

# Knowledge Society and Educational Institutions - Towards a Sociological Theory of Knowledge

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## **Introduction**

We are in a paradoxical situation.

On the one hand almost everybody seems to agree that knowledge is a basic phenomenon of and an adequate basic concept for our current society. Very few would dispute that we live in a “knowledge society”, that it is important to develop “knowledge intensive” enterprises, or that the knowledge production of educational institutions is central for the reproduction of the wealth of our nations.

On the other hand we do not seem to know how knowledge should be defined within the context of a theory of society. Most of the current theories of knowledge society, knowledge production and knowledge intensive enterprises do not suggest an explicit concept of knowledge, and even if they do, the concept is a narrow one – so narrow that it does not inform the knowledge production practice of educational institutions.

In this paper I will first demonstrate that the above, critical statement concerning current knowledge society theories is relevant and true. Secondly, I will present an elaborated concept of knowledge, a concept that can be used for developing a theory of forms of knowledge that can inform the understanding of the functional mechanisms of the so-called knowledge society and the design and contribution of educational practices.

According to my theory of knowledge, knowledge can be categorized into four forms: 1st, 2nd, 3rd and 4th order knowledge. After having presented the concept and the categories of knowledge I will demonstrate the relevance of the knowledge categories in the context of education. Corresponding to the four categories of knowledge four forms of teaching and learning can be identified. Similarly, the way in which learning should be evaluated of course depends on the type of knowledge in question. Finally, I will demonstrate that the knowledge categories can inform the identification of strategies for the teacher's self-reflection and thus can qualify the teacher as a reflective practitioner.

The ultimate aim is to develop a theoretical basis for educating the professional teacher, assuming that the days have past when teaching was an activity based only on common sense. In a knowledge society teaching is a professional activity founded in research based evidence (cf. OECD 2005).

## **Current Knowledge Theories**

It seems to be generally agreed upon that present-day society is rapidly moving away from being an industrial society, the basic function of which was to develop mechanical systems of production and organization that could transform nature into industrial products, towards a knowledge society, the basic function of which is to handle complexity with the aid of knowledge, no matter whether this knowledge exists as a resource in the individual worker or as knowledge systems in companies and organisations.

150 years ago Karl Marx confronted a similar challenge: the capitalist society developing into its industrial phase. His answer to this challenge and to his aim of understanding the functional mechanisms of capitalism was to identify and to analyse the basic "atom" of that society: The commodity.

The fundamental challenge of creating a theory of society is to choose an adequate starting point, or – in a post-ontological jargon – to make an adequate, initial distinction. For Karl Marx this starting point was: the commodity. For him this was the atom of capitalist society. Based on a post-metaphysical understanding and thus replacing identify – “atoms” – with differences – “distinctions” – we would call it the marked state of the initial distinction (cf. Spencer Brown 1971 and Clam 2002 and 2004). Anyway, Marx created what became a normative distinction between a commoditized society versus a (utopian) non-commoditized society. In the second half of the 20th Century Jürgen Habermas suggested another basic distinction: For him the marked state of the initial distinction was named: life world – assuming that the unmarked state is systems: A non-mediated life world based on free individuals aiming at consensus versus the systems mediated by symbolically generalized media aiming at efficiency. At the same time, the German sociologist Niklas Luhmann suggested yet another initial distinction, namely: system versus environment.

Of course, scientific concepts form the contact of science with reality (cf. Luhmann 1995 p. li). Therefore, selecting an initial distinction is to decide upon a particular contact with reality, and not others. The question is whether this contact is more adequate than others. Still, however, the basic problem of making an initial distinction is that “[e]very conceptual determination ought to be read as a constraint on the possibility of further conceptual determination.” (Ibid. p. l). With the choice of an initial distinction the sociological observer of society starts the building of a conceptual system that cannot lead anywhere, but – if the concepts are solid – is self-restricting.

Thus, Marx chose “the commodity” as his starting point and developed a theory of production and circulation of commodities and capital as a self-limiting context for the observation of society. In *Soziale Systeme* Luhmann chose “system” as his initial distinction. He decided that “systems” defined through the concept of autopoiesis

should be the starting point for developing his self-restricting system of concepts. Marx developed one set of restrictions for the observation of society, Luhmann developed another set. For both, the consequence was that some parts of reality could be better observed than others. Developing a theoretical paradigm, some phenomena will be enlightened while others will be less clearly seen.

Similarly, in order to observe society as a knowledge society and to understand the functional mechanisms of an emerging knowledge society – or, as I would prefer: a knowing society – one should focus on the “atom” of this society: Knowledge.

But in order to test whether this initial distinction is adequate, the concept must be taken seriously. It must be defined in such a way that it is robust as the basis for further conceptual determinations. What is knowledge? Which knowledge categories can be identified?

In most theories of the knowledge society, any explicit, sociologically relevant definition of knowledge is absent. As early as 1959, the English economist and organization analyst Edith Penrose emphasized the growing importance of knowledge in economy, but in addition she admitted that the whole subject of knowledge is so “slippery” that it is impossible to get a firm grip of it (Penrose 1959 p. 77). In 1969 Peter Drucker announced that knowledge has become the central capital, cost centre and basic resource of the economy (Drucker 1969 p. ix). Still however he did not suggest how to appropriately define this basic resource. Approximately thirty years later Luhmann correctly summarized: “...was is Wissen? Wenn man von der Gesellschaftstheorie ausgeht und selbst wenn man die moderne Gesellschaft als ‘Wissensgesellschaft’ bezeichnet, findet man keinen brauchbaren Begriff des Wissens.” (Luhmann 2002 p. 97)

However, in some of the theories subscribing to the knowledge society idea, definitions of knowledge have been suggested. Still, in my mind these definitions are not

adequate.

Sometimes, often in relation to information and communication technologies (ICTs), knowledge is defined as an essence or substance; cf. for instance the OECD report from 2004, *Innovation in the Knowledge Economy*, which focuses on "implications for education and learning". Here, it is emphasized that it is important to have a clear idea of "...what it is that is passing through the electronic pipelines: knowledge, information or data?" (OECD 2004 p. 18). However, the challenges of education and learning – why doesn't teaching automatically lead to adequate learning, if teaching is only a matter of transporting knowledge? – and of knowledge sharing – why is knowledge sharing actually most often not happening automatically? – cannot be answered if it is assumed that knowledge is a substance that can easily be transported from one person to the other. It is well known that this is not what happens in the classroom or in the knowledge sharing organization. Knowledge about something is a representation of something according to interpretation standards, which may change from person to person and from teacher to pupil. My knowledge is not equal to your knowledge, and it cannot be transported from me to you.

Also, ICT should not be subsumed under the general concept of technology as a tool for physical manipulation. As Joseph Weizenbaum demonstrated many years ago, ICT does not belong to the class of prosthetic technologies, but to the class of non-prosthetic technologies. ICT should not be compared to hammers or spades or cars, with which you perform a physical manipulation or transportation of physical stuff. No, ICT is much closer related to sign technologies like books, images, posters or watches. A watch does not move time, it represents time. Similarly, ICT does not function as a transportation or manipulation machine, but as a sign medium.

In other contexts, knowledge has been defined in a restricted way as certified

knowledge. In his classical book about the post-industrial society Daniel Bell defined knowledge as "...a set of organized statements of facts or ideas, presenting a reasoned judgment or an experimental result, which is transmitted to others through some communication medium in some systematic form" (Bell 1973 p. 175). In his book about the network society, Manuel Castells has, as he says, "no compelling reason to improve on" this definition (Castells 1996 p. 17). But certified knowledge is only one aspect of knowledge, as for instance Michael Polanyi has convincingly argued. Also, tacit knowledge – the knowledge of e.g. how to ride a bike – is knowledge, although it cannot be written down or "proved" and certified in any traditional scientific way.

In the 2004 OECD report this is reflected upon by making a distinction between on the one hand certified (tested) and practical (uncertified) knowledge, or in French: between "savoir" and "connaissance", and on the other hand between codified and tacit knowledge (OECD 2004 p. 18ff), and although no systematic categorization of knowledge forms is provided, at least it is made clear that the question of knowledge is complex.

Yet another systematization has been suggested by Bengt-Aake Lundvall in the OECD 2000 report Knowledge Management in the Learning Society. Here he suggests a categorization into four forms of knowledge:

- Know-what that refers to knowledge about facts;
- know-why that refers to knowledge about principles and laws governing facts;
- know-how that refers to skills, i.e. abilities to do something with one's factual knowledge;
- know-who that refers to the ability to trace knowledge providers across disciplines and specialisations (OECD 2000 p. 14f).

While I agree to some of these categories, I think the fourth knowledge form, "know-who" falls outside the paradigm hidden behind the categories.

My conclusion on this brief review of existing sociological knowledge theories is that we must leave the model of knowledge as an essence, which can be transported from place to place, i.e. from the research laboratory to the enterprise. Similarly, we must give up the idea that knowledge as suggested by Bell and Castells can be defined only as codified knowledge. For me, the concept of knowledge is multidimensional, and it cannot be perceived as something, which is created and certified in the ivory tower of research and then – sometimes via the educational sector – transferred to society in general and to the business sector in particular.

## **The Mystery of Knowledge**

### *The Weird World of "Mind vs. Reality"*

I hope that it is by now obvious that there is a job to do in order to unveil the mysteries of knowledge, and that this job is both important and demanding.

One of the problems of understanding knowledge and of developing a sociologically adequate concept of knowledge is that there is a mismatch between the understanding of society and the understanding of knowledge. While society is described in its current form as "post-industrial", "post-modern" etc., assuming that realities have changed during the latest hundred years, knowledge is still understood through classical epistemologies. The problem is a problem concerning theoretical a-synchronicity. I will briefly demonstrate, that the understanding of knowledge is based on an epistemology developed by Descartes and classical philosophy, while the understanding of society is post-cartesian: It is – although most often implicitly – based on 20th century sociological theories informed by Husserl, Heidegger and others.

According to Cartesian philosophy, the world can be divided into *res cogitans* and *res extensa*. The thinking subject versus the external – not-thinking – world. Consequently, knowledge is the result of a correspondence between mind and world.

Thus, to know something is to establish a link or a correspondence between mind and reality. Just listen to the words: A "link". "Mind versus reality" – as if mind isn't reality, and as if thoughts are models "corresponding" to an external world. According to this world-view, to know something is to transport knowledge from the external world into the mind. Consequently, knowledge is the store of facts (in the computer-age: the memory of information), and to share knowledge is to transfer knowledge from one file to another.

Still, most epistemological theory implicitly assumes that this weird world of correspondences, of minds outside reality and realities outside mind, constitutes the indisputable precondition for talking about knowledge. You may disagree about what comes first. You may be "realist" or "antirealist". Still, however, the very distinction between mind and reality is beyond discussion (for a recent example see Klausen 2004).

In accordance with this theory, modern knowledge management theory defines knowledge as a substance. Knowledge management is equal to management of physical processes. It is a theory about how to file, to transport and to provide access to knowledge substances.

### **Critique of "the ghost in the machine" paradigm**

Inspired by e.g. Edmund Husserl's critique of the Cartesian philosophy, in 1949 the English language philosopher Gilbert Ryle reacted against this paradigm. He characterised the idea that there should exist a certain thinking device, which did not belong to the world, as "the ghost in the machine" paradigm. As a result of his criticism, Ryle concluded that knowledge cannot primarily be understood as knowledge of something. With his famous statement in *The Concept of Mind* "knowing-that" presupposes "knowing-how" (Ryle 1949). In order to know that something is the case, one must know the conditions on which it is the case. Facts are not simply facts, but they are facts according to an attitude or a point of view, which could be

otherwise. The innocence of pure knowledge has been lost.

With his critique of pure knowledge and with his addition of knowing-how to knowing-that, Ryle broke the curse of knowledge. Knowledge is more than knowing-that. He passed from first order to second order knowledge i. e. from simple knowledge (knowledge of something) to reflexive knowledge (knowledge of knowledge). However, he did not reach the third or fourth orders of knowledge, i.e. the orders of knowledge in which the mystery of knowledge occurs: The orders in which new knowledge is created.

### **Definition of Knowledge**

However, before developing a system of categories of knowledge one has to suggest a definition of knowledge per se. What is knowledge? For me, a very simple, yet practical and applicable sociological definition of knowledge is that knowledge is confirmed observations. Observations may be confirmed over time or in society. When I observe something and then repeat my observation with the same result it becomes a confirmed observation and thus: personal knowledge. Similarly, when I observe something and another person can confirm this observation it becomes social knowledge.

This implies that knowledge is not a quality of the world, but a quality of observing the world. Knowledge isn't something that we find "out there", but something that is created by observing the world and by comparing world observations over time and among different observers, bearing in mind, of course, that the observer is part of the observed world (cf. von Foerster 1984). Thus, knowledge isn't created and re-created from moment to moment, but is always a matter of confirmation of observations through repeated self-observations and through communication of others' observations. Thus, knowledge systems are always relatively stable, yet dynamic, and different mechanisms have been created to establish such stable, but dynamic systems. The mass media system is one such system, which from

day to day confirms, modifies and challenges "yesterday's knowledge". One might even suggest that so-called consensus is the contingent result of mass media mediated knowledge production. The scientific system is another knowledge producing functional system in society. The scientific system has developed very explicit and specific criteria for knowledge production, i.e. for the confirmation of observations (so-called truth criteria) and – consequently – for what counts as scientifically confirmed knowledge.

Consequently, knowledge may change over time or between social systems: Knowledge of one society or organisation may be different from the knowledge of another society or organisation. For instance our current knowledge about the system of planets is different from the knowledge of the system of planets in a traditional, pre-modern society. We know that the sun is the centre of the planetary system, and that the universe is expanding. 600 years ago "they" knew that the earth was the centre of the planetary system, and that the universe had a fixed size, surrounded by shell with stars. In 200 years from now yet new systems of observations will have been confirmed and thus transformed into knowledge. Thus, knowledge is contextual, which explains why knowledge sharing is not just a question of transmitting facts, but is also a question about the negotiation of a shared knowledge context.

Knowledge, then, is defined as confirmed observations. However, knowledge does not only concern observations. It also concerns actions. One may also confirm one's actions: If I do this or that, I know what will happen, because prior to the present situation this very action has been repeated by myself or by others with the same result. This type of knowledge might be termed "practical knowledge", or in the tradition of Polanyi: Tacit knowledge. I would however suggest that it is named: Skills. Skills are confirmed actions. Together, skills and knowledge constitute the totality of abilities.

One of the important implications of this definition of knowledge is that knowledge is always reflexive. The knowing subject is not excluded from the extended world – the “res extensa” – but is always already included in this world. Consequently, knowledge is always both knowledge about something in the world and knowledge about itself. I fully agree with Ryle in emphasizing that knowledge includes both knowing-that and knowing-how. One must always ask how one’s knowledge about something is constituted the way it is.

This implies that knowledge is dynamic, and that the “dynamics” of knowledge has two sources: firstly knowledge may change, because the world changes. But secondly knowledge may change, because the way in which we observe the world changes. Furthermore, these two sources of change are interconnected: The observing or acting subject is him- or herself part of a changing world. As we shall soon see, this constitutes the theory of the categories of knowledge. Adding to know-that and know-how, one must also consider why our knowledge is, as it is. We know what we know according to collective paradigms of knowledge, and again these paradigms change over time (cf. Kuhn 1967). Finally, one must consider the totality of what is known and can currently be known, i.e. our knowledge culture or knowledge horizon. Inspired by Gregory Bateson, this fourth form of knowledge can be characterised as an evolutionary fact.

### **Function of Knowledge**

Knowledge can be defined as confirmed observations. But what is the function of knowledge? Why is knowledge developed?

Here, I would suggest an evolutionary approach. I understand the development of knowledge as a special case of the general “Morphogenese von Komplexität” (Luhmann 1997 p. 415).

The basic hypothesis is that human beings and social systems survive and develop

by maintaining the distinction between system and environment, that is by managing external complexity. But external complexity can only be managed through the development of internal complexity, cf. the general statement that “[o]nly complexity can reduce complexity” (Luhmann 1995 p. 26, [1984 p. 49]).

Thus, for me knowledge is a certain form of internal complexity: the sum of confirmed observations, and knowledge is a resource of all meaning-based systems, i.e. both psychic and social systems. Of course, in order to accumulate knowledge, other resources must be used (or developed), such as books, libraries, files etc. of the social system, and such as neural media of the psychic system. One does not find knowledge “in” books and files, or “in” the neurons, but structural couplings must be exercised between the psychic system and the brain, and between the social system and books, libraries etc.

According to the classical epistemology, a clear distinction can be made between the internal system of knowledge and the environment. The accumulation of knowledge is a closed and finite process, which happens during the “formative years” and primarily within the educational system. Here, a fixed knowledge system is being built. This understanding has informed the industrial society, in which skills were accumulated through externally stimulated learning. This constitutes the learning-to-know paradigm.

However, according to a post-cartesian epistemology, knowledge must be applied not only to the environment, but also to itself. Knowledge is used in order to manage external complexity, but it is also and simultaneously used in order to manage its own complexity, i.e. to manage “eigen-complexity”. Thus, the system of knowledge is characterised by not only being complex, but by being hyper complex (cf. Qvortrup 2003). Knowledge is not a stable resource, but a dynamic, self-developing resource, constituting the learning-to-learn paradigm, and confirming the well-known sentence: The more we know, the more we know that we do not know

(concerning the dynamism of knowledge see: Serres 1997).

### **Categories of Knowledge**

Inspired by the phenomenological critique of the Cartesian paradigm, and particularly influenced by the American anthropologist and epistemologist Gregory Bateson, in my book, *The Knowing Society*, with the subtitle: "The mystery of knowledge, learning and culture" (Qvortrup 2004) I have systematized the categories of knowledge with a special focus on the third category of knowledge, creative knowledge.

In accordance with Ryle's critique of Cartesian dualism, in the 1960s Bateson suggested that learning and communication can be divided into four categories: first, second, third and fourth order learning (Bateson 2000 [1972])<sup>1</sup>. Taking inspiration in Bateson's categorization, from a post-cartesian or – more specifically – a systems theoretical approach one can identify four forms of knowledge. First order knowledge is simple knowledge: Knowledge about something. Second order knowledge is knowledge about knowledge, i.e. reflexive or situative knowledge. This category corresponds to Ryle's "knowing-how". Third order knowledge is knowledge about knowledge about knowledge, i.e. knowledge about the preconditions for reflexive knowledge. Finally, one can identify a fourth category of knowledge, which represents the social evolution of knowledge, i.e. the collective and perhaps unconscious knowledge process and the total knowledge potential. This is closely related to what Edmund Husserl called the meaning horizon of society.

The theory presented in *The Knowing Society* builds on this idea. Its main claim is that a mundanised subject observing the world in order to know about the world

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<sup>1</sup> See also the detailed review of Bateson's categories of learning in Qvortrup 2001

– and all subjects are mundanised subjects – must make the following forms of observation:

- it must observe the world as an object of observation
- it must observe itself in the world
- it must observe the world (including itself) as a precondition for observing the world.

In addition, this theory of knowledge presupposes that the world, including the subjects observing the world, exists as a knowledge horizon, i.e. as a totality of what can be known. The theory furthermore presupposes that this world is dynamic, i.e. that it changes in unforeseen directions (this is the result of its hyper complexity, cf. Qvortrup 2003) and thus makes change of knowledge possible. It isn't just a knowledge world, but also a knowing world. Society can not adequately be characterised as a "knowledge society", but it should be termed a "knowing society". Finally, the theory assumes that changes in the world take place by virtue of the world itself. Drawing a distinction between the subject and the world, the mundanised subject changes the world through its observation, and it is changed by the world through its observation: It transforms the world and is transformed thereby, whether this last change is called socialisation or learning.

This implies that four categories of knowledge can be identified:

<b>Knowledge category</b>	<b>Knowledge form</b>	<b>Knowledge designation</b>
1st order or simple knowledge	Knowledge about something	Factual knowledge
2 <sup>nd</sup> order or complex knowledge	Knowledge about the conditions of knowing	Reflexive or situative knowledge
3 <sup>rd</sup> order or hyper complex knowledge	Knowledge about the conditions of the reflexive knowledge system	Systemic or creative knowledge
4 <sup>th</sup> order knowledge	Knowledge about society as dynamic knowledge horizon	World knowledge

Where the first forms of knowledge represent observation-based forms of knowledge, i.e. relations between subject and world (including the subject's knowledge of itself as a subject in the world), the fourth form of knowledge is not knowledge about the world but the world as knowledge.

- First order knowledge is knowledge about something. For instance, I know that from where I am sitting I can see a beautiful bed of rhododendrons, and I know that the large plant in the middle is a *Rhododendron Cawtabiensis*.
- Second order knowledge is knowledge about knowledge, i.e. the capacity for self-observation. Not only do I know that the shrub out there is a *Rhododendron Cawtabiensis*, but I also know that I know it because I had to elaborate my wishes to the owner of the nursery I bought it from. I also know that the fact that I consider it beautiful may be because I planted it myself. In other words, I am not only capable of categorizing what I see, but I also have the ability to stand next to my own observation and consider it.
- Third order knowledge is knowledge about knowledge about knowledge, i.e. knowledge about the system of knowledge that first order knowledge is based on. I know what I know according to a knowledge system or paradigm. It can, for instance, be knowledge of the botanical systematics, which lead to the designations of species that I employ. Or it can be knowledge of the aesthetic criteria for beauty, which make me find my garden beautiful. My aesthetic preferences could be caused by a predilection for English garden aesthetics rather than the more formal French or Italian classicist garden aesthetics.
- Finally, fourth order knowledge is knowledge transcending the preconditions for the knowledge systematic. One sometimes says that it is represented by the entire cultural system, into which these knowledge forms and judgements of taste are embedded. Following Bateson's categories of learning and communication, this fourth order knowledge is a very particular form of knowledge, which cannot be contained within one person but resides in the social community of which the individuals are members.

The ideal knowledge worker is a worker who includes all four categories in one indi-

vidual person: Firstly, he/she has accumulated a large number of confirmed observations and actions into files of factual knowledge. He or she is qualified. Secondly, he/she is able to improvise, to organise his/her own work together with others. He/she knows how to use his/her knowledge. He or she is competent. Thirdly, he/she is able to go beyond the taken-for-granted assumptions. He/she knows what constitutes his/her knowledge categories. He or she is creative. And finally, he/she knows that his/her and others' knowledge sum up to a knowledge system, which constitutes their common knowledge culture. He or she is cultivated in the sense that he/she knows that his/her knowledge is one element of an evolutionary and contingent knowledge system.

Adding to these four knowledge categories a distinction should be made between codified and non-codified knowledge, or between skills and knowledge. Skills can be defined as tacit abilities, while knowledge can be defined as codified abilities.

Again, however, skills can be divided into four categories:

- ready-at-hand skills (the simple ability to e.g. use a hammer);
- situative skills (the ability to solve problems by using an instrument, e.g. using a hammer as a bottle opener);
- systemic skills (the ability to practically reflect on the use of e.g. different tools, which can be found among skilled practitioners);
- the culture of skills (which is established in a workshop with different specialties, e.g. in an orchestra with specialized musicians).

The total system of abilities, divided into skills and knowledge forms, looks like this:

<b>Forms of connaissance/skills</b>	<b>Forms of savoir/knowledge</b>
Ready-at-hand skills	Factual knowledge
Situative skills	Situative knowledge
Systemic skills	Systemic knowledge
The culture of skills	The culture of knowledge

### **Knowledge Categories: The Case of ECCO Footwear**

Let me illustrate the knowledge categories presented above by referring to one of the modern, knowledge-based enterprises in Denmark, ECCO Footwear. ECCO Footwear started in the 1960s as a footwear production enterprise in Denmark, employing hundreds of unskilled industrial workers. Currently, however, footwear is only designed and the total, global footwear production system is managed in Denmark, while the physical production of footwear is performed at factories in China, Indonesia and elsewhere. Consequently, within a Danish perspective, the ECCO Footwear company is a typical, knowledge-based enterprise.

What skills must those employed at a knowledge-heavy company such as ECCO Footwear possess? It would be easy to follow Richard Florida in saying that they should be "creative" workers. But although I agree with Florida, when he says that the concept of creative workers "...has a good deal more precision than existing, more amorphous definitions of knowledge workers, symbolic analysts or professional and technical workers" (Florida 2004: 9), not only is his category of creative workers too narrow; his rather romantic idea of creativity as something emerging from social and cultural diversity is not appropriate. Yes, creativity is part of the

competencies of an employee at ECCO Footwear, but there is more to it than just creativity. Here, the categories – and the systematics – presented above can prove their usefulness.

Employees at a knowledge-heavy company such as ECCO Footwear must have considerable factual knowledge, i.e. a whole series of technical and professional qualifications: Designers at ECCO have to have design knowledge, knowledge of materials, and be able to use advanced digital tools.

They must have considerable reflexive or situative knowledge. They must be able to work in teams, to handle unexpected situations with their colleagues, to improvise and empathize.

They must have systemic knowledge. They must constantly be able to rise above the I-you situation of the group and see things from the outside, identifying and re-interpreting even basic assumptions that are perhaps not so self-evident as they appear at first glance. This is a prerequisite for being able to act creatively: to be able – taking the design and production of footwear as an example – to understand that shoes are not just shoes but narratives about and self-stagings of the person wearing them. One is not designing a functional technology but a culture-historically based tool for identity-construction and -reflection.

Lastly, they must be part of what I have referred to as metasystemic knowledge, or knowledge culture. For instance, they must be able to adopt an attitude towards the company culture of which they are a part, yet only can play a role in and contribute to by being different: the value of modern knowledge workers presupposes that they contribute to the organization by being different. They are included by being exclusive.

## **The Categories of Knowledge and Educational Practices**

### Teaching and Learning

“Die Absicht zu erziehen ist vor allem an Handlungen erkennbar, mit denen der Erzieher versucht, Wissen und Können an jemanden zu vermitteln, der darüber noch nicht verfügt” (Luhmann 2002 p. 59). The aim to educate is observable in actions with which the educator tries to mediate knowledge and abilities to somebody, who does not yet possess this.

But how do the parties involved – the educator and the student – fulfil this aim? In order to answer this question at least four aspects must be addressed.

The first aspect is that a distinction must be made between teaching and learning. While teaching is restricted to communication, the learning of the students – the building of knowledge – can be defined as their own cognitive accumulation of confirmed observations. Knowledge cannot be transferred from the teacher to the student, but the teacher must select communicative actions, which can be observed by the students. The hidden mystery of education is that this observation of communicative actions (speaking, drawing on the blackboard, showing examples, etc.) in some way must be supposed to support the learning – the cognitive accumulation of confirmed observations – of the student, although the relationship between teacher and student is characterized by its double contingency.

This leads to the second implication, namely that all teaching is mediated. There is no such thing as un-mediated teaching. Also by acting, pointing, speaking and drawing, media are employed, and new digital media – computers and networks – are just new distribution media for the specialised communication of teaching.

Thirdly, learning – the accumulation of confirmed observations – cannot be directly observed. The teacher cannot observe whether or what the student learns. He or she can only observe the indirect expressions of the learning process, for instance

by asking the student to join the educational communication process. This can be done in the informal discussions in the classroom or in formal test settings. However, the aim is the same: To achieve some indirect sign of the learning of the pupil.

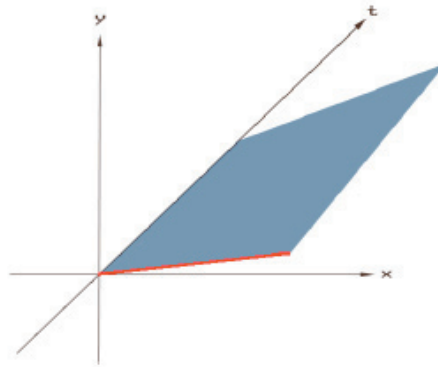
Finally, the fourth point – or assumption – is that there is a connection between forms of teaching and forms of knowledge. In order to mediate certain forms of knowledge adequate forms of teaching should be selected.

### **Categories of Learning and Teaching**

It is my research-based hypothesis that there is a connection between the four categories of knowledge and corresponding categories of learning and learning stimulation, i.e. teaching. This does not imply that one type of knowledge only corresponds to one type of learning, and that it can only be mediated through one type of teaching (or, with a more precise concept, learning stimulation). But the assumption is that one form of teaching is better aimed at mediating the accumulation of one particular form of knowledge than other forms of teaching.

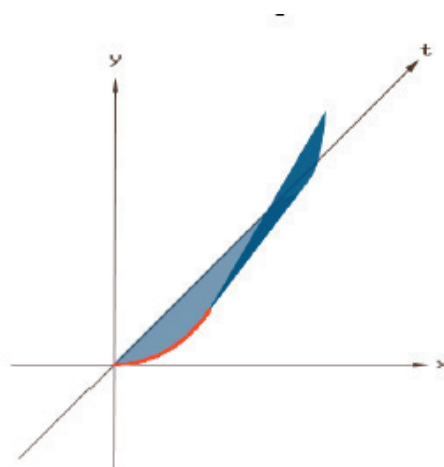
Thus, in order to mediate 1st order learning – accumulation of confirmed observations i.e. 1st order knowledge processes – direct learning stimulation through classroom teaching, lecturing etc. is adequate.

The assumption is that this can be represented by a first order equation, where there is a one-to-one correspondence between input and output. As can be seen in the illustration, there is a first-order equation correspondence between this type of teaching and learning. However, over time the teaching-learning factor – the so-called “learning curve” – can be increased.



In order to mediate 2nd order learning, i.e. construction of knowledge concerning how to use one's abilities in an adequate way for solving tasks and problems, stimulation of self-learning is adequate. This is practiced through group work, project work etc. Inspired by Jean Piaget, this learning type might be called assimilation.

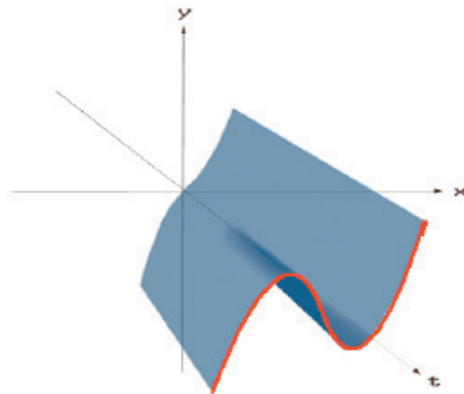
The assumption is that this type of learning can be represented by a second order equation, because the acquirement of one task solving competence results in the ability to solve not one, but two or four problems.



The 3rd category of knowledge is knowledge about the conditions of knowledge, and having knowledge about the conditioning of common knowledge it the precondition for changing these conditions. Again inspired by Piaget the corresponding learning form might be called: Accommodation. When somebody accommodate, he

or she changes the structure of knowledge, i.e. the basic assumptions. This is typically practiced in creative teaching environment, for instance at the higher classes of art schools, where the student is supposed – and is stimulated – to create his or her own “style”. But it is also practiced in the process of writing master theses, in which the student is supposed to discuss and even to challenge existing theoretical assumptions.

Here, it is the assumption that this type of learning can be represented by a third order equation, in which under certain condition the input-output relation turns upside-down in the sense that a certain input results in an opposite output, cf. René Thom’s theory of catastrophes (cf. Thom 1975 and 1983).



Finally, the fourth form of learning is about the total learning topology, be it a finite curriculum process, the total process of a person’s lifelong learning or the learning of an organization or a society. Here, one does not just learn to learn (which is what happens in the 2nd and 3rd forms of learning), but one is part of a lifelong and collective learning process. Such processes can be stimulated in educational planning, but also in creating the architectural context of the learning processes in educational institutions. To build a school or to plan the total curriculum is to act at the order of fourth order learning stimulation.

In schematic form, these categories and correspondences can be summarized as

follows, again emphasizing that there is no simple or causal relationship between one category and the other.

<b>Learning forms</b>	<b>Learning types</b>	<b>Knowledge forms</b>	<b>Forms of learning stimulation</b>
1. order learning	Accumulation	Qualifications	Direct learning stimulation (class room teaching, lecturing)
2. order learning	Assimilation	Competencies	Stimulation of self-learning (group and project work)
3. order learning	Accommodation	Creativity	Stimulation of self-conditioning (construction of learning conditions)
4. order learning	Change of paradigm	Culture	Change of social and organisational conditions (...of basic conditions)

### **Curriculum planning**

One of the most obvious implications of the theory of knowledge categories is that it can inform curriculum planning. The idea is that any curriculum must be structured according to the knowledge categories, and that adequate teaching forms must be chosen.

Let me illustrate this idea by the case of history. A history course must be based on 1st order knowledge, which is on historical facts. Having a course of Danish history the students must learn that the Danish king Christian 4th built a number of the most important and beautiful buildings in Copenhagen, buildings that still are providing cultural identity to the city. Having a course of the Middle East and Arabic world, students should know that the present day state of Iraq was defined in 1919 by The United Kingdom as a patchwork of different Islamic cultures and of parts of Kurdistan. Here, a combination of reading and lecturing seems to be an adequate teaching method.

However, this accumulation of 1st order knowledge should lead into development of 2nd order knowledge, i.e. knowledge answering the question concerning the use – and usefulness – of 1st order knowledge. Here, the students are not primarily accumulating facts, but they place themselves in an observation position outside the basic facts, asking what they can be used for. Concerning the course of Danish history the knowledge of who created the basic buildings of Copenhagen could lead into considerations concerning the cultural identity of the city and of the layout of its fundamental geographical power structure. Concerning the course of Iraq, the knowledge of the post 1st World War nation design could of course inform the understanding of the current problems of establishing a stable, post-dictatorship Iraq. Here, it seems adequate to include project work, class-room discussions and other forms of more independent individual or group based student work, thus stimulating the development of competencies, i.e. the ability to use the basic factual qualifications for problem solving.

Going into 3rd order knowledge would imply that for instance theories and paradigms should be explicitly included in the teaching. Here the students should not only observe their primary factual knowledge from a pragmatic point of view, asking what it can be used for, but they should observe the way in which observations are made. Why does the historical world look in one way, and not in other ways? Why is the choice of an initial distinction – leading into a paradigm of concepts – important for the way in which facts appear for the observer? In the case of the Danish history of course the classical question would be: Did Christian 4th really build these buildings? Wasn't it the workers who were forced to do so? Or, equally importantly: Who actually designed these buildings? The students would learn that the current city of Copenhagen is influenced by French architectural design, and thus that Copenhagen isn't a pure "Danish" city, but is an amalgamation of cultural influences from Germany, France and Italy. But they would also learn that things are not, what they appear to be. Facts are always seen through a pa-

radigm or an "optical design", which could be different. They learn to observe their own observations and thus to understand that if they put themselves into another observation position they might come to a different result. They learn to be creative. Here, it seems adequate to include broad classroom discussions, asking students to present different approaches to the subject.

Finally, 4th order knowledge is knowledge about the totality of knowledge as an evolutionary fact, i.e. knowledge about society as a dynamic knowledge horizon. The students should understand that there are limits for understanding, that certain horizons condition our knowledge of the world as what would earlier be called a matter of transcendentalty. How can this be illustrated in the history class? One way of doing so would be to discuss our history as a cultural horizon. The reference to King Christian 4th is a reference to a collective reference point and thus a reference to one or the millions of facts that constitute a common cultural identity. Thus, history is part of all that knowledge, which constitutes a horizon of knowledge that defines Danes as Danes.

With this example I want to illustrate the way in which the categories of knowledge can inform the curriculum planning and the teaching practice. I certainly do not suggest that a linear structure should be made from 1st to 4th order knowledge, nor do I suggest that every student independently of age and abilities can work equally well with all knowledge forms. But I suggest that both the curriculum planning and the teaching practice should be based on the inclusion of all knowledge forms, that every subject should be seen within all knowledge contexts, and that teaching and working forms should be selected in accordance with those forms of learning that are related to the actual knowledge form.

### **Categories of Evaluation**

The learning of the student cannot be directly observed by the teacher. There is no introspective tool or trick allowing the teacher to observe the learning process. He

or she can only observe those communicative utterances, which may (or may not) be an expression of what the student has understood and learned. In order to do so, different communication tricks can be used, from the discussions in the classroom over the observations of the students ("are they engaged?", "do they follow me?" etc.) to the formal organization of such communicative evaluation events in tests and examinations.

It is my hypothesis that there is a correspondence between different knowledge forms and evaluation forms.

The traditional examination, which tests the acquirement of factual knowledge, can be organised as a summative evaluation, for instance as a multiple-choice test. Here, the function of the evaluation is to observe whether the student has accumulated knowledge according to the requirements presented in the curriculum.

Other knowledge forms however call for other evaluation forms. If one wants to test whether second order knowledge has been acquired, e.g. whether a problem oriented project group has learned how to solve problems, a group examination should be organised, focusing on the ability to solve problems, i.e. work together, create problem solving strategies etc. Here, the observation of the examiner must be oriented not only towards the accumulated knowledge, but also towards the knowledge development strategies acquired by the members of the project group. As these competencies point towards the future ability to solve comparable problems, this evaluation form can be called: formative evaluation.

Focusing on third order knowledge, it is my assumption that indirect or meta-reflexive evaluation forms should be used. How does one find out whether a work of art produced by an art student is good or bad? In order to do so, one must include the discussion of evaluation criteria, that is organise what could be called systemic evaluation. Here, the evaluation criteria are included in the evaluation process as

part of the discussion. Taking the example of an art student examination, the work of art cannot be tested as simply correct or incorrect. The examiner necessarily has to discuss with the art student, which aesthetic criteria he or she finds valuable, and in which ways the work of art is related to these specific aesthetic criteria. The same meta-reflexive approach can be found in e.g. the evaluation of a master or ph. d. thesis, where it is necessary to write an evaluation report. A single mark or grade is not sufficient, because it cannot include the reflection of the criteria for the evaluation.

Finally, the total system of evaluations constitutes an evaluation culture, which can be found in e.g. organisational procedures of ongoing self-evaluation. An organization that continuously evaluates itself has established an evaluation culture, i.e. a fourth order knowledge oriented evaluation form.

<b>Knowledge form</b>	<b>Evaluation form</b>
Factual knowledge ("qualifications")	Summative evaluation
Reflexive knowledge ("competencies")	Formative evaluation
Systemic knowledge ("creativity")	Systemic evaluation (evaluation of evaluation)
Metasystemic knowledge ("culture")	Evaluation and self-evaluation culture

### **The reflexive Teacher**

Inspired by Donald Schön's classical book from 1983 *The Reflective Practitioner* (Schön 1991), in which he analyses the ways in which professionals think in action, i.e. reflect on their ongoing professional activity, one can identify different forms of teaching reflection.

The basic form is what could be phrased basic teaching practices. The teacher communicates with the class of students in order to stimulate their learning processes.

In his classical analysis of communication, Watzlawick demonstrated that one cannot just communicate. All communication implies communication about communication or observation of communication. When we communicate, we observe the way in which the other communicates and the way we communicate ourselves: Why didn't he make eye contact when he complimented me? How should I respond appropriately? Literally spoken, the communicator is divided into two persons: One who communicates, and one who observes the ongoing communication.

Similarly, teaching practice is always combined with an ongoing reflection of teaching. However, using the categories of knowledge this reflection and self-reflection activity can be specified.

The basic form of teaching self-reflection is observation of the teaching practice. Of course the teacher has to observe the students in order to get an idea of their learning activity, but simultaneously he will also observe his own teaching as communication in order to reflect, whether the utterances chosen are appropriate or not. In its formalised form this type of teaching reflection can be named didactics, assuming that didactics can be defined as that form of teaching reflection that is related to a specific topic or to a specific teaching practice. Didactics is the methodology of teaching.

Adding to teaching reflection comes what can be called educational meta-reflection. Here the teacher includes reflection about the values and assumptions of the basic process of teaching and reflection. Implicitly or explicitly he discusses on which assumptions the immediate teaching and teaching reflection is based. This second order teaching reflection can be phrased pedagogy, assuming that pedagogic is the theoretically formalised reflection about teaching and teaching reflection, including the basic assumptions and values of teaching. Pedagogic is the theory of teaching.

Finally the organization of a group of teachers, including their mutual discussions about teaching practices and mutual teaching observations, for instance in teacher

teams, is equal to the fourth category of teaching reflection: The teaching, reflection and meta-reflection culture of an organization, for instance of a school, i.e. the totality of the teachers' practices and their methodological and theoretical discussions.

<b>Knowledge form</b>	<b>Evaluation form</b>
Factual knowledge ("qualifications")	Teaching practice
Reflexive knowledge ("competencies")	Teaching reflection: Didactics
Systemic knowledge ("creativity")	Teaching meta-reflection: Pedagogy
Metasystemic knowledge ("culture")	Teaching culture/organization

## Conclusion

In this paper I have argued that in order to develop a theory of the so-called "Knowledge Society" – or as I prefer: "The Knowing Society" – it is necessary to create an explicit definition of knowledge and a systematic theory of knowledge forms.

According to my theory, four categories – or four reflection levels – of knowledge can be identified. 1st order knowledge, or factual knowledge, results from the immediate observation of facts. The accumulation of 1st order knowledge is a simple, summative activity. 2nd order knowledge, or reflexive knowledge, results from the reflexive observation of factual knowledge. It is aimed at developing competencies, i.e. abilities to solve problems with one's factual knowledge. 3rd order knowledge, or systemic knowledge, results from the reflection of the combination of qualifications and competencies: What lies behind the way in which I observe things, and the way in which I solve problems? This 3rd order knowledge is about the – often hidden – basic assumptions of our knowledge-based practices. Knowing about basic

assumptions makes it possible to modify or change these basic assumption and thus to be creative. Finally, 4th order knowledge is the evolution of world knowledge, be it in interaction groups, in organizations or in societies. 4th order knowledge – world knowledge – represents the totality of what is known and what can currently be known.

Based on these categories of knowledge, four categories of learning can be identified, leading into a better understanding of teaching forms and of evaluation forms. Also, four corresponding forms of the reflexive teacher's self-reflection can be identified.

The final aim of these theoretical efforts is to contribute to the development of a theoretical basis for educating the professional teacher, assuming that the days have past when teaching was an activity based only on common sense. In a knowledge society teaching is a professional activity founded in research based evidence

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