Learning to Learn: What is it and can it be measured?

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Contents

Abstract

Measuring Learning to learn is part of a process to establish and monitor the learning processes and outcomes needed to facilitate the development of Lifelong learning in Europe. This report highlights the European political developments that have taken place which have placed learning to learn as a political priority within the Lisbon 2010 Education and Training process. It connects these with the turn to a competence based approach that emphasis the testing of a holistic and real-world based capability that includes values, attitudes, knowledge and skills.

The report analyses how the competence learning to learn has been defined. It highlights different understandings which have been developed from within the social-cultural and cognitive psychological paradigms. It investigates the European definition of learning to learn and how it broadly transverses these epistemological positions. The report also establishes what learning is not by visiting concepts such as intelligence, problem-solving and learning strategies.

In a second step the report investigates how learning to learn can be measured. 3 national tests that are combined within the European test are explained: University of Helsinki test, the Bristol University test and the Dutch test. The European framework is then described and preliminary evaluation of the European learning to learn prepilot is briefly given. Existing international tests, in particular PISA, are analysed to see if these tests cover the definition. The results described are that these tests do not cover the full range of aspects of learning to learn and tend only to use the affective questions as explanatory variables for the test results rather than one dimension of the measurable outcomes. Finally, future directions for research to improve the conceptual basis of the European learning to learn test are proposed which highlights the need for more interdisciplinary research in the field of learning.

1. Introduction

One of the basic skills for success in the knowledge society is the ability to learn. With increasingly rapid changes in the work place, in part due to changing technology and as a result of changing societal needs in the context of globalization, citizens must learn to learn in order that they can maintain their full and continued participation in employment and civil society or risk social exclusion. In this context learning to learn is a quintessential tool for lifelong learning and thus education and training needs to provide the learning environment for the development of this competence for all citizens including persons with fewer opportunities (those with special needs and school dropouts), throughout the whole lifespan (including pre-school and adult learners) and through different learning environments (formal, non-formal and informal) (Fredriksson and Hoskins, 2007).

There has been an increasing interest in trying to define what is referred to as "basic skills", "new basic skills", "key competencies," "central competencies," "problem solving abilities" and "life skills." The Council and the European Parliament adopted in December 2006 a Recommendation on key competencies for lifelong learning which outlined the European position on key competences which in part had been informed by Eurydice study (Eurydice, 2002). On a more global level the Swiss Federal Statistical Office together with the OECD organised the project DeSeCo (Defining and Selecting Competencies) (Rychen, and Hersch-Salganik, 2003; DeSeCo, 2005) whilst UNESCO has tried to define the concept of "life skills" (UNESCO, 2002).

There have also been a number of recent studies carried out on learning to learn; the University of Helsinki has as a part of the Finnish project "Life as Learning (LEARN)" organised a number of studies on learning to learn (Hautamäki et al., 2002). Within the British Project "Teaching and Learning Research Programme" questions related to learning to learn have been raised (TLRP, 2007). Within the PISA surveys a special study took place in 2003 on problem solving (OECD, 2004).

The aim of this report is to identify the phenomenon of learning to learn and to highlight the challenges associated with defining and measuring this concept in the context of the development of a European test on learning to learn.

This report will begin with introducing the European policy context of learning to learn, the reasoning behind the development of indicators and how the need for a European test on this topic was established. To deepen this discussion, chapter 3 will reflect on the concept of competences and how learning to learn can be understood as a key competence. Chapter 4 of the report defines this phenomenon exploring the concept of learning to learn and diverse definitions that exist. This will be followed by chapter 5 where concepts close to learning to learn are discussed and distinctions between these concepts and the concept of learning to learn developed. In chapter 6 we will explore the second key questions of the paper – how learning to learn can be measured and introduce the Framework of the European learning to learn test. The section will also discuss some

tests that could be considered close to measuring learning to learn and explore the similarities in differences between these tests. The paper will close with summary of the key findings and future directions.

2. The European Policy Context

To understand the current interest in learning to learn at a European level it is necessary to revisit the policy process that has led to the need to develop a European indictor in this field. To understand the foundation for the development of indicators on key competences it is necessary to return to the introduction of the Open Method of Coordination and the Lisbon summit[1] in 2000 when the leaders of the EU member states met to discuss goals and strategies for the future known as the Lisbon strategy.

2.1 Learning to Learn as a part of the Lisbon Process

An important basis for the development of indicators on learning to learn and indeed all key competences and indicators in the field of education has been the introduction in the Lisbon Council 2000 of the tool of the Open Method of Coordination (European Council, 2000). This intergovernmental cooperation framework was introduced as part of the Lisbon strategy to enable member states to make progress towards shared goals in domains where the power and decision making authority clearly rests with the member states. In these circumstances the shared goals are defined and called objectives and are set within a given timeframe. In order to measure progress made towards fulfilling these objectives then indicators and benchmarks need to be agreed. Regular reviews are set in place to monitor the progress made. The sharing of good practice is used as method for assisting member states to obtain the shared objectives.

In Lisbon the leaders of the EU member states decided that the strategic goal for the next decade was that Europe should "*become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion*" (paragraph 5, European Council, 2000). The Conclusions from the Lisbon summit continues with a number of recommendations on what needs to be achieved order to reach the strategic goal. The conclusions refer to completing the internal market and the application of an appropriate macro-economic policy mix. In addition to traditional economic measures, the need to invest in people is also mentioned. This was further explained under the heading "*Education and training for living and working in the knowledge society*". Under this headline, a series of measures related to Europe's education and training systems is mentioned. Among these measures was the development of a European framework to define the new basic skills to be provided throughout lifelong learning (European Council, 2000 paragraph 26). This was the first time in the history of EU summits that education and training is described as a major tool for implementing a strategic goal (Fredriksson, 2003).

The Lisbon European Council called on education ministers "*to undertake a general reflection on the concrete future objectives of education systems focusing on common concerns and priorities while respecting national diversity (….) and presenting a broader*

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[1] The meeting of the European leaders in Lisbon is usually referred to as the Lisbon European Council.

report to the European Council in the spring in 2001" (European Council, 2000, paragraph 27,).

With education set at the heart of economic prosperity and social cohesion specific objectives in the education field were required. In February 2001 the Council on education adopted a report on the concrete future objectives of the education systems. This report was approved in March 2001 by the Stockholm European (Education Council, 2001), which asked that a detailed work programme be drawn up. The detailed work programme was adopted on 14 February 2002 and was the subject of a joint report transmitted by the Commission and the Council to the Barcelona European Council on 15 and 16 March 2002. These reports contained 3 objectives and 13 sub-objectives. The 3 objectives are below;

1) improving the quality and effectiveness of education and training systems in the European Union;
2) making lifelong learning accessible to everyone;
3) making our education and training systems more outward-looking as regards the rest of the world.

The Education Council (2001) text objective 1.2 under the sub-objective, 'Developing skills for the knowledge society' stated that the skills that are needed are for 'work and life'. In this objective it clearly states that the most important competence 'is the ability to learn' and that lifelong learning is dependent on this. This statement formed the foundation for the discussion of the key competence of learning to learn.

The detailed work programme highlighted the shift in the terminology from using the term 'basic skills' that it said emphasised 'numeracy and literacy' to 'key competences' that focused also on the needs of modern society which reflected not just the cognitive but the affective dimensions (Education Council, 2002 p.7). It stressed the need for the assessment of 'personal effort' and 'attitudes' (Education Council, 2002 p.7). This policy text also gave an initial list of the 'key competences' to be reviewed; numeracy, literacy, maths science and technology, foreign languages, ICT skills, learning to learn, social skills, entrepreneurship and general culture.

A plethora of activities were initiated as a result of this work programme in particular working groups for 13 sub-objectives comprised of nominated national experts. One of the original working groups was developed on basic skills, foreign-language teaching and entrepreneurship it was this group who were involved in the identification of key competences needed for everyone (European Commission, 2005a) which developed into the European Reference framework of key competences (European Commission, 2005a) (Education Council, 2006).

Indicators and reporting
Another of the working groups which were developed was called the Standing Group Indicators and Benchmarks and was given the objective to support the development of indicators and benchmarks and first met in 2002. In 2003 they agreed a framework for the measurement of the 3 objectives and 13 sub-objectives consisting of 29 indicators in order to measure progress. A reporting process was begun with the first report on

progress in the form of a staff working paper in 2004 that has been published yearly since this date (European Commission, 2004, 2005b, 2006, 2007, 2008).

A separate report adopted by the Council, 'The Joint Council/Commission Report on the implementation of the Education & Training 2010 work programme' has been published biannually since 2002 (Education Council and European Commission, 2004, 2006, 2008) giving key policy statements from the monitoring reports.

Learning to learn, however, has yet to be measured or monitored within either of these reports.

Development of CRELL 2005
Based on the 2005 Council decision (Education Council, 2005) on new indicators in education and training, the Centre for Research on Lifelong Learning (CRELL) was created inside the European Commission at the Joint Research Centre in Italy. It was constructed with the purpose to support the DG Education and Culture in the development of indicators and benchmarks in Education and Training. CRELL began in autumn 2005 with one of the first projects to be developed on topic of learning to learn.

Development of new indicators
In the same Council conclusion from 2005 (Education Council, 2005) the Council requested strategies to develop indicators in a number of fields of education. In areas where data was said not to exist then new European surveys were requested to be proposed to the Council. This was the case for learning to learn and language skills. This Council conclusion (2005) also asked the European Commission to report back in 2006 on a proposal for a Coherent framework of indicators and benchmarks.

The new Coherent Framework 2007
The Commission in 2006 proposed 8 areas for indicators including key competences. In this domain indicators proposed were on **Literacy in reading, maths and science**, **Language skills**, **ICT skills**, **Civic skills**, and **Learning to learn skills**. All the indicators on key competences were adopted[2] as core indicators in the Council in 2007 (Education Council, 2007) in the form of a Communication. In total 16 core indicators were adopted and with 5 of these indicators on key competences, it gave a significant position to the development and measurement of key competences in Europe.

The development of the European learning to learn test
The European Network of Policy Makers for the Evaluation of Education Systems was asked in 2005 by the Analysis, statistics and indicators Unit of the Directorate-General for Education and Culture of the European Commission to present a proposal on how a pilot survey across different European countries could be carried out with the view of creating a European indicator of the development of learning to learn. An expert group was set up by the network containing experts appointed from countries interested in the project. The Expert Group reviewed existing European experience in the assessment of

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[2] Proposal which were not accepted by the Council were for indicators on stratification of education systems, school management, school as a multipurpose learning centre and returns to education.

Learning to Learn, discussed the possibility of devising an assessment framework valid across the EU and discussed how a pilot project for assessing Learning to Learn skills in European Union members States could be organised (Bonnet et al., 2006).

Based on this initial report (Bonnet et al., 2006), the European Commission set up an expert group, with the support of CRELL, to develop an instrument for testing learning to learn. It was based on 4 existing national instruments on learning to learn which were considered to be useful in the further work to create a European instrument. These four instruments were the tests on learning to learn which had been elaborated by the University of Helsinki (Hautamäki *et al*., 2002), the Effective Lifelong Learning Inventory (ELLI) developed by The University of Bristol (Deakin-Crick, Broadfoot & Claxton, 2004) the test on cross-curricular skills developed by the University of Amsterdam (Elshout-Mohr, Meijer, Oostdam & van Gelderen, 2004) and the test on Metacognition developed by the University of Madrid (Moreno, 2002). These four instruments and the projects behind them will be further discussed in section 3 on defining learning to learn and section 6 measuring learning to learn. This test has been prepiloted in 8 different European countries (Spain. Portugal, France, Italy, Cyprus, Finland and Slovenia) the results of which will be analysed and published autumn 2008 and discussed briefly in Section 6.4.

In parallel to the test development on the instrument there has been a need to conceptually develop the concept of learning to learn. This has been achieved through the creation of a European research network on learning to learn with the purpose to provide opportunities for researchers and practitioners with expertise in the field of learning to learn from different countries research experience. Within the work programme of CRELL[3] a network on learning to learn was established. The network contains 20 persons from different countries with different expertise in the field of learning to learn. Three meetings of the network have taken place during 2006 - 2007. Reports from the meetings are available on the CRELL website[4].

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[3] CRELL - Centre for Research on Lifelong Learning is a part of the Institute for the Protection and Security of the Citizens at the European Commission Joint Research Centre in Ispra, Italy
[4] http://crell.jrc.ec.europa.eu

3. Learning to Learn as a Key Competence

In order to understand learning to learn as a key competence it is necessary to explore what is a competence and what are key competences. Competences have come to the fore due to the policy demand to know what individual learning outcomes are required for a citizen to contribute to a modern globalised society both economically and within civil society. These learning outcomes have been called competences and are usually comprised of a combination of knowledge, skills, attitudes and values. Competences are typically measured in relationship to real world tasks and not general theoretical abilities, for example, PISA. Key competences are those competences which are quintessential necessary through out the life for continuing to gain employment and be included within the everyday life activities including those of civil society and decision making. The key difference from the past is that the emphasis in education when highlighting competences based approach is no longer the passing down of knowledge from generation to the next (Hoskins and Deakin Crick, 2008). This understanding does not function in the rapidly changing technological and globalised world of today where it is not possible to establish which type of knowledge is needed in the next 5 or 10 years let alone a lifetime. Instead it takes a holistic notion of the individual combing the values, attitudes of the individual such as the desire to learn from others in interaction and the valuing of different knowledge with the cognitive processes of building on prior learning and the capacity to develop strategies and solve problems to learn something new.

As stated at the beginning of this paper, learning to learn has been identified at the European level as one of these key competences. The Council of Europe (1997) symposium proposed that competence and competencies should be regarded *"as the general capability based on knowledge, experience, values, dispositions which a person has developed through engagement with educational practices"* (p. 26). One project which has worked on the development of the theoretical understanding of key competences is the OECD and Swiss Federal Statistical Office DeSeCo project. Within the context of this project a competence was defined by Rychen and Salganik (2003 p. 43) 'as the ability to successfully meet complex demands in a particular context through the mobilisation of psychosocial prerequisites (including cognitive and non-cognitive aspects)'. They further explain that competences are the 'internal mental structures in the sense of abilities, dispositions or resources embedded in the individual' and these function in interaction with a 'specific real world task or demand'. Later Rychen and Salganik (2003 p. 44) describe these internal structures of a competence as the dimensions of 'Knowledge, Cognitive skills, Practical skills, Attitudes, Emotions, Values and ethics and Motivation'.

A competence is defined as something beyond skills and knowledge for example Kegan (2002, p. 2) discusses that the*"great benefit to a concept like "competence" is that it directs our attention beneath the observable behavioral surface of "skills" to inquire into the mental capacity that creates the behavior. And it directs our attention beyond the acquisition of 'knowledge' as storable contents (what we know) to inquire into processes by which we create knowledge (how we know)."*

In policy texts, as well as in many other contexts, the words skills and competences are used interchangeably. In education research these words are defined differently and as Chisholm (2005) points out : "*they do not really mean the same thing. Competence means the ability to apply knowledge, know-how and skills in a stable/recurring or changing situation. Two elements are crucial: applying what one knows and can do to a specific task or problem, and being able to transfer this ability between different situations*"(p.1). A **skill,** however, is normally defined as an ability, usually learned and acquired through training, to perform actions which achieve a desired outcome.

Rychen also discusses the difference between competence and skill saying that "Let us emphasise that the terms competence and skill were not used as synonyms. Skill was used to designate an ability to perform complex motor and/or cognitive acts with ease and precision and an adaptability to changing conditions, while the term competence signated a complex action system encompassing cognitive skills, attitudes and other non-cognitive components. In this sense, the term competence represented a holistic concept." (Rychen, 2004 p. 21 – 22). In an article about how to develop key competencies in education systems Tiana discuss the difference between competence and skill: "From a strictly conceptual viewpoint, competence has a broader meaning than skill and many analysts consider a competence to include several skills. If we accept that distinction, then the concept of competence should be considered as broader, more general and a higher level of cognition and complexity than the concept skill." (Tiana 2004 p.73)

3.1 Key Competences

Policymakers are interested to know which are the transversal competences that are essential for an individual to be employable and socially included. Thus domain specific competences may be relevant for specific occupations but do not fit into a concept of what is necessary for all citizens. Key competencies are defined in many different ways. In an OECD report the philosophers Canto-Sperber and Dupuy (OECD, 2001, p. 75ff) refer to key competencies as competencies indispensable for the good life. In the same report the anthropologist Goody writes that "*the major competencies must be how best to spend one's work and leisure-time within the framework of the society in which ones lives*' (OECD, 2001, p. 182). According to Dearden a key competence refers to 'second-order learning' (Dearden, 1976, p. 70) thus not content or context based but a transdisciplinary competence. The DeSeCo project proposes, based on a review of existing work in the area of competence, three general criteria: 1) key competencies "*contribute to highly valued outcomes at the individual and societal levels in terms of an overall successful life and a well-functioning society*", 2) key competencies "*are instruments for meeting important, complex demands and challenges in wide spectrum of contexts*", 3) key competencies "*are important for all individuals*" (Rychen, 2003 p. 66 – 67). Rychen also provides a short definition of the concept key competence: "*Key competence is used to designate competencies that enable individuals to participate effectively in multiple contexts or social fields and that contribute to an overall successful life for individuals and to a well-functioning society (i.e. lead to important and valued individual and social outcomes).*" (Rychen, 2004 p. 22).

The Eurydice report on key competencies (Eurydice, 2002) reviews the literature on the topic key competencies and suggests two criteria to decide about key competencies: "*The first criterion for selection is that key competencies must be potentially beneficial to all members of society. They must be relevant to the whole of the population, irrespective of gender, class, race, culture, family background or mother tongue. Secondly, they must comply with the ethical, economic and cultural values and conventions of the society concerned*" (Eurydice, 2002, p. 14). Eurydice also concludes about key competencies: "*The main conclusion to be drawn from the large number of contributions to this search for a definition is that there is no universal definition of the notion of 'key competence'. Despite their differing conceptualisation and interpretation of the term in question, the majority of experts seem to agree that for a competence to deserve attributes such as 'key', 'core', 'essential' or 'basic', it must be necessary and beneficial to any individual and to society as a whole. It must enable an individual to successfully integrate into a number of social networks while remaining independent and personally effective in familiar as well as new and unpredictable settings. Finally, since all settings are subject to change, a key competence must enable people to constantly update their knowledge and skills in order to keep abreast of fresh developments*" (Eurydice, 2002, p. 14).

Within the DeSeCo project a number of OECD countries were asked to list which competences they considered to be key competences. Four groups of competencies were frequently mentioned in the country reports: Social Competencies / Cooperation; Literacies / Intelligent and applicable knowledge: Learning Competencies / Lifelong Learning; and Communication Competencies (Trier, 2002). Eurydice has examined how EU member countries deal with the concept key competencies in their curricula: "*…the development of key competencies is a curricular feature in four out of all the education systems under consideration. A further six are examining whether it would be appropriate to integrate the development of key competencies into their general education curricula. Identification of these competencies is above all a question of educational priorities but also one of terminology. The most striking difference between countries seems to be the type of competencies – general (6), subject-specific or both – that they regard as 'key competencies'. For all types to qualify as such, they must be transferable to contexts other than the one in which they were acquired. General key competencies are developed with the help of many subjects, while subject-specific ones (as their name suggests) are best developed via one particular subject*" (Eurydice, 2002, p. 34 -35)

Key competences can therefore be seen as the competences required for an individual well being in that society. There are three major factors that have been highlighted: first, the *knowledge economy* –a competences that enables you to get a job, second, *lifelong learning* – the ability to continue to update your skills in a rapidly changing job market and third, *social cohesion* – that people have the social skills necessary for society to function in a democratic manner and in a culturally diverse environment. Learning to learn has been argued to be a transversal competence that is necessary for well being in Europe and in particular is highly relevant for developing and updating job related skills.

3.2. Is Learning to Learn a Key Competence?

The DeSeCo project argues that "*Key competencies are not determined by arbitrary decisions about what personal qualities and cognitive skills are desirable, but by careful consideration of the psychosocial prerequisites for a successful life and a well-functioning society. What demands does today's society place on its citizens? The answer needs to be rooted in a coherent concept of what constitutes key competencies*" (DeSeCo, 2005, p. 6). The DeSeCo project identifies three categories of key competencies: 1) interacting in socially heterogeneous groups, 2) acting autonomously and 3) using tools interactively. None of these categories refer directly to learning to learn, but several competencies mentioned within the categories are close to those mentioned in the definition of learning to learn in the recommendation on key competencies for lifelong learning adopted by the Education Council and the European Parliament (Education Council, 2006) and in the framework on learning to learn (Bonnet et al., 2006). The category "interacting in socially heterogeneous groups" contains among several competences the ability to cooperate. The category "acting autonomously" contains three competencies: 1) acting within the "big picture" or the large context, 2) forming and conducting life plans and personal projects and 3) defending and asserting one's rights, interests and needs. The category "using tools interactively" refers to three competencies: 1) using language, symbols, and text interactively, 2) using knowledge and information interactively and 3) using technology interactively (Rychen, 2003 P 85 – 104).

Based on the work of the DeSeCo project Tiana (2004) makes a tentative proposal for key competencies for education systems. He divides his proposal into two parts; curriculum- bounded competencies and cross-curricular competencies (see table 1).

Tiana does not mention learning to learn explicitly, but several of the cross-curricular competencies are close to those mentioned in the recommendation on key competencies for lifelong learning adopted by the Council and the European Parliament (Education Council, 2006) and in the framework on learning to learn (Bonnet et al., 2006).

Eurydice notes in the report on key competencies that several of the concepts that can be regarded as parts of learning to learn are discussed in many countries: "*Self-initiated, self-regulated, intentional learning at all stages of life has thus become the key to personal and professional advancement. Within this context, much attention is now focused on the critical role of metacognitive competence, the capacity to understand and control one's own thinking and learning processes. This competence makes people aware of how and why they acquire, process and memorise different types of knowledge. In this way, they are in a position to choose the learning method and environment that suits them best and to continue to adapt them as necessary*" (Eurydice, 2002. p. 16).

Curriculum- bounded competencies	Cross-curricular competencies
Ability to communicate with others, both orally and in writing: - oral and written mastery of the mother tongue - reading comprehension - mastery of at least one foreign language	Metacognitive competencies - problem solving - developing learning strategies - critical judgement - divergent thinking
Basic mathematics skills and numeracy	Intrapersonal competencies - management of motivation and emotions - self-concept - developing personal autonomy
Computer literacy and media competence	Interpersonal competencies - capacity of joining and functioning democratically in groups - ability to relate well to other people - ability to play by the rules and to manage and resolve conflicts
Capacity of situating in the world of the individual - knowledge of the natural and social world - development of civic attitudes	Positional competencies - ability for coping with complexity - dealing with diversity and change

Table 1: Key competencies for education systems: a tentative proposal
Source: (Tiana, 2004 p. 51)

As discussed earlier (section 3.2.) learning to learn is mentioned as one eight key competencies in the recommendation on key competencies for lifelong learning, which was adopted by the Education Council and the European Parliament in December 2006 (Education Council, 2006).

From a research perspective it seems reasonable to refer to learning to learn as a key competence. It makes sense to refer to it as a competence and not a skill because it seems to include not only skills component but also affective dimensions such as attitudes. It also make sense to refer to learning to learn as a key competence because it is a competence that is *"a highly valued outcomes at the individual and societal levels in terms of an overall successful life and a well-functioning society"*, an *"instruments for meeting important, complex demands and challenges in wide spectrum of contexts"* and *"important for all individuals"*(Rychen, 2003, p. 66 - 67).

As shown above, different lists of key competencies have been referred to in diverse contexts. Learning to learn is directly referred to as a key competence in some of these lists, while others have had alternative organisations in which learning to learn can be said to be referred to indirectly i.e. even if learning to learn is not directly mentioned a number of skills and attitudes that are part of definitions of learning to learn are referred to.

4. What is Learning to Learn?

As can be seen from the previous section of this report Learning to learn has become a political priority in the education context and beyond due to the link between the development of this key competence lifelong learning and the knowledge economy and social cohesion. From this perspective it is of crucial interest to reflect on what learning to learn actually is. Several attempts have been made to define the concept. Stringher (2006), from the learning to learn research network, has made a review of existing sources on learning to learn and found 40 different definitions of learning to learn. She points out the complexity of this concept and notes that in the present understanding of learning to learn   there are a diversity of concepts such as metacognition, socio-constructivism, socio-cognitive and socio-historical approaches, lifelong learning and assessment studies.

4.1.   The Paradigms Debates

Learning research has developed typically within two separate research paradigms the cognitive psychology paradigm and the social cultural paradigm.

The cognitive psychological perspective traditionally examines how human beings process information and/or construct new knowledge in terms of internal cognitive processes. From this perspective the human brain is sometimes understood as a "processor" and theories of how information is collected, processed, stored and searched for in the memory are discussed (see for example Norman, 1969). An important contribution and development of the cognitive tradition has been made by Jean Piaget (see for example Piaget, 1972) in his work on the cognitive development of the child. The main object of his studies has been mechanisms used by the learner to internalise knowledge. In this approach, what can be identified and measured are the learning outcomes from learning to learn which are then described in relationship to being to perform certain cognitive processes. The affective dimension, in this approach, is measured in order to understand the acceptance and motivation towards performing the task.

The social/cultural perspective also examines how knowledge, skills and attitudes are constructed. However, the difference is that the focus is directed towards the social dynamic of learning rather than the internal cognitive processes. In the field of education the social cultural theories has been developed amongst others by Bernstein and Vygotsky. The epistemological stance is the principle that learning is embedded within a social context and develops through social interaction thus highlighting the importance of learning relationships, communities of learning and the social production of competences. Within this paradigm, learning to learn can not be understood separately from the learning context (classroom, youth club, work environment, home, peers, adult learning centre etc.) and the relationship and the interaction between the learner and the facilitator of learning (the facilitator could be a teacher and a student, a student with their peers or a youth worker with another young person etc.). Thus in this discipline learning to learn

can be understood more as a process which is captured through its interaction with the learning environment. Thus the affective dimension of learning to learn has the greater weight in this approach due to the fact that this includes the identification and the measurement of the social learning environments and includes scales on values, attitudes and learning relationships.

4.2. EU Definition

The EU working group on "Key competencies" identified 'Learning to learn' as the ability to pursue and persist in learning. As a result of the outcomes of the working group a recommendation on key competencies for lifelong learning has been developed and was adopted by the Council and the European Parliament in December 2006 (Education Council, 2006). The Recommendation sets out eight key competencies:
1) Communication in the mother tongue;
2) Communication in foreign languages;
3) Mathematical competence and basic competences in science and technology;
4) Digital competence;
5) Learning to learn;
6) Social and civic competences;
7) Sense of initiative and entrepreneurship; and
8) Cultural awareness and expression.

The recommendation contains the following definition of the concept learning to learn:
'Learning to learn' is the ability to pursue and persist in learning, to organise one's own learning, including through effective management of time and information, both individually and in groups. This competence includes awareness of one's learning process and needs, identifying available opportunities, and the ability to overcome obstacles in order to learn successfully. This competence means gaining, processing and assimilating new knowledge and skill as well as seeking and making use of guidance. Learning to learn engages learners to build on prior learning and life experiences in order to use and apply knowledge and skills in a variety of contexts: at home, at work, in education and training. Motivation and confidence are crucial to an individual's competence..' (Education Council, 2006 annex, paragraph 5).

Learning to learn within the European Commission texts contains elements from both social cultural and cognitive psychological traditions. What we can see from the above definition is that it contains both affective and cognitive dimensions. The affective refers to social skills which can be seen in the definition - the learning relationships, 'motivation', 'confidence' and learning strategies -'organise their own learning, including through effective management of time and information'. The cognitive dimensions is referenced in the definition in relationship to the capacity to 'gain, process and assimilate knowledge' and the 'ability to handle obstacles'. The definition emphasises that the combined skills should be able to be used in multiple different contexts by the individual who has them. This is referring to the transversal nature of learning to learn. The definition also emphasises the lifelong and life-wide learning dimension of this

competence by referring to building on 'prior learning' and emphasising the multiple environments where this competence can be utilised.

As a result of the European framework of key competences, Learning to learn has been recently introduced into the national curriculum in Spain, Italy and Cyprus. In other European Countries like Portugal, Austria, Finland and England they have similar concepts in their curriculum. There are also countries like France where the concept of learning to learn is quite new.

4.3. The University of Bristol Definition

The University of Bristol has developed ELLI, the Effective Lifelong Learning Inventory (Deakin Crick, Broadfoot and Claxton, 2004) (for more information about ELLI see section 6.3). This project aims to define and measure a person's orientation towards effective lifelong learning. Lifelong learning is understood in this context as lifelong and lifewide and builds on Smith and Spurling (1999) concept that emphasises 'continuity, intention and an unfolding strategy in personal learning' and the transversal aspects of 'personal commitment to learning, respect for other learning and respect for truth'(Deakin Crick, Broadfoot & Claxton, 2006 p. 250). They call what is needed to achieve this capacity as Learning power and this is defined as, "*a complex mix of dispositions, lived experiences, social relations, values, attitudes and beliefs that coalesce to shape the nature of an individual's engagement with any particular learning opportunity of individual students*" (Deakin Crick, Broadfoot & Claxton, 2006). The concept 'learning power' from the empirical study has been identified as containing seven dimensions; Growth orientation (changing and learning), Critical curiosity, Meaning-making, Dependence and fragility, Creativity, Strategic awareness**.**

The definition is based on the concept of learning as a process and that it is part of a holistic process that involves a combination of social and environmental factors in combination with values, desires and volitional and behavioural elements and cognitive processes (Deakin Crick, Broadfoot & Claxton, 2006).

4.4. The University of Helsinki Definition

One of the largest research projects on learning to learn is the project which has been run by the University of Helsinki (for more information about the project see section 6.1). Using the cognitive paradigm, a framework for assessing learning to learn has been developed. Learning to learn is 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*" (Hautamäki et al., 2002, p. 39). The framework recognises that the 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*" (Hautamäki et al., 2002, p. 41). The 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 Caroll's fluid and crystalised intelligence or to*

Snow's procedural and declarative knowledge" (Hautamäki et al., 2002, p. 41). Affective skills and abilities "*refer to the control of emotions in tasks 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 sphere of work*" (Hautamäki et al., 2002, p. 41).

4.5. Other Definitions

There are many other attempts to try to define learning to learn. The British Campaign for Learning defines 'learning to learn' "*as a process of discovery about learning. It involves a set of principles and skills which, if understood and used, help learners learn more effectively and so become learners for life. At its heart is the belief that learning is learnable*" (The Campaign for Learning, 2007). The Campaign continues and argues that "'*learning to learn' offers pupils an awareness of:*
- *how they prefer to learn and their learning strengths*
- *how they can motivate themselves and have the self-confidence to succeed*
- *things they should consider such as the importance of water, nutrition, sleep and a positive environment for learning*
- *some of the specific strategies they can use, for example to improve their memory or make sense of complex information*
- *some of the habits they should develop, such as reflecting on their learning so as to improve next time"* (The Campaign for Learning, 2007).

The CRELL research network on learning to learn attempted to further describe and define the concept. The concept of metacognition became a major theme of these debates. Several of the contributions in the reports from the Learning to learn network refer to metacognition. For example, Bakracevic (2006) suggested that metacognition is an important building bloc of learning to learn. Moreno (2006) argued that the learning to learn approach is mainly related to a more comprehensive notion of metacognition and that this term usually is defined as *any knowledge or cognitive activity that takes as its object, or regulates, any aspect of any cognitive enterprise (*p. 43*)*. In the same way that metacognition refers to cognition about cognition, she suggests that we could talk about *metalearning* in the sense of learning about learning. Sorenson (2006) stressed the metalearning perspective as one of the most significant features of the learning to learn phenomenon. She argued that metalearning is *learning of meta-knowledge about learned knowledge*, i.e. learning about how one learns; learning about one's own learning, thinking and acting, and learning how to learn is an important part of meta-learning.

Learning to learn has been defined by McCormick (2006) as,
- 	'Knowledge about cognition (knowing what you do and don't know)
- 	Self-regulating mechanisms (planning what to do next, checking outcomes of strategies, evaluating and revising strategies)'.
He highlighted a definition by Dearden focusing on the concept of "second-order learning" (1976): "Learning how to learn is at one stage further removed from any direct specific content of learning. It might therefore reasonably be called 'second-order learning'. There could be many such comparably second-order activities, such as

deliberating how to deliberate, investigating how to investigate, thinking out how to think things out, and so on".

Another concept used in several of the presentations in the network meetings was self-regulated learning. Bakracevic (2006) pointed at self-regulation as an equally important part of learning to learn as metacognition. Moreno's (2006) concept metalearning also contains several references to what can be described as self-regulation, for example to plan and monitor the learning process. McCormick (2006) mentions control of pace and control of path through the material as part of the pedagogy that should support learner agency.

A similar way of discussing learning is to refer to it as a type of generic competence working behind other skills and competences. Demetriou's Smaragda Model (2006) captures this from a cognitive psychological perspective, he refers to a type of central intellectual processing and executive control which control the specialised structural systems (imaginal spatial, quantitative relational, verbal propositional, qualitative analytical, causal experimental). He further explores this when he identifies a number of skills involved in learning to learn. Among these skills are the skill to actively direct inquiry in the sake of acquiring, modifying, restructuring and automatising information skills, and knowledge; skills enabling one to make full use of available resources, knowledge; skills to support and facilities and to minimise their limitations; and skills enabling one to fight and minimise forgetting, interference, irrelevant associations, limited motivation and interest, and brain damage that may have occurred. The Smaragda Model is illustrated in figure 1.
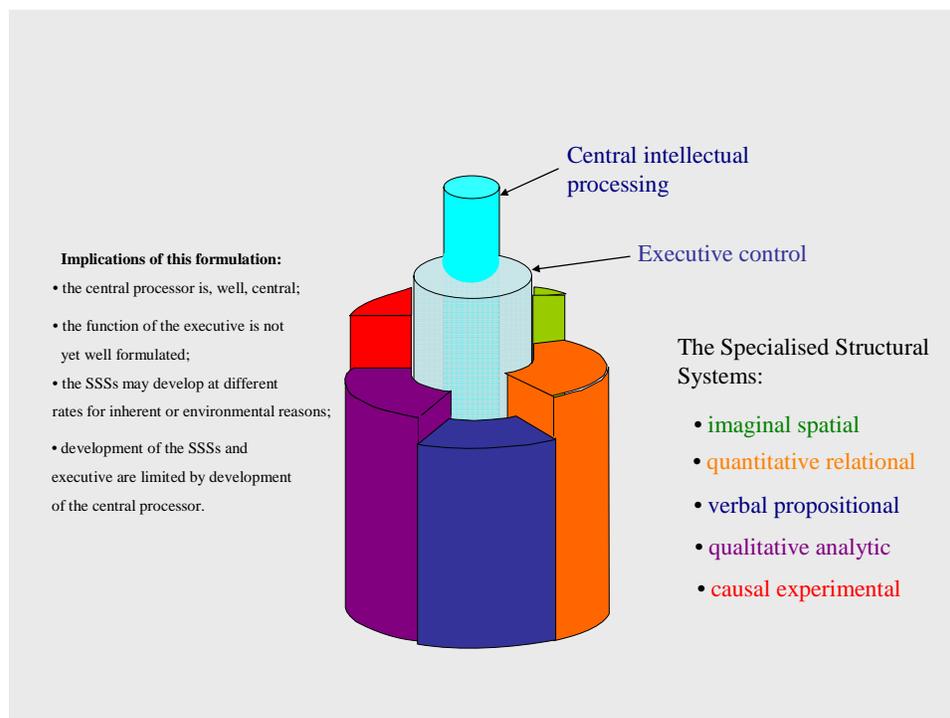

Figure 1. The Smaragda Model, source Demetriou, 2006

This conceptual understanding of Learning to learn moves towards the concept of intelligence. The relation between learning to learn and intelligence will be further discussed in section 5.1.

5. Concepts Close to Learning to Learn

One way to define learning to learn is by examining what it is not. There are a number of concepts which have been argued to be close to or overlap with this concept such as intelligence, problem solving and learning strategies. This chapter will explore the similarities and differences between these concepts.

5.1 Intelligence

One of the concepts which could be argued to be similar to learning to learn is intelligence. A traditional notion of intelligence is that this ability is more or less fixed and non malleable – thus intelligence tests – not without controversy – tried to establish innate ability. More recent understanding of intelligence constructs intelligence as malleable and describes the processes required to increase intelligence (Adey, 2006). A modern definition of intelligence, frequently used, originates from the "Mainstream Science on Intelligence", which was signed by 52 intelligence researchers in 1994:

> *a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely book learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings—"catching on", "making sense" of things, or "figuring out" what to do.* (Gottfredson, 1997, p. 13).

This definition refers to learning and many of the skills mentioned could be regarded as part of part of learning to learn competence. If this definition of intelligence is compared with the learning to learn framework (see section 6.4) it can be concluded the *affective dimension* is not taken into account in the definition of intelligence. Since learning to learn has been defined to contain a strong affective element, it is difficult to assume that learning to learn is the same as intelligence. It can also be concluded that intelligence, as defined in the definition above, is a broader than the cognitive dimension of the learning to learn concept.

IQ tests in general are trying to abstract a cognitive element out from the social context of learning. If the social context is added it is usually an after thought rather than one of the key starting points so if learning to learn should be defined as a mix of the social and cognitive interaction, IQ tests are not measuring learning to learn. This is even the case if IQ is constructed as malleable. Intelligence tests have been constructed to measure the concept of intelligence and not the concept learning to learn. Even if there are some overlaps, it is unlikely that they measure the same phenomenon.

5.2 Problem solving

Problem solving can be understood in two different ways. It can be seen as a general competence which includes the ability to combine different skills and it can be seen as domain specific knowledge and skill.

When problem solving was covered as a domain in PISA 2003 the approach was to regard it as a cross-curricular competence. Problem solving was defined in the following way: "*Problem solving is an individual's capacity to use cognitive processes to confront and resolve real, cross-disciplinary situations where the solution path is not immediately obvious and where the literacy domains or curricular areas that might be applicable are not within a single domain of mathematics, science or reading*" (PISA, 2003 p 156). Problem solving as a subject by itself was not covered in the PISA survey in 2006 and will not be covered in the 2009 survey.

Another way to regard problem solving is to assume that you need domain specific knowledge and skills to solve a particular problem. A key competence refers to 'second-order learning' (Dearden, 1976 p. 70) which is not content or context based but cross-curricular. Problem solving as such then is more of an example of a domain specific competence.

Depending on how you choose to describe problem solving it will be more or less close to learning to learn. If problem solving is, as suggested in PISA 2003, is a cross-curricular competence it is close to learning to learn. If on the other hand problem solving is context related, it is less close to learning to learn. What can be added to this argument is that, although learning is about getting the tools to solve problems, learning is not itself always about solving a problem. Learning may also refer to learning certain actions or tasks or to learn the specific meaning of concepts. Language learning is for example to a large extent related to memorising words in the new language and this type of learning task does not fit within the concept of problem solving.

The extent to which problem solving tests can be used to measure learning to learn is partly depending on how we understand the concept of problem solving. Thus if learning to learn is transferable and problem solving as such remains specific to the topic – these test do not measure the same thing. Learning to learn is not simply solving a single problem in maths or history but the ability to be able to identify what obstacles are in the way of learning how to learn something and being able to identify how to overcome these barriers and implementing the strategy. Thus learning to learn is the transferable key competence between different problems or learning tasks. This will be an important component of the argument when we discuss the existing international tests. This difference is confirmed by researchers who say that problem solving tests do not test the 'individual self awareness of the learning processes and do not test the intention to learn' (McCormick, 2006).

5.3 Learning Strategies

Another concept close to learning to learn is learning strategies. This concept is used in many different contexts and with different meanings depending on the circumstances. Generally the concept can be seen as a way of describing behaviors and thoughts in which a learner engages and which are intended to support the learner's learning process. Therefore learning strategies could be any behaviors or thoughts that are assumed to facilitate the learning process. These thoughts and behaviors may constitute more or less well organized plan of actions designed to achieve a learning goal. These plans can also be referred to as learning techniques in some contexts. Examples of learning strategies could be actively rehearsing, summarizing and paraphrasing.

Learning strategies are sometimes linked to the concept of learning styles. It is assumed that different individuals learn in different ways and a way to improve the learning of the individual is to help her/him to choose the right strategy. It is also sometimes assumed that there are specific learning styles suited for some individuals but not for others. Obviously, this is close to the earlier discussion about metacognition and more specifically to the ability of a person to reflect on her/his own learning.

As discussed above this is an important part of the concept learning to learn, but only one part. Other parts mentioned in the different definitions of learning to learn are motivation, curiosity, self-esteem and the ability to use certain learning strategies more or less well.

It can be concluded that learning strategies also is a concept similar to learning to learn – but not identical.

6. Measuring Learning to Learn

Based on the discussions above on what learning to learn is the next step is to examine whether learning to learn can be measured.

A number of European research projects have been undertaken to explore the concept learning to learn and how to measure it. These projects have been based on different theoretical frameworks. Some of these frameworks have been leaning more towards a cognitive psychological perspective and other towards a social cultural perspective. In this section the experiences from three studies which have earlier been mentioned (see sections 2.1, 4.3, and 4.4) will be briefly reported: the learning to learn project organised by the University of Helsinki, the test for cross-curricular skills developed by the University of Amsterdam and The Effective Lifelong Learning Inventory (ELLI) from the University of Bristol. Finally in this section we will examine the framework for a European test on learning to learn which a combination of these existing tests

6.1. The Finnish Learning to Learn Studies

The University of Helsinki has as a part of the Finnish project "Life as Learning (LEARN)" organised a number of studies on learning to learn (Hautamäki et al., 2002). The Finnish National Board of Education, responsible for the development of tools for assessment, started in 1995 to cooperate with a research group to develop a test on learning to learn. A framework was developed based on the definition mentioned in section 4.4. The framework contained three major elements: context-related beliefs, self-related beliefs and learning competences. The context-related beliefs was composed of societal frames and perceived support for learning and studying. Self-related beliefs was composed of learning motivation, action-control beliefs, academic selves at school, assignment/task acceptance, self-evaluation and future orientation. Learning competences was composed of learning domain, reasoning domain, management of learning and affective self-regulation.

In the tests that have been developed "*the cognitive tasks cover text macro processing, basic mathematical operations, deductive and analytical reasoning, and formal operational thinking, i.e., skills that are malleable and can be developed by good teaching, meaning that the results can be used to steer later teaching and thus enhance the effectiveness of education*" (Kupiainen & Hautamäki, 2006, p. 37). The affective component in the same tests are "*assessed using self-report questionnaires, and covers both self-related and context-related beliefs. The self-related beliefs comprise learning motivation or goal orientation, control and agency beliefs, learning strategies, self-handicapping, fear of failure, means-ends-believes, academic self-concept (in thinking, math, reading, writing), general self-esteem, school and classroom atmosphere, socio-moral view of oneself as a student, and group work behaviour. The context-related beliefs include the experienced support of significant others (parents, teachers, peers) in school and in learning related activities. Also scales to measure students' motivation for or orientation toward later / lifelong learning are included*" (Kupiainen & Hautamäki,

2006, p. 37). In addition to the cognitive and affective components the assessment also includes background data covering students' gender and home background (parents' education, mother tongue), class, school, municipality (urban, / rural) and province. In addition to the assessment of the students, later surveys have also asked teachers about their views on their own teaching, the classes they teach, and the school where they work as a whole (Kupiainen & Hautamäki, 2006).

Based on the framework a number of surveys have been organised in Finnish schools. Students in grade 6 and 9 and 17+ year olds in upper secondary education have been tested in 1996 / 2002 and 1997 / 2001, respectively. There has also been a survey at the upper secondary level in the academically oriented schools and vocational schools in 2000. In 2006 some 80 000 students had been assessed in different surveys between 1996 and 2006 (Kupiainen & Hautamäki, 2006). Some of the data will make it possible to make longitudinal comparisons between students learning to learn competence and lifelong learning.

The Finnish instrument has also been tested in Sweden in 2001 by 283 students in four upper secondary schools. Important problems highlighted in the Swedish study were problems related to the duration of the test and students' motivation to participate. The teachers found it difficult to find time for the test and several students did not want to participate. Out of the 445 students who where supposed to take the test only about 60% (283 students) actually did so (Skolverket, 2002).

6.2. The Dutch Development of Tests for Cross-Curricular Skills

In the Netherlands the University of Amsterdam has developed tests on cross-curricular skills (Meijer, Elshout-Mohr & Van Hout-Wolters, 2001; Elshout-Mohr, Meijer, Oostdam and van Gelderen, 2004) referred to as cross-curricular skills test (CCST). As a result of curricula reforms in the Dutch education system the SCO-Kohnstamm Institution of the University of Amsterdam was asked to develop "*an assessment device for the measurement of mastery of cross-curricular skills by students in secondary education*" (Meijer, 2007, p. 157).

After having analysed the skills in the Dutch core curriculum and comparing them with different theoretical classifications of general skills the cross-curriculum skills were condensed into a set of eight cross-curricular skills: 1) Conducting observations, 2) Selecting and ordering information, 3) Summarizing and drawing conclusions, 4) Forming opinions, 5) Recognising beliefs and values in opinions and actions of oneself and others, 6) Distinguishing opinions from facts, 7) Working together on assignments (cooperation) and 8) Requiring quality of one's own work (process demands as well as product demands) (Meijer, Elshout-Mohr & Van Hout-Wolters, 2001; Elshout-Mohr, Meijer, Oostdam and van Gelderen, 2004; Meijer, 2007). The construction of the test was based on these skills.

To judge the validity of the test it was assumed that the cross-curricular skills were educable skills. It was argued that "*if CCST total scores were very highly correlated with*

scores on intelligence tests, one might argue that CCST measures nothing new since one might as well administer an intelligence test" (Meijer, 2007, p. 159). Following this the following hypothesis were articulated: "*Thus, as a first hypothesis, it is expected that CCST total scores will correlate more strongly with academic achievement compared to intelligence, because the latter is assumed to be less modifiable. Furthermore, since cross-curricular skills are dependent on a positive attitude towards learning, we also expect a moderate correlation between CCST achievement and social-affective factors, such as need achievement, social affiliation in leisure time and the expenditure effort in school (e.g. time spent on homework). This is the second hypothesis. In view of the educable character of cross-curricular skills, it is expected that the structure and content of the curriculum will show an association with the mastery of cross-curricular skills as measured by CCST. That is to say, the more attention that is given to cross-curricular skills in the curriculum, the higher the achievement on CCST. This constitutes the third hypothesis. Finally, it is expected that there is a correspondence between cross-curricular skills and learning to learn skills. Learning to learn skills are supposed to be related to the capacity for lifelong learning and thus to learning skills, which are independent of a particular subject matter. This is the fourth hypothesis*" (Meijer, 2007, pp. 159 - 160). These hypotheses were tested in a study involving students in secondary education in the cohorts 1993 and 1996. Basically, these studies confirmed the hypotheses which had been established.

6.3. The Effective Lifelong Learning Inventory

The University of Bristol has developed ELLI, the Effective Lifelong Learning Inventory (Deakin Crick, Broadfoot and Claxton, 2004). ELLI is an instrument used to improve the effectiveness of learning measuring the 'learning power' of individual students (see section 4.3 above). Building on previous instruments from Ball (2001), extensive interdisciplinary literature review in the field and inputs from policy and practice an initial instrument was developed with 112 field trial items and through a lengthy testing of this instrument it was refined to 65 items and produced the 7 learning power scales. In short the seven factors included in the inventory can be described as follows:

- **Growth orientation** (changing and learning) establishes the extent to which learners regard the process of learning is itself learnable;
- **Critical curiosity** demonstrates learner's desire to find out new things;
- **Meaning-making** affirms the extent to which learners are on the lookout for links between what they are learning and what they already know;
- **Dependence and fragility** finds out how easily learners are disheartened when they get stuck or make mistakes;
- **Creativity** establishes the learners' ability to look at things in different ways;
- **Relationship/interdependence** (learning relationships) establishes the learners' ability to manage the balance between sociable and individual approaches to learning;
- **Strategic awareness** finds out learners' awareness of their own learning processes.

(Deakin Crick, Broadfoot & Claxton, 2006).

One of the interesting aspects of this instrument is that it is "*a tool that can be used diagnostically by teachers and others to articulate with their students what it is to learn.*"(Deakin Crick, Broadfoot and Claxton, 2004, p. 267). After the first studies the instrument has been used by a number of schools. "*Since 2003 over nine thousand learners between the ages of 7 and 21 have used the Learning Power Profiles in formal learning contexts, usually schools*" (Deakin Crick, 2007, p. 144). Learning Power Profiles are the feedback given to those who do the test. It is a spider diagram showing the learning profile of a person based on the seven factors included in the test.

6.4 The Framework for a European Test to Measure Learning to Learn

The Expert Group set up by the European Network of Policy Makers for the Evaluation of Education Systems in 2005 suggested in a report to the Commission in 2006 a framework for assessing learning to learn (see section 2.1). The framework is based on the assumption, proposed in the recommendation from the Education Council and the Parliament European Commission (see section 4.2), that this key competence can be defined as containing two dimensions; a cognitive part and an affective (or belief). The cognitive part of the framework contains four subscales: identifying a proposition, using rules, testing rules/propositions and using mental tools. These scales have been based on an elaboration of the subscales in the Finnish test (see section 6.1) and the Dutch CCST test (see section 6.2). The affective dimension contains five subscales: learning motivation, learning strategies and orientation towards change, academic self-concept and self-esteem, learning environment, perceived support from significant other, learning relationship. These subscales have been based on existing subscales in the Bristol University and Finnish University tests (see section 6.3) (Bonnet et al, 2006).

The European framework and test has been revised by CRELL in cooperation with experts and member states and the current framework can be seen below. The new framework model is based on three dimensions of learning to learn, Cognition, Metacognition and affective dimensions. The metacogntive dimension, based on a Spanish test from University of Madrid, (Moreno, 2002) introduces from the definition the notion of the capacity to reflect accurately on your own ability.

Learning to learn framework

The affective dimension is comprised of 3 sub-dimensions;
- Learning motivation, learning strategies and orientation towards change
- Academic self-concept and self-esteem
- Learning environment

The cognitive dimension is based on the 4 sub-dimensions;
- Identifying a proposition
- Using rules
- Testing rules and propositions
- Using mental tools

Meta-cognition which comprises 3 sub-dimensions;
- the problem solving (metacognitive) monitoring tasks,
- metacognitive accuracy
- metacognitive confidence

Figure 2. European test learning to learn framework

The current version of the test has been prepiloted in 8 European countries; France, Italy, Cyprus, Slovenia, Finland, Austria, Spain and Portugal in April-June 2008 testing 2310 14 years old students in 49 schools across Europe. Each country produced a national report and the cross country data is currently being analysed by the University of Helsinki who will report the findings in Autumn 2008. The initial results from the country reports showed that the prepilot demonstrated a need for further developments on all aspects of the instrument cognitive, affective and meta-cognitive. The national reports highlighted cultural differences in both the cognitive and affective dimension. One of the points raised has been that the most difficult and lengthy cognitive items were also testing the affective aspects of perseverance and resilience with many students simply giving up or not even trying to answer these questions. This highlights the difficulty of trying to separate cognitive and affective aspects of learning. The test was considered quite new to most students with many of them noting that what they had learned out of school had helped more than what they learned in school. Overall the prepilot indicated that further significant theoretical and conceptual research on understanding the definition of learning to learn and how this concept can be made operational is needed. In particular, what was considered necessary is working towards a truly interdisciplinary theoretical approach to the conceptual understanding of learning to learn was required as a basis towards

measuring and testing this concept. A European Communication on learning to learn will be written in autumn 2008/spring 2009 which will outline how to take this test forwards to the next stage of development.

6.6. International Tests: PISA, TIMSS and PIRLS

Over the years a number of international projects assessing students' skills and knowledge have been completed. The OECD and IEA[5] have organised an increasing number of international surveys in recent years. With the demand of international tests on countries increasing if a new European test on learning to learn is going to have a large number of countries participate then it needs to demonstrate how it is different to the existing tests.

The IEA has since 1958 organised a number of international studies. The two most recent studies are Progress in International Reading Literacy Study (PIRLS) in 2001 and Trends in Mathematics and Science Study (TIMSS) in 2003. Further TIMSS studies will take place in 2007 and 2008 and a PIRLS study was organised in 2006 (IEA, 2007)

The IEA studies (TIMSS and PIRLS) have been specific studies on subject areas. TIMSS is an assessment of students' achievement in mathematics and science. Students in the participating countries have been tested in mathematics and science, and information about the teaching and learning of mathematics and science has been collected from them, and from teachers and school principals. PIRLS is an assessment of students' reading literacy achievement and policy and practices related to literacy (IEA, 2007).

The IEA studies have generally been considered to follow the curriculum of the participating countries when the framework for the assessment has been decided. This is explained in the following way in the TIMSS 2007 framework:
"*Building on earlier IEA studies of mathematics and science achievement, TIMSS uses the curriculum, broadly defined, as the major organizing concept in considering how educational opportunities are provided to students, and the factors that influence how students use these opportunities. The TIMSS curriculum model has three aspects: the intended curriculum, the implemented curriculum, and the achieved curriculum ...*" (p. 4, Mullis et al., 2005)

In TIMSS and PIRLS the common denominator of national curricula has been used as the starting point for test construction. Partly as a reaction towards this approach the OECD organised PISA (Programme for International Students Assessment) studies emphasise a broader and cross-curricular approach to knowledge and skills. The knowledge and skills tested in PISA "*are defined not primarily in terms of a common denominator of national school curricula but in terms of what skills are deemed to be essential for future life. This is the most fundamental feature of PISA. School curricula are traditionally constructed largely in terms of bodies of information and techniques to be mastered. They*

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[5] IEA stands for the International Association for the Evaluation of Educational Achievement, and has its Secretariat in Amsterdam (The Netherlands).

traditionally focus less, within curriculum areas, on the skills to be developed in each domain for use generally in adult life. Focus even less on more general competencies, developed across the curriculum, to solve problems and apply ideas and understanding to situations encountered in life. PISA does not exclude curriculum-based knowledge and understanding, but it tests for it mainly in terms of the acquisition of broad concepts and skills that allow knowledge to be applied. Further, PISA is not constrained by the common denominator of what has been specifically taught in the schools of participating countries." (PISA 2006 p. 11,).

Even if the PISA studies have had less of a curriculum oriented approach than the studies organised by IEA it has also focused on specific domains: reading, mathematics and sciences. The way these domains have been defined have slightly changed in the frameworks which have been presented for the surveys in 2000, 2003 and 2006, but the main characteristics of the domains are basically the same.

In the framework for the 2006 survey reading literacy is defined as: "*An individual's capacity to understand, use and reflect on written texts, in order to achieve one's goals, to develop one's knowledge and potential and to participate in society*" (PISA, 2006 p. 12,). Mathematic literacy is defined as: "*An individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgements and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen*"(PISA, 2006 p.12). Scientific literacy is defined as: "*An individual's scientific knowledge and use of that knowledge to identify questions, to acquire new knowledge, to explain scientific phenomena, and to draw evidence based conclusions about science-related issues, understanding of the characteristic features of science as a form of human knowledge and enquiry, awareness of how science and technology shape our material, intellectual, and cultural environments, and willingness to engage in science-related issues, and with the ideas of science, as a reflective citizen*" (PISA, 2006 p. 12,).

In the PISA survey in 2003 problem solving was also covered as a domain. This is described in the PISA report 2003: "*One of the most important innovations of PISA is to access characteristics of students in ways that go beyond curriculum areas, but also consider their broader characteristics as learners. PISA 2000 took a first step in this direction by asking students about aspects of their motivation, self-concept, and learning strategies. PISA 2003 continues to do this, but makes an important advance in assessing directly a generic student competency that cross curricular areas - problem solving*" (PISA, 2004 p. 29,). Although the inclusion of problem solving in PISA 2003 was described as an important advance it has been decided that problem solving will not be included in future PISA studies.

In the following pages a preliminary analysis will be performed in order to examine the extent the issues relevant to the concept learning to learn are represented in different international student assessment studies. The framework referred to is the framework presented by the expert group in 2006 (Bonnet et al., 2006). The focus for this analysis

will be on PISA. The reason for this is, as mentioned above, is that PISA in general claims to have a more cross-curricular approach than the other studies.

First it will be examined to which extent the cognitive subscales in the learning to learn framework are present in the PISA survey and then to which extent the affective subscales are present.

The major difference between the cognitive scales in the learning to learn framework and the domains covered by PISA is that the purpose of the learning to learn framework is to assess learning to learn which to a certain extent is more cross curricular and competence based than PISA's focus on assessing reading literacy, mathematical literacy and science literacy. The fact that the domains to be tested are different may not mean that there is not an overlap. In order to examine this more in detail each of the four subscales in the suggested learning to learn framework will be compared with the PISA studies.

The first subscale in the learning to learn framework has been called "Identifying a proposition". The objective is to test students' ability to identify propositions. This may relate to facts or opinions in the information they receive. The purpose is not specifically to test reading. Reading is one way of getting information. Another way is oral information. However, for practical reasons in a paper and pencil test it would probably be very difficult to test these skills in any other way than by asking the students to read one (or several) texts and to respond to a number of questions related to them. One difference compared with PISA is that in a learning to learn test the students would rather be asked to identify what type of sentences they have read in a text than to give the right answers, which is of course close to what is often referred to as reading comprehension. The difference between testing reading comprehension and learning to learn is the purpose and the context in which it is performed.

Reading can also be seen as a challenge in a broader context. In most tests students are asked to read something and respond to questions based on what they have read. Weak readers may have more problems doing this than strong readers. Test results in science and mathematics may not only reflect the knowledge that students have in these subjects, but also their ability to read and comprehend what they read. A test on learning to learn will not be different from other tests in this respect as long as no other means for the test than paper and pen are used. New testing methods are being developed in which students are asked to respond on-line. Many of these tests still rely on reading and then additionally the factor of the students ICT skills. E-testing has the potential to find ways of testing beyond reading, but to develop such tests an intensive further development is required.

The second subscale in the learning to learn framework is "Using rules". The purpose here is to test the student's ability to use a rule in different ways. A way to do this is to let the student work out, which of the basic operations of addition, subtraction, multiplication and division the invented operands refer to in different problems, based on definitions given to the operands. Such a task is basically solving an arithmetic problem. This scale is close to what PISA call mathematic literacy. The purpose of the learning to

learn test would not be to test mathematics as such, but mathematics is used as a mean to provide a task.

The third subscale is "Testing rules/propositions". Tasks could be built on formal operational schemata to test this subscale. To solve such tasks reflective abstraction in the form of processes such as control of variables and the planning of an experiment should be needed. Students must test a proposed hypothesis by completing and/or constructing comparisons. This may be seen to be close to what PISA refers to as scientific literacy.

The fourth subscale is "Using mental tools". The student's ability to use mental tools could be tested by an extended task, with several possible solutions. All information needed for answering the questions can be found in the texts and charts of the task. The question should then be followed by asking the student to provide another solution to the problem posed which has not been given in the multiple choice option. This is close to what could be referred to as problem solving, which was part of PISA in 2003. Originally it was not intended for PISA to continue with problem solving but it may now be introduced into the PISA survey in 2012.

When tasks from the PISA surveys are examined it can be concluded that some of these tasks could be part of a learning to learn test because they do not only test reading, mathematics and science. Many tasks are cross-curricular in their approach, but not all. PISA also contains tasks that are pure reading, mathematics and science tasks. Unfortunately, it is not possible to indicate the relation between tasks in PISA which could be used in a learning to learn test and those which could not be used as the whole PISA test can not be examined.

The conclusion based on a comparison between the cognitive subscales in the learning to learn framework and the tasks in the PISA tests is that there are similarities. The subscales in the learning to learn framework are close to reading literacy, mathematical literacy, science literacy and problem solving, but they have been constructed in another context. Many PISA tasks could probably be used as part of a learning to learn test, but not all PISA tasks would reflect the subscales of the learning to learn framework and not all aspects of learning to learn are covered within the recent PISA surveys. It can be argued that Learning to learn is more cross curricular and 'real world' in terms of a competence based assessment than PISA that still focuses on school subjects.

In order to examine the extent that the affective subscales in the learning to learn framework are covered in the PISA studies it is necessary to examine the PISA student questionnaires.

A reading of the student questionnaires for 2000, 2003 and 2006 and an attempt to see which questions in the questionnaires that can be related to the five subscales of the affective learning to learn framework gives the following results.

Table 2. Number of questions in the PISA student questionnaires which are related to the belief subscales in the learning to learn framework

Subscales in the framework	PISA 2000	PISA 2003	PISA 2006
Learning motivation, learning strategies and orientation towards change	8	6	8
Academic self-concept and self-esteem.	1	3	2
Learning environment.	7	3	5
Perceived support from significant other.	3	1	1
Learning relationship	1	1	1
Total number of questions which can be related to learning to learn	20	14*	17**
Total number of questions in the student questionnaires	41	38	37

* 7 questions predominantly on mathematics

** 10 questions predominantly on science

As can be seen in the table (2) a bit less than half of the questions in the student questionnaires can in some ways be related to learning to learn.

In this context two things should be kept in mind. Firstly, in the "classification" of survey questions a very generous approach has been used. In case of doubt questions have been accepted as related to learning to learn rather than being refused. For example questions that refer to possessions, such as computer or mobile that the students have at home, have been included in the dimension of the students learning environment.

Secondly, several of the questions that have been related to learning to learn are specifically related to the learning of the domain in focus of the PISA study. Five of the questions that could be regarded as related to learning to learn in PISA 2003 were predominantly dealing with mathematics. PISA 2003 elaborates on the characteristics and attitudes of students as learners in mathematics. In PISA 2006 seven of the questions related to learning to learn predominantly deal with science.

All five of the affective subscales of learning to learn are in some way touched upon within the PISA questionnaire. In some years this goes deeper than others. Two dimensions are more tackled more in-depth; learning motivation, learning strategies and orientation towards change and learning environment. It should also be added that some of the questions which have been classified with one dimension of the learning to learn framework actually contain items which also could have been classified as part of another dimension.

One of the major differences between the European learning to learn test as it stands and the PISA test is how this affective data is used. The PISA test generally uses the affective questions as explanatory variables rather than the outcome of a learning process. In contrast, the European learning to learn test currently aims to measure and score the affective dimension in order to provide more holistic concepts of learning to learn than simply a cognitive score would give. With the Education Council (2006) definition of learning to learn a normative approach has been established as to what are the more

useful attitudes and behaviours towards learning and lifelong learning. This formal basis gives the possibility for measurement on attitudes and behaviours which does not exist across OECD countries where such a normative framework has yet to be constructed.

However, in general it can be concluded that certain elements of what can be described as learning to learn are covered in some international tests. This is even more the case for the PISA studies than for TIMSS and PIRLS. Based on available items from PISA it can be concluded that some of them could form part of a learning to learn test. A learning to learn test would most likely contain more questions on how student understand their learning processes and their learning relationships than the PISA student questionnaire and would aim to measure these in comparison to normative guide provided in the Council definition of learning to learn. A general conclusion is that a test with the objective to test learning to learn will give more information about learning to learn than the PISA studies.

7. Conclusion

The question of how to develop people's competence for lifelong learning has come to the fore at a European policy level since Lisbon 2000, as this competence has been considered crucial to the Lisbon strategy for economic performance and social cohesion. In this respect the competence learning to learn (the knowledge, skills, attitudes and values for lifelong learning) has been identified as one of the eight key competences mentioned in the recommendation on key competences adopted by the Education Council and the European Parliament in December 2006. Learning to learn has also been identified as an area in which it is important to develop indicators to monitor national education systems in Europe.

The turn to testing competence rather than testing knowledge has been as a result of a realisation that the world is changing so fast that it is no longer possible to know what knowledge is relevant in the future and therefore what people need is the capacity to learn. This capacity has been considered as much a result of the learning environment and positive attitude towards learning as a cognitive skill thus a competence based approach highlights both the cognitive and affective dimensions. It also emphasises testing competence in relationship to real world tasks that people may face.

In this context, the European Commission (DG EAC and CRELL) in collaboration with member states have been working towards the development of a European test on learning to learn based on existing national tests in this field. Three tests were identified, the University of Helsinki on learning to learn, a project developed by the University of Bristol to construct the Effective Lifelong Learning Inventory and a project developed by the University of Amsterdam to tests cross-curricular skills. An initial European framework and test was created. The framework contained three dimensions; cognitive, affective and metacognitive. The cognitive dimension contains in the proposed framework four subscales: identifying a proposition, using rules, testing rules/propositions and using mental tools. The affective dimension contains five subscales: learning motivation, learning strategies and orientation towards change, academic self-concept and self-esteem, learning environment, perceived support from significant other, learning relationship. The metacognitive dimension contained: 3 sub-scales metacognitive problem solving, metacognitive accuracy and metacognitive confidence.

The learning to learn concept has been developed within two different research paradigms; the cognitive psychology paradigm and the social cultural paradigm. The cognitive psychological perspective traditionally examines how human beings process information and/or construct new knowledge in terms of cognition. The social/cultural perspective also examines how knowledge is constructed and the social processes related to learning. The test development so far on learning to learn contains elements from both these traditions.

With the high demand of existing tests on member states then the question has been raised as to whether existing international tests can cover the testing of learning to learn. International tests have been constructed to measure students' knowledge and skills in specific domains such as reading, science and mathematics. It is possible that these tests may be highly correlated with learning to learn skills, but their purpose has not been to measure learning to learn.

It is also the case that the majority of the existing tests, rely on a subject oriented test and either do not fully cover the affective dimension of learning to learn or consider this mainly as explanatory variables rather than the outcomes of a learning process. Existing international tests, take less into account a holistic concept of the individual, their beliefs and their learning environment, which is the central part of the competence based approach. One exception to this is the IEA International Civic and Citizenship study (ICCS) in which behaviours and perceptions are also considered citizenship outcomes (IEA, 2008).

In contrast to the majority of existing international tests, The European learning to learn test is a combination of both the cognitive psychological (University of Helsinki, the and the University of Amsterdam) and the social cultural paradigm (University of Bristol). These existing tests have been integrated into an initial single European learning to learn test. The prepilot indicated that further research is needed to improve the theoretical and conceptual development of this test. However, the fact that both traditions are represented within the European test on the learning to learn test and are present in the continuous work represents both a challenge and an opportunity. A challenge because there is a need to find a broad consensus and this creates a situation where the concept learning to learn has to be carefully elaborated and opportunity because it opens up a dialogue for interdisciplinary work. The CRELL research network began an interdisciplinary dialogue on the concept of learning to learn and more opportunities in the future are required to further this debate.

If there is a desire to try to measure learning to learn it seems reasonable that the best way to achieve this would be to construct a study with this purpose in mind. If tests originally developed to measure intelligence, problems solving, mathematics, reading or another area are to be used to measure learning to learn it means that learning to learn have to be defined as identical with these concepts. The existing definitions and concepts of learning to learn described in this report although having overlaps with these concepts are also significantly different from them and would suggest that a different European test would be needed to measure learning to learn.

Next steps
In the process of developing a European test on learning to learn competence further research is needed. In this final section of the report we highlight some suggestions for the research which we think would be necessary to undertake:

- An interdisciplinary theory-based research project needs to be set up that would further analyse the definition of learning to learn. It would need to arrive at a coherent working model of learning to learn that encapsulated the social environment and the process of learning with the cognitive psychological approach. The project would need to work from this point towards making operational the current definition of learning to learn. A comparison could then be made with the existing learning to learn tests and prepilot results to develop a new version of the test on learning to learn.
- To further the interdisciplinary research approach on learning to learn, there needs to be the possibility that European researchers from different disciplines to have the opportunity to exchange and continue their dialogue which began in the CRELL network on learning to learn.
- An empirical research project on the learning process of the competence learning to learn could be developed to enhance the development of learning to learn across Europe. This research project would explore the learning environments and practitioners' pedagogical approaches towards developing the competence of learning to learn across

Europe and to develop a number of case studies of good practice and quality criteria for effectiveness. This would provide empirical evidence from which to further develop a school, teacher and head teacher questionnaire for the European learning to learn test. Having this evidence within a European learning to learn test would give significant added value to the test as it would aid our understanding of which pedagogical methods and learning environments best support the development of this competence.

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Abstract

Measuring Learning to learn in Europe is part of a process to establish and monitor the learning processes and outcomes needed to facilitate the development of Lifelong learning in Europe. This report highlights the European political developments that have taken place which have placed learning to learn as a political priority within the Lisbon 2010 Education and Training process. It connects these with the turn to a competence based approach that emphasis the testing of a holistic and real-world based capability that includes values, attitudes, knowledge and skills.

The report analyses how the competence learning to learn has been defined. It highlights the different understandings which have been developed from within the social-cultural and cognitive psychological paradigms. It investigates the European definition of learning to learn and how it broadly transverses these epistemological positions. The report also establishes what learning is not by visiting concepts such as intelligence, problem-solving and learning strategies.

In a second step the report investigates how learning to learn can be measured. 3 national tests that are combined within the European test are explained: University of Helsinki test, the Bristol University test and the Dutch test. The European framework is then described and preliminary evaluation of the European learning to learn prepilot is briefly given. Existing international tests, in particular PISA, are analysed to see if these tests cover the definition. The results described are that these tests do not cover the full range of aspects of learning to learn and tend only to use the affective questions as explanatory variables for the test results rather than one dimension of the measurable outcomes. Finally, future directions for research to improve the conceptual basis of the European learning to learn test are proposed which highlights the need for more interdisciplinary research in the field of learning.

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