own efforts at curricu-
lar reforms. Educational technologies, on the other hand, refer to aspects of schooling in which pupils are tested, graded, marked and grouped in a continuous flow during and for lessons and grade levels, and at different crossroads of their educational careers. One of the vital issues concerning learning-to-learn assessment is how to define the level of assessment correctly, so as to be able to draw conclusions relevant and helpful for both the individual pupil, the school, and the educational system as a whole. How can we measure the quality of schooling and see whether we have been able to form the fundamental ingredients of reason and moral capacity?

A general framework for educational assessment

Educational assessment optimally produces information of four kinds, or on four levels. It is planned to provide indexes of a special type; it provides information concerning the relevant contexts to be used in the interpretation of and in presenting the results; repeated assessments provide information on trends; and all these provide a growing pool of data for policy studies and academic research (OECD, 1999).

In the assessment of learning-to-learn competencies, the indexes will reflect the factors behind the general two-dimensional (cognition / belief) notion of learning-to-learn, and are discussed in detail in Chapters 2 and 3. The context variables chosen are based on considerations of added-value factors or fairness variables (Webster & Mendro, 1997; Millman, 1997), which, in the Finnish studies, have been gender, parental educational background, and domicile or location of the school (province and form of community). Repeated studies would overcome sampling variations and variations between cohorts to reveal possible trends at different levels of education, or in the educational career of one age-group through the different levels of schooling. However, no large-scale, repeated studies have yet been conducted as part of the Finnish research project. Hence, the assessment results, for now, cannot be used to draw binding conclusions on the level of national standards even if they provide adequate information for school- and local-level decisions. Trends, as well as common data pools, will be important long-term outcomes that
we hope will provide material for international collaboration in addition to their national policy use.

The traditional forms of assessment, the assessment of school achievement or literacy, are assessments of past outcomes. The assessment of learning-to-learn competencies – and even more that of life-long learning motivation – is ideally a prophecy of the future use of acquired skills, abilities, and beliefs. This apparent paradox of assessing what does not yet exist, has to be solved. In the ideal case criterion validity would be the obvious way to measure the validity of the indicators. However given the lack of trends and data pools to allow for that, there is still one way to partially overcome this problem: the use of school marks (GPA) as a criterion. This seems to form a paradox, too, as the aim of learning-to-learn and related measures is exactly to extend and surpass the predictive value of school marks and school-achievement assessments. However, there is evidence that school marks do have predictive value in relation to later studies, and even to job success. Given the lack of longitudinal studies to lean on for criteria, learning-to-learn test results combined with GPA seem to form the most promising type of criteria for the assessment of the learning-to-learn competencies of even over- and underachieving pupils. Alongside their use for criterion validity, longitudinal studies will also help in disclosing the degree of permanence of the different modes of action, and in showing whether the effect of the different factors will be the same for the success of pupils in later life.
Learning-to-Learn: Formation and Assessment

Developing a model of learning

Learning-to-learn has been analysed in literature since the late 1970’s and 1980’s\(^5\). Several approaches have been used, but they seem to converge predominantly into two main lines. Either the approach is in essence psychological, or it is more oriented toward society and its new and changing demands.

The psychological approaches can be further subdivided into models in which the aim is to apply working-memory concepts (for example Nuthall, 1999) in combination with some model of concept-forming stages (e.g., selecting, sorting, integrating, elaborating, evaluating), and to models which apply results and theories from research on thinking and intelligence. The latter use concepts such as higher-order thinking, thinking skills, skills and strategies, and teaching for understanding\(^6\). Weinert (1999) presents a good summary of that approach in his article “Concepts of Competence”. The socio-culturally oriented approaches analyse and use concepts such as ‘learning society’ and ‘risk society’ (Claxton, 1998), or directly address the issue of how people and firms learn.

Whatever the approach chosen, the definition of a fuzzy notion such as learning-to-learn requires some reference to psychological theories and

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\(^{5}\) See, for example, Pask (1976), Pintrich, McKeachie & Lin (1987), and Klauer (1988).
\(^{6}\) See, for example, Kirkwood, 2000; Resnick, 1987; Markman & Gentner, 2001; VanLehn 1996.
to attempts to generalise the results of psycho-educational studies on learning, thinking, and problem solving. One major component is the problem of how to define and analyse competencies in relation to (relatively) new situations and tasks. The rationale behind the learning-to-learn concept is the need and aspiration to assess how new tasks can be solved using the skills, abilities, beliefs and motivations people have acquired at school, e.g., in terms of their capacity to transfer skills and abilities to fit or adapt to new situations, and how they cope with new tasks where failure is a real possibility.

The Finnish framework for the assessment of learning-to-learn competencies takes into account the socio-historical approach, with its emphasis on forming “a nation of good learners”, and the need for an individual to have the power of reflection and self-awareness in order to manage his or her learning career (Claxton, 1998), but applies some of the best measurement models of the psychological aspects of schooling and of educational psychology as well.

On a very general level, the search for learning-to-learn might be classified under Hirsch’s theme “Tool Conception of Education” (Hirsch, 1996). Hirsch includes notions such as accessing skills, critical-thinking skills, higher-order skills, life-long learning, metacognitive skills, and problem-solving skills. The Finnish framework embraces the idea of general tools formed through good teaching, but simultaneously acknowledges the fact of slow changes and of structural constraints on learning and development.

**Building a model of learning-to-learn assessment**

In the Finnish model the assessment of the central factors of learning-to-learn is based on a slightly modified version of Snow’s earlier models of educational assessment (1990, 1994). The components assessed in the 1990-model (Snow, 1990) The components assessed are Conceptual Structures, Procedural Skills, Learning Strategies, Self-Regulatory Functions and Motivational Orientations. Each component may be examined from three different perspectives or on three levels. The first is the perspective of Aptitude Constructs and Initial States, the second Learning-Development
Transitions, and the third Achievement Constructs and Desired End States. A certain aptitude is assumed to provide the starting point for a new learning activity, and to (re)appear as a new achievement. There is, accordingly, a relation between an aptitude and the respective achievement, which is reflected in some form of aptitude – treatment – interaction mediation. If learning-to-learn assessment is made using tasks that require adaptation in the sense of learning-developent transition by the pupil, the tasks can be described from the perspective of both aptitude and achievement assessment.

The concept of learning function is used to make a distinction between knowledge (to know), skill (to be able), exploration (to study) and hope (to hope) (Häyrynen & Hautamäki, 1977). Knowledge refers to the knowing of facts, to declarative knowing, or conceptual structures (Snow, 1990). Skill refers to knowing how, to the ability to apply knowledge, or to procedural knowledge (Snow, 1990). However, the mere knowing of facts or of how to proceed does not, in itself, lead to the willingness to tackle a problem. What is needed is the act of exploration – the readiness to assess the situation, to set a goal, and to act on it with perseverance (Hautamäki, A. & Hautamäki, J., 2001). In the Snow model (1990), The functions covered here by the term exploration are in the Snow model (1990) embedded in the concepts of learning strategies and self-regulation. What is still needed, in addition to knowledge, skill and exploration, is the component of hope as an integral but conceptually distinct part of exploration. Hope refers to the willingness and readiness needed to actually direct oneself towards a task, to form goals, to become motivated, to have the courage to face the challenge – and possible defeat. Only in conjunction with hope the acceptance of the task will lead to effort and exploration.

The link between the concepts of learning-to-learn and the will could theoretically be made through the construct of the relatively autonomous fields of personal control in the areas of the up-keep of the self and of reflective thinking, of learning and personal development, and of the socio-moral self. These are all domains of voluntary action in which the autonomous setting of goals is central to the quality of the action. Seen from this perspective, the concept of learning-to-learn is closely attached to that of voluntary learning. Another way to approach the issue is to talk of autonomously generated goal-directed action.
Pupils’ goals at school are linked to learning tasks that the teacher gives, and which the pupils are expected to accept as their own. In this process, the outer social context is to be replaced by the inner context of the self. The solution – be it positive or negative – is then evaluated on two levels. Social comparison and achievement assessment tie it to the social system – to teachers, classmates and parents, whereas the pupil’s inner evaluation links it back to the goals set, so that the inner norm established by the pupil is either reinforced or is given the incentive to change. It is thus natural to take the normal setting of school assignments as the basis for the assessment of education. The pupils are given tasks that they are invited to accept as their own, with all the motivational, goal-related and ability conditions (or beliefs thereof) attached to them, and the processes of learning-to-learn are set in motion in this acceptance. Regardless of the knowledge or skill level of the pupil, the acceptance of the task (or the refusing of it) activates processes that either enhance or hinder flexible, intellectual work.

Snow (1994) relates the notion of ability tests to the notion of academic tasks, that reflect the way pupils’ cognitive skills and abilities, or their competencies, are generally assessed by means of various ability tests. The aim of learning-to-learn assessment, however, is not only to try to assess or model pupils’ skills and abilities, but also to try to assess or model how they perceive academic tasks, and how they use their skills and abilities to solve them. The academic task, in a form not directly tied to the curriculum, is seen to serve well as a tool for assessment, as it requires the acceptance of the task and the use of knowledge and skills learnt at school. Snow shows in his later model (1994) that, before being accepted as a task, the task activates the orientation to task type, subject-matter characteristics (relevance and novelty to the learner, dominant symbol system), treatment dimensions (ambiguity, risk and form of evaluation, stress and importance of outcome, novelty, meaningfulness, complexity of information processing required, structuredness and completeness, adaptiveness to the learner), and instructional-social contexts.

When a new task is presented, the pupils’ abilities, aptitudes, and task-analysis skills meet up with their affective and cognitive constraints and potentialities. They have to adapt their aptitudes and attitudes to the new task in order to solve it, and to maintain their epistemic mentality, e.g.,
their identity as a person who is able and willing to commit him- or herself to learning, knowing, and solving required tasks by adapting present competence to a novel situation. The environment, which in the case of a pupil means the school, could be seen as presenting tasks which are then accepted, and in this sense it is the task that “wakes up” the skills and abilities in the pupil. This shift in the formation of the description of the process changes the individual interpretation of skills and abilities (see Gazzaniga, 1992).

Among the various models of human cognitive abilities, the most comprehensive one was put forward by Carroll (1993). Spearritt (1996) analysed Carroll’s model for its educational implications, and found his proposal for the identification of first-order factors plausible, especially with reference to the analysis put forward by Gustafsson (1984). These factors include visualisation, spatial orientation, flexibility of closure, speed of closure, cognition of figural relations, induction, memory span, vocabulary and school achievement. The second-order factors include visualisation, and fluid and crystallised intellect. Carroll did identify a learning domain, but only in a weak sense, e.g., for him, learning is made up of memory processes, which are important, but in relation to learning-to-learn assessment not of cardinal relevance. Spearritt (1996) concludes that there is insufficient cohesion within Carroll’s learning-ability factors to justify their consideration for direct educational implications. We have taken this to imply that the notion of learning-to-learn refers primarily to reasoning on the first-order level and to fluid abilities on the second-order level.

**Learning-to-learn and specific and general cognitive strategies**

One issue critical for the concept of learning-to-learn is the question of transfer. Klauer (2000) differentiates between trivial and nontrivial transfer, and between identical and non-identical tasks in assessing the amount and direction of transfer. For example, assessment tasks have to be different from the tasks used in teaching, otherwise what is assessed is a trivial case of learning effect. Klauer also remarks how it is not always easy to define whether the tasks used for the assessment of transfer are really dif-
ferent enough from those used in teaching. This issue is important in the general framework of assessment, and needs consideration. In most achievement assessment, as in assessment not directly tied to the school such as international assessment of literacy or science, the tasks should have sufficient connection to the national curricula, and to the tasks used in teaching and in school-level assessment of the skills and contents in question. Continuous collaboration is thus needed to safeguard the interests of different national educational systems in the compilation of sets of items that adequately reflect the various curricular contents.

In terms of assessing learning-to-learn, the situation is different. What is needed, is a set of tasks which are sufficiently close to, but also sufficiently removed from, standard curricular tasks, be it in science, language or mathematics teaching or assessment, and which do not directly or too narrowly draw on specific skills, abilities, or contents taught in the different school subjects.

Klauer (2000) uses the concept of strategy as a plan for an activity sequence for the achievement of the goal of the activity. He also makes the important point that strategies – even as plans – may be unconscious and unintended as well as conscious and deliberate. Likewise, in the context of learning-to-learn, it is necessary to make the point that the skills and abilities in question are not, by definition or necessity, conscious or internally-mastered activities, but may vary in this sense and also be rather undeveloped and specific. However, these skills and abilities, when forming part of learning-to-learn competencies, may be voluntarily activated and directed in a goal-oriented way to the solving of different tasks which resemble, even if they are not identical to, the tasks through, or in connection with, which the skills and abilities have been learned at school.

Klauer also makes a distinction between general and specific strategies. General strategies are those related to the execution of the core aspects of tasks in a discipline or field. He points out the asymmetrical relationship between specific and general strategies. The learning of a task- or field-specific strategy leads, in the learning situation, to transfer effects,

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7 As in any activity theory (e.g., Galperin, Leontiev, Lompscher, Davydov; or Skinner, Chapman, Baltes), the notion of activity has the immanent aspect of including a goal, so that one can speak about goal-directed activity.
which build on, and are dependent of, general strategies. The reverse, however, is not true. The learning of a general strategy does not lead to transfer effects in learning situations, which are always dependent upon specific strategies. As Klauer sums it up: a general strategy is used, a specific strategy is learned. He calls these higher-order skills, or general strategies, analytical thinking, and the related specific strategies inductive thinking, and sees the forming of inductive thinking as a means to promote learning and the formation of higher-level general strategies.

In the light of Klauer’s theory, learning-to-learn skills and abilities, or competencies, could be seen to form a general-ability complex. This is brought about through the learning and application of specific strategies that can be specified in a curriculum-relevant manner, and which are connected to their respective curricular areas. These specific areas are related to, or are part of the forming of, a more general core area which is developmentally higher and provides for the use of general, higher-order strategies.

The next step in the search for the core area of the cognitive side of the learning-to-learn complex is to have a look at some recent generalisations concerning thinking. Klauer (2000) discussed general and specific strategies, and in a related manner, Markman & Gentner (2001) speak of domain-general and domain-specific reasoning. Generally, reference is made to the distinction between content-related and thinking/learning-related issues in which a relationship between content and form, or between specific and general is seen to prevail. However, in the general context of learning-to-learn, it is essential to take account of Markman & Gentner’s claim that new instances of domain-specific cognition result from domain-general processes operating on domain-specific representations – a view very similar to Klauer’s. Furthermore, they suggest that learning typically occurs as a by-product of reasoning, rather than as an end in itself (Markman & Gentner 2001, 236). The main point thus seems to be the relationship between general processes and specific knowledge structures, reflected in the division between the assessment of learning-to-learn competencies and the more traditional achievement assessment. The research conclusion has been that people seem to align specific causal systems between premises and conclusions to guide their induction.
Learning-to-learn and reflective abstraction

One of the central features of the theoretical framework for learning-to-learn is the differentiation of the object of learning from the mental tools available to the learner. Knowledge is defined as a function of the relationship between the knowing subject and the object to be known, and new knowledge is formed in a process in which a person applies his or her prior knowledge and conceptual machinery to the task at hand. The potential for new knowledge that a novel task carries in itself is realised in the process of being at the same time mentally analysed and experimentally tried (what kind of properties it has, how it is similar to or different from other more familiar things), while the mental tools are further developed in that very same process (see Piaget, 1985; Piaget & Garcia, 1989). The focus of the assessment of cognitive learning-to-learn competencies thus lies beyond mere school achievement, on the abilities of the pupil to analyse novel problems and to form new concepts with the help of what has already been learnt.

In Piagetian terms, a distinction is made between general means of thinking and learning on the one hand, and the mastering of subject matter on the other. The latter is the focus of traditional school assessment, the former the subject matter of learning-to-learn competencies. The focus is on the form, on the ‘how to’, not on the content. This is why the content and form of the assessment tasks are not directly tied to subjects taught at school at the grade levels assessed. Instead, they are chosen so as to require the use of the ‘mental tools’ available to the pupil in ways that do not allow for the mere mechanical application of formulas learned. The differentiation of form and content in the cognitive realm is purely conceptual, however. Even if the tasks used for the measuring of analytical thinking, for example, do not necessarily resemble the problems encountered in the mathematics curriculum, the skills actually needed to analyse and solve the tasks are the same ones. The Piagetian perspective allows for making the general remark that the (latent) levels of learning-to-learn are characterised by the sorts of problems the subject is capable of solving (Piaget & Garcia, 1989). The Piagetian model (1985) also allows for the specification of the reactions of subjects when they face a new
challenge, assignment, or task - the alfa, beta and gamma types of cognitive and emotional reactions.

A developmental and epistemological approach is used to define the core of the learning-to-learn complex. In terms of cognition learning-to-learn means the readiness to adapt oneself to, and to acquire new knowledge in, solving tasks provided and defined by the (task) environment. In other words, learning-to-learn means the process in which a task activates the subject’s internal structure of equilibration, which in turn provides the capacity to learn and to structure the learning-acquisition-appropriation process. This could also be conceived of in Piagetian terms as dynamic equilibration between assimilation and accommodation in the service of reflective abstraction (Piaget, 2001; Tryphon & Vonèche, 2001) in order to provide both a new internal structure for the subject and a need, as well as an impetus, for him or her to re-structure the environment.

With the core notion of reflective abstraction as a starting point, it is possible to formulate a model combining most of the concepts referred to above, and to converge the basic parts of mental actions. Only then can the attitudes or beliefs be related to the model. Reflective abstraction comprises the processes of assimilation and accommodation which, in turn, are related respectively to crystallised and fluid intelligence (Carroll, 1993), and these, in turn, to declarative and procedural knowledge (Snow, 1990). This three-level complex can then be related to learning-to-learn as a competence by separating two conceptual sub-areas of learning-to-learn competencies – Learning Activities and Reasoning Activities.

![Figure 1. Learning-to-learn as a competence](image-url)
The model supports the claim that assimilation is both conceptually and in practice more related to crystallised intelligence, and through that to declarative knowledge, whereas the activation of accommodation is a process more related to fluid intelligence and through that to procedural knowledge. The different factors are, nevertheless, in constant interaction, and the extent and nature of this interaction is one deciding dimension of the assessment of learning-to-learn as opposed to more traditional achievement assessment.

The role of beliefs in learning-to-learn assessment

Pupils’ beliefs are approached in the assessment of learning-to-learn from two perspectives. The developmental approach focuses on the formation of, and on changes in, self- and context-related beliefs in a dynamic relation to learning, and to the requirements set by the school and by education in general. The other approach, with its basis in motivation theory, focuses more closely on self-regulation in learning and school performance.

The development of self-regulation refers both to the actual process and to the individual’s reflections on this process. These reflections become crystallised as personal beliefs. The contents of beliefs, as well as their psychological functions, vary from person to person, in time, and as a function of the particulars of the situation at hand. Beliefs covered in learning-to-learn assessment must hence address both the demands of content diversity relevant to the processes of learning and education, and the variety of functions beliefs serve in directing learning activity and related actions towards – or away from – tasks posited for the pupil.

Developmental theory, as well as developmentally oriented self-concept research (Harter, 1999), attest that changes, or progress, in the differentiation of the domains of a person’s beliefs are paralleled by a hierarchical (re)ordering of the structure of his or her respective context-related self-concepts. The developmental outcome is considered to be a multi-dimensional and hierarchically ordered self-concept (Marsh, 1990; Shavelson et al., 1976; Shavelson & Marsh, 1986) or set of beliefs. This presumed developmental pattern, initially linked mainly to the domain
of the academic self-concept, was demonstrated by Byrne & Shavelson (1996) to apply equally to the social self-concept. This developmental interpretation could be taken as a general approach to the personal beliefs pupils have in relation to school and learning.

Byrne & Shavelson (1996, 611) stress that children do not simply always just add new facets to their conceptualisations of themselves when facing new domains, “but rather that they evaluate themselves in different terms relative to the ontogenetic development of their social cognitions”. There is thus a gradual progressive shift during the primary grades, from describing the self in physical terms, and in terms of outer activities, to a description of the self in psychological terms during adolescence (Harter, 1999).

Transition to the role of the pupil represents a new developmental task for children (Erikson, 1951/1977; Havighurst, 1948/1972). When the child starts primary school, he or she embarks on a new institutional career (Mayer, 1986), surrounded by a complex set of new interrelated expectations (Hautamäki, A., 1982, 1986; Hautamäki, A. & Hautamäki, J., 1997a; Nurmi, 1993). Children will be confronted with new developmental standards (Caspi, 1987; Nurmi, 1993) and subsequent norms for age-appropriate behaviour, and they will be evaluated according to them, usually in comparison to their classmates. In particular, the focus will be on the child’s capacity to learn and to work industriously towards the acquisition of what Erikson has termed “the technological ethos of a culture”. It is posited that children, as pupils, react to this challenge by developing their skills and, ideally, by gradually generalising their beliefs of themselves as achievers in relation to the requirements of the school, e.g., forming a belief structure in which education does matter, and according to which to achieve well in school is important and worth striving for. It is also presumed that coping with this task is reflected in the development of more generalised domain-specific self-concepts.

If a developmental perspective is endorsed, beliefs are seen both as multi-layered and multi-voiced, and as reflecting a complexly orchestrated self. Both self-related and context-related conceptions, or beliefs, are then defined as cognitive schemas. Campbell et al. (1996, 141) maintain that this organised knowledge structure “contains traits, values, semantic and episodic memories about the self and controls the processing of self-rel-
evant information”. Situational determinants of behaviour, e.g., demands implicit in social scripts and subsequently imposed on pupils, are thus emphasised.

Observations of how an individual’s behaviour depends on the current situation have challenged earlier static views of individual personality, and directed the focus from trait-based conceptualisations of individual differences to more dynamic approaches to person-situation transactions (Higgins, 1990; Mischel & Shoda, 1995). It has turned out that situation-dependent variation is not random, but reflects fairly stable characteristics of the individual (e.g., Shoda, Mischel, Wright, 1993). The apparent complexity of the person-situation transaction thus necessitates both a more process-oriented conception of personality, and the need to address the issue of stable variability across situations.

The cognitive-affective process system model of personality (Mischel and Shoda, 1995), incorporating the role of situations, events and contexts into the conception of personality, is one attempt to respond to this challenge. According to the model, individuals differ in “how they selectively focus on different features of situations, how they categorise and encode them cognitively and emotionally, and how those encodings activate and interact with other cognitions and affects in the personality system” (Mischel & Shoda, 1995, 252). According to the model, people do not just passively react to situations, but are active and goal-directed agents who make plans and generate changes, and by their role partake in creating the situations themselves.

Analogously, in the context of school, pupils could be seen as active agents whose subjective interpretations of the different classroom situations largely determine the goals they choose. These situational interpretations are, however, dependent on their motivational beliefs and on their perceptions of themselves. Furthermore, even if the situational construals may instigate the goals they choose to strive for, the actual engagement is also dependent on their volitional control, i.e., on their ability to support and maintain the chosen paths of engagement, and on the support and the constraints of the instructional and social environment.

According to achievement-goal (or goal-orientation) theory, personal and environmental factors are both seen as necessary components of
motivation (Pintrich & Schunk, 1996). Goal orientations, i.e., individ-
uals’ preferences for certain types of desired end-states (Niemivirta, 1998a, 2002a), provide an organising framework through which a variety of cog-
nitive and affective responses to achievement situations can be interpreted (cf. Ames, 1992). These reflect a pupil’s general orientation towards class-
room situations and tasks, and are closely associated with other related beliefs about purpose, competence, success, ability, effort, errors and standards (Pintrich, 2000). The integrated and organised nature of these different beliefs provides the theoretical utility and predictive power of the achievement-goal construct.

Goal orientations may be viewed as knowledge structures that become activated depending on the contextual setting and environmental cues (Niemivirta, 1998a; Pintrich, 2000). Various achievement-related ele-
ments, such as purposes, definition of success, the role given to effort and errors, and standards, are nodes in a network that display different pat-
terns of activation as a function of contextual and internal personal fac-
tors. This type of representational model suggests that goals are dynamic states, which fluctuate in response to contextual information as well as to internal feedback between the different nodes or units in the network. Consequently, this view implies that goal orientations influence the very way individuals perceive their present social and contextual arenas.

The psychological significance of an event could be seen as a critical determinant of how a person responds to it, and the psychological signifi-
cance as a product of both the person and the situation (Higgins, 1990; Järvelä & Niemivirta, 2001). This is elaborated by Boekaerts and Niemivirta (2000), who suggest the way pupils give meaning to situations proceeds through the processes of identification, interpretation and appraisal. Pupils’ situational construals are thus not based just on their perceptions of the situation as such (data-driven processing), but much of the significance of events, situations and other social objects is determined by how they categorise them (theory-driven processing). Subjective mean-
ing is thus a joint construction of previous experiences and current infor-
mational input from the situation at hand (Higgins, 1990; Higgins & Bargh, 1987).

The first stage of a pupil’s situational construal is identification, the rec-
ognition of the situational input and the resulting activation of related
knowledge. For example, when facing an examination, pupils recognise the stimulus to be an instance of a previously-established class of events, a specific type of classroom episode with specific implications. The second phase could be conceptually partitioned into two tightly-interwoven processes, interpretation, or inference of the implications of the stimulus, and appraisal, an estimation of the personal significance of those implications. These two are often, if not always, related to some kind of standard or reference point (Higgins, Strauman & Klein, 1986). The last phase of the meaning-giving process, the pupil’s appraisal of the personal significance of the situation at hand, is of specific interest here, because it is – by definition – a motivationally charged one. Pupils’ situational construals are considered to set the scene for further engagement. In order to transform an appraisal of a situation into desired action, however, the pupil must first set, or activate, appropriate goals, and create a corresponding action plan (see Bargh & Chartrand, 1999, and Boekaerts & Niemivirta, 2000). Here, a qualitative distinction can be made between the notions of goal setting and goal striving (Lewin et al., 1944; cf. Niemivirta, 1999). For example, Kuhl (1984) refers to the former as a motivational phase concerning the decision on what goals to adopt, whereas the latter refers to the determined pursuit of goal completion. The factors and processes leading to a goal choice are largely based on subjective interpretations and appraisals of prevailing situations. Then, once the choice has been made, the initiation and execution of the corresponding actions themselves must take place.

The action-phase model suggested by Heckhausen and Gollwitzer (1987; Gollwitzer, 1990), going beyond the conceptual distinction of goal setting and goal striving, provides a coherent framework for bridging different aspects of motivation and volition. The model incorporates the issues of initiating and maintaining action into a process-like continuum. The temporal phases of goal-directed engagement are partitioned into

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8 It must be noted that, although the theoretical descriptions provided above rely on a cognitively and individually saturated psychological framework, the “previously established classes of events” affecting the pupil’s situational construals become such only as parts and products of the socio-culturally shaped common practices embedded in the context. What is identified as a classroom episode, and what characteristics become attached to it, depend on the socially-shared meanings developed in the classroom, in school, or even in a larger cultural setting (cf. Niemivirta, Rijavec & Yamauchi, 2001).
four phases, which in turn are separated by particular transition points (decision, action initiation, and action outcomes, respectively) that give rise to subsequent engagement. According to this framework, both appraisals and the process of forming a goal intention can be described as characteristic of a pre-decisional phase—a phase in which people translate their wishes into intentions. In other words, during the pre-decisional phase, individuals weigh the desirability and feasibility—or outcome-expectancy and subjective value—of different alternative goals and their potential outcomes or consequences on the basis of various subjective criteria. This “relative preference expressed in a context of conflicts, alternatives and trade-offs” (Mischel, Cantor & Feldman, 1996, p. 333) manifests itself in a commitment to the chosen goal. The formation of a goal intention thus represents a leap from a state of uncertainty to a goal state in which the desired outcome becomes an end state that the individual feels committed to attain (Gollwitzer, 1990).

The subjective criteria that define the desirability and feasibility of goal choices are, in part, determined by individuals’ situation-specific judgements. Unlike goal orientations, which are considered as general or relatively context-free sets of motivational beliefs, some types of motivational beliefs can be viewed as more situational by nature. Three important classes of personal judgements that are likely to influence individuals’ goal choice and their subsequent action are self-efficacy beliefs, task value, and anticipated interest.

Self-efficacy refers to individuals’ judgements about their ability to carry out specific actions in specific situations (Bandura, 1997). Such beliefs have been found to be highly influential in predicting actual behaviour and task performance (cf. Pajares, 1996). Task value refers to the degree or amount of value and worthiness that individuals attach to the future task and/or to its outcomes, whereas anticipated interest reflects their expectations about the extent to which the upcoming activity will be experienced as interesting. Recent studies examining the relationships between general motivational beliefs, situational appraisals and performance have supported the assumption of the importance of situation-specific self-appraisals in mediating the influence of general beliefs and prior achievements on later performance (Boekaerts, 1999; Niemivirta, 2000; see also Pajares, 1997).
The outcomes of students’ situational construals define the course of further engagement, but they are not sufficient determinants of actual engagement (Boekaerts & Niemivirta, 2000; Kuhl, 2000). Sometimes learners fail to realise their intentions or to attain desired goals, and sometimes they carry out even the most boring or unpleasant tasks with great effort and commitment. One explanation for how they could become active in tasks that may initially seem frustrating is through effective volitional control. This comprises the strategies and plans invoked after decisions to pursue certain goals have been made. According to Kuhl (1984; see also Corno, 1993), volition could be characterised as a dynamic system of psychological control processes that protect concentration and directed effort in the face of personal and environmental distractions.

The affective content areas essential to the assessment of learning-to-learn, which complement the cognitive components discussed earlier, seem to fall onto two separate but internally related and interacting levels – self-related and context-related beliefs.

**Self-related beliefs** are assumed to disclose pupils’ conceptions of themselves as persons in general, and as learners in particular, along with their personal interpretations of the meaningfulness and demands of different learning situations. Self-related beliefs thus encompass the general self-esteem of the pupil, his or her self-concept in relation to various academic disciplines, goal orientations and action-control beliefs, the degree of task-acceptance, the continuous updating of self-evaluation, and personal future orientation.

**Context-related beliefs** are assumed to disclose the pupils’ personal interpretations of issues related to the wider educational context of society with the conflicting interests in its (sub)cultures and classes. The generational issue is approached through the role the pupils consider their parents and teachers to have in their education. Context-related beliefs also comprise pupils’ interpretations of the prevalent beliefs concerning the societal frames of education, as their interpretations of the larger societal frames and future of education, work and society have an effect

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9 These could be seen to include issues such as the value of formal education vs. the constitution of knowledge at work, the value of epistemic reflection and intellectual enterprise, the value of cultural inheritance, and the value of moral rules and of the capacity - and willingness - for the moral evaluation of the workings of society.
on their personal educational beliefs and choices. This wider social perspective has not yet been addressed in the context of the proposed set of scales, although the issue could be of special interest in international comparisons.

Perceived support for education – mediators and social relations. There exists a rich body of empirical and theoretical evidence on the role of parenting and of the parent-child relationship in the development of affective self-regulation and intellectual competencies, and in the socio-moral domain (Baumrind, 1993). Teacher relations and peer relations also have effects on school achievement (Wenzel, 1996). Pupils’ social goals not only have their own influence, but also interact with their academic goals, having a conjoint effect on school performance, learning and development. It has been found, for example, that pupils’ perceptions of teacher support are positively associated with – and make possible – instructional techniques that stress mastery and learning goals (Covington, 2000, p. 180).
Learning to Learn – the ability and willingness to adapt to novel tasks, activating one’s commitment to thinking and the perspective of hope by means of maintaining one’s cognitive and affective self-regulation in and of learning action.

Figure 2. The conceptual framework for assessing learning-to-learn. Chapter 3.
A framework for learning-to-learn assessment

Defining learning-to-learn

Learning-to-learn may be defined as the ability and willingness to adapt to novel tasks, activating one’s commitment to thinking and the perspective of hope by means of maintaining one’s cognitive and affective self-regulation in and of learning action.

In this definition, adaptation refers to the pupils’ active action for the maintenance of a balanced state between assimilation and accommodation (equilibration). von Glasersfelt refers to the same with his remark that an organism (the pupil) must be viable within the constraints of the environment (the school). Conceptual structures are seen as the product of active knowers shaping their thinking to fit the constraints of experience. Adaptation is seen as comprising two levels. On the practical level, the pupil has to devise schemes of action that circumvent the obstacles and perturbations the task, or assessment, places on his or her path. On the conceptual level of theories and explanations, it is a question of achieving a coherent balance that avoids internal contradictions (von Glasersfelt 1996, see also 2000).

Learning-to-learn competencies are activated or realised when a person is facing novel tasks. The tasks used in the assessment of learning-to-learn thus have to be relatively new as compared to the tasks used when the relevant specific competencies were taught and acquired, and unanticipated in their occurrence. However, the new tasks must have some
relevant resemblance to curriculum tasks so as to require thinking and pondering, but to allow, in the end, for accommodation or pre-existing knowledge and forms of thinking.

Pupils have to accept as part of education, and of being a member of society, that other persons and external systems set them assignments and tasks which are not self-produced or self-generated, but which they have to accept and to complete. This format of task giving and its expected acceptance is simulated in learning-to-learn assessment for the purpose of revealing the interaction between the cognitive and affective components of performance. This constraint is a precondition for the learning action.

The activation of pupils’ commitment to thinking and their perspective of hope refers to the two basic components of learning-to-learn, the cognitive one of skills and abilities and the affective guiding system of beliefs and attitudes, needed for their successful implementation. The emphasis is on the voluntary nature of the activation, the directing and maintaining of mental activities as cognitive and affective systems. An ethical perspective on fundamental commitment to our understanding of the socio-historical formation of human consciousness in human activity (Nussbaum 1997) is implicit in the notions.

Cognitive and affective self-regulation refer to the activated psychological systems that include cognitive, conative and emotional components, all of which must be co-ordinated and voluntary controlled. Covington (2000, 172) analyses the motivational dynamics of school achievement, and remarks how “achievement goals differently influence school achievement and the will to learn via cognitive, self-regulation mechanisms”. The distinction between motives-as-drives and motives-as-goals is also crucial in terms of self-regulation in learning-to-learn. The drive aspect is visible in the handling of the emotional conflict between striving for success and avoiding failure, while the motives-as-goals aspect is needed for understanding how learning and performance goals entice subjects towards action. Covington focuses on the goals-cognitions-achievement sequence, and points out that self-regulation forms an essential link between academic goals and achievement behaviour (Covington, 2000, 180).

Learning action refers to learning as goal-directed action, when the whole motivational system is activated for a long-term commitment
within the context of the life process. The goals are activated in accord with the level of the pupil’s commitment to learning. Learning action is the main context for learning-to-learn assessment, and is to be kept separate from learning activity (Tätigkeit), or learning operations in the sense of making notes and doing exercises, for example.

**Components of learning-to-learn**

Learning-to-learn competencies comprise various domains of skills and abilities. They can be divided into *cognitive skills and abilities* and *affective control skills and abilities*. The difference between skills and abilities is relative, and refers respectively to lower- and higher-level aggregates of mental operations and actions.

Cognitive skills and abilities could be considered to refer to Klauer’s subject-confined specific strategies and general strategies, to Piaget’s processes of accommodation and assimilation, to Carroll’s fluid and crystallised intelligence, or to Snow’s procedural and declarative knowledge (see p. 19). Affective skills and abilities, on the other hand, refer to the control of emotions in task situations, measured here in the context of assessment tasks but presumed to reflect the pupil’s use of them for any cognitively challenging task at school or later in the sphere of work. Affective skills and abilities are not beliefs, but are observable instances of emotional and affective experiences that happen during cognitive action. In this framework, emotions are defined as experiences resulting from a comparison between the mental image of the goal and that of the present outcome, or of one’s position in relation to the goal.  

There are other cross-curricular or learning-to-learn competencies that could be considered important in the context of learning. Of these *social skills* and *study skills* are included in the Finnish model of learning-to-learn assessment. For practical reasons they, as well as the other affec-

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10 There are, naturally, other emotions involved in the process, but the assessment does not attempt to assess these as separated from the way they are reflected in the process of self-evaluation during the present goal-oriented action.
tive components of learning-to-learn, are measured using self-reported self-evaluation.

A. Learning competencies

Learning competencies comprise various domains of skills and abilities. They are divided into four main categories, each containing more detailed subdivisions: the learning domain, the reasoning domain, the management of learning, and affective self-regulation.

The learning domain

comprises tasks in three areas: verbal-argumentational comprehension, quantitative-relational comprehension, and cultural knowledge.

Verbal-argumentational comprehension refers to hierarchical text comprehension or macro-processing (Lyytinen & Lehto, 1998; Lehto, Scheinin, Kupiainen & Hautamäki, 2001). One task in the assessment set is a test of verbal comprehension. The texts used are of an expository nature and aim at the level of language found in semi-professional press or literature. The task of the pupil is to read and analyse the text at a relatively demanding level using the pre-formatted structure of the test. For reasons associated with the problem of large-scale testing, no free production of argumentation is required.

Quantitative-relational comprehension refers to the use of mathematical-analytical operations in surprising or relatively new contexts or forms (Demetriou et al, 1996). Two or three different types of quantitative-relational tasks are included in the assessment set.

Cultural knowledge refers to general knowledge that helps pupils as later citizens to orient themselves in culturally important issues and activities, and to be able to relate individual and national experiences to European and global traditions and cultural heritage. One optional task will be included in the assessment set.

The reasoning domain

comprises tasks on two levels or of two types: those measuring logical reasoning and those built on a formal operational schema measuring reflec-
The tasks rely on skills already measured in with the performance of tasks in the learning domain (analytical thinking), but are further removed from the kind of tasks required of pupils at school. Some of the tasks are meant to emulate a form of problem-solving in an easy-to-score format.

**Logical reasoning** tasks include verbal, numerical or pictorial tasks tapping one or more of the forms of formal logic - inductive reasoning, deductive reasoning and abductive reasoning (Peirce, 1931). This is an area with multiple options for scales (see for example Tryphon & Vonèche, 2001), and tasks covering several combinations of forms of reasoning and using different modalities have been used in the earlier Finnish studies. Of these, a task of deductive or inductive reasoning is proposed for the assessment set.

The tasks built on **formal operational schema** (see Adey & Shayer, 1994) require reflective abstraction in the form of processes such as classification, control and exclusion of variables, ratio and proportionality of variables, compensation and equilibrium, correlation, probability, and the constructing and using of formal models. One formal operational task (Piaget) has been used to calibrate all the cognitive tasks, but it is also possible to have one as an option for the assessment set.

There is also an **integrated-task** option. These tasks are complex and are more easily classified not as a measure of a specific cognitive process, but rather by negation - they are not elementary cognitive tasks (see Carroll, 1993; Spearritt, 1996), but require the use of a combination of skills and abilities. They often feature instructive texts, pictures and tables, require more time, and easily lose something when built to a multiple-choice format. It could be claimed that most problem-solving tasks are by nature integrated, extended tasks. One task of this type should be included in the assessment set. The area of integrated tasks is one in which co-ordination with other types of assessment is especially profitable.

**The management of learning**

refers to study skills and to how learners plan their learning activities prior to a task. *This aspect is assessed through the pupils’ (self-reported) estimation of their use of deep and surface processing.*
**Affective self-regulation**

refers to the control of short- and long-term emotional states related to the pupils’ aspiration level, their hope—for success or fear—of failure, their persistence and epistemic resilience, and their readiness to tune themselves to different task affordances (Snow, 1994). The primary predicament is resilience, e.g. the ability to stay mentally and intellectually engaged in a task despite temporary frustration or confusion. Resourcefulness could be seen as a tendency to look at any learning setting in terms of the utilities and resources which it may allow to support the current learning activity (Claxton, 1998).

The ratio of tasks accomplished in the cognitive area versus the items answered in the belief area may be used as an index in the assessment of affective self-regulation. This can be calibrated by calculating and scaling the internal loss of different scales, as pupils have a tendency not to do all the items on the cognitive scales when their overall level is relatively low, and when the their beliefs and attitudes do not support their cognitive system.

**Social skills**

comprise interpersonal skills that could be expected to contribute to learning competence. *Such skills are assessed through the pupils’ (self-reported) estimation of their co-operative skills, assertiveness, pro-sociality, withdrawal, task orientation in group activities, and verbal aggression.*

**B. Self-related beliefs**

Self-related beliefs maintain—or protect—the epistemic mentality and personal identity of the pupil when he or she is facing various situations at school, either as a learner or just as a human being. In the context of learning, manifold self-related beliefs become activated in questions related to motivation, in connection with different academic subjects, when the pupil is faced with a new task, or when preparing for public or self-evaluation. A number of self-related beliefs contributing to learning-to-learn are assessed by means of self-report questionnaires.
Learning motivation
comprises scales for assessing goal orientation (i.e., pupils’ preferences for specific classes of goals and/or outcomes; learning orientation, achievement orientation, performance-approach orientation, performance-avoidance orientation, and work-avoidance orientation, respectively), school value, fear of failure, and academic withdrawal (e.g., the pupil’s tendency to give up when facing demanding tasks or situations), and control motivation (pupils’ interest in assessing the causes of failure or success at school).

Assignment or task acceptance (versus task rejection)
comprises scales for the direct assessment of various situational self-appraisals, such as task value, self-efficacy, interest and self-handicapping. These measures are integrated into the assessment of learning competencies in a way that permits the evaluation of pupils’ situation- and task-specific motivation ‘on-line’, concurrently with the actual task engagement.

Action-control beliefs
comprise scales for assessing means-ends beliefs (i.e., pupils’ beliefs about the extent to which certain means produce or cause certain outcomes), agency beliefs (i.e., pupils’ beliefs about the extent to which they possess such means), and control expectancy (pupils’ beliefs about the extent to which they think they can produce positive outcomes and prevent negative ones).

Academic selves at school
include scales for assessing academic self-concepts, such as reading, writing, mathematics and thinking, study skills and possibly also scales for assessing pupils’ perceptions of learning opportunities (books, other persons, observations).

Self-evaluation
comprises scales for self-esteem in various forms, the social self-concept, experienced support from significant others, the role of the moral values of the good student (versus sloth) at school and at work, and, again pos-
sibly, some assessment of self-awareness (orientation to the needs and interests of oneself in relation to others and to the situation).

**Future-orientation**

refers to the possibility of assessing the visions the pupils see the future as promising or denying. For now, these are not included in the model.

**C. Context-related beliefs**

Context-related beliefs refer to the beliefs that support, reflect and mediate the pupils’ relationships with different social contexts, and their perceptions of the dominant (or competing) values and interpretations of different phenomena in those contexts. These values, and the personal interpretations the pupils make of them, have an indirect effect on learning and on other factors pertaining to task commitment. Cultural diversity, as well as questions related to differences in world view and personal interest due to social class, gender and generation, are factors that, even if only partially cognised by pupils, do have an effect on their beliefs. Depending on the external constraints and goals, contextual factors may be included to different degrees in the assessment.

**Perceived value of education**

refers to pupils’ interpretations of the more general socio-cultural factors related to education. The scales used concentrate on the following areas: the value given to education, the value of reflection and intellectual pondering, the value of moral commitment and moral capacity, all on the level of the society, and on the pupil’s vision of the future of education and work. Pupils’ perceptions here are seen as strongly supporting – or vitiating – their commitment to learning on a personal level.

**Perceived support for learning and studying**

comprises scales for the assessment of the extent to which pupils perceive their different near-contextual surroundings to value learning and education, to support their work, and to function in consonance with the
school. The contexts or support networks covered include home and the parents, the school and the teachers, classmates, and other friends.

**Perceived opportunities for the acquisition of information**

comprises scales for the assessment of the pupils’ knowledge - and actual use - of the possibilities for information seeking. The scales cover the use of computers and the internet, books and libraries, and newspapers and periodicals.

**D. A set of scales for the assessment of learning-to-learn**

The framework presented here is to be understood as a general model for the assessment of learning-to-learn as part of cross-curricular competencies. Not all of the topics proposed here need to be assessed and there may be other factors that should be included in order to reflect the particular needs of the assessing agent. The final number of areas covered and of scales used may even depend on factors fairly far removed from the educational goals of the assessment.

Nevertheless, the framework represents an attempt to present a comprehensive model for the measuring of learning-to-learn, and an instrument has been built based on the model. The model has been tried in, and refined in conjunction with, actual assessments made in Finland. Lists of the types of scales proposed for use in the European forum are given in Appendix 1 (competencies) and Appendix 2 (beliefs). The final scales have not yet been presented, and the proposed sets do not include scales for all the sub-areas discussed in the above framework.

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11 An English translation of the instrument used for the 1997 national assessment of 9th-grade pupils was presented to participants at the ‘Learning-to-Learn as part of Cross-Curricular Competencies’ meeting in Helsinki, March 1999. The later, more concise versions are not available in English yet.
The assessment procedure and technical details

The assessment procedure

The assessment is to be performed in a normal classroom setting as part of an otherwise regular school day. The administering of the assessment requires two double lessons (à 90 minutes), but it is advisable not to execute them during the same day. The assessment sessions may be administered and supervised by the school’s own teachers or by trained evaluators. If the school’s own teachers are used it is advisable, for reasons of reliability, not to use the class teacher of the pupils in question. As of now, the assessment is based throughout on paper-and-pencil tasks and questionnaires with adjoining easy-to-read instructions, presented to the pupils in the form of booklets with separate fill-out sheets to allow for easy computerised scanning. However, a computer-based (pdf) version of the test-package has been developed, and a parallel testing of pencil-and-paper vs. e-form has been executed, with result due in 2002.

The assessment set includes detailed instructions for the administering of the testing in the form of a booklet for the supervising agent. This Instructions Booklet contains a description of the assessment procedure, the whole set of tests with adjoining separate instructions for the test supervisor, and approximate time frames for the separate parts of the test package. It is of utmost importance that the administering agent studies the instructions closely before the assessment to assure the compatibility of the results through standardised implementation of the test. No
additional help or instructions are to be given to the pupils during the assessment.

The tasks to assess cognitive competencies and the self-report questionnaires for the assessment of the pupils’ beliefs are divided in a pre-set order between the two assessment sessions to prevent unwanted interactions of the two procedures. The sessions are likewise to be run in a pre-set order to assure the compatibility of the results from different assessment sessions.

A. The assessment of competencies

Time
The different competence scales (learning and reasoning domain) require about 140 minutes of testing time, i.e., about 1½ of the two double lessons needed for the assessment.

Task types
The cognitive tasks are all in an easy-to-answer-easy-to-score multiple-choice format. The individual tests, however, differ in the way the task is set and consequently in the character or mode of the choices from which the pupils must select their answers. Three major forms are used:

i) a standard two-to-five-choice format with only one correct answer

ii) a true-false choice with, for some tasks, an additional question to test the pupil’s conviction of the correctness of his or her answer, e.g. whether the solution was concluded or guessed and how certain the pupil is of the answer,

iii) a three-choice format for the assessment of the relative importance of different statements when reflected against a text that has been read.

Reliability
The minimum level of reliability required for the different scales is set at .50 for the competence scales, because the assessment is not intended for prognosis on the level of the individual pupil, but rather for class- and school-level diagnostics in the use of educational evaluation at the national level.
In order to provide for a non-relative criterion for the different competence scales, they are all Rasch-scaled in the preparatory phase in relation to the formal operational level using the Science Reasoning Tasks (Shayer & Adey, 1981: Adey & Shayer, 1994)\textsuperscript{13}. This referential scaling will allow for a set criterion for good or adequate performance in the different areas (in the Finnish 9th-grade study the scales used had all their means at the Piagetian 2B* or ‘Concrete Generalisation’ level), which provided a basis for their mutual comparison (Hautamäki et al, 2001). The scaling also allows for the use of the learning-to-learn tasks as an indicative tool for estimating the proportion of pupils at different levels of education who have reached the Piagetian ‘Formal Operational’ level in thinking.

To emphasise the pivotal role of text comprehension in the modern information society, and the relatively slow attainment of adult-level reading skills, the assessment instrument for verbal-argumentational or text comprehension is considered to require an assessment of ‘standard’ reading using a normative adult population in addition to the age-level-cohort-based Rasch-scaling. The goal is for a .85–.90 between-adults agreement concerning the ‘correct’ reading of expository texts using a normative population of subjects working at the minimum on the Piagetian ‘Early Formal Operational’ (3A) level (preferably 3A/3B).\textsuperscript{14}

\textbf{Standard scores}

For the purposes of national (or international) educational assessment and policy, more detailed goal-setting and comparison, the accumulated results could be used as data to form a normative scale or frame with the national (or international) median and averages for the lowest and highest quartiles serving as a referential norm. The frame could then be used as a criterion-giving tool against which the results of different schools (or countries) could be compared for further analysis of the comparative level and particular characteristics of the samples.

\textsuperscript{12} In the 9th-grade study the reliability varied between .41 and .89 (Hautamäki et al., 2000).

\textsuperscript{13} The competence scales used in the Finnish 9th grade study were afterwards (e.g., with N=2826) scaled on the basis on the Rasch-scaled Piagetian Pendulum-task. (Hautamäki et al., 2000, 60-70)

\textsuperscript{14} See Lyytinen & Lehto, 1998; Lehto et al., 2001.
B. The assessment of beliefs

Time
The assessment of beliefs comprises three parts, which require about 40 minutes of testing time. The different parts are dispersed among and between competence-measuring tasks to avoid unwanted interaction of the different assessments. For example, the questionnaire for the assessment of learning motivation are presented to the pupils before any competence tasks are given.

Task types
All parts of the assessment of beliefs are carried out using self-report questionnaires. The format is a standard one offering statements on which the pupils are asked to take a stance in terms of the degree to which the statement reflects their opinions, their view of themselves, or their mode of action in different situations, for example. The response scale used is a seven point Likert scale with only the end points given a verbal description, where 1 equals (I feel that) “This is not at all true (of me)” and 7 equals (I feel that) “This is very true (of me)”.

Reliability
The minimum level of required reliability for the different sub-scales is set at .50, as for the competence scales\(^\text{15}\).

C. Context variables to be used

When assessment data is collected there is a variety of options regarding the context-information to be attached to it. The actual variables to be used depend on the availability of different types of contextual information and on the different expectations concerning the use of the results.

\(^{15}\) In the 9th-grade study, the reliability varied between .57 and .92. (Hautamäki et al., 2000)
at different levels of educational decision making. Gender, age and mother tongue could be considered the standard or minimum information to be used as classifying variables. The Finnish studies additionally included information on the educational level of the parents (both mother and father), and on the pupil’s school achievement during the year of the assessment or the previous year (GPA and marks in some separate subjects relevant to the comparative analyses). Information about the pupils’ possible enrolment in special education could also be significant.

Contextual information concerning the school and its location (size, province and type of municipality) added to the data related to the individual pupil could contribute significantly to the comparative analysis and to later educational policy making (Sammons, Thomas & Mortimore, 1995).

D. Samples

To allow for generalisations based on the results of the assessment, and for comparisons on the international level, a random sampling of schools with a randomised choice of a class or classes within each one is needed, ending with a sample of approximately 3000 pupils for any one country. However, if the results are to be used for comparisons between individual schools, the choice of just one class does not suffice. Moreover, when there are four or more parallel classes per grade in one school, it is recommended that at least three randomly taken, or all, classes are used to enable the extent of between-class variation to be established.

E. Data collection

As stated earlier, there are three data-collection options:

i) Detailed instructions are prepared and the schools with nominated teachers collect the data. Teachers are not allowed to supervise the assessment of their own classes.

ii) Trained instructors and evaluators collect the data.

iii) Computer-based testing is used.
Computer-based testing is seen as the future standard solution for large-scale testing as soon as the computer facilities at the schools allow for it.

F. Drawing conclusions and preparing reports

Variable-centred methods provide the basic data of means and standard deviations for the different sub-scales to be used as norms and bases for further analysis and comparison, and standard analysis-of-variance models provide tools for further analysis. Multilevel models extend the analysis by offering a means to uncover the level of possible variation (pupil, class, school, national, international). Person-centred methods (such as cluster analysis) could be used, instead, to extend the analysis to individual and group differences in student profiles (see Niemivirta 1998b, 2002a, 2002b; Scheerens & Bosker, 1997).

Two larger reports covering the national assessments of 6th and 9th graders (Hautamäki et al., 1999; Hautamäki et al., 2000), and numerous smaller reports prepared for individual schools assessed have already been published, with the national upper secondary school report due in 2002 (Hautamäki et al., in press). As part of the assessments carried out for the City of Helsinki Educational Department, a more interactive system of feedback to the schools tested has been developed 16. The results have also been presented in numerous scientific forums (see footnote 4). There are thus various tested models for the school level and national reports on learning-to-learn assessment that could serve as a model for an international report.

16 The City of Helsinki has made a contract with the Centre of Educational Assessment for the assessment of all of the city’s comprehensive schools in four years, assessing all 6th and 9th grade pupils of a quarter of the schools each year. In addition to these, all of the City’s high schools and vocational schools (the 17+ age cohort) were assessed in autumn 2000 as part of the national study (Hautamäki et al., in press).
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Competence scales proposed to be included in learning-to-learn assessment

**Learning Domain**
1. Verbal-argumentational comprehension
   - Text comprehension (two separate measurement structures)
2. Quantitative-relational comprehension
   - Arithmetical operations
   - Creative numbers
   - Generalisation of mathematical rules
3. Cultural Knowledge
   - Optional task

**Reasoning Domain**
4. Logical reasoning
   - Deductive, inductive or abductive reasoning
5. Formal operational schema
   - Science Reasoning (criterion task)
   - Control of variables (optional)
6. Integrated tasks
   - Exigency of information
   - An extended task (chemical substances)
   - Mechanical reasoning (optional)

**Management of Learning**
- Assessed in conjunction with belief scales.

**Affective Self-Regulation**
- Indirect assessment based on the amount, type, and configuration of items not responded to on the competence and belief scales.
Belief scales proposed to be included in learning-to-learn assessment

**Learning Motivation**
1. Goal orientation  
   Learning, achievement, performance-approach, performance-avoidance, and work-avoidance orientations
2. School value
3. Fear of failure
4. Academic withdrawal
5. Control motivation  
   Cause of failure or success

**Action-control beliefs**
Agency beliefs, means-ends beliefs, control expectancy

**Academic Selves at School**
6. Academic self-concepts  
   Reading, writing, speaking, mathematics, thinking
7. Study skills  
   Deep and surface processing  
   Other study operations (optional)
8. Learning opportunities  
   (optional)

**Task Acceptance**
9. Task value
10. Self-efficacy
11. Interest
12. Self-handicapping

**Self-Evaluation**
13. Self-esteem
14. Social self-concept
15. Support from others  
   Parents, teachers, peers
16. Socio-moral self at school, as compared to with family and friends  
   Good pupil, sloth, self-assured, rational

**Future Orientation**
17. Future and possible selves  
   (optional)

**Societal Frames**  
   (optional)

**Perceived Support for Learning and Studying**
Parents, teachers, peers
The Finnish Studies

**A national study of 6th graders in 1996**
(the 12-year-old age cohort, N=2891)
The results of this study have since acted as the national norm against which later testing results from individual schools and school districts have been measured.
A report of the study has been published in Finnish, Hautamäki, J. et al, 1999.

**A national study of 9th graders in 1997**
(the 15-year-old age cohort, N=2826)
The results of this study have likewise since been used as the national norm against which later testing results from individual schools and school districts have been measured.
A report of the study has been published in Finnish, Hautamäki, J. et al., 2000.

**A national study of upper secondary school students in 2000**
(the 17+ age cohort, both high school and vocational school. N=3639)
Both student groups were assessed using the same sets of tests. Some of the scales were the same as in the earlier studies to allow for developmental comparison, even if the study was not a follow-up of earlier cohorts. Some more age- and ability-appropriate tasks were added, especially in the areas of cognitive competencies and general knowledge. Special focus was placed on the changes and the development manifest in the two student populations that chose, or were bound to, different educational careers after comprehensive school.
A report of the study is to be published in Finnish in 2002 (Hautamäki et al., in press).

**A new national study of 9th graders in 2002**
(the 15-year-old age cohort, N=app. 4000+3500)
The study, a repeat of the 1997 test, acted also as a trial for the new e-form test-package (N=app. 4000, pencil-and-paper; N=app. 3500, e-form). A portion of the students (N=app. 500) filled out both forms to allow for a preliminary standardisation of the e-form.
A report of the study is due in Finnish in 2002/3.

**The City of Helsinki** is running an extensive programme of learning-to-learn assessment under which all the city’s primary and lower secondary schools will be assessed over a period of four years. A quarter of the schools will participate each year with their 6th or 9th grades. The first assessments were carried out in 1999. The City of Helsinki also participated in the national assessment of upper secondary school students by extending it to cover all the city’s schools.