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# Netlearning and Learning through Networks

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**ABSTRACT**

Traditional non-computerized learning environments are typically founded on an understanding of learning as acquiring silence for an effective *individual learning process.* Recently, it has also been reported that the high expectations for the impact of computer-based technology on educational practice have not been realized. This paper sets out to challenge both the assumptions made about the *requirements* for effective learning environments by pointing in the direction of *social creative learning processes*, as well as the technologies for effective and creative learning processes by redirecting the focus from what has been labeled "traditional computer-based learning environments" towards *user-driven learning networks*. Thus, this paper proposes the concept of *netlearning* as a general label for the traditional use of computer-based learning environments as education tools and then, it suggests the concept of *learning through networks* as a challenging concept for addressing user-driven technologies that support social, collaborative and creative learning processes in, via, or outside typical educational settings. The paper is inspired by recent research into the interaction society and the Scandinavian tradition in system development that always have highlighted the importance of user-driven processes, users as creative social individuals, and a perspective on users as creative contributors to both the form, and content of new interaction technologies. The paper ends with a presentation of a participatory design project in which children developed their own computer-based tools for editing film and I present this technology followed by a discussion on user-driven design of learning technologies in which the technology is not just a container for something else, but instead, novel technologies as a tool that directly enable the children to do new things, i.e. to collectively learn through their computer-supported social network.

**Keywords**

Device cultures, Interaction, Learning through networks, Mobility. Netlearning, Web 2.0

## Introduction – silence please!

Think about a typical non-computerized learning environment, e.g. a library, or a student room. One thing obvious about these two different settings is that the library design, and the student room layout, as well as the expected activities that these two different rooms should support can be characterized by the word *"silence"*. Traditional non-computerized learning environments are typically founded on an understanding of learning processes as acquiring silence for an effective *individual learning process.* These two aspects of learning processes, i.e. *silence* and *individual isolation* are two aspects that this paper sets out to challenge from a modern computer-based learning perspective, including recent studies into the importance of social interaction and creativity for effective computer-based learning processes (Muirhead, 2007). Most recently, it has also been reported that the high expectations for the impact of computer-based technology on educational practice have not been realized (e.g. Gifford & Enyedy 1999; Muirhead, 2007). According to Beynon (2007) and Norris, et al. (2002) this latest fact has led researchers to place greater emphasis on cultural issues. Following this trend, this paper sets out to explicitly explore the concept of learning technologies, or netlearning within the socio-technical culture of an emerging interaction society (Wiberg, 2004). On a more detailed level, this paper sets out to challenge both the assumptions made about the *requirements* for effective learning environments, by pointing in the direction of *social creative learning processes,* as well as the *technologies* for effective and creative learning processes, by redirecting the focus from what has been labeled "traditional computer-based learning environments" towards *user-driven learning networks* supported by social internet based applications.

## Let's get loud – from isolated & individual learning environments to social networking and learning through networks

While the traditional, individual, and isolated learning environment can function as a calm place for an individual to reflect upon e.g. text books, articles or other forms of literature, and while this setting is often romanticized, the individual is in fact also restrained by a number of factors. In an isolated learning environment, the single individual have no access to a second opinion from another person, no access to a complementary perspective, or external critique, neither do the single individual have any chances to get complementary literature from anyone which might have a different reference library. Given this, there is not much social interactions in this kind of traditional learning environment.

More recently, we can see this focus on isolated learning environments gaining new terrains in forms of e.g. self-studies and “learn yourself x in only three weeks”-book series. Technology wise, we have as a technological field, followed a similar trend in our focus on learning technologies that support the individual and his/her learning processes. Some of these technologies, e.g. systems for online universities, or distance education do have some support for social interaction. However, most of these systems assume a centralized communication model in which the learning peers (i.e. the students) mostly communicate with one central peer (i.e. a mentor or advisor). This leads in many cases to communication related to the structure rather than the content of an online education and does not support spontaneous, creative social learning processes.

On the other hand, it is today widely acknowledged that social networking is an important aspect of learning processes (Castells, 1996), and the following conversation can serve as an illustrative example of how much of what we know is in fact just part of threads which includes other persons in our social networks:

> "Do you think me a learned, well-read man?"
> "Certainly," replied Zi-gong, "Aren´t you?"
> "Not at all," said Confucius.
> "I have simply grasped one thread which links up the rest"
>
> (Recounted in Sima Qian (145-ca. 89 BC), "Confucius," in Hu Shi, The Development of Logical Methods in Ancient China, Shanghai: Oriental Book Company, 1922; quoted in Qian 1985:125, in Castells 1996, p. 1. )

This quotation also illustrate that what it is to be knowledgeable can be defined either in terms of how much one person have read and learned in isolation, or how knowledgeable a particular person is about different threads to grasp in order to gain access to other peers in different social networks. In more general terms, the later understanding of what it is to be knowledgeable corresponds to the “learning through networks” concept as proposed in this paper. This concept pinpoint the social dimension of learning processes, it pinpoints the social interaction setting, and it goes back to a Socratic understanding of knowledge gaining through conversations and argumentations with others.

The concept of *“learning through networks”* also corresponds well to the current development towards an interaction society (Wiberg, 2004) in which IT plays an important role since these new interaction technologies enable people to communicate and interact “anytime, anywhere”. In this view, modern interaction technologies enable social networks to stay connected even though they might not be collocated, to collaborate over distances, and to keep each other updated whenever they need or want to get in touch with each other. In the interaction society, the focus is not directed at one-way information flows or information processing. Rather, the focus is on the technology-enabled interplay between the habitants of the interaction society, their social networks, their innovations of new interaction technologies, and the new channels they invent for their own social learning processes. Today, we can see new computer-related behaviors arising as an effect of these interplays including e.g. community building activities, the establishment of sharing cultures, and innovative linkages of different interaction technologies (sometimes referred to as “mash-ups”).

In line with this trend, this paper proposes the concept of *netlearning* as a general label for the traditional use of computer-based learning environments as education tools and the concept of *learning through networks* as a challenging concept for addressing user-driven technologies that support creative, social learning processes in, via, or outside typical educational settings.

There is a wide range of literature today that point in the direction of user-driven, innovative and creative processes in which modern IT plays an important role as a mediating and enabling platform, and support engine for social interaction. For instance, the book *“The interaction society”* (Wiberg, 2004) illustrates the turn to social interaction when it comes to modern IT-use and points out that IT might be better described as an interaction technology, rather than just an information technology since much of our IT-use today can be more closely related to supporting social interaction (e.g. email, skype, ICQ/MSN, etc) rather than information processing (e.g. calculation or transactions) from the individuals viewpoint of everyday IT-use. Another example of this kind of literature is the book *"Connections – New ways of working in the networked organization"* (Sproull & Kiesler, 1998) which illustrate the complexity of social networks and the highly intertwined role of modern IT as a mediating channel for social interaction.

Finally, in the book *"The rise of the Networked Society"* Castells (1996) provide an in-depth analysis of how this new technology is not only reshaping our everyday IT-use, our social networks and our organizations, but in fact, how this technology have large scale implications for our society as a whole. According to his view, our modern society is today best described as a network society in which people uses their social and computational networks to do business and live their everyday lives. In the next section I take one step back and discuss how this focus on interaction relates to the Scandinavian tradition and the emerging interaction society on a general level before presenting a more detailed description of interaction as a core concept in learning trough network processes.

## Interaction as a vehicle to support new learning processes

This paper is inspired by recent research into the interaction society (Wiberg, 2004) as well as it has some of its roots in the Scandinavian tradition (e.g. Hirschheim & Klein, 1989; Spinuzzi, 2002) i.e. in Scandinavian system development projects that always have highlighted the importance of user-driven processes (see e.g. Ehn, 1988), users as creative social individuals (Warr & O´Neill, 2005), and worked for a perspective of users as creative contributors to both the form, and content of new interaction technologies (Ehn, et al., 1983).

Interaction is as such an approach with clear roots in Scandinavia and at the same time it is a modern concept able to capture a movement towards an interaction society. In such a society the technology enable new learning cycles and new paths for generating new knowledge. As formulated by the International Herald Tribune:

> "We are moving from the information society to the interaction society, and Lunarstorm is leading the trend," said Ola Ahlvarsson, chairman of Result, a Stockholm-based technology consulting company. "Young people here no longer accept a flow of information from above. They trust what they hear from friends on their network."

This quote describes the story about Lunarstorm, a Swedish Internet service that 90% of high school students in Sweden are subscribed to. As this quote illustrates, we are heading towards an emerging interaction society in which new technologies enable socially connected, creative, online learning environments. It also illustrates the bottom-up approach, or the *learning through networks* learning cycle. Today, this learning through networks approach can also be found elsewhere on the Internet in the form e.g. the Web 2.0 concept, or sometimes also described as user-generated content.

## The basic concept of interaction

Before going further into the importance of social interaction for creative learning processes we present a close-up view of the concept of interaction and discuss how it relates to the concept of interaction technologies, CSCW (Computer Supported Cooperative Work) - and CSCL (Computer Supported Collaborative Learning)- technologies.

The concept of interaction can, according to Dix & Beale (1996), be decomposed into the concepts of communication and collaboration. These two dimensions of interaction form two basic levels in the person-person-object model as formulated by Ljungberg (1999) based on Dix & Beale (1996) (see figure 1).

In this model, communication is the exchange of information between people, e.g. Video conferencing. Collaboration is when two or more people are operating a common object or artifact (e.g. co-operative authoring where the shared document is the common object. In collaboration, operations produce "feedback" to the operator, but also "feed through" to co-workers). Support for collaboration is sometimes combined with support for communication, e.g., a collaborative authoring system (collaboration) equipped with a chat feature (communication). In the context of this model, communication and collaboration can be conceived as subsets of "interaction". As suggested by Ljungberg (1999b) we can use "CSCW technologies" to frame the technological support for interaction, i.e., communication technologies, collaboration technologies, and interaction technologies.

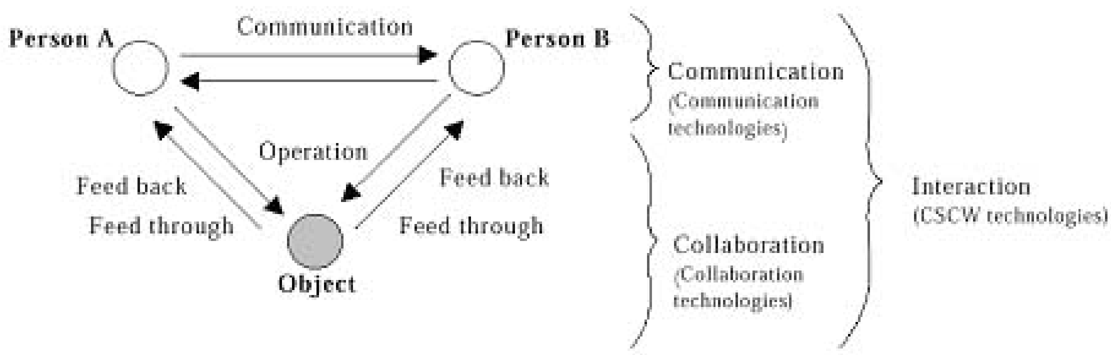


*Figure 1.* Definition of the concept of interaction and interaction technologies (From Ljungberg (1999) based on Dix & Beale (1996))

According to Dix & Beale (1996) the concept of interaction is precisely this combination of person-to-person communication, and collaboration around a shared object. In other terms, the concept of interaction can be conceived as a unifying concept for communication and collaboration. This social interplay between different people around shared objects, and how these people and objects are intertwined in different social structures and contact networks are thus the primary focus for studies of the interaction society.

Today, we can see new such structures arising as an effect of clever design of social network technologies that enable social interaction, networking and new ways of learning, i.e. learning through networks. These services include interaction technologies like e.g. YouTube, Flickr, Skype, and del.ici.ous, and in the next section we take a close-up look at a couple of these services that support this new learning through networks learning cycle.

## Interaction technologies in support of learning through networks

During the last couple of years we have been able to witness a shift in the development of learning technologies. While traditional learning technologies were focused on teacher-centered learning processes (Hiltz & Turoff, 2005; Gertzman & Kolodner, 1996) and specific learning objects we can now see how the technology is developed in a new direction (Shackelford, 1990; Gifford & Enyedy 1999). Now, the technologies are characterized as being open for everybody, general in terms of content, and builds upon a model of user-centered production of content instead of centralized, or teacher-centered production of content. Further on, the architecture is flat, and typically peer-to-peer to facilitate direct people-to-people interaction, collaboration, and learning.

These new web-based technologies (including e.g., Skype, Flickr, YouTube, Orcut, LinkedIn, Wikis, blogs, and new forms of social network services like e.g. the Four word film review web site www.fwfr.com) enable people to come together in new ways to share ideas, opinions, content, humor or ideals and as such, these technologies enable new forms of creativity, socialization, and learning. As described by Jenkins and colleagues (2006) these new social network services enable and scaffold new “participatory cultures” including; 1) *affiliations* (memberships, formal and informal, in online communities centered around various forms of media, such as Friendster, Facebook, message boards,m metagaming, game clans, or MySpace), 2) *expressions* (producing new creative forms, such as digital sampling, skinning and modding, fan videomaking, fan fiction writing, zines, mash-ups), 3) *collaborative problem-solving* (including working together in teams, formal and informal, to complete tasks and develop new knowledge (such as through Wikipedia, alternative reality gaming, spoiling), and finally, 4) *circulations*, i.e. shaping the flow of media (such as podcasting and blogging).

While email and mobile phones are two basic technologies that have enabled people to communicate at a distance, we can now see new forms of interaction support being developed. In this section we point at four such digital services that all demonstrate new ways of learning through networks. More specifically, we will take a closer look at the digital services YouTube, Creative Commons, Stumble Upon, and Del.icio.us.

One thing that these four Internet-based services have in common is that they rely on user-generated content, i.e. the company behind the service offers only the digital structure for it and leaves the content to be consumed, and produced by anyone interested in contributing to the community forming around the service. If taking a closer look at YouTube (www.youtube.com) for instance (see figure 2, left), the service enable people to upload their own short movies to the YouTube website, and others can brows the uploaded moveclips and play any clip they find interesting. YouTube continuously present “videos being watched right now” by others, as well as a list of featured videos. Besides this “social navigation” (Dieberger, et al., 2000) inspired support the site also support standard search of the content on the site. On YouTube, everybody can post new move clips, and everybody can rate, comment, or save a clip as a personal favorite. Each time a clip is watched it is tracked by a counter so it is always possible to know for how many times a certain clip has been played. A clip can also easily be shared by pushing a “share” button in the end of each clip to send a URL to anyone over email.

Another example of a web-based sharing service is Creative Commons (www.creativecommons.org) (see figure 2, right). Creative commons has the tag line “Share, reuse, and remix — legally”, and that is the essence of what this service is all about. A big issue when it comes to open web-based services for sharing user-generated content has been how to deal with copyright issues. On Creative Commons everybody are able to share their content with anyone. However, what is different here is respect to YouTube is that e.g. authors, scientists, artists, and educators can easily mark their own work with the proper rights they want their content to carry. Anyone who contributes with some content to Creative Commons can apply any copyright terms from "All Rights Reserved" to "Some Rights Reserved.” Thus, Creative Commons supports a bottom-up, user-driven, and open learning and sharing culture while protecting the individual’s rights.

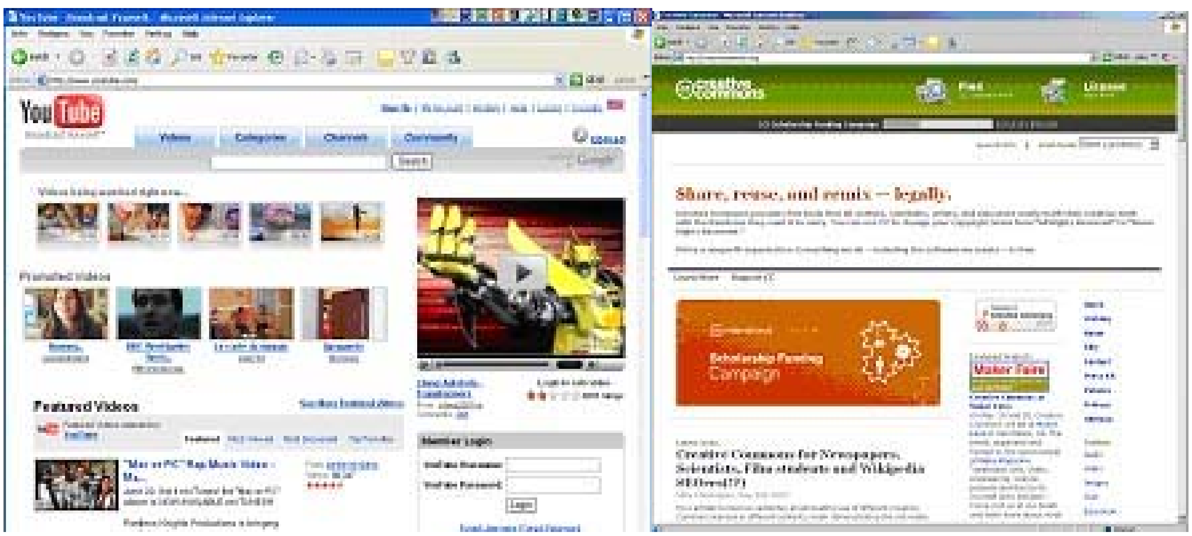

*Figure 2.* Screenshots of YouTube (left) and Creative Commons (right)

In relation to the main argument in this paper, these two services illustrate another important aspect of the learning through networks phenomenon. While traditional learning material are directed, produced, packaged, distributed, and consumed by learners, new material in these digital networks follow another cycle characterized by user-generated content that is continuously spread, re-mixed, re-spread, and so on. As such, this new media follows a new media life cycle (Wiberg, 2007).

The sharing culture is important for social learning processes, for maintaining a community, and for the creation of shared points of references. But in these new learning environments it is not only the content that is shared and circulated, but also the peers themselves (Hoppe, et al., 2005; Milrad, et al., 2005). Today we can see several similar sites growing fast in terms of number of associated and active members including e.g. the Stumbleupon.com site and the del.icio.us site (see figure 3). Below we take a closer look at these two services from the perspective of new learning environments for learning through networks.

One important aspect for the learning through networks concept to work is to provide the tools for finding new peers of content in the network, and to be able to share found peers with other members of the network. Two such examples of technical support can be found at the Stumbleupon.com site and the del.icio.us web site. Stumbleupon.com (figure 3, left) works actively with the tag line "Discover new sites" and that is also the essence of the site. On Stumbleupon.com people can recommend and review sites so that others more easily can get across relevant information and find sites related to their own interests. The overall idea with Stumbleupon.com is to serve as a public recommendation service. The del.icio.us site (figure 3, right) on the other hand serves a similar, but slightly different purpose. Here, the focus is about providing information to make it easier for others to find new interesting peers in the network. But, it is now just any peer that one might want to recommend to others. Instead, the central unique idea behind the del.icio.us site is that it is assumed that what is interesting to the single individual might also be interesting to others. Thus, on the del.icio.us site anyone can share their personal favorites (similar to "my bookmarks" in a browser) to anyone else. As such, the del.icio.us site builds upon an idea of finding new interesting material in the network through the glancing at other points of references in the network.


*Figure 3.* Screenshots from the StumbleUpon site (http://www.stumbleupon.com/), (left), and the del.icio.us site (http://del.icio.us/), (right)

Del.icio.us can thus be thought of as a new way of sharing your points of reference, which is indeed an important aspect of any body of knowledge. While Albert Einstein ones said, "The secret to creativity is knowing how to hide your sources" we can now start to see the creative power behind mass interaction around shared sources. The del.icio.us site is only one example. Another example is Wikipedia, the online, user-generated, and user-maintained dictionary, which contains almost the same amount of information as the Webster´s dictionary (although its accuracy has been frequently debated during the last two years).

With all these new services in place for uploading and sharing new content across the Internet it also becomes obvious that there are not only needs for tools to *find new peers*, but also to *keep track of changes* at already known peers of interest (Hoppe, et al., 2005; Jones, et al., 2005, Chen, et al., 2007). Today, we can therefore see a growing interest in e.g. RSS- and similar technologies to enable people to automate the checking for new content on remote peers (Miao, et al., 2005; Glotzbach, et al., 2007), and mash-up technologies (Ankolekar, et al., 2007), (including e.g. yahoo pipes) to enable people to more easily combine different sources of information, and also form new services (to again support the new learning vehicle of uploading, sharing, and circulating interesting content across the networks.

## Taking one step back and two steps forward – towards new physical (and social) learning environments

If taking one step back for a moment to have a look at the direction in which the development of many traditional learning environments are heading today, we can notice that there is a similar trend going on around traditional, physical learning environments as well. In the classical library, silence and individual search for literature was key factors for any library design. Now however, we have a new set of design requirements for these classical learning environments.

For instance, if reviewing the redesign of the city library in Umeå (see figure 4), a city in the north of Sweden, we can notice a couple of fundamental changes. In the old library, bookshelves were arranged as to create narrow corridors all across the library. Now, there is the same amount of books, but 1/3 of the books have been placed on a newly built upper floor. A stair with glas sealing enable the library visitors at the ground floor to see other people moving up and down the stairs. And, it enables people using the stairs to get a good overview of the library area below. Further on, the upper floor only covers 1/3 of the ground floor. This enable people at the upper floor and ground floor to see each other and communicate if they which to do that. Finally, a new sofa was installed around one of the scaffolding piles in the library. An important aspect of this sofa is its central place in the new open area, and another important aspect is that the seats are faced outwards. This might not be ideal for a sofa conversation, but it fulfills the idea of an open library in which people notice and acknowledge each other. According to the architects behind this redesign, a guiding principle was "social awareness", a not so unfamiliar word in the area of information technologies these days.


*Figure 4.* Illustration from the redesign of the city library in Umeå as an example of a new approach to traditional learning environments

What we can learn from this example is that the "learning through networks" trend is more far reaching than we can grasp if looking solely at digital and specific learning environments. Instead, we need to redirect our attention and acknowledge that this trend moves across the digital and the physical landscape, and across new, as well as traditional, old-style, learning environments. While the traditional library was about silence, and individual browsing of literature, the new library might be better labeled as"the social interaction library". While this might be to extreme, this example still illustrates the movement towards more open and more socially encompassed learning environments.

## Device cultures

It is not only the physical learning environments that are affected, effected, and changed as an effect of this movement towards socially encompassed learning settings. Another change is related to *where* the learning processes, in terms of knowledge sharing, interaction, and collaboration take place. In the knowledge society, sometimes referred to as an "interaction society" (Wiberg, 2004) people bring along a myriad of interaction tools and digital devices (typically mobile phones, laptop computers, or different handheld devices) to enable them selves to interact with anyone, at anytime, and anywhere. These devices and the appropriation of these devices are interesting in several different ways. The way in which people customize their devices to make them fit their needs and everyday behaviors is very individual, and it tells a lot about the individual who customize the devices. At the same time, the adoption and customization of devices is not only an individual processes, but also a highly social process. In the customization of my own devices, I do at the same time do this in relation to others. For instance if my friends are running Skype, or similar VoIP services on their computers it is likely that I will also install and set up my own Skype account on my device. The customization of digital devices is therefore both an issue for the individual, as well as it is a highly social process. In our view, this is also an example of a delicate symbiotic interplay concerning the acknowledging of the peers in the social networks, and simultaneously about the acknowledging of oneself and ones relation to the peers that these networks consist of. In the end, we are just individual peers in these new social networks, but this time around we have the technology available for reaching out to interact with others who might not be, in geographic terms, close to us.

The device culture, characterized by people wearing, carrying, using and constantly configuring digital devices are now possible to observe allover our modern society. People see these devices as their ontological security (Lowry & Moskos, 2005), think that they cannot manage without them (Fortunati, 2001) and carries them with them to ensure constant accessibility to their online social networks (e.g. Wiberg & Whittaker, 2005; Sadler, et al, 2006). From a learning through networks perspective, and in line with Lankshear & Knobel (2006) it is a way to ensure their belonging to their social networks as an important point of reference for their learning, and collaborative processes.

The device culture is also characterized by a few additional factors. The device cultures are about the use and appropriation of digital devices, but also about a few additional aspects in relation to the learning through networks phenomenon. First of all, we have the "I, I, I trend", i.e. we can see the acknowledging of the individual in services like iTunes and iGoogle. But at the same time, we can also see digital services that build upon the strength of individual contributions to the public, which is about our social networks, shared digital content, and mass interaction (Keen, 2007) including e.g. the most recently, and highly popular internet service Facebook (www.facebook.com). Further on, we should not underestimate the importance of fun as a mean to support creative learning processes. This has been acknowledged previously in the literature (e.g. by Neal, et al., 2004 and MacFarlane, 2005) and specific terms, like "edutainment" (e.g. Rasmussen, 1994 and Rapeepisarn, et al., 2006), has been formulized to highlight the importance of fun for good learning processes. Finally, we should not forget about the coming generation, i.e. the children as an important component of today's device cultures. These young people are often early adopters of new technology, creators of innovative products and services and adaptive to learn, and spread new things (Jenkins, et al., 2006). Without making it into a cliché, the young people of today are the nodes in tomorrow's networks.

To summarize this trend, which today is typically described or labeled as a movement towards "Web 2.0" we can now make the following distinctions between "Web 1.0" and "Web 2.0": In "Web 1.0" most web sites were quite static in terms of frequency of information updates, designed to be centrally (and seldom) administrated, corporate-driven, and seen as a showroom for internet visitors. On the other hand, for "Web 2.0" services the focus is on user-driven/invented Internet projects, user-generated content, socially exchanged digital media via these new digital services, and characterized by a high frequency of updates, which typically include various forms of digital media rather than text based corporate information.

## Supporting children to learn film editing through participatory design and social collaboration

While it might be fine to just theorize about the important aspects of devices cultures and the development towards Web 2.0 in relation to the phenomenon of learning though networks it might be equally important to illustrate these ideas in a concrete project. In this section I therefore set out to take the aspects of learning through networks in the modern device cultures to an applied setting and present a participatory design project in which children developed their own computer-based tools for editing films and movie clips. On a general level, our project is related to e.g. the work of Hiroaki Ogata, specially their project with RFID Tags for language learning (http://www-yano.is.tokushima-u.ac.jp/ogata/projects.html), the research conducted by Masanori Sugimoto on tangible learning environments (e.g. Sugimoto, et al., 2003), the research conducted by Kurti, et al. (2007) in the AMULETS (Advanced Mobile and Ubiquitous Learning Environments for Teachers and Students) project, and the Savannah project at FutureLab in the UK (http://www.futurelab.org.uk/resources/documents /project_reports/ Savannah_research_report.pdf).

In this section, I present our project and the technology we have developed followed by a discussion on user-driven design of learning technologies in which the technology is not just a container for some other learning objects, but instead, a novel technology that in itself serves as a tool that directly enable children to do new things, i.e. to collectively learn through their computer-supported social network, i.e. a digital support for learning through networks.

In 2005, we initiated a participatory design project together with 12-year old children as part of the EU funded Meetings/vITal research project. During 6 mounts, a group of 13 children from a local school participated in a creative process of identifying needs for novel collaboration technologies. Their participation included the needs identification process, the system requirement analysis, and the design of a concrete system to support their vision of a novel collaboration technology. In this project, the children developed a huge number of paper mock-ups, interface sketches, and low-fi prototypes to illustrate, and communicate their visions concerning novel technical support for editing film (see figure 5). Their main vision included, amongst other ideas, a circular, table size, area for tangible editing of movie clips by just arranging physical tags (RFID-tags) in the order they should be played in the finalized video, and the whole project is carefully described in Vaucelle, et al., (2005).

*Figure 5.* Two illustrations from the creative process of identifying the needs and visions for a future computer-based novel tool for editing movie clips. To the left, a picture from one of the sessions with the children, and to the right, an example of an interface sketch drawn during this project

From a "learning through networks" point of view, however, there are some interesting aspects to acknowledge here. As formulated above, we took those principles as a guide and involved children as creative and active participants in this project. We also allowed them to freely play around with paper and pencil materials as to make the process fun. We stimulated them to work together rather than in isolation, and we wanted them to develop a tool that could work for them as an individual as well as being a good support for collectively editing film.

To us, it turned out that these criteria's worked very well, and in only 6 mounts, the children went from vague initial ideas to an implemented system (although they had some help in the end with the programming of the actual system and the creation of the table, the tags, and the special cameras developed in the project. Figure 6 illustrate the final version of the system which contains 1) a circular editing table that the children can use to arrange their tags (RFID-tags) on in any order they want them to appear in the final cut of the movie, 2) a special camera developed that was built using a camera-equipped PDA running windows mobile which we also equipped with a WLAN-card and an RFID tag reader (as to enable association of video clips with RFID-tags, and as a seamless way to transfer the video clips taken to the editing table (over WLAN). As illustrated in figure 6 (right) the children could then just take an RFID-tag. Place it in the holder on the camera (see the little light blue circle), shot a sequence, and then just take the RFID-tag from the camera and place it in a proper place on the editing table.

*Figure 6.* The editing table (left), the RFID/WLAN-camera (center), and a couple of the children in the project playing around with the cameras and the editing table (right)

So, while this project on the one hand illustrates the design of a novel technology for film editing in terms of a robust, tangible interface for collaborate film editing, it does at the same time illustrate something else of importance from a learning through networks perspective, i.e. the power of social, user-driven design of learning technologies in which the technology is not just a container for something else, but instead, a tool that directly enable the children to do new things, i.e. to collectively learn through their computer-supported social network. For the children that participated in this project, the most important lesson might not be how to design this specific tool, but rather the discovery of the power of playing around together, playing around with digital technology, and participate in a design process of new technologies Vaucelle, et al (2005), and how such a process can stimulate creativity, and thus stimulate new ways of learning.

## Conclusions – A final note on netlearning vs. learning through networks

In this paper we have elaborated on the notion of *netlearning* as a labeling concept for learning technologies, vs. *learning thought networks* as a label for the new ways in which people use the Internet and wireless mobile networks to communicate, collaborate, participate and generate new knowledge around their own special topics. As such, this paper have challenged both the *assumptions* made about the *requirements* for effective learning environments by pointing in the direction of social, creative learning processes, as well as the *technologies* for effective and creative learning processes by redirecting the focus from what has been labeled "traditional computer-based learning environments" towards user-driven learning networks.

Further on, we have in this paper proposed the concept of *netlearning* as a general label for the traditional use of computer-based learning environments as education tools and then we have proposed the concept of *learning through networks* as a challenging concept for addressing user-driven technologies that support creative, social learning processes in, via, or outside typical educational settings. The general outline for this paper has been inspired by recent research into the interaction society and the Scandinavian tradition in system development that always have highlighted the importance of user-driven processes, users as creative social individuals, and a perspective on users as creative contributors to both the form, and content of new interaction technologies.

Finally, we have in this paper presented a participatory design project in which children developed their own computer-based tools for editing film and we have presented this technology followed by a discussion on user-driven design of learning technologies in which the technology is not just a *container* for something else, but instead, a novel technology that in itself serves as a tool that directly enable children to do new things, i.e. to collectively learn through their computer-supported social network, i.e. a digital support for learning through networks.

While this paper started out with a quick step away from the traditional learning environment and the idea of *silence* as an important factor for effective individual learning processes I think that the biggest challenge for further research in this field is about generating new knowledge about the other side of the individual "silence coin"., i.e. research efforts directed towards understanding and generating new theories and concepts that can explain and shed new light upon the processes related to collaborative and creative *concentration* as a result of learning through, and playing with, new forms of digital networks.

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