Review of Learning 2.0 Practices

Deliverable 2 of the study:

**Learning 2.0
The Impact of Web 2.0 Innovations on
Education and Training in Europe**

Draft Working Paper

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October 2008

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Table of Contents

Executive Summary

Changed learning paradigms. Looking at the way in which digital technologies have changed how people access and manage information, a new learning paradigm is emerging, displayed most clearly by the so called generation of "New Millennium Learners (NML)" (OECD, 2007), but also shaping older generation's ways of acquiring knowledge. This paradigm can be summarized as follows:

- Due to information overflow, there is a necessity to learn how to **sift, select**, **organise** and **manage** information according to relevance.

- Learning in the digital era is fundamentally **collaborative** in nature; social networks arise around common (learning) interests and aims and scaffold the learning process by providing social and cognitive guidance and support.

- The **learner** plays a **central** role in the learning process – not as a passive recipient of information, but as an active author, co-creator, evaluator and critical commentator.

- As a consequence, learning processes become increasingly **personalised**, tailored to the individual's needs and interests.

Innovative Learning 2.0 strategies. Due to the novelty of social computing, take-up in education and training is currently still in an experimental phase. There are various and diverse small scale projects and initiatives, launched all over Europe, which try to exploit social computing for a multitude of learning purposes, but research on enabling and disabling factors is scarce. However, looking at current practice, at least four different – though overlapping – innovative ways of deploying social computing tools in primary, secondary, vocational and higher education can be discerned:

1. (LA) *Learning & Achieving:* Social computing tools can be used as methodological or didactic tools to directly support, facilitate, enhance and improve learning processes and outcomes. Social computing is conceived of as a means of personalizing learning processes and promoting the students' individual learning progress, ultimately leading to an empowerment of the learner;

2. (N) *Networking:* Social computing can be embraced as a communication tool among students and between students and teachers, supporting also the exchange of knowledge and material, but mainly creating an environment of understanding and assistance, thus contributing to the establishment of social networks or communities between and among learners and teachers;

3. (D) *Embracing Diversity:* Social Computing can be thought of as a means of integrating learning into a wider community, reaching out to virtually meet people from other age-groups, backgrounds and cultures, linking to experts, researchers or practitioners in a certain field of study and thus opening up alternative channels for gaining knowledge and enhancing skills;

4. (S) *Opening up to Society:* Finally, social computing can be conceived of as a tool for making institutional learning accessible and transparent for all members of society, promoting the involvement of third parties like parents, but also facilitating the access of current and prospective students to information.

Together these four approaches to Learning 2.0 give rise to new areas for innovation in learning, to *innovative lands for Learning,* or: iLANDS.

Figure 1-1: iLANDS for innovation in learning

Education institutions are susceptible to all of these strategies, although focus and implementation differ substantially between higher and secondary or primary education. Learning 2.0 opportunities outside the institutional framework arise in particular by combining the use of social computing to directly enhance learning processes and outcomes with its networking potential. Teachers profit in particular from social networking tools, which allow them to build up communities of practice for the exchange of knowledge, material and experiences. Evidence on adult education, workplace training and informal learning in general is scarce; the scope of Learning 2.0 strategies in this area is indicated under the heading "personal development".

Organisational Innovation. The outer three shells of the iLANDS model illustrate the potential of Learning 2.0 for promoting organisational innovation in E&T by creating a learning environment that is open to society, transparent and accommodating to all individuals involved in and affected by organised learning. As evidence collected from a number of examples indicates, *networking* (N) within institutions and outside of them leads to the emergence of new communities for learning, disconnected from place and time, in which participants to organised learning can transcend the limits of traditional communication, developing new learning strategies and forms together with their peers. Embracing *Diversity* (D) as a source of new insights and inspirations does not only widen the learners' horizons, but causes educational institutions to intensify their collaboration with other organisations, across borders, language barriers, and sectors. An intensified activity in this area will lead educational institutions to realize that they are embedded in a globalised and constantly evolving knowledge society, and that, as a consequence, they will have to redefine their role within society and within the learning process.

The way in which social computing is used to overcome institutional barriers and to make learning more transparent and accessible to *Society* (S), symbolizes and epitomizes a recent change in the way educational organisations interact with their clientele, redefining roles and dependencies. Social computing promotes organisational innovation in this area by allowing institutions to better address students and parents as customers to the learning service, respecting their need for information, easy access and quality control and meeting them in a public virtual sphere that is customized to their needs rather than the institutions' priorities. Thus, social computing supports organisational innovation by re-integrating the institution into the community (S), transcending borders between organisations, countries and cultures (D) and strengthening the social interactions between all participants involved in the learning process, transforming E&T institutions into communities (N).

Pedagogical innovation. The inner core of the iLANDS model indicates the potential of social computing to facilitate *innovation in learning*, i.e. pedagogical innovation, by disrupting traditional learning and teaching patterns, giving rise to new and innovative ways of acquiring and managing knowledge. Evidence collected from a wide variety of Learning 2.0 cases from all over the world suggests six areas in which Learning 2.0 strategies seem to effectively foster pedagogical innovation:

(1) **Supply of and access to learning material:** Social computing tools can facilitate learning processes by making study material more readily available, thus supporting different individual learning styles. In particular, teacher or course blogs can be used to distribute information, wikis support collective resource building, and podcasts assist in making learning material accessible, increasing flexibility and personalisation.

(2) **Personal knowledge management and resource network building:** Social computing tools allow for an improved knowledge exchange, which supports the individual's personal knowledge and resource management und contributes to the personalisation of learning processes;

(3) **Subject specific methods and tools:** Some social computing applications, particularly immersive environments and media-sharing services, can be used to create innovative ways for attaining subject specific skills, changing learning methods and procedures in subjects like medicine, environmental studies, law, architecture, history and arts. As a consequence, new pedagogical and scientific methods evolve that change the way in which a particular subject is learned and taught.

(4) **Improving personal achievement:** Social computing tools can contribute to increasing the individual's performance and academic achievement. On the one hand, they are suited to support basic skills and competences, like digital skills, writing skills and foreign language skills; on the other hand their potential to increase collaboration and personalisation can open up new learning opportunities in all subjects, which are better suited to the individuals' needs and therefore improve their performance and achievement.

(5) **Personal skills:** The **affective** and **social** dimension of the learning process can be exploited to allow the learner to not only enjoy learning, but acquire skills that empower him to actively engage in the development of his personal skills and competences. Social computing can in particular enhance the individuals' motivation, improve their participation and foster social and learning skills.

(6) **Higher order skills & meta-competences:** Social computing tools can contribute to the development of higher order **cognitive** skills like reflection and meta-cognition, increasing self-directed learning skills and enabling individuals to better develop and realize their personal potential.

Challenges. Though there are several obstacles to be overcome in the implementation and adaptation of social computing to educational contexts, the main challenge to be addressed is equal access for all participants. Furthermore, even young people accustomed to ICT may lack essential components of digital competence, such as critical evaluation skills for online information and personal knowledge management skills to benefit from Learning 2.0. Finally, social computing services have to be chosen with care and adapted adequately to the respective learning context. Educators have to address problems connected with the possible loss of data, the openness of the environment, copyright issues, and the commercial interests of the service providers.

Research results indicate that, learners with special needs, for example students with dyslexia, might not be able to benefit from Learning 2.0 approaches (Woodfine et al., 2008). Learners with disabilities might likewise face accessibility problems when using social computing tools (Fisseler & Bühler, 2007). However, social computing also has the potential to alleviate access and participation for learners with disabilities and learning difficulties (Fisseler & Bühler, 2007; Tan & Cheung, 2008). Yet tools have to be used appropriately and prudently, adequate assistive technologies will have to be developed and equity standards will have to be implemented. Teacher support will remain critical.

Factors influencing Learning 2.0 take-up. The success of social computing tools in facilitating and improving learning processes and outcomes depends on a variety of factors, which might well be contingent to the specificities of each case. However, some of the more salient aspects relevant for the outcome of social computing projects documented in the research literature include (1) the availability and accessibility of social computing tools by teachers and learners; (2) the functionalities of the tools employed, their suitability for the chosen task and the learners' familiarity and acceptance of the tools; (3) the students' attitudes towards the respective social computing tools and the extend to which they are able to appropriate them to their personal needs; (4) the participants' background of knowledge and skills, the group structure, and the form of interaction and communication among peers; and (5) the scaffolding, i.e. way in which social computing tools are embedded within the course, subject or institutional environment, including in particular guidance and support, the structure of the tasks and the teacher's ability to encourage participation and embed the tools in the learning process.

While in many European countries, the availability and accessibility of tools should not limit take up, the learning environment itself, and the roles, expectations and attitudes it evokes, might impede successful implementation. On early evidence, a *structured approach* is critical for the success of Learning 2.0. Although Learning 2.0 empowers students play a more active part in the learning process, the role of the teacher remains vital – or becomes even more important – for the success of the learning activities.

Inclusion. A number of examples suggest that Learning 2.0 strategies have a high potential to re-engage individuals disconnected from learning opportunities and at risk of exclusion from the knowledge society in learning. The low barrier to entry, the playful and interactive character of social computing applications, the pre-valence of visual, audio and video material make Learning 2.0 particularly attractive to learners with a fragmented learning biography. However, research on the potential of Learning 2.0 to support lifelong learning is still scarce. Policy support is needed to close the gap of basic access and ICT skills for all learner groups, enabling them to benefit from lifelong learning 2.0 approaches.

1.   Introduction

This report is part of an IPTS[1] research project "Learning 2.0: Impact of web 2.0 innovations on education and training" under the Administrative Arrangement between DG JRC-IPTS IS Unit and DG EAC Directorate A Unit 2. The study aims to evaluate the projected impact of social computing on learning and to analyse its potential in supporting innovation and inclusion within education and training. The primary aim of this literature review, contributing to this goal, is to collect evidence and summarize published research findings on the ways in which social computing applications change learning patterns and give rise to new learning opportunities.

Over the last few years, there has been an impressive take-up of social computing, i.e. applications for blogging, podcasting, collaborative content (e.g. Wikipedia), social networking (e.g. MySpace, Facebook), multimedia sharing (e.g. Flickr, YouTube), social tagging (e.g. Deli.cio.us) and social gaming (e.g. Second Life). Especially younger people have taken up social computing: 45% of teens aged 12-14 have online profiles; "older" teens (aged 15-17, especially girls) are more likely to visit social networking sites and have profiles while young adults (those aged 18-29) are among the most active video viewers. Recent data indicates that other population groups, in particular women and people aged 50-64, are also starting to embrace social computing. (cf. Pascu, 2008)

Digital technologies have not only deeply penetrated people's private and professional life, but have already profoundly changed learning patterns (cf. chapter 2). The emergence of social computing is contributing to this change in remarkable ways, which open up new opportunities for institutional learning. Social computing applications empower users to produce, publish, share, edit and co-create content, offering them new opportunities for learning and self-realization. With the emergence of these new participative functions of the web, new ways of cooperation and social networking are supported, facilitating knowledge exchange and collaborative content production (cf. Ala-Mutka, 2008).

Education and training systems need innovative change to foster new skills for new jobs, taking into account the changing living, working and learning patterns in a digital society. Social computing both causes and responds to these changes by, on the one hand, disrupting established practices, and, on the other, providing new means for fostering lifelong learning, supporting the vision of personalized future learning spaces in the knowledge society (cf. Punie et al, 2006).

However, so far education and training systems have on the whole not reacted to these changes and neither schools nor universities have seized this new potential for enhancing learning and addressing their learner's needs. Results of the last PISA survey (2006) indicate an astonishing lack of ICT usage in general in European schools: While 86% of pupils aged 15 frequently use a computer at home, 50% of students in countries belonging to the European Union declare that they have not used a computer in the classroom in the past 12 months (OECD, 2008).

The European Commission has recognized the need for modernising educational systems, increasing quality, equity and personalization in providing lifelong learning for all (European Commission, 2006, 2007a). In its Communication on Media Literacy in the Digital Environment (2007b) the Commission takes note of the fact that due to the increased availability of digital media products and user generated content, there is a need to empower

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[1]   IPTS (Institute for Prospective Technological Studies) is one of the 7 research institutes of the Joint Research Centre of the European Commission.

the citizens to "actively us[e] media, through, inter alia, interactive television, use of Internet search engines or participation in virtual communities, and better exploiting the potential of media for entertainment, access to culture, intercultural dialogue, learning and daily-life applications (for instance, through libraries, podcasts)" (2007b: 4). European Parliament and Council (2006) further emphasize the importance of promoting digital skills by listing digital literacy as one of the key-competences for lifelong learning.

The objective of this report is to contribute to European policy making by gathering evidence on Learning 2.0 practices in Europe, assessing factors for success and failure, and indicating the potential impact of social computing on education and training systems and institutions.

The following chapter will outline several aspects and perspectives that contribute to the emergence of distinct learning patterns among current learners, which are expected to have a profound impact on institutional learning. These trends originate in the fact that the younger generation – the so-called "New Millennium Learners (NML) (OECD, 2008) – have grown up surrounded by different digital technologies that have shaped the way in which they learn and interact. Chapter 3 is devoted to the presentation of some of the key concepts which form the conceptual and theoretical framework for the study of the use of social computing for learning. In chapter 4, the most common social computing applications relevant for learning will be presented and their projected educational use will be described, indicating possible obstacles and threats. These three chapters, taken together, set the scene for the study of the potential of social computing applications to promote innovation in education and training, which will be the focus of chapters 5-8.

Chapter 5 will introduce the notion of Learning 2.0 *iLANDS,* i.e. areas in which social computing applications support innovation in learning. These innovative territories comprise different Learning 2.0 strategies, i.e. using social computing to enhance *learning* and *achieving* (LA), to foster *networking* (N) learners, teachers, researchers and E&T institutions, to embrace *diversity* (D) and open up to *society* (S) as a potential for richer and more transparent learning opportunities. The latter three strategies or stances primarily support institutional innovation and will be illustrated and discussed in chapter 5. Chapter 6 will be devoted to a more in depth discussion of the core of Learning 2.0, the *Learning & Achieving* perspective on social computing, which aims at innovating learning processes and outcomes. Chapter 7 will outline enabling and disabling factors for the uptake and success of Learning 2.0 in organised learning, indicating the need for supportive measures to scaffold Learning 2.0 projects. Chapter 8 discusses the potential impact of social computing on fostering or undermining the inclusion of individuals who are at danger of being disconnected from learning opportunities. Chapter 9 will close with some conclusions.

This study concentrates on gathering reliable data on good practices for Learning 2.0 as a basis for the subsequent assessment of the potential of social computing in promoting innovation in learning in Europe. In the research literature, the use of web 2.0 in higher education is widely discussed and well documented, while there is little evidence on good practices for secondary and primary education and research efforts have not yet addressed adequately issues of vocational training and lifelong learning. Since it is well-known that teachers play a key role in mediating ICT take-up, more research is needed on supporting and networking teachers to mainstream Learning 2.0 practices.

2. New Challenges for Education and Training Systems

Education and training systems are challenged by several emerging trends, as discussed e.g. by Punie et al (2006) in their visionary work for future learning spaces in the knowledge society. This report chapter is devoted to the presentation of aspects and perspectives that contribute to the emergence of distinct learning patterns, which are projected to have a profound impact on institutional learning. This trend originates in the fact that the younger generation – people born in the early eighties or later – have grown up surrounded by different digital technologies that have shaped the way in which they live, think, learn and interact. This generation – the "New Millennium Learners" – and their learning styles, as presented in the literature, will be characterized in the first section. The second and third section will supplement these insights this some exemplary empirical results that underline the validity of the analytical and theoretical findings of the first section.

2.1. New Millennium Learners (NML)

Several terms have been used to describe the current generation of learners – the generation of young people born after 1982 – and their supposedly deviant learning styles, who have been raised in a context where digital technologies form an inextricable part of daily life (Pedró, 2006). Most prominently among them figure the notions of "digital natives" (McLester, 2007), "Net Generation" (Olbinger & Olbinger, 2005), "Millenials" (Pedró, 2006), "New Millennium Learners"(OECD, 2008) or even "Neomillennial Learners"(Baird & Fisher, 2006; Dede, 2005); they have also been dubbed IM Generation, which stands for Instant-Message Generation (Lenhart, Rainie, & Lewis, 2001), the Gamer Generation (Carstens & Beck, 2005) for the obvious reference to video games, or even the homo zappiens (Veen, 2003) for their ability to control simultaneously different sources of digital information. Each of the terms focuses on different aspects of the same phenomenon. We will therefore in the following consider them as interchangeable concepts, describing the same phenomenon from different angles, while giving preference to the term "New Millennium Learners", or the shortened version "NML", which seems to be the most widely accepted terminology.

NML are the first generation to grow up surrounded by digital media, and most of their activities dealing with peer-to-peer communication and knowledge management, in the widest sense, are mediated by these technologies (Pedró, 2006: 2). The changing ways that members of this generation can learn, communicate and entertain themselves are according to Pedró (2006) the primary reasons behind the growing popularity of social computing applications such as blogs, wikis, tagging and instant messaging. This popularity can help explain why today's teenagers are increasingly spending more time using home digital media (computer, games, the Internet) rather than watching TV.

While not all people born after 1982 display the "typical" properties of NML and there are profound discrepancies between different OECD or EU countries and within different countries, reflecting prevailing digital divides (cf. OECD, 2008), a tentative characterisation, compiled from different sources, illuminating changing learning patterns, will be presented in the following. Although other observations may be made about NML, the points mentioned here illustrate changing learning attitudes, styles and patterns, which have a profound impact on learning.

2.1.1. Technology Usage

Baird & Fisher (2006) point out that NML are "hardwired" to simultaneously utilize multiple types of web-based participatory media. They are technologically savvy, have grown up with

the Web and are "always-on". According to Pedró (2006), Millennials are adept with computers and creative with technology. Having grown up with widespread access to technology, NML are able to intuitively use a variety of digital devices. Although they are comfortable using technology without an instruction manual, their understanding of the technology or source quality may be shallow (Olbinger & Olbinger, 2005).

2.1.2. Multitasking

According to Pedró (2006) NML are highly skilled at multitasking. They usually take for granted that multitasking is the normal approach to using digital media: being online while at the same time watching TV, talking on the phone, and doing homework. Undoubtedly, their recurrent activity with these technologies can be said to have fundamentally shaped their notions of communication, knowledge management, learning, and even their personal and social values. They multitask, moving quickly from one activity to another, sometimes performing them simultaneously (Olbinger & Olbinger, 2005). According to a recent OECD study multitasking as a phenomenon will not disappear, but, contrarily, it will become mainstream (OECD, 2008).

As a consequence of their continuous multitasking, cognitive patterns change: NML do not think linearly and are less structured than previous generations (McLester, 2007). They gain knowledge by processing discontinued, non-linear information, which profoundly changes their learning styles (Pedró, 2006). OECD (2008) research shows that the exposure to the proliferation of imagery in media has contributed to the selective increases in nonverbal intelligence scores during the past century in industrialised countries.

However, Dede (2005) warns that multitasking can result in cognitive overload and concomitant loss of effectiveness. He emphasizes that, whether multitasking results in a superficial, easily distracted style of gaining information or a sophisticated form of synthesizing new insights, depends on the ways in which it is employed.

2.1.3. Individualisation & Personalisation

Siemens (2006: 71) summarizes this phenomenon with the notion "the rise of the individual", which points at an increased personalisation, control and capacity to create, coupled with a strong sense of identity and ownership. However, individualisation, as Pedró (2006) underlines, also points at a reinforced isolation, even if cyberspaces for social relationship emerge as alternative exchange fora. McLester (2007) observes that while NML are extremely social, they are also mostly egocentric and striving to be independent.

Baird & Fisher (2006) further elaborate the aspect of personalisation, underlining that NML have "personally tailored" learning paths, picking and choosing from multiple sources of media, resources, projects or other curriculum content which they can then bundle together to meet individual needs and learning styles. They tend toward independence and autonomy in their learning styles.

2.1.4. Increased Connectedness

Connectedness describes the attitude of being continuously available for one's contacts, supported by the prevalence of communication through cell phones, online social networking sites and instant messaging (Pedró, 2006). The particular device may change depending on circumstance but NML are constantly connected and always on (Olbinger & Olbinger, 2005). Relationships are defined by convenience and interest not geography; we can connect where-ever (space breakdown) and whenever (time breakdown) (Siemens, 2006).

Siemens (2006) adds that the increased connectedness diminishes the limits between the physical and the virtual world; our virtual existence is becoming almost as natural to us as our real existence so that we know how to function in both worlds. In a similar vein, but more critically, the OECD (2008) points out, that the prominence of digital games among the younger generation might be distorting the limits between the real and the virtual world.

2.1.5. Immediacy

Typically the everyday lives of NML are characterised by immediate communication, via instant messenger, cellular conversations or text messaging (Pedró, 2006: 2). Immediate responses and quick reaction speeds are seen as the norm in personal communication (Pedró, 2006: 11; Siemens, 2006: 71). NML are not only used to receiving information really fast, they also expect instant gratification (McLester, 2007). Whether the immediacy with which a response is expected or the speed at which they are used to receiving information is concerned, more value may be placed on speed than on accuracy. The expectation of immediacy holds true for access to friends, services, and responses to questions (Olbinger & Olbinger, 2005).

As a consequence, NML are extremely impatient (McLester, 2007; Baird et al., 2007), a characteristic which has been described as "grasshopper mind", alluding to the inclination to leap quickly from one topic to another, sometimes back and forth, instead of lingering over a subject (Pedró, 2006). Thus, NML become irritated if sources of information are not instantly at their fingertips, and rarely spend long hours thinking about the same thing. As a further consequence, reflection is becoming a lost art, which NML must be reminded and encouraged to use (Siemens, 2006; Olbinger & Olbinger, 2005).

The rapid pace with which NML like to receive information means they often choose not to pay attention if a class is not interactive, un-engaging, or simply too slow (Olbinger & Olbinger, 2005). Accustomed as NML are to multiple stimuli, they easily get bored in the traditional classroom, while older educators bemoan their short attention span (Baird et al., 2007).

2.1.6. Multiple Media Types

Olbinger & Olbinger (2005) note that NML have been exposed to multiple media types from a very young age; as a consequence they are more visually literate than earlier generations and more comfortable in image-rich environments than with text. Many are fluent in personal expression using images and are more comfortable in an image-rich than a text-only environment (McLester, 2007). Much of the reading done by NML has been on the Web, where they are more likely to scan than to read (Olbinger & Olbinger, 2005, MLester, 2007).

Multimedia content is considered to be, by its very nature, of higher value than mere text (Olbinger & Olbinger, 2005; Pedró, 2006). Preference is given to electronic environments (McLester, 2007), images, movement and music over text (Pedró, 2006). NML are more visually literate than previous generations; many express themselves using images (McLester, 2007). They are able to weave together images, text, and sound in a natural way (Olbinger & Olbinger, 2005). Because of the availability of visual media, their text literacy may be less well developed than in previous cohorts (McLester, 2007; Olbinger & Olbinger, 2005). Writing, however, becomes increasingly important due to the physical constraints imposed by the devices and services used, up to the extent of generating new languages (Pedró, 2006).

Olbinger & Olbinger (2005) report on cases in which NML refuse to read large amounts of text, whether it involves a long reading assignment or lengthy instructions. In a study that

altered instructions from a text-based step-by-step approach to one that used a graphic layout, refusals to do the assignment dropped and post-test scores increased.

2.1.7. Engagement and Working Attitude

NML show an active involvement, are extremely creative and constantly engaged (McLester, 2007). Most NML prefer to learn by doing rather by being told what to do; they prefer "doing things" over thinking or talking about things (Olbinger & Olbinger, 2005). They are oriented toward inductive discovery, making observations, formulating hypotheses, and figuring out patterns (Olbinger & Olbinger, 2005). McLester (2007) adds that due to their experiential nature (Olbinger & Olbinger, 2005), NML are risk-takers.

According to Olbinger & Olbinger (2005) NML readily take part in community activities. Given a choice, they seem to prefer working on things that matter, such as addressing an environmental concern or a community problem. They believe they can make a difference and believe in the power of science and technology to resolve difficult problems. NML are very achievement oriented and like to know what it will take to achieve a goal (Olbinger & Olbinger, 2005). Barnes et al. (2007) underline the fact that, against prevalent suppositions, NML are in general ambitious and extremely goal-oriented, and understand that achieving their career ambitions entails a good education.

2.1.8. Sociality & Team Spirit

According to Olbinger & Olbinger (2005), NML are open to diversity, differences, and sharing; they are at ease meeting strangers on the internet. Many of their exchanges on the Internet are emotionally open, sharing very personal information about themselves. They have developed a mechanism of inclusiveness that does not necessarily involve personally knowing someone admitted to their group. Being a friend of a friend is acceptable. They seek to interact with others, whether in their personal lives, their online presence, or in class. However, as McLester (2007) points out that NML, while being extremely social, also need a sense of security. As a consequence of their social nature, NML often prefers to learn and work in teams. A peer-to-peer approach is common and sometimes peers are given more credibility than teachers (Olbinger & Olbinger, 2005).

2.1.9. New Skills for the Digital Era

McLester (2007) argues that NML are surface oriented. They live in a world that is characterized by information overload and a widening gap to information access (Siemens, 2006). To them all information is equal, they are not looking for the right answer (McLester, 2007). By its nature the web rewards comparison of multiple sources of information, individually incomplete and collectively inconsistent. This induces learning based on seeking, sieving, and synthesizing, rather than on assimilating a single "validated" source of knowledge as from books, television, or a professor's lectures (Siemens, 2006; Dede, 2005).

Apart from the skills needed to manage the abundance of information available, learners need additional skills to react to the challenges of a digital society and to counterbalance the deficiencies of their natural learning styles. Siemens (2006) lists the following skills: (1) *Anchoring*: Staying focused on important tasks while undergoing a deluge of distractions; (2) *Filtering*: Managing knowledge flow and extracting important elements; (3) *Connecting with each other*: Building networks in order to continue to stay current and informed; (4) *Being Human Together*: Interacting at a human, not only utilitarian, level to form social spaces. (5) (6) *Creating and Deriving Meaning*: Understanding implications, comprehending meaning and impact; (7) *Evaluation and Authentication*: Determining the value of knowledge and

ensuring authenticity; (8) *Altered Processes of Validation*: Validating people and ideas within appropriate context; (9) *Critical and Creative Thinking*; (10) *Pattern Recognition*; (11) *Navigate Knowledge Landscape*: Navigating between repositories, people, technology, and ideas while achieving intended purposes; (12) *Acceptance of Uncertainty*: Balancing what is known with the unknown to see how existing knowledge relates to what we do not know; (13) *Contextualizing*: Understanding the prominence of context, seeing continuums, ensuring that key contextual issues are not overlooked in context-games.

2.2. Some Empirical Findings on the Characteristics of NML

To verify the hypotheses on young people's skills and attitudes presented above, Lam & Ritzen (2008) conducted a small scale survey among 96 first year higher education students and 30 university teachers from six European countries (France, Germany, Spain, Sweden, Italy and the Netherlands). Due to the restricted size of the sample, the uneven distribution of students among the countries and the different ways of using the questionnaires, it is not possible to draw solid conclusions or generalize the results. However, their findings can be regarded as indications and tendencies.

Questioned on their personal ICT usage at home, students in all the countries mentioned email, chat and mobile phone as being most frequently used; older students tend to use email most frequently, while younger students prefer chat. Students have different opinions in what they feel as the most important tool: some indicate mobile phone, others MSN, internet or the computer. With the exception of France, teachers in all countries note a difference in their personal ICT use (with a focus on email and internet) compared to their students' use – which they see dominated by mobile phone usage. In general, university teachers in all countries use email, internet, presentation programmes like PowerPoint and virtual learning environments (VLE's) in their teaching and learning process. The German and Swedish teachers mention several additional tools like blogs, wikis, podcasts and e-portfolios, online exams, simulations, electronic quizzes and special software applications.

Participants were asked to indicate on a five points scale (1=totally disagree, 5=totally agree) to what extent they agree or disagree with thirteen statements, which were summarized into seven topics that are presented in Table 2-1. The mean of each country is presented. **Bold print underlined** indicates the most important statement per country, **bold font** the second ranked and ~~strikethrough~~ the least important statement.

Statements grouped	Students							Teachers					
	ES	FR	DE	IT	NL	SW		ES	FR	DE	IT	NL	SW
Fast and impatient	2.5	3.4	3.3	3.2	3.0	3.3		3.6	3.4	~~2.9~~	3.4	3.5	~~2.7~~
Learning by doing	~~1.7~~	~~1.7~~	2.8	2.7	~~2.8~~	~~2.8~~		~~2.8~~	3.4	3	3.5	3.4	3.4
Result oriented	3.6	2.7	3.4	**4.4**	4.1	3.3		**_4_**	**_4.2_**	**3.5**	**_4.3_**	4	3.4
Social & interactive	**_4.0_**	**_4.4_**	3.5	**_4.6_**	**_4.3_**	**4.1**		3.7	3.4	**_3.7_**	3.9	**_4.3_**	3.7
Simultaneous activities	**3.7**	4.0	**3.7**	3.1	4.1	**_4.4_**		3.6	~~3.3~~	**3.5**	3.8	**4.2**	**3.8**
Visually	3.2	3.2	~~2.2~~	~~2.0~~	2.9	~~2.8~~		**3.9**	3.4	3.4	~~3.2~~	~~3~~	**_3.9_**
Connected & mobile	2.4	**4.1**	**_3.8_**	2.5	**4.3**	3.6		3.7	**3.5**	3.4	**4**	3.7	3.5

Table 2-1: Lam & Ritzen (2008): Characteristics of nowadays youth (average of answers).

Most of the students indicate "being social and interactive" as an important characteristic of the nowadays youth, while all other characteristics are more or less distributed. Teacher opinion is more diverse. Teachers from Spain, France and Italy rate "result oriented" as the most important characteristic, whereas in Germany and the Netherlands a "social and

interactive" attitude is mentioned first. With the exception of France, teachers agree that students are apt at multi-tasking.

Many of the characteristics demonstrate differences between countries and also between student and teacher perception, and given the restrictions of the survey, no generalizations can be made. However, some tentative conclusions concerning the characteristic properties of "New Millennium Learners" can be drawn from the survey results. First of all, it can be noted that according to student and teacher perception, this generation of learners can be characterized as **social and interactive**, apt in **multitasking** ("simultaneous activities") (all above 3) and **result oriented** (with student perception in France below 3, but French teachers rating it top). While students, do not necessarily consider themselves particularly "**connected and mobile**" – maybe because they do not know any different – according to teacher perception, this feature is very characteristic of their students. Looking at the generally high averages in all categories, the only properties that might not be quite as decisive as expected in the literature for describing the NML's work attitude are their supposed tendency towards "learning by doing", the priority of visual perception and possibly the allegedly increased pace and student impatience.

2.3.   Some Empirical Findings on Students' Learning Styles

In their empirical study among UK university students, covering a series of in-depth case studies carried out across four subject disciplines, Conole et al. (2008) investigated how university students' learning patterns are influenced by the availability of ICT. They found evidence to support and validate the hypothesis that current cohort students are immersed in a rich, technology-enhanced learning environment and that they select and appropriate technologies to their own personal learning needs. Their findings indicate a shift in the way in which students are working, suggesting a complex interrelationship between individuals and tools. They identify eight factors that characterise the changing nature of studying:

Pervasive
Supporting all aspects of study
To find, manage, produce & share resources

Personalised
Use of variety of tools simultaneously,
to suit individual needs

Integrated
Mixing and matching different tools

New working patterns
Complex thinking, evaluation & synthesis

Adaptive
Use adapted to

Time/space boundaries
Continuous & immediate support;
multitasking, multiple resources

Organised
Sophisticated information management

Transferable
skills and knowledge are transferred to other aspects of private and professional life

Figure 2-2: Student Use and Perception of Technology (Conole et al, 2008)

1. Pervasive: Students use technologies to support all aspects of their study; finding, managing and producing content. They are part of a wider community of peers who they share resources with, ask for help and mutually peer assess. *2. Personalised:* Students appropriate technologies to suit their own needs, employing different technologies simultaneously. *3. Niche, adaptive:* The use of particular tools is not uniform; different technologies are used for particular purposes, not just for the sake of using them. *4. Organised:* Students are adept at finding, managing and manipulating relevant information and synthesising across different information sources and use a variety of communication tools. They are used to having easy access to information and therefore have an expectation of the same for their courses. *5. Transferable:* Skills gained through using technologies in other aspects of their lives are transferred to other (learning) contexts. *6. Time and space boundaries:* Students are now able to communicate with tutors and peers in a variety of ways and expect immediate or near-immediate responses. Technologies provide them with more flexibility in terms of being able to undertake learning anytime, anywhere. Students appear more adept at working in a constantly changing environment, comfortable with multitasking and able to work with multiple resources and tools simultaneously. *7. Changing working patterns:* Methods of validation and cross-referencing indicate that students mix and match information sources, combining old and new methods. Higher-level skills such as evaluation and synthesis are necessary to make sense of their complex technological-enriched learning environment. *8. Integrated:* Students are using tools in a combination of ways to suit individual needs, missing and matching and switching between media, sites, tools, content, etc.

One of the most striking features for Conole et al (2008) was the extent to which students were capitalising social computing applications providing peer support and communication. They paint the picture of a networked, extended community of learners using a range of communicative tools to exchange ideas, to query issues, to provide support and to check progress.

2.4.   Summary

To summarize, the generation of New Millennium Learners displays complex learning styles that are shaped by the ubiquity, accessibility and ease of use of digital resources. Compared to prior generations of learners, they are digitally literate, they think more visually and in a non-linear manner, they practise multitasking and give preference to multimedia environments. They are continuously connected with their peers and "always on". In learning environments they are easily bored, need a variety of stimuli not to get distracted, are impatient and expect instant feedback and rewarding. They are social, team-spirited and engaged, goal-oriented and pragmatic, and appropriate (learning) resources to suit their individual needs. To come to terms with the information overload of the digital era, they (need to) employ learning strategies that involve searching, sieving, managing, re-combining, validating and contextualizing information.

3.   Conceptual Frameworks for Learning in the Digital Era

This chapter will introduce and explain some of the key concepts which form a theoretical framework for the study of the use of social computing for learning. These concepts are invariably used in the literature to analyze learning processes that are facilitated by social computing applications and they are useful in understanding the underlying social processes and general features of ICT mediated communication. The chapter serves in particular to introduce and differentiate between the theory of "connectivism" (Siemens, 2005), "learning communities" (Wenger et al., 2002), "communities of inquiry" (Garrison & Anderson, 2003), and the notion of "produsage"(Bruns & Humphreys, 2007), a presumed characteristic of content production with social computing tools. These four concepts capture adequately different aspects of collaborative learning processes like those enabled by social computing applications.

3.1.   Connectivism: A Theory for Learning in the Digital Era

Connectivism is a theory describing how learning happens in a digital age. It describes a learning strategy that responds to information overload, to the fact that "knowledge flows too fast for processing or interpreting" (Siemens, 2006: 33). As content creation accelerates our relationship to content changes since we can no longer consume all relevant content items. Instead of the individual having to evaluate and process every piece of information, s/he creates a personal network of trusted nodes: people and content, enhanced by technology; the act of knowing is thus "offloaded onto the network itself" (Siemens, 2006: 33). Relevance (instead of truth) is the main requirement for the adoption or use of information.

Thus, according to connectivism, learning is the process of creating networks. Learning networks can be perceived as external structures that we create in order to stay current and continually acquire, experience, create, and connect new knowledge (external). Nodes are the external entities (people, organisations, libraries, web sites, books etc.) which learners can use to form a network. Internally, learning networks can be perceived as structures that exist within our minds in connecting and creating patterns of understanding. Relevance, i.e. the degree to which a resource or activity matches an individual's need, becomes the main criterion for the adoption or use of information (supplied by the network). Learning follows the following path (beginning with the basic and moving to the more complex):

Awareness and Receptivity: Individuals acquire basic skills for handling information abundance, have access t o resources and tools.

Connection Forming: Individuals begin to use tools and an understanding acquired during level one to create and form a personal network. They are active in the learning space in terms of consuming or acquiring new resources and tools. Selection (filtering) skills are important. Affective/emotive factors play a prominent role in deciding which resources to add to the personal learning network.

Contribution and Involvement: The learner begins to actively contribute to the network – essentially, becoming a "visible node." The learner's active contribution and involvement allows other nodes on the network to acknowledge his/her resources, contributions, and ideas – creating reciprocal relationships and shared understandings (or, if social technology is used, collaboratively created understanding). Selecting the right element within the learning ecology is valuable in ensuring the efficiency and effectiveness of the learning process.

Pattern Recognition: Individuals are network aware and competent. As dynamic participants in the ecology, they have moved from passive content consumption to active contribution.

Time in the network has resulted in the learner developing an increased sense of what is happening in the network as a whole. Having mastered the basics of being a participant, they are now capable to recognize emerging patterns and trends.

Meaning-Making: Individuals are capable of understanding meaning. What do the emerging patterns mean? What do changes and shifts in trends mean? How should the learner, adjust, adapt, and respond? Meaning-making is the foundation of action and reformation of view points, perspectives, and opinions.

Praxis: Individuals are actively involved in tweaking, building, and recreating their own learning network. Metacognition (thinking about thinking) plays a prominent role as they evaluate which elements in the network serve useful purposes and which elements need to be eliminated. The learner is also focused on active reflection of the shape of the ecology itself. The learner may engage in attempts to transform the ecology beyond his/her own network. Praxis, as a cyclical process of reflection, experimentation, and action, allows the learner to critically evaluate the tools, processes, and elements of an ecology or network.

According to Siemens (2006), knowledge materializes itself through the knowledge flow cycle (see Figure **3**-3-1). The knowledge flow cycle begins with some type of knowledge creation (individual, group, organization) and then moves through the following stages:
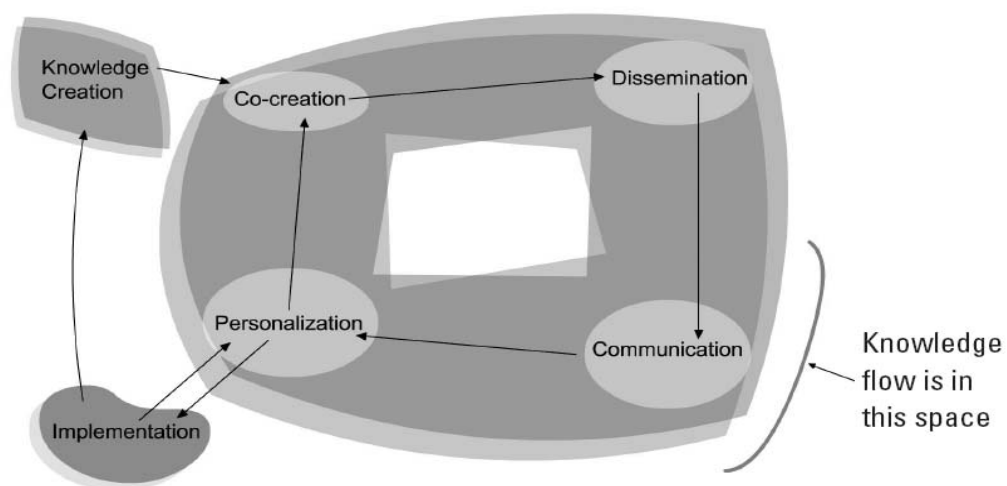
Figure 3-1: Siemens' (2006) Knowledge Flow Cycle

Co-creation: Co-creation, like end-user generated content, is a recent addition to the knowledge cycle. The ability to build on/with the work of others opens doors for innovation and rapid development of ideas and concepts.

Dissemination: Dissemination involves analysis, evaluation, and filtering elements through the network.

Communication Those key ideas that have survived the dissemination process enter conduits for dispersion throughout the network.

Personalization: At this stage, we bring new knowledge to ourselves through the experience of internalization, dialogue, or reflection.

Implementation: Implementation is the final stage, where action occurs and feeds back into the personalization stage. Our understanding of a concept changes when we are acting on it, versus only theorizing or learning about it.

3.2. Learning Communities

According to Wenger et al. (2002) learning communities are groups of people who acquire new knowledge through cooperation and collaboration. The thriving of such a community depends on its social space, the characteristics of its members and the characteristics of the community as a whole. A sound social space is characterized by affective work relationships, strong group cohesiveness, trust, respect, belonging, and satisfaction (Kester et al., 2006). With Kester et al. (2006), three social factors can be determined as prerequisite for social interaction, and in particular cooperation, to occur: (1) any two individuals must be likely to meet again in the future (**continuity**), (2) all individuals must be able to identify each other (**recognisability**) and (3) all individuals must be able to know the others' past behaviour (**history**). If individuals only meet once, they are very much tempted to behave selfishly, which negatively influences the cooperation process. In addition, if individuals are not identifiable and no history of a person's behaviour is available, group members are more likely to act selfishly because they cannot be held accountable for their actions.

Communities are characterized by (1) boundaries, (2) rules, (3) monitoring possibilities and (4) sanctioning mechanisms (Koper, et al., 2004). Successful communities have clearly defined boundaries that protect the collective good of the community to outsiders and encourage ongoing interaction because the group members are likely to meet again. In addition, communities have a set of rules governing the use of common resources, which are jointly generated, modified and enforced by employing sanctions, like banishment.

Kester et al. (2006) emphasize that social interaction enhances the emergence of learning communities, while task-driven interaction, directed towards the completion of assigned tasks, can have detrimental effects. Moreover, an individual's prior expectations of the community can negatively influence social interaction. According to Brown (2001), individuals who believed that joining a community had to be voluntarily or felt that face-to-face association was necessary, only developed a sense of belonging and trust if they joined a community voluntarily.

The thriving of a community furthermore depends on its members. According to Kester (2006), three member profiles tend to influence cooperation:

(1) *Veterans:* Brown (2001) found that 'veterans' showed good community behaviour, in contrast to 'Newbies'. Veterans are supporting and encouraging peers, sharing knowledge and experiences, reflecting on past learning, and sustaining friendships and acquaintances begun earlier. 'Newbies', however, depended much less on other group members and were wont to rapidly call for tutor help. They preferred a tight social structure – as in a traditional class – with frequent interaction with and helpful assessment from the tutor. Because of their experience, veterans model good community behaviour to the newbies. Newbies can turn to veterans for support and encouragement, instead of to the tutor. However, veterans need an incentive to continue to interact with newbies. Veterans are inclined to do their 'duty' in the beginning but after a while tend to restrict their communication to veterans only, which hinders community building (Brown, 2001).

(2) *Trendsetters:* Though most users are trend-followers, trendsetters make the difference. Nichani (2001) describes three types of trendsetters: connectors, mavens and salesmen. *Connectors* form the 'social glue' of a community; they are sociable and attentive and rapidly make friends. *Mavens* are the information experts, they collect and disseminate information. *Salesmen* are persuaders, they have a tendency to reach out to the unconvinced and persuade them. The absence of trendsetters in a community will negatively influence elementary features such as belonging, trust and social interaction.

(3) *Posters:* According to Preece et al. (2004) participants of online newsgroups differ in their inclination to either lurk or post in a community. By definition, a *lurker* belongs to a community but never posts in it. Posters and lurkers join a community for the same reasons. However, posters feel their needs are better met, perceive more benefits and feel a greater sense of membership than lurkers. Partly because posters do not regard lurkers as inferior members, lurking is not necessarily a problem in active communities. Without a critical mass of posters, however, a community will never thrive.

3.3. Communities of Inquiry
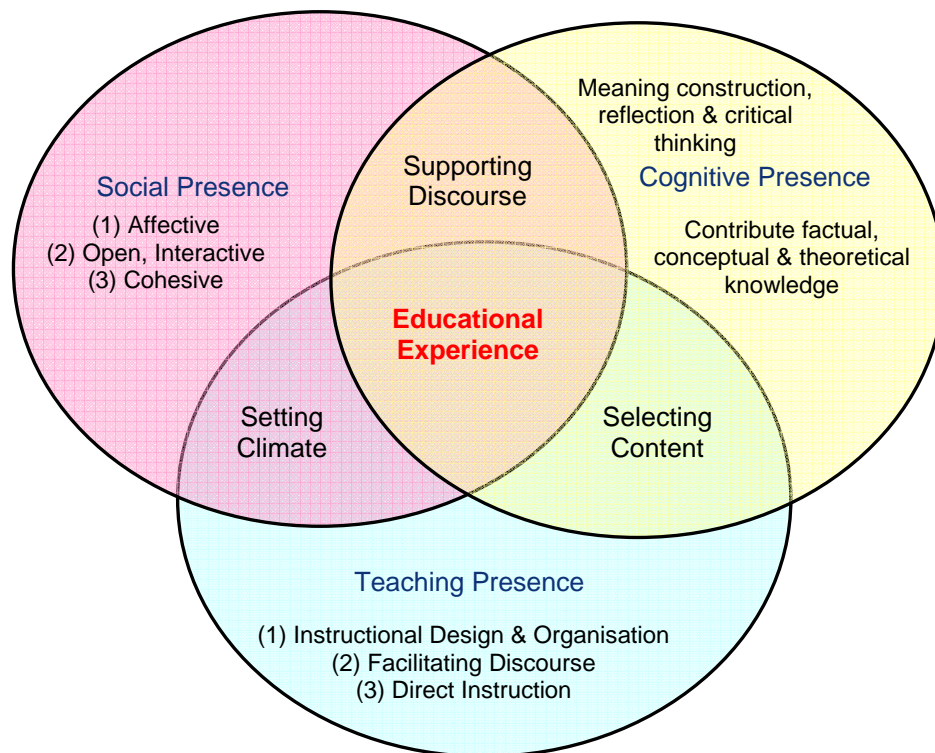
Figure 3-1: Garrison's & Anderson's (2003) Community of Inquiry Framework

The Community of Inquiry Framework developed by Garrison and Anderson (2003) and further advanced by Garrison and Arbaugh (2007) is widely used[2] as a tool for conceptualizing learning processes, in particular in **higher education**, and here with a focus on **online learning**. The framework consists of three elements – *social, cognitive* and *teaching* presence – as well as categories and indicators to define each presence (see Figure 3-2).

Social presence in online learning is conceived as the ability of learners to project themselves socially and emotionally, thereby being perceived as "real people" in mediated communication. The categories of social presence are affective expression, open communication and group cohesion. According to Garrison & Arbaugh (2007), social presence must create personal, but purposeful relationships.

Of the three elements of the CoI framework, the role of social presence in educational settings has been studied the most extensively, in both online and face-to-face course settings, suggesting that (1) there is a strong relationship between social presence and learning outcomes, (2) activities that cultivate social presence also enhance the learner's satisfaction

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[2] For example by Farmer (2006), Redmond & Lock (2006),

with the internet as an educational delivery medium (3) collaborative activities allow learners greater opportunities for increased social presence and a greater sense of online community, which also tends improve the socio-emotional climate in online courses, which in turn (4) results in increased satisfaction with both the learning process and the medium through which it is delivered. This research suggests that although social presence alone will not ensure the development of critical discourse in online learning, it is extremely difficult for such discourse to develop without a foundation of social presence; social presence seems to be necessary for the development of cognitive presence (cf. Garrison & Arbaugh, 2007).

Cognitive presence is described as "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse" (Garrison & Arbaugh, 2007: 161). Garrison and Albaugh (2007) reconstruct the emergence of cognitive presence as a four-phase process (see Figure **3**-3-3): (1) a triggering event, where some issue or problem is identified for further inquiry; (2) *exploration*, where students explore the issue, both individually and corporately through critical reflection and discourse; (3) *integration*, where learners construct meaning from the ideas developed during exploration; and, (4) *resolution*, where learners apply the newly gained knowledge to educational contexts or workplace settings. The integration phase typically requires enhanced teaching presence to probe and diagnose ideas.

Though cognitive presence appears to be more challenging to study, with Garrison and Arbaugh (2007) some observations can be formulated: (1) for enhancing cognitive presence in online learning settings, group composition appears more decisive than the format used; (2) research shows that the individual learning process has great difficulty to move from the second step in the inquiry cycle ("exploration") to the third ("integration"). To facilitate this step, on the one hand, teaching presence seems vital, assisting with well designed learning activities, appropriate tasks and questions. On the other hand, a lack of common purpose and personal connectedness in the group might be responsible for inquiring getting stalled at the exploration stage. Garrison & Arbaugh (2007) argue that, consequently, social presence needs to move from open communication to cohesion and then to personal connectedness.
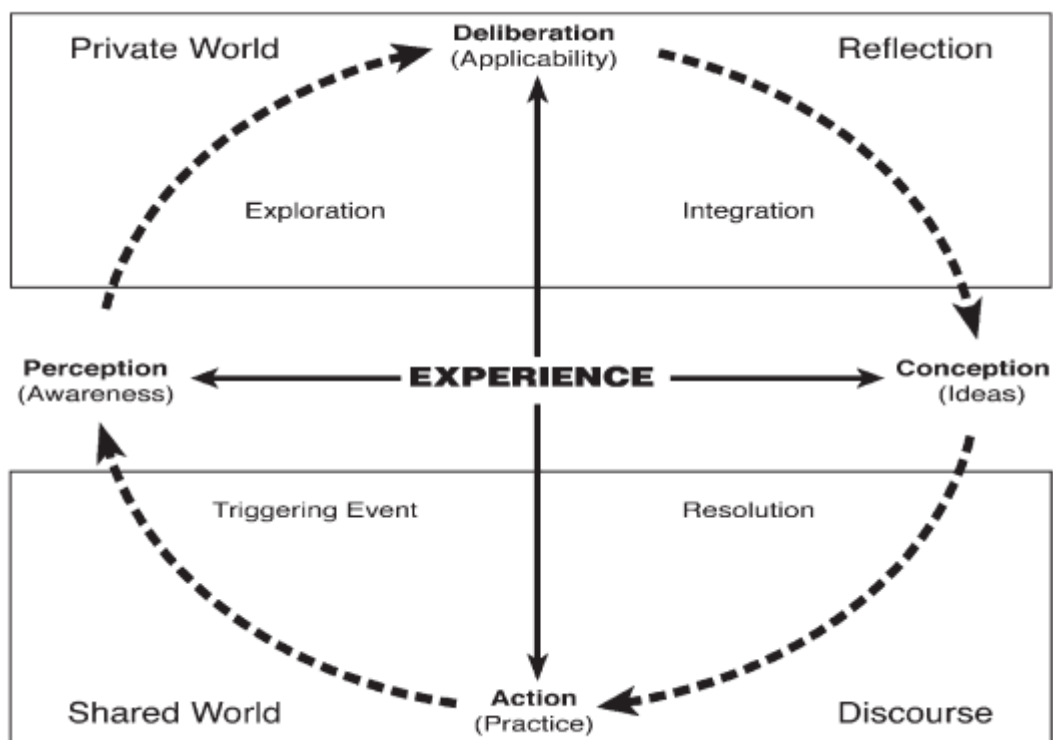

Figure 3-3: Practical Inquiry Model (Garrison & Arbaugh, 2007: 161)

Teaching presence encompasses the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes (Garrison & Arbaugh, 2007). It has three components: (1) instructional design and organization; (2) facilitating discourse; and (3) direct instruction. Research suggests that teaching presence is a significant determinant of student satisfaction, perceived learning, and sense of community. The quality of the discourse and the depth of learning appear to be influenced by metacognitive awareness, which, in an educational context, is the role of the teacher to induce. Research further indicates that in some cases teaching presence is more predictive of affective and cognitive learning than the affective dimension of social presence.

The CoI framework has been extended by Redmond and Lock (2006) by dividing the elements of the CoI and their interactions into seven separate sequential sections, resulting in "knowledge in action". Their conceptualization suggests that the process of inquiry begins with the establishment of social presence, which is then used to create teaching presence followed by cognitive presence. Cognitive presence then interacts with social presence to produce knowledge in action.

Archer et al. (2007) react towards the difficulty, observed by Garrison & Arbaugh (2007), of moving inquiry beyond the exploration stage, by proposing to extend the Community of Inquiry model beyond the online discussion to encompass all parts of a typical online course: the course guide and readings supplied to the students; the online discussion; the students' written assignments; and any experiential components that may form part of the course. Their hypothesis is that many, if not most, triggering events are present in the course package (online or printed), most exploration takes place in the online discussion forum (as many researchers have already noted), most integration occurs in the students' written assignments, and much or most resolution occurs in the experiential component that forms part of some courses.

3.4. Collaborative Content Production

According to Bruns & Humphreys (2007) the (co-)production of content by the user – dubbed "produsage" – which is supported by many social computing applications, in particular by blogs and wikis – has four fundamental characteristics:

(1) *Community*: It is based on the collaborative engagement of (ideally, large) communities of participants in a shared project.

(2) *Fluidity*: Participants occupy occupy different roles throughout the life of a project.

(3) *Dynamic products*: The 'artefacts' are under continual development, and never reach a static end point.

(4) *Common property:* What is produced is common property, although recognition of the individual merit of contributors and contributions is a standard feature of produsage environments.

Bruns & Humphreys (2007) conclude that education has to respond to the new working styles promoted by "produsage" by emphasising certain skills and attitudes:

(1) *Creativity*: Participants need the skills to be collaborative co-creators occupying flexible roles, in contrast to the self-sufficient creative 'producer'.

(2) *Collaboration:* It is important to build the capacity for collaborative engagement under fluid, heterarchical rather than hierarchical structures.

(3) *Critical capacity*: Participants in co-creative environments need to develop sufficient critical capacities to establish the appropriate context for their engagement in produsage processes. This requires a critical stance both towards potential collaborators and their work and towards their own creative and collaborative abilities and existing work portfolio. During the collaborative process itself, critical capacities are indispensable in the giving and receiving of constructive feedback on the ongoing collaborative process and the artefacts it produces. Thus critical capacities must extend well beyond the ability to assess the quality of content encountered in standard research processes.

(4) *Communication:* In a collaborative environment, there is a particular need for an explicit focus on effective and successful communication between participants. Participants need to be able to be both constructively critical, and able to communicate about the collaborative and creative processes (a meta-level skill). These are aspects of communication that may need to be fostered specifically, rather than assumed to be inherent in the communication skills of learners.

3.5.   Conclusion

The variety of theoretical frameworks presented in this chapter illustrates recent attempts to capture and structure learning patterns that are emerging as a result of the ubiquity and accessibility of information in the digital era. Neither of the theories might reflect current and future learning practice adequately and all might be wrong in describing emerging cognitive patterns. But they all try to react towards the recent changes in learning styles elaborated in the previous chapter by outlining the main features of change in learning processes and patterns. As such, they all highlight the collaborative nature of learning in a digital age, the necessity to sift and select information according to relevance and the centrality of the learner in the learning process – not as a passive recipient of information, but as an active, creative and critical author, co-creator, commentator and evaluator.

Education and Training institutions will have to respond to these changes. Exploiting social computing applications for educational purposes may well prove a means of doing so. The remaining chapters will present, analyse and discuss in depth the use of social computing to innovate learning processes, highlighting the main opportunities and challenges for their deployment in E&T.

4. Social Computing Applications for Learning

"Web 2.0" or "social computing" (a term we prefer to use in this report) refers to the range of digital applications that enable interaction, collaboration and sharing between users. Such digital applications include those for blogging, podcasting, collaborative content (e.g. wikis), social networking (e.g. MySpace, Facebook), multimedia sharing (e.g. Flickr, YouTube), social tagging (e.g. Deli.cio.us) and social gaming (e.g. Secondlife) (cf. Pascu, 2008). Alternatively the concept of "social software" is employed, which broadly refers to any web-based software tool that supports or fosters group interaction (Vuorikari, 2007; Owen et al., 2006).

Asian countries lead in the usage of social computing with more than 50% of Internet users across all applications, followed by the US (with about 30% of Internet users) and Europe (with about 20-25%). Creation, use and adoption of social computing applications have been growing strongly since 2003. However, growth has slowed down lately, indicating that the diffusion of social computing is entering the maturity phase. (Pascu, 2008)

Social computing applications allow users to communicate and collaborate in diverse ways and in a variety of media, which also helps learners to act together and to build knowledge bases that fit their specific needs (cf. Owen et al., 2006). In this chapter, the most common social computing applications relevant for learning will be presented, indicating their potential for enhancing education and training and outlining some obstacles and threats to their implementation in learning settings. Chapters 5-6 will be devoted to a more in depth discussion of the potential of social computing applications for learning, describing in detail current practice and highlighting empirical evidence on the educational value of the tools described below.

The categories presented in this chapter are partly overlapping due to the fact that a number of social computing applications either provide a variety of integrated tools or integrate different services around a topic. For example, media sharing sites in general allow the media to be bookmarked and support social networking. Thus, the categories address different perspectives on the use of social computing applications rather than different tools.

4.1. Social Computing Tools and their Educational Uses

4.1.1. Social Networking Services

Social networking services can be broadly defined as internet- or mobile-device-based social spaces designed to facilitate communication, collaboration and content sharing across networks of contacts (Childnet International, 2008; Cachia, 2008). They enable users to connect to friends and colleagues, to send mails and instant messages, to blog, to meet new people and to post personal information profiles, which may comprise blogs, photos, videos, images, audio content (OECD, 2007; Cachia, 2008). Prominent examples of social networking services include Facebook[3] and MySpace[4] (for social networking/socialising), LinkedIn[5] (for professional networking), Second Life[6] (virtual world) and Elgg[7] (for knowledge accretion and learning). Social networking systems allow users to describe themselves and their interests, implement notions of friends, ranking, and communities.

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[3] http://www.facebook.com/
[4] http://www.myspace.com/
[5] http://www.linkedin.com/
[6] http://secondlife.com/
[7] http://elgg.net/

In October, 2007, there were over 250 million profiles in social networking sites. On a monthly basis, using social networking sites is the third most popular online activity in Europe (Pascu, 2008). Recent surveys in the US found that 55% of US online teens have created a personal profile online, and 55% have used social networking sites like MySpace or Facebook; 9-17-year-olds reported spending almost as much time on social networking sites and other websites as they do watching television (9 compared to 10 hours per week)(Attwell, 2007; Childnet International, 2008). Interestingly, the findings indicate that education-related topics are the most commonly discussed, with 60% of the young people surveyed talking about education-related topics and 50% discussing their schoolwork (Childnet International, 2008).

Davies & Cranston (2008) observe that young people tend to use social networking services primarily to (1) keep in touch with friends, (2) develop new contacts, (3) share content and engage in self-expression, (4) explore their identity, (5) hang out and consume content, and (6) access information and informal learning. As Childnet International (2008) points out, there are a number of educational benefits and opportunities inherent in the use of social networking among young people, including in particular their potential for making young people social participants and active citizens as well as the fact that they encourage discovery and exploration, thus facilitating self-directed learning, broadening users' horizons and supporting young people in becoming independent.

When integrated into education and training, social networking invites for more creative and motivating ways of learning by strengthening the social and explorative aspects of learning (Rudd et al., 2006a). According to Childnet International (2008), the potential uses of social networking services for schools and educators lie in (1) developing e-portfolios as online space where learners can record their achievements and collect examples of their work, exploring and promoting their talents and interests; (2) facilitating literacy and communication skills; (3) fostering collaboration and group work; (4) supporting learning about data protection and copyright issues; (5) learning about self-representation in a digital world; (6) learning about e-safety issues; (7) producing public showcases for work, events or organisations; and (8) forming communities of practice around particular topics or interests. In addition to providing a whole community with useful information about a school, college, organisation or event, an educational institution's profile on a social network sends a clear message to learners that the institution is aware of the types of spaces students enjoy online.

4.1.2. Syndication & Notification Technologies

Syndication is a means of having an update on changing content from a given web source sent directly to you, rather than you having to go and check this site on a regular basis (Owen et al., 2006). A feed reader (or aggregator), relying on protocols called RSS (Really Simple Syndication) and Atom to list changes, can be used to centralise all the recent changes in the sources of interest, by regularly polling nominated sites for their feeds, displaying changes in summary form, and allowing the user to see the complete changes (Franklin & van Harmelen, 2007; Owen et al, 2006).

Syndication via RSS feeds is not a particular social computing tool like the other applications mentioned in this chapter. It is rather a key technological application that facilitates accessing, coordinating and inter-connecting different online sources. From an educational perspective, syndication might provide the basis for an extensive online learning environment without the need for a heavily managed service; for example, when the tutor publishes new materials this update will be sent out to students and similarly the tutor will be able to be notified when the student has updated their response on their blog (Owen et al., (2006). Furthermore feed

readers enable students and teachers to become aware of new blog posts, to track the use of tags in social bookmarking systems, to keep track of new shared media, and to be aware of current news (Franklin & van Harmelen, 2007).

4.1.3. Blogs

"Weblogs" or "blogs", a term coined by Jorn Barger in 1997, are online public writing environments, which enable a single author or a group of authors to write and publicly display articles, called posts, which are listed in reversed chronological order (Ellison & Wu, 2008; Anderson, 2007). Depending on the author's wishes, blogs can include visual, audio and video content, as well as features such as links to other blogs, information about the author, and comments from readers (Ellison & Wu, 2008; OECD, 2007). The large number of people engaged in blogging has given rise to its own term – blogosphere – to express the sense of a whole 'world' of bloggers operating in their own environment (Anderson, 2007). To search within the blogosphere an array of blog and RSS search services have appeared, with different foci depending on user needs and information architecture (Alexander, 2006).

The size of the blogosphere has doubled every 5-7 months in recent years and more than 100,000 blogs are created daily (Pascu, 2008). According to OECD (2007) data, in, 2007, it is estimated that there were up to, 200 million blogs. Nearly 75% of all blogs are written in English, Japanese or Korean. Blogging is also very popular in China, India, and Iran (OECD, 2007). A recent survey in the UK found that about half of the responding educational institutions reported using blogs (Open Source Software Watch, 2006). Children and young people are increasingly becoming authors of blogs (Owen et al., 2006). There are blog sites, like Edublogs[8], that offer free blogs aimed specifically for pupils and teachers (Rudd et al., 2006a).

In educational settings, blogs can be used (1) by institutions and teachers as an easy way to produce dynamic learning environments for course announcements, news and feedback to students; (2) by students as digital portfolios to collect and present their work; (3) among a group of learners, using their individual blogs, to build up a corpus of interrelated knowledge via posts and comments, enhancing collaboration; and (4) with the aim of linking, via syndication technologies, different groups of learners and teachers (Franklin & van Harmelen, 2007; Bartolomé, 2008; Farmer, 2006; Ray, 2006; Berson & Berson, 2006; Kim, 2008).

Educational benefits are projected specifically in the following areas:

(1) Blogging can enhance reflection as well as analytical, critical and creative thinking by encouraging students to engage with positions divergent from their own (Ellison & Wu, 2008; Farmer, 2006; Akbulut, 2007; Berson & Berson, 2006; Kahn, 2007);

(2) Blogs can enhance communication and promote more engaged learning, increasing student motivation and participation (Berson & Berson, 2006; Farmer et al., 2008; Utrecht, 2007; Kim, 2008);

(3) Blogging is an effective tool for user centred, participatory learning, highlighting the individual learners and their unique authorial voices (Burgess, 2006; Akbulut, 2007; Ellison & Wu, 2008).

(4) Writing for an internet audience not only enhances students' writing skills, but also gives them a sense of responsibility, authorship and ownership (Farmer et al., 2008; Ellison & Wu, 2008; Akbulut, 2007);

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[8] edublogs.org

(5) Blogs offer an opportunity for students to experiment (in a protected environment) with different persona and expand their friendships; blogs foster deeper and more meaningful interactions and help develop the social and civic skills (Berson & Berson, , 2006).

4.1.4. Wikis

A wiki is a website that allows users to collaboratively add, remove and otherwise edit and change content, usually text (Owen et al., 2006; OECD, 2007). Unlike blogs, wikis generally have a history function, which allows previous versions to be examined, and a rollback function, which restores previous versions (Anderson, 2007). The most prominent example of a wiki is Wikipedia[9], a collaboratively created online encyclopaedia. Since its creation in 2001, Wikipedia has grown rapidly into one of the largest reference web sites, attracting at least 684 million visitors yearly by 2008. There are more than 75,000 active contributors working on more than 10,000,000 articles in more than 250 languages. The English version of wikipedia is the biggest with 2,573,854 articles in October 2008.[10]

Wikis can easily be password protected; images, links to audio and video files and other web sites can be integrated (Warlick, 2006). There are wiki-like Web 2.0 services aimed at collaborative writing, like Writeboard[11] and Writely[12], which restrict editors to those invited (Owen et al., 2006) and/or directly target educational needs, like Wikia[13], which offers education sections for the contribution and exchange of learning (Rudd et al., 2006a). Additionally, these services usually identify individual contributors and track the number of unique views, a feature that is generally not available in wikis and helpful in educational contexts for assessing students' contributions (Alexander, 2006; Warlick, 2006).

In educational contexts, wikis are ideal for collaborative writing or group projects involving multimedia and are particularly suited to the collaborative creation of study guides, text books, annotated reading lists and subject specific knowledge repositories However, wikis can also be used as a simpler alternative to school and class website, to which a broader interested audience can contribute ideas and comments; or by teaching staff to scaffold collaborative projects. (Bryant, 2006; Warlick, 2006; Bartolomé, 2008; Franklin & van Harmelen, 2007).

4.1.5. Tagging, Social Bookmarking and Folksonomies

A social bookmarking service provides users the ability to record (bookmark) web pages, and tag those records with significant words (tags) that describe the pages being recorded (Franklin & van Harmelen, 2007). Examples include del.icio.us[14], furl[15] and Bibsonomy[16]. This process of organising information through user-generated tags has become known as 'folksonomy' (Owen et al., 2006; Vuorikari, 2007). Whereas traditional metadata is usually hierarchical, structured, and predetermined by content authorities, folksonomic metadata consists of words that users generate and attach to content (Alexander, 2006; Vuorikari, 2007). In addition to a person's or group's own bookmarks, any user can create an in-box for what someone else is bookmarking, by subscribing to the other person's social bookmarking page, creating their own network of users with similar interest (Franklin & van Harmelen,

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[9]   http://wikipedia.org/
[10] http://en.wikipedia.org/wiki/Wikipedia:About.
[11] http://writeboard. com/.
[12] http://www.writely.com/.
[13] www.wikia.com/wiki/Wikia
[14] http://del.icio.us/
[15] http://www.furl.net/
[16] http://www.bibsonomy.org/

2007). Users can also subscribe to tags and receive a list of URLs tagged with a certain word on their del.icio.us page (Alexander, 2006).

The concept of tagging has been widened far beyond website bookmarking and has been integrated in many social computing applications to allow a variety of digital artefacts – photos, videos, music, blog posts, podcasts – to be socially tagged (Anderson, 2007). Different social bookmarking sites encourage different uses: some sites encourage more playful and personal tagging, for example Flickr, the phototagging site; while others afford a more deliberate style of tagging with a very clear idea of a specific audience, such as the academic sites Connotea or CiteULike (Owen et al., 2006; Vuorikari, 2007).

Social bookmarking potentially supports the following educational uses:

(1) Teachers and learners can build up collections of resources by sharing personally classified bookmarks and collaborative filtering digital content (Vuorikari, 2007; Franklin & van Harmelen, 2007; Porto, 2008; Alexander, 2006);

(2) With the use of multiple tags and tag clouds, these collections can be used to build up reading and resource lists (Franklin & van Harmelen, 2007). Alternatively, teachers and librarians can create pre-selected and tagged lists of resources for learners to browse and extend (Vuorikari, 2007).

(3) Teachers and learners can recommend, rate and comment on certain resources they found and post their bookmarks to an individual's blog or a common websites focusing on a given subject area, thus supporting each others' research efforts (Vuorikari, 2007);

4.1.6. Media-Sharing Services, Podcasts & Vodcasts

Media-sharing devices store user-contributed media, and allow users to search for and display content. Examples include YouTube[17] (movies), iTunes[18] (podcasts and vodcasts), Flickr[19] (photos), Slideshare[20] (presentations), DeviantArt[21] (art work) and Scribd[22] (documents) (Franklin & van Harmelen, 2007).

Posting photographs online is one of the most popular online content creation activities, driven by increasing popularity of digital cameras and mobiles with cameras. More than 1 billion photos (1 million updated daily) and 40 million user-created videos (~70,000 uploaded daily) are uploaded in photo- or video-sharing sites. Tens of billions of objects are created by the users of Second Life and social tagging is on the rise with millions of photos tagged in Flickr or videos in YouTube (1 million tags added per week in Flickr). (Pascu, 2008)

Media-sharing sites make web videos easily accessible for educational purposes. Educational videos are widely popular within YouTube, ranging from a "10 minute cooking school" to videos that teach hair styling or "How to kiss passionately" (Downes, 2008). Special sites like TeacherTube, while far smaller, but still containing nearly, 20000 items, also offer a wide range of educational videos without the risk of students being exposed to inadequate offensive content (Downes, 2008).

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[17] http://www.youtube.com/.
[18] http://www.apple.com/itunes/.
[19] http://www.flickr.com/.
[20] http://www.slideshare.net/.
[21] http://www.deviantart.com/.
[22] http://www.scribd.com/.

Drawing on the experiences of using Facebook by two different lecturers in two (US) higher education settings, Nicole Ellison[23] points out that Facebook, used as a teaching tool, is easily accessible, convenient for students, provides an at least initially more engaging learning environment and adds a "social" peer-to-peer component. However, she considers it problematic to rely on a private company to host student material (which will be graded), given that it may or not be archived and could disappear at any time. She also argues that students without Facebook accounts are put at a disadvantage, and observes that students are resistant to letting educational issues invade in a playful environment distinct from their academic pursuits.

4.1.7. Podcasts and Vodcasts

Podcasting is a way in which a listener may conveniently keep up-to-date with recent audio or video content; vodcasts are video versions of podcasts (Franklin & van Harmelen, 2007). The estimated number of podcasts in 2007 is over 100,000, when only three years earlier, there were fewer than 10,000 (Pascu, 2008). Apple iTunes hosted over 82,000 podcasts in 2006, representing a 10 fold increase since 2005 (Pascu, 2008; OECD, 2007). Mobile-casting, i.e. receiving video and audio podcasts on mobile phones, is expected to develop rapidly (OECD, 2007). Compared to other social computing services, however, podcasting is less popular with only around 2% of Internet users in Europe using it in 2007 (Pascu, 2008).

Podcasting and Vodcasting are powerful tools that allow the communication and distribution of educational content (cf. Cruz & Carvalho, 2007). They are attractive to learners because they allow them to learn at their own pace, listen to the audio or video content as many times as they want to, and to use e.g. commuting time to learn (Morales & Moses, 2006). Podcasts can be used (1) to augment teaching by providing lecture recordings as well as additional learning material and resources (Harris & Park, 2007; Franklin & van Harmelen, 2007); (2) as a sensory aid supporting students with learning impediments, but also learners who are more susceptible to auditory and visual stimuli (Harris & Park, 2007; Morales & Moses, 2006); (3) for student assignments and as an alternative way of producing and presenting coursework (Harris & Park, 2007; Cruz & Carvalho, 2007); (4) as a means of presenting the education institution and delivering information on services, by, for example, providing news broadcasts or library tours (Harris & Park, 2007).

Educational benefits are projected to stem from (1) enabling the communication with students beyond the temporal and spatial limitations of conventional face-to-face education (Harris & Park, 2007); (3) addressing the individual needs of certain groups of learners, as well as (2) assisting students in improving their academic achievement, promoting self-directed learning activities (Cruz & Carvalho, 2007); and, (4) allowing the educational institution to reach out to a wider community (Harris & Park, 2007).

4.1.8. Virtual Worlds & Immersive Environments

Virtual environments, like Second life[24], or similar online 3-D virtual worlds, such as Active Worlds[25], Entropia Universe[26], and Dotsoul Cyberpark[27] provide users with a online game-like 3D digital environment to which users subscribe (OECD, 2007). The user is represented by an avatar, i.e. the interactive representation of a human figure in a three-dimensional

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[23] http://nellison.blogspot.com/2007/12/ecar-facebook-as-teaching-tool.html.
[24] http://secondlife.com/.
[25] http://www.activeworlds.com/.
[26] http://www.entropiauniverse.com/.
[27] http://www.dotsoul.net/.

interactive graphical environment (de Freitas, 2007). Users can build, display, and store virtual creations, as well as host events and businesses or real university courses (OECD, 2007).

SecondLife appears to have a rapidly growing base of 1.3 million "active residents", representing an increase of 46% in the number of active residents from January 2007, 61% of which are European (Pascu, 2008). In March, 2007, more than 250 universities, 2500 educators and the New Media Consortium, with over 225 member universities, museums and research centres, had a presence in Second Life (Calongne, 2007).

A survey among 209 educators using Second Life, conducted by the New Media Consoritum (NMC) in early 2007, indicate the manifold uses of 3D environments for educational purposes (NMC, 2007): 60% of educators took (43%) or are planning to take (17%) a class in Second Life; 58 % taught (29%) or are planning to teach (28%) a class in Second Life. Other activities include: supervising class projects and/or activities (total: 51%; done: 24%; planning: 27%), conducting research in SL (46%/24%/20%); class meetings (50%/23%/27%); virtual office hours (47%/18%/29%); mentoring student research projects (34%/15%/19%); student services and support activities (34%/12%/23%). 8% of respondents taught a real life class entirely in Second Life; 19% are planning to do so. Asked about the potential of Second Life for education, a majority of respondents see a significant or high potential for role-playing (94%), simulation and scenario activities (87%), artistic expression (86%), group work, collaboration and meetings (78%), distance learning programs (74%), team building (73%), conducting training (71%), professional development (68%), and teaching full courses (60%).

4.1.9. Online Office Applications

Online office applications, also called "Web office", "Web desktop" or "WebTop" (as opposed to "desktop") are software packages, that replicate desktop applications like Microsoft Office or Open Office, usually including a word processor, data sheet, multimedia presentations, etc. (Bartolomé, 2008, Anderson, 2007). These collaborative editing tools allow learners in different locations to collaboratively edit the same document at the same time. Examples comprise Google Docs[28] for word processing, spreadsheets and presentations, Stikkit[29] for contacts, meetings and e-mail (copying the functions of Microsoft Outlook) and Backpack[30] which is targeted at as group of users sharing and accessing common information, coordinating schedules and keeping each other informed.

Online office tools facilitate the collaborative production of documents online, with some history, discussion and annotation resources, as well as a controlled publication and production management system. However, use of these tools in educational settings is rare. As a consequence, the potentials of online office tools have not yet been studied in depth.

In her blog[31], Vicky Davis reports on a collaborative project, in which more than 40 educators, making 500 entries, jointly authored and edited a presentation on the educational use of "Google docs", using the Google docs' presentation tool. In this collaborative presentation[32], it is argued that the advantages of using online office tools, apart from supporting group collaboration on presentations from home or at school without any costs for

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[28] http://www.google.com/google-d-s/tour1.html.
[29] http://www.stikkit.com/.
[30] http://www.backpackit.com/tour.
[31] Blog post, 20/09/, 2007, http://coolcatteacher.blogspot.com/2007/09/and-walls-came-down.html.
[32] http://docs.google.com/TeamPresent?fs=true&docid=ah4zsdj46b66_578cv4x7&skipauth=true and http://docs.google.com/Present?docid=ah4zsdj46b66_578cv4x7.

software, lie in the potential of distance collaboration, across the room or across the globe. Since teachers can see who has been making revisions, individual assessment is possible. Additional features, like the organizational tool for planning events and/or activities allow for assignments and sign-ups to be done online and accessed in real-time. All collaborators can be invited to a meeting using google calendar. A chat feature (which apparently is currently disabled) allows students to type in questions and thoughts as they present.

However, the authors also display a quite extensive list of features they, as educators, would like to see included in further versions of Google Presentations, i.e. the ability to embed the presentations in blogs, websites, wikis, etc.; the integration with Skype, the ability to export the presentation in an open format other than zip; the possibility to add notes and comments under each slide and view edits live; the possibility to upload and embed audio and video files, insert google spreadsheets and add images by URL; the opportunity to chat while in editing mode (as with Google Spreadsheets), to log the chat and save it or copy from the chat window and to archive an entire chat log.

Wagner (2007) subsequently used the Google presentation tool in workshops with school administrators and primary school teachers. Drawing on these experiences he outlines as benefits (1) the possibility to collaboratively create slide shows with powerful interactions, additionally supported by a chat feature; (2) the possibility to collaborate among participants from all over the world; and (3) the ensuing transfer of power from the presenter to the audience, which, in educational contexts, leads to an empowerment of the students. However, he also underlines some limits of the tool, i.e. the absence of sound (unless Skype is added), the lack of a screen sharing or screen casting tool, which means that participants who are not present face-to-face cannot see other applications or sites the presenter shows; the need for individual computers and google accounts to participate in the online chat feature; and a the unavailability of a chat archive.

4.1.10. Web 2.0 Tools Designed for Learning Purposes

Some online collaboration applications are especially tailored for educational purposes. For example Moodle is a free software e-learning platform designed to help educators create online courses with opportunities for rich interaction (cf. Stemmer & Hummer, 2007). Students can contribute entries to a data base, comment on other students' entries or to work collaboratively in a wiki. It has a significant user base with 38,896 registered sites with 16,927,590 users in 1,713,438 courses (as of January, 2008, wikipedia). A new Open Source project, "sloodle"[33] aims to integrate the Second Life multi-user virtual environment and the Moodle learning-management system to develop tools for supporting education in virtual worlds, making teaching easier, developing sound pedagogies for teaching across web-based and 3D virtual learning environments.

Also some of the tools and services mentioned above explicitly address educational needs. Ning in Education[34] and Second Life Grid[35] are examples of umbrella groups that support educators using or wanting to use Web 2.0 tools for education. Elgg[36], an educational web 2.0 service, which is available as Open Source software and calls itself a "learning landscape", comprises a system of blog management, a file repository and a marked bent for the support and development of social relationships, through internal communities and the definition of

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[33] http://www.sloodle.org/.
[34] http://education.ning.com.
[35] http://secondlifegrid.net/programs/education.
[36] http://elgg.org.

detailed user profiles, usable to "discover" people with the same interests and objectives, and importable and exportable from and to other social networking sites (cf. Calvani, 2007).

Another example of educational social computing applications is the San Francisco based initiative Wikispaces[37] which started in January, 2006 to offer hosting thousands of Wikis to primary and secondary school teachers for free. These Wikis are full-featured, can be public or private, and have no commercial ads (Geser, 2007b).

There are many smaller scale initiatives implementing software designed for certain specific educational situations and needs. For example, Opdenacker & Van Waes (2007) report on the development of Calliope, a Belgian multilingual online writing centre which provides a feedback editor, a collaborative writing environment ("Escribamos"), and an e-portfolio tool. Arenas (2007) reports on "MASSIVE" a peer review service for universities. Aliyev (2007) discusses the advantages (and drawbacks) of a (UK) learning activity management system (LAMS), which provides several web 2.0 like activities through a collection of tools.

Furthermore, social computing applications facilitate the use of computer games for educational contexts. The Training Room[38] platform, for example, is an environment where trainers can define there own collaborative on-line role playing scenarios fitted to their respective learning objectives. The platform provides a variety of communication means within the scenarios; players can communicate with the use of discussion forums, text and voice chat modules as well as through multi-user video conferencing. The collaborative learning design allows participants to exchange information as well as to produce ideas, simplify problems, and resolve tasks (cf. Pivec & Pivec, 2008).

4.2. The Benefits and Opportunities of Learning 2.0

As has been indicated in chapter 2, one of the main reasons for considering social computing applications a means for enhancing learning stems from the fact that the ubiquity of digital technologies has already changed learning styles and strategies – at least outside school and university – forcing and E&T institutions to respond to these changes. Along with the change in life style and learning attitudes, cognitive processes and knowledge acquisition patterns have also changed (chapter 3), which might more adequately be addressed by integrating social computing applications – as tools that reflect these changes – into learning processes.

However, there are additional reasons for exploiting social computing applications in educational contexts. First of all, the emergence social computing provides **additional challenges** for E&T institutions and systems. As Rudd et al. (2006) stress, digital technologies offer opportunities for flexible, distributed learning, which could provide learners with more varied opportunities to engage with learning in diverse environments, outside institutional learning. The mixing of a range of online or virtual experiences with face-to-face learning offers opportunities potentially changing the physical space that is required, forcing E&T systems to reconsider what education might look like in the future and how learning might become more distributed and diverse through the use of new digital technologies (Rudd et al., 2006b).

There are also new opportunities to be grasped by education and training systems in facing societal challenges. According to Attwell (2007) our current educational systems – and especially secondary education – are have become dysfunctional in view of **societal demands**, not supporting the skills and competences actually needed. Education systems have acted with at best suspicion to social networking systems and technologies, often banning the

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[37] http://www.wikispaces.com.
[38] http://www.gamedesigncampus.com.

use of mobile phones and blocking social networking sites. Yet these are the very systems and tools which businesses are increasingly seeing as central to future knowledge creation and distribution. Attwell (2007) argues that secondary education systems must start to encourage the networking and creativity displayed by students outside educational institutions, instead of isolating institutional education further from real life. Schools will also need to revise the fundamental idea of individual attainment, given that knowledge development is increasingly mediated through sharing, cultural interchange and networking.

Fischer & Sugimoto (2006) emphasize that industrial nations in their transition to an information age, face a profound lack of **creativity and innovation**. They argue that, although society often thinks of creative individuals as working in isolation, much human creativity is social and results from the interaction and collaboration with other individuals. According to them, social computing applications with their potential for supporting collaboration can contribute to raising creativity. Rudd et al. (2006b) add that the growing opportunities to generate, share, edit and publish material will trigger the emergence of new forms of digital creativity.

Coenen (2005: 257) supports the same argument by claiming that social software may be able to influence creativity through the support of knowledge sharing between people. He argues that creativity occurs by associating previously unconnected concepts in a cognitive system, for which the integration of knowledge from various fields is often important. This knowledge in turn can be gathered over social contacts in different domains and is thus related to communication in a social network structure. Social computing applications, imitating face-to-face interactions without constraints in space and time, may allow for rich and effective knowledge exchange, thus supporting creativity (2005: 257).

Rudd et al. (2006c) note that educational and social research is increasingly making a case for a new understanding of learning processes that acknowledges their often networked, collaborative and connected properties. At the same time, social, technical and leisure life is already increasingly organised around **networks, collaboration** and **connection**, while learning institutions are only just starting to react towards research results that indicate that connection and collaboration play important and complex roles in learning processes and knowledge acquisition. Rudd et al. (2006c) summarizes and juxtaposes some of the research results as follows:

(1) higher order functions arise through social interactions;

(2) knowledge is socially constructed between learners and experts, not simply 'acquired' or 'delivered';

(3) learning is understood to be more powerful when actively scaffolded by expert others;

(4) progress is greater when learning focuses upon collaborative rather than independent problem solving;

(5) knowledge is distributed in nature; it is necessary to acknowledge the 'webs of knowledge' created in the social process of learning;

(6) learning occurs best when individuals are active participants in communities of practice, sharing mutual interests, collaborating and exchanging resources in order to find solutions to shared problems or areas of interest.

Learning networks, enabled by digital technologies, would offer the possibility of recognising diversity, encouraging the mobilisation of social capital and enabling powerful collaborative and relevant learning experiences, addressing the students' needs in a networked society (Rudd et al., 2006c).

In a similar vein, Owen et al., 2006 argue that, since **learning to learn**, **collaboration**, and the **personalisation** of educational experiences are at the core of educational agendas, and since social software supports these trends, it offers opportunities to respond to current educational and social needs.

Rudd et al. (2006b) underline the necessity for **changing teacher and student roles**, putting the learner at the centre and making his voice heard. They argue that, boundaries between 'teachers' or 'experts' and 'pupil' or 'novice' can and do become blurred, in particular through the emergence of social computing tools that empower learners to become creators, publisher, editors and (peer) tutors – roles that have to be addressed and integrated in current E&T. The self-directed nature of social computing applications supports approaches where the control of many aspects of the learning process currently controlled by teachers, can be handed over to learners (Rudd et al., 2006a).

Rudd et al. (2006a) emphasize the importance of making "**learner voice**" heard, i.e. of better accommodating the interests and needs of students within educational systems. They argue that the communicative, collaborative and community-building aspects of social software open up new possibilities for greater and better dialogue between learners and between learners and staff, by facilitating alternative ways for learners to express their views.

Rudd et al. (2006a) further note the potential of social computing applications in supporting a greater knowledge exchange which enables **peer-to-peer learning** and can help overcome some structural barriers to participation.

Green et al. (2005) call for a greater **personalisation** of education, i.e. for the creation of an education system that meets the needs, interests and potential of all learners, regardless of their backgrounds. Observing that many learners today are already creating personalised learning environments for themselves outside school using digital resources, they argue that the relationship between personalisation and digital technologies has the potential to reshape the education system around the learner. Access to digital technologies enables learners to tailor their informal learning to their own interests, to access information of relevance to them, to communicate with people who can support their learning, and to share ideas and expertise within informal learning communities. Schools could be empowered to better understand the skills, resources and interests of children, parents, and local communities outside the school gate, including these people as experts and participants in more expansive networks of learning.

Furthermore, as Warlick (2006) illustrates, social computing applications can be very powerful tools for diversifying and simplifying teaching in middle school, in particular by interconnecting teachers, learners and parents. He argues that the interconnected knowledge exchange among teachers, enabled by RSS, does not only improve communication and collaboration among teachers with the same subject or class, but also enhances professional development, cross-curricular lesson planning and articulation among grade levels. Student work and class discussions can be made available to a greater audience; tagging tools enable collective resource building.

Alexander (2006: 40f) points out that social computing applications with their **lowered barrier to entry**, may give rise to a variety of new cultural forms of expressions and a variety of new learning methods, from storytelling to classroom teaching to individual learning. He argues that setting up a del.icio.us tag for a topic one wants to pursue, spinning off a blog or blog departmental topic, is far easier than it is to physically meet; starting a wiki-level text entry is far easier than beginning an article or book.

Franklin & Harmelen (2007) add some arguments for integrating social computing applications into higher education. They observe that there is an increasing interest among higher education educators in new pedagogies supporting more **effective ways of learning and teaching**, which web 2.0 applications might contribute to. They claim that web 2.0 applications can support universities in their aim to produce independent, autonomous and self-directed learners, i.e. learners who are able to set their own learning goals, develop strategies and plan how to achieve those goals, work towards realising the goals, either on their own or with others, and reflect on their learning processes and outcomes, in turn learning by that process of reflection.

4.3. Barriers and Risks to Learning 2.0

The ideas presented in the previous section and the exemplary evidence presented in the following chapter underscore the prevalent assumption that the potential of social computing applications to enhance learning is substantial. However, as has also been widely observed, institutional teaching and learning practices in general have not been disrupted by the advent of social computing (cf. e.g. OECD, 2008). ICTs in general have not had the impact on learning that could have been expected considering the societal changes already brought about in other areas. In this section some of the main barriers, risks and obstacles to the implementation of social computing into teaching and learning practice will briefly be presented and discussed.

4.3.1. Access & Digital Skills

There is evidence that the introduction of digital technologies in homes and schools can serve to reinforce and reproduce existing inequalities in the education system (Green et al., 2005; Davies & Cranston, 2008). Accessibility constitutes a major obstacle to equal opportunities and remains a key problem for inclusion (Akbulut, 2007; Ray, 2006; Davies & Cranston, 2008). Therefore, to benefit from the advantages of Learning 2.0, equal access to these tools and the necessary skills for using these resources have to be ensured.

At present, differences in access to ICT are noticeable both on an individual and an institutional level in Europe. Individuals' internet access, one of the basic requisites for the use of online environments in learning, differs substantially between different age and social groups and among different regions in Europe (Ala-Mutka, 2008). On average, 57% of the EU27 population had accessed internet access in last three months in 2007. Furthermore, there are different social groups at risk of exclusion, such as older people, the less educated or the unemployed. For example, only 19% of females and 31% of males aged 55-74 used the internet regularly in the EU27 in 2007, as opposed to 77% of females and 79% of males aged 16-24.[39]

Regional differences are reflected in the ICT equipment and internet connectivity levels of schools. While the use of computers in European schools has reached almost the 100% saturation point in all member states, there are large variations in the number of computers per 100 pupils, ranging from 27 (DK) to 6 (LV, LT, PL, PT, GR) computers per 100 pupils in 2006. Computer equipment levels also vary according to school type with an average of 9 computers per 100 pupils in primary schools (8 of which are internet connected) at the bottom end and 16 (14 internet) computers per 100 pupils in vocational schools at the top. Similarly, internet connectivity varies according to country and school type: While in the Nordic

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[39] http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-QA-07-023/EN/KS-QA-07-023-EN.PDF.

countries, the Netherlands, Estonia and Malta more than 90% of schools have broadband access, in Greece only 13% of schools were connected in 2006. (Korte & Hüsing, 2006)

Furthermore, there are differences in the acquaintance with ICT in general and social computing in particular among different learners and learner groups, giving rise to a possible "participation divide"(Hargittai & Walejko, 2008). Eurostat data (2007)[40] indicates that, for example, only 24% of Europeans have ever posted messages to chatrooms, newsgroups, or participated in online discussions; again there are large differences between countries, ranging from 43% in Estonia to 8% in Cyprus. Similar differences emerge with more basic digital skills, like using a search engine or sending e-mails with attachment (EU27 average: 57% & 50% respectively, ranging from 23% rsp. 21% (RO) to 83% rsp. 75% (NL))[41]. Thus, not all learners might be endowed with the basic digital skills that allow them to participate in Learning 2.0 activities. Different digital skills levels will have to be considered and addressed when exploiting social computing applications in learning contexts.

4.3.2. Adolescent Users

Displaying personal data: In particular young (i.e. adolescent) internet users tend to misunderstand the nature of social computing environments, believing to be writing for a closed group of friends, unaware that the information they have posted may be publicly available, can be searched for and read by a much wider audience (Childnet International, 2008). They tend to disclose their most intimate feelings without considering the consequences of publishing these (Berson & Berson, 2006).

While there may be some basis for concern, a rapid survey of blogs on LiveJournal or MySpace, two popular blog systems used by young people, suggest that most of the communication between bloggers appears to be between people who already know each other in the offline world (Rudd et al., 2006a; Owen et al., 2006). In a survey of the profiles of US teenagers, the Pew Internet Study, found that over 82 per cent of profile creators include their first name in their profiles, 49 per cent include the name of their school, 29 per cent include last names, and 2 per cent include mobile phone numbers; only 5 per cent of profile-owning teenagers have publicly visible profiles displaying their full names, photos and details of where they live (Davies & Cranston, 2008). However, personal information is also shared through the media that individuals upload, in the comments attached to media and events, in the groups individuals join, and in the public messages sent through the wall feature of profiles (Cranston & Davies, 2008).

Self-destructive behaviour: Young people might engage in self-destructive behaviour, including sexual exploits, drug experimentation and criminal activity, and share these activities with their online social networks. In some US secondary schools, students are already facing disciplinary action for their blog posts, and police are monitoring blogs, sometimes uncovering confessions of crimes by teenagers (Berson & Berson, 2006). Inappropriately or unintentionally shared personal data may be used in bullying, be accessed by potential employers or educational establishments, lead to an inability to escape past actions and have a fresh start and be used in grooming and abuse (Davies & Cranston, 2008).

Cyberbullying, i.e. the use of ICT, particularly mobile phones and the Internet, deliberately to upset someone, is an increasingly common phenomenon (Childnet International, 2008). There are cases of cyber bullying of both students and teachers, to which some educational institutions have reacted by restricting access to collaborative content sites (Ala-Mutka, 2008;

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[40]   http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-QA-07-023/EN/KS-QA-07-023-EN.PDF.
[41]   http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-QA-07-023/EN/KS-QA-07-023-EN.PDF.

Berson & Berson, 2006). The Euro Barometer Survey (2007) found that features on social network sites such as applications for rating friends could facilitate bullying activity and there is evidence on young people creating fake profiles or websites about peers and using these to spread false or offensive content (Davies & Cranston, 2008). However, the 2006 National Bullying Survey in the UK found that whilst 69 per cent of young people had been bullied, internet technologies and text messaging was a factor in only 7 per cent of cases (Byron, 2008).

Online grooming refers to a number of techniques that are used to engage the interest and trust of a child or young person for the sexual gratification of an adult (Childnet International, 2008). Social networking services are especially susceptible to this kind of illegal online activity. The UK Centre for Exploitation and Online Protection have noted an increase in the number of reports to law enforcement that relate to the sexual abuse in social networking environments (Brennan, 2006). Whilst social networking sites have not increase the risk to young people of being victimized by online molesters, the Second Youth Internet Safety Survey of a representative sample of US teenagers in 2005 found that 13 per cent of young people to have received an unwanted sexual solicitation online, with four per cent experiencing an 'aggressive sexual solicitation', i.e. one in which the solicitor made orattempted to make offline contact with the young person (Wolak et al., 2006). Wolak et al. (2008) found that posting personal information online does not, by itself, appear to be a particularly risky behaviour, rather, it is voluntarily interacting with strangers online, particular engaging in conversations of a sexual nature that increases young people's risk of sexual solicitation and aggressive sexual solicitation. Fortunately, due to the general concern most children are well aware of the dangers of talking to strangers online and understand basic internet security (Fielder, 2007).

In all of these cases it is vital that schools understand the issue, know how to prevent incidents, respond to incidents and keep up to date on the legal issues surrounding this challenging subject (Childnet International, 2008). Students need to know how to identify and report inappropriate behaviour on sites they are using. When using social computing services in educational contexts, Berson & Berson (2006) advise explaining and discussing the guidelines of the Electronic Frontier Foundation (EFF) in order to create a more protected Learning 2.0 experience; Ray (2006) suggest implementing the "Kids' Rules for Online Safety". Additionally, password-protected environments should be preferred, particularly for younger learners (Berson & Berson, 2006; Kolb, 2006), and privacy protections such as the use of pseudonyms, first names or initials as student identifiers should be implemented (Berson & Berson, 2006). Student safety can further be improved through constant guidance and supervision (Ray, 2006: Akbulut, 2006).

As a response to the risks associated with the use of social computing applications by minors, education institutions will have to in particular raise awareness, improve digital competence to facilitate the young people's critical and responsible participation in digital environments, and protect minors by implementing safeguarding measures (Ala-Mutka, 2008). The European i2010 Mid-Term Review has already taken initiative in this respect by setting a target for the European Commission to publish a guide that explains user rights and obligations in the digital environment,[42] including plans for the European Commission to launch a Safer Internet, 2009-2013 programme for the protection of minors and the fight against illegal content.[43]

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[42] http://ec.europa.eu/information_society/eeurope/i2010/i2010_actions_2008_2009/index_en.htm
[43] http://ec.europa.eu/information_society/activities/sip/programme/index_en.htm; See also http://teachtoday.eu site developed to help teachers and pupils.

4.3.3. Using External Services

Another set of risks is associated with the fact that, in most cases, Learning 2.0 initiatives will make use of an external service provider – either an external service, like a publicly available social computing site (e.g. MySpace, Second Life, Deli.cio.us, etc.) or some (educational) software, whether freely available or not, which is adapted to the particular educational context and only accessible within a closed environment (e.g. Moodle, Elgg, Ning etc.). In both cases, problems arise concerning control and preservation of data. Franklin & van Harmelen (2007) list the following risks:

(1) Loss of content in case of the sudden termination of the service;

(2) No or insufficient back-up facilities, procedures and responsibilities;

(3) Sudden introduction of fees;

(4) Limited control by teaching staff, in particular over unacceptable use;

(5) Potential problems attempting to provide multiple versions;

(6) Impact on academic freedom in the case of external services, as, for example images from an art history course or research might be deemed offensive by the service provider and result in the loss of the images or the corresponding account from the service.

Services can become (temporarily) inaccessible, making it necessary for educators to keep backup copies of essential documents, and ensure alternative ways of using and storing information (Childnet International, 2008).

In particular, **advertising** may be irritating and inadequate to the purpose of using social computing applications in learning contexts (Ellison. 2007[44]). Advertising and spamming might pose a threat to the use of social computing services with younger learners (Davies & Cranston, 2008; Buckleitner, 2008). A survey of online advertising for the National Consumer Council (UK) found that only 37 % of advertisements on popular websites were labelled as such; hidden persuasion techniques are employed, in the form of commercial messages that cannot be easily identified by children, and a quarter of 70 advertisements examined were for products or services that are prohibited for children under 16 in the UK, including gambling and dating (Fielder et al. 2007; Davies & Cranston, 2008).

There is trend on social network sites towards integrating advertising content alongside information from friends and even leveraging information about friends to provide 'social adverts' displaying details about products and services that individuals or their friends have used or bought (Davies & Cranston, 2008).

Educators have to be aware of these risks and take adequate measures to address them and raise awareness among young users. In the case of primary and secondary education, teachers might consider using products and services that are tailored to be used for learning purposes and avoid inadequate advertising activities (see chapter 4.1.10).

Copyright: Since social computing gives rise to content generation, re-purposing and consumption, many people will create and modify content, which may lead to questions as to who owns the content (cf. Franklin & van Harmelen, 2007). When anybody can use, create and publish content online, both conscious and accidental infringements of copyrights and moral rights, and personal misunderstandings can occur (Ala-Mutka, 2008). Although copyright protection is automatic upon the creation of a qualifying work, many users of social computing technologies and services are not aware of this and mistakenly believe that because

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[44] http://nellison.blogspot.com/2007/12/ecar-facebook-as-teaching-tool.html.

of the ability to create, share and adapt material, the Internet contains vast amounts of Public Domain material that can be freely accessed and used (Franklin & van Harmelen, 2008).

For an education institution, like a university, there may be additional complications where people outside the institution (visiting lecturers, external workers on collaborative projects, etc.) contribute to the system. Additionally, many universities claim the IPR for the content that their staff (and, in some cases, students as well) create in the course of their duties. This may become increasingly difficult where content is placed in open environments, especially where they require the ceding of some or all the IPR (Franklin & van Harmelen, 2007). Plagiarism is an additional concern for educators as they would like to encourage collaboration and scientific research strategies, but find it difficult to monitor, detect and discern plagiarism (Ala-Mutka, 2008).

4.3.4. Teachers and Teacher Training

Educators confidence in and experiences with social computing services is one of the main barriers to exploiting them within education (Childnet International, 2008). Although some studies in OECD countries show that teachers might be amongst the most skilled technology users, it appears that they are unable to take advantage of their competence and apply it to the way they teach (cf. OECD, 2008). According to the OECD (2008) three reasons emerge as the most salient for explaining this paradox: (1) the absence of appropriate incentives to use technology in the classroom and, more generally, getting involved in any innovation; (2) the dominant culture in the teaching profession, which does not rely very much on research-based evidence to identify good teaching methodologies and strategies; and (3) the observation that teachers lack the vision and the personal experience of what a technology-enhanced teaching could look like. Especially the last two reasons suggest that initial teacher training has to be revised to prepare teachers for an adequate in-classroom use of technology.

According to Blin & Munro (2008) the lack of transformation of teaching practices in higher education can also, at least partly, be attributed to the lecturers' lack of appropriate competencies, which is not properly addressed by the training and development programme offered by the University. In their opinion, it is however unlikely that training alone will suffice; more radical transformations of the overall social and cultural context of the university teaching practices are also likely to be required.

Childnet International (2008) observes that in the UK professional development programmes, advice and information for teachers have not kept pace with the emergence of new technologies and practices, also within schools, particularly those that have become widespread and commonplace among learners. While educators may well be using social networking services themselves, they may not recognise the educational potential and opportunities for their learners, or understand the potential risks, both for themselves and their learners. Many educators do not use the Internet in the same way as many young people – as a ubiquitous, always-on extension of their physical space which, for young people, has always been around.

5. Learning 2.0 Practices for Innovation

While ICT in general and social computing in particular have brought about disruptive changes in many different areas of society, E&T institutions and systems have so far remained relatively untouched (cf. Alexander, 2006; Geser, 2007b; Owen et al., 2006). Rather than a fast transformation of educational practices, a slow process of diffusion, experimentation and adoption of ICT is expected (Geser, 2006; Owen et al., 2006). An important role in promoting social computing applications is being played by national and regional educational networks that provide information, services and support for teachers (cf. Geser, 2007).

However, throughout Europe there are currently an amazing number of small-scale experiments using social computing in E&T being carried out, in different educational institutions, with diverse educational objectives and approaches. In particular, universities, secondary and primary schools are embracing social computing as a means of discovering new and innovative ways of enhancing learning. While there is little evidence on the potential of social computing to facilitate vocational training, workplace learning and professional development in general, teacher training and practice are starting to exploit the potential of social computing in facilitating collaboration and knowledge exchange.

This chapter and the following chapter will explore more in depth the manifold experimental uses of social computing applications in different learning contexts, collecting experiences and outlining research results. The main aim is to give an overview of actual practice in different institutional learning settings, discussing how social computing in general, and certain tools in particular, can enhance learning processes.

As the landscape of Learning 2.0 is extremely varied and research results are still scarce, only a snapshot of actual practice can be presented[45]. Thus some clusters or islands that are representative of a bundle of Learning 2.0 activities have been isolated from the research literature, which display certain characteristic Learning 2.0 approaches and indicate the specific potential of social computing in each of these different areas. These *Learning 2.0 iLANDS* will be presented and discussed in the following.

5.1. iLANDS – New Territories for Innovation in Learning

Looking at current practice, at least four different innovative perspectives or stances on the use of social computing for learning can be discerned. Although these approaches mutually support each other, they point to the different objectives underlying the appropriation of social computing applications by learners, teachers and institutions. Moving from the core to the periphery, the four perspectives on learning are the following:

1. (LA) *Learning & Achieving:* Social computing tools can be used as methodological or didactic tools to directly support, facilitate, enhance and improve learning processes and outcomes. Social computing is conceived of as a means of personalizing learning processes and promoting the students' individual learning progress, ultimately leading to an empowerment of the learner;

2. (N) *Networking:* Social computing can be embraced as a communication tool among students and between students and teachers, supporting also the exchange of knowledge and material, but mainly creating an environment of understanding and assistance, thus

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[45] For more examples, please refer to the Annex, which contains a more extensive overview of Learning 2.0 practice in Europe and the rest of the world.

contributing to the establishment of social networks or communities between and among learners and teachers;

3. (D) *Embracing Diversity:* Social Computing can be thought of as a means of integrating learning into a wider community, reaching out to virtually meet people from other age-groups, backgrounds and cultures, linking to experts, researchers or practitioners in a certain field of study and thus opening up alternative channels for gaining knowledge and enhancing skills;

4. (S) *Opening up to Society:* Finally, social computing can be conceived of as a tool for making institutional learning accessible and transparent for all members of society, promoting the involvement of third parties like parents, but also facilitating the access of current and prospective students to information.

Together these four approaches to Learning 2.0 give rise to new areas for innovation in learning, to *innovative lands for Learning, or:* iLANDS.
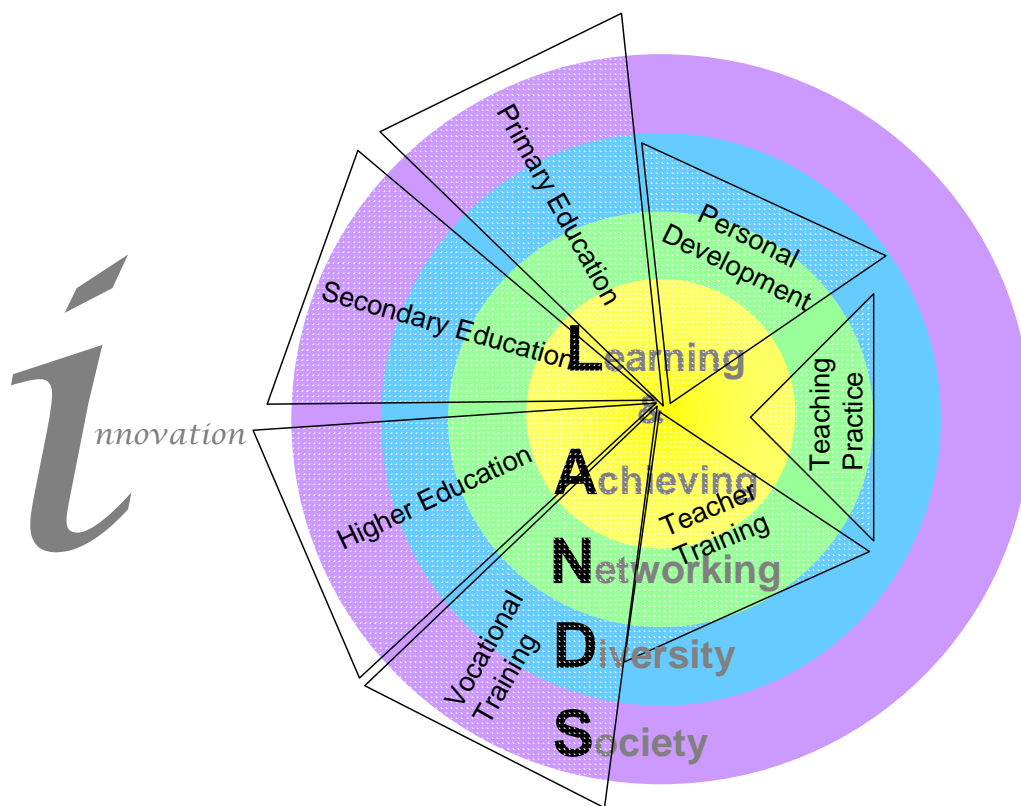

Figure 5-1: iLANDS for innovation in learning

Though partly overlapping and often jointly targeted, these different perspectives on fostering innovation in E&T by the use of social computing point towards different strategies and objectives. As indicated in Figure 5-1, education institutions are susceptible to all of these strategies, although focus and implementation will differ substantially between higher and secondary or primary education institutions. Learning 2.0 opportunities outside the institutional framework arise in particular by combining the use of social computing to directly enhance learning processes and outcomes with its networking potential. Teachers profit in particular from social networking tools, which allow them to build up communities of practice for the exchange of knowledge, material and experiences. Evidence on adult education, workplace training and informal learning in general is scarce and has therefore been included in Figure 5-1 under the heading of "personal development".

In the following, the characteristic uses of social computing in different learning settings will be discussed for the outer three shells of *Learning 2.0 iLANDS* – networking (N), embracing diversity (D) and opening up to society (S) – addressing in particular **institutional innovation**. The subsequent chapter will be devoted to investigating more in depth the core of Learning 2.0, the *learning & achieving* (LA) stance, aimed at exploring the potential of social computing to directly enhance learning processes and outcomes. Thus the presentation will move in concentric circles from the outer shelf of Learning 2.0 towards the centre, from society to the learner.

5.2. Opening up to Society

Many higher education institutions are embracing social networking services to present their institution to society and to connect with current and prospective learners. The University of California, Berkley, USA, was the first to make full course lectures freely available through YouTube[46]. It runs its own channel as a YouTube partner and provides over 300 hours of content (cf. Childnet International, 2008). The University of Warwick[47], UK, was one of the first European universities to set up a MySpace profile that provides information about the university and act as a meeting place for current, prospective and past Warwick students. The Case Western Reserve University in the US uses the "Cleveland Plus" representation in Second Life to actively recruit prospective students, offering a virtual tour of the campus guided by student ambassador avatars, to conduct classes and showcase students' work (cf. Shapiro et al., 2007). Following suit, many European universities are now creating profiles on different social networking sites. The Spanish open university of Catalonia (UOC), for example, has a web presence on Facebook and Twitter, participates in Netvibes and has a YouTube channel[48].

The main objective in all these cases is for the educational institution to be present where its students are, alerting the attention of current and prospective students, making information more readily available, and increasing the visibility of the institution's educational endeavours to a greater audience.

Complementary to this approach, universities are currently testing different strategies for integrating social computing services into the overall institutional architecture. The aim in all these cases is to make social computing tools and services available to teachers and learners in a closed environment, and to foster access to information, research resources and university services, e.g. administration.

The University of Edingburgh's Web 2.0 strategy exemplifies the perceived opportunities in enhancing the university's virtual learning environment with social computing tools: Blogs and RSS feeds are used instead of newsletters; social bookmarking technologies facilitate the management of course reading lists in a collaborative way, link the service with Library resources and WebCT; podcasts of public lectures can be downloaded after the event; and services such as Frappr[49] can be used to help build a sense of community amongst international postgraduate students prior to arrival (cf. Franklin & van Harmelen, 2007). Similarly, many other universities (particularly in the UK) have recently integrated various

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[46] http://youtube.com/ucberkeley.
[47] www.myspace.com/warwickuniversity.
[48] See overview: http://www.uoc.edu/portal/english/difusio_i_publicacions/uoc_20/index.html. Sites: http://www.facebook.com/pages/Barcelona-Spain/Universitat-Oberta-de-Catalunya-UOC/21651276645; http://twitter.com/UOC_University; http://www.netvibes.com/uoc_eng#Home; http://es.youtube.com/uoc.
[49] http://www.frappr.com/.

social computing applications into their services package[50]. Most of these projects, however, are still in a pilot stage[51].

Some universities are experimenting with combined approaches. Martin Weller writes in his blog about the Open University (OU) course profile application[52], which allows Facebook users to look up OU courses by code or title and list the courses they have studied on their profiles. Additional applications are currently being developed which will allow students to find people who have studied the same course and get a study buddy; the associated course books will be displayed and can be bought online (from online bookshops or second hand from fellow students); links to associated networks will be supplied, student suggested resources can be viewed, the library set of materials will be accessible through Facebook, etc[53].

Though different in spirit and strategy, the main idea underlying these three different approaches is to make university information and services available to learners in a format that addresses and acknowledges the fact that the current generation of students is using social computing as a natural way of presenting themselves, accessing information and communicating with others.

Secondary, primary and pre-primary education institutions are also trying to encompass social computing to increase transparency and accessibility. However, in most of these cases, the intention and approach is slightly different from the case of universities. First of all, integrated solutions prevail with the institution's web site being the main entrance gate to information. Secondly, instead of the learner, actual and potential parents are the main target group; and thirdly, the information made available using social computing mostly concerns internal learning processes and results. The main objective in these cases is therefore to make the institution's educational strategy, daily work, special activities and the outcomes thereof more transparent to parents.

One of the more salient examples is the recent trend to install webcams in pre-primary institutions that allow parents to monitor their children's activities via the internet during the day[54]. In Spain, this movement was triggered by documentary on the appalling conditions in a crèche in Madrid, raising the awareness of parents and education institutions to the fact that educational procedures are not transparent. While this movement is discussed rather controversially by parents, educators and employers, some of the more obvious positive examples of the use of social computing in schools include the display of students' work and school projects to a greater audience, inviting parents and outside experts to participate in the learning process. The "Schoolbox 2.-4." blog[55], for example, functions as a website of a mixed-aged Swiss primary school class, where class projects, including stories and podcasts, are displayed and students and parents are kept up to date with important information. The

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[50] See for example, the Universities of Brighton (http://community.brighton.ac.uk/), Leeds (https://elgg.leeds.ac.uk/; http://www.lts.leeds.ac.uk/elgg/), and Westminster (https://connect.wmin.ac.uk/). As far as these tools are used to support networking activities, they are discussed below, under the Networking stance. For a discussion, see: Franklin & van Harmelen, 2007.

[51] Cf. Suhonen & Uimonen, 2007; Calvani et al., 2007.

[52] The application can be found at: http://www.facebook.com/r.php?referrer=112&app_id=4472914735; to gain access to the application as a non-user, enter "T171" as a course code.

[53] http://nogoodreason.typepad.co.uk/no_good_reason/2007/10/first-ou-facebo.html.

[54] See for example: http://cherryblossomcreche.com/webcams.htm (UK); http://www.cocoonchildcare.ie/watch_me_live.asp (Ireland); http://www.escuelainfantileltrenet.com/es/seccion/inicio.html (Spain); http://www.issy.com/index.php/fr/parents/petite_enfance/les_cyber_creches__1/les_webcams (France).

[55] http://www.sofresh.ch/school/index.php.

French "podcast de radios scolaires" project[56] offers a central website for sharing podcasts that are produced by primary and secondary school radio projects. The site allows schools to make their school radio broadcasts available to a greater audience, facilitating the creation and distribution of emissions. Social computing sites can also be used with the aim to showcase student work. Linda Hartley, a UK primary school teacher, for example, administers a Flickr group[57], where (primarily primary school) groups can publish their classroom displays. The Flickr group works as a visual archive to capture interesting and original displays that would otherwise vanish unrecorded, and to promote discussion.

To summarize, under the *society* stance, social computing services are appropriated by educational institutions as a means of making information and services linked to the institution more readily accessible and more transparent to current and prospective students and parents. Higher education institutions focus on addressing the fact that their current and prospective learners are using social computing tools extensively, by (1) creating institutional profiles with access to information and services on popular social networking sites, (2) integrating social computing tools into their virtual learning environment, thus offering the services students are used to outside education and training systems within the educational sphere (and encourages teachers to take up these services) and by (3) experimenting with solutions that allow students to seamlessly integrate their educational profile into their personal online activities – and vice versa. Secondary, primary and pre-primary institutions target society via the actual or future parents rather than the learners themselves. Social computing tools and services are primarily used to make educational activities within the institution more transparent to parents, by (1) offering monitoring services, (2) displaying student work and school projects, and (3) creating forums for interaction between the different parties involved. The common objective of all of these diverse strategies is to overcome institutional barriers, creating a more transparent learning environment that makes opportunities for information and participation available to all parties involved.

5.3.   Embracing Diversity

There are a number of initiatives, especially in primary and secondary education that approach social computing as a means of integrating learning into a wider community, reaching out to virtually meet people from other age-groups, backgrounds and cultures, linking to experts, researchers or practitioners in a certain field of study and thus opening up alternative channels for gaining knowledge and enhancing skills.

The vast majority of projects from the eTwinning initiative and similar European partnership projects among schools follow this approach by using ICT to connect learners from different cultural backgrounds and encouraging them to discuss common cultural values and different cultural traditions and rites. The "Once Upon a Blog" eTwinning project[58] between a Maltese and Irish primary school encourages students aged 4-11 to exchange national myths and legends using podcast technologies and interacting through a project blog. To strengthen the cooperation and cultural exchange, a weekly live link between the two schools was established. As a side effect, the eTwinning project has resulted in the setting up of a permanent podcast studio and increased the teachers ICT skills, in particular the use of studio equipment and webcams.

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[56]   http://podcast.ac-rouen.fr.
[57]   www.flickr.com/groups/classrmdisplays.
[58]   http://slua.com/?page_id=171; http://slua.com/.

The eTwinning podcast project[59] explores how podcasts can be used as a learning tool supporting intercultural dialogue. The students of four secondary schools in UK, France, Spain and Italy are encouraged to produce podcasts which are shared by RSS feed and other communication technologies among all partners. The objectives of the project are to share cultural experiences, explore each others environment, motivate and excite students with the idea of becoming internet broadcasters. A blog has been use to initiate and share project ideas[60]. In addition online chats within the VLE and video conferencing have been used to reinforce the relationship. A shared web based whiteboard has been used as a collaborative environment, where all material is posted for discussion prior to publication. The project has its own area on the iTunes podcast directory. The initiators found that the students' motivation levels are so high that the project has become student led. Students themselves generate ideas, identify the new skills required and produce the final product. Strong friendships between schools, teachers and learners have been established.

In the "Telling Lives" eTwinning project[61], 13-16 year old students from a Finnish and Norwegian secondary school produce their own digital stories made of personal photos, drawings, media clips or private archives, and personal English voice-over based on a written manuscript. The digital stories are based on agreed topics between the twinned schools. The digital story is then uploaded on the project's Twin Space at the European eTwinning website. Students are encouraged to download films from their partner pupils, watch these, and comment (in English) on the films by using the Forum and the Bulletin Board available on the Twin Space.

The "Share IT with friends" project[62] is a collaborative media production projects between primary school pupils from Knockaclarig NS, Ireland, and Vindängen, Sweden. Students collaborate and build knowledge together by producing media material, publishing it on the project blog and giving feedback. Two main themes have been running on the blog since spring, 2007, "Wild Flowers of the Countryside" and "A study on small animals in a pond next to school." The EU Socrates partnership project "Languages from the Cradle" (The Lullabies of Europe)[63] between different European primary schools, uses a wiki to collect lullabies in 7 European languages, submitted by primary school students all over Europe[64].

Also globally interesting cooperation projects using social computing exist: The Horizon Project[65], like it's predecessor, the Flat Classroom Project[66] is a global collaboration project for middle and senior high school students at International Schools in Bangladesh, Georgia, Australia, Austria and China. Students were paired with a global partner to discuss a certain subject and create videos using a wiki, Twitter, MySpace, e-mail and Skype for collaboration. The "KMIKY (Knowing Me Is Knowing You)"project[67], initiated by a Romanian secondary school and currently involving partner schools in 15 European and non-European countries, encourages primary and secondary school students to engage in cross-cultural activities,

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[59] Cf. http://www.andeducation.co.uk/etwinpodcast.htm and http://www.andeducation.co.uk/blog/. For more information see: http://www.etwinning.net/ww/en/pub/etwinning/ideas_and_practice/gallery/galleryitem.cfm?fuseaction=gDetail&lang=en&gLang=en&pID=9201&mode=1.

[60] http://www.andeducation.co.uk/blog/.

[61] For more information see: http://www.etwinning.net/shared/data/etwinning/booklet/etwinning_handbook_2007/etwinning_en.pdf.

[62] http://blog.eun.org/film2/.

[63] Cf. http://www.lullabies-of-europe.org/.

[64] http://lullabiesofeurope.wetpaint.com.

[65] Cf. http://horizonproject.wikispaces.com; http://horizonproject.wikispaces.com/About+Us.

[66] http://flatclassroomproject2006.wikispaces.com/; http://flatclassroomproject.wikispaces.com/.

[67] www.geocities.com/optionalcourse7a191.

exchanging opinions, stories, customs and traditions. Each activity provides teachers with practical guidance. Many pupils (including children with special needs) have submitted texts and photos related to these activities, thus creating a global archive of personal accounts about different cultures that aims to increase cultural awareness and foster tolerance and understanding among the peoples of the world. A set of online interactive exercises has been designed to help pupils reinforce the information learned in the project. The project encourages the development of co-operation, communicative skills, initiative and research skills.

The iCamp project[68], to give an example from higher education, is a cross-border collaborative problem-based learning project under FP6, in the first trial of which a total of 36 (graduate and post-graduate) students from four different partner universities in Turkey, Poland, Estonia and Lituania participated. Eight cross-cultural groups of four or five students were formed encompassing members from all four participating countries. These teams collaborated on a given task making extensive use of social computing tools such as Wordpress for individual and group blogs, Flickr for image sharing, delicious (for bookmarking blogs, reading lists and questionnaire delivery addresses), Flashmeeting (Teleconferencing), Nextspace (shared workspaces for projects and facilitators), Google docs (Shared document production in the questionnaire development) and MSN (for Email, chat, and teleconferencing) (Kuru et al., 2007).

These examples illustrate the potential of social computing in creating a community for intercultural exchange between education institutions in different countries. There is, however, another set of examples targeted at embracing diversity in a different way, by reaching out to involve external experts in learning projects, improving the cooperation between institutions or different spheres of society. Langhorst (2006), for example, employed blogs in two school projects with (US) junior high school students, where a historic novel was read, commented by their students in a collective book blog, involving parents, other community members and the author of the novel. He records the involvement of the author and the parents as most rewarding, as they significantly enhanced student motivation. The "Learning and Teaching Scotland (LTS)"[69] organisation encourages students to take part in a "virtual work experience"[70], which allows them to discover different professional profiles and job roles in a 3D animated environment, encouraging them to investigate their own career options[71].

Witte (2007) reports on a blog project in which middle school students (USA) collaborated with pre-service teachers, i.e. university students on reading a novel through blogging. In the first trial, collaboration was disappointing, mainly due to communication problems between the two groups. The project was re-launched with major modifications, including a focus on blog collaboration and conversation (rather than literature), more guidance of pre-service teachers in how to interact with middle school students, face-to-face meetings between the two groups and enhanced technology, e.g. including videos. With these corrections, the project became a huge success and role model for similar projects in the US.

To outline the scope of the field and the opportunities associated with social computing tools in transcending horizons and embracing diversity, one example of inter-institutional cooperation between higher and secondary education using a wiki and other communication tools, shall be described (cf. Hodgkinson-Williams et al., 2008). The "e-Yethu" project is a

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[68] http://www.icamp.eu/learnmore/project/: http://www.icamp.eu/watchwork/models/.
[69] http://www.ltscotland.org.uk/.
[70] http://www.ltscotland.org.uk/virtualworkexperience/index.asp.
[71] http://www.nesta.org.uk/assets/Uploads/pdf/Case-Studies/virtual_work_experience.pdf.

virtual and physical community of between lecturers and students from the Computer Science and Education Departments at Rhodes University, teachers from the local community, the provincial Department of Education and a non-governmental organisation, which enabled ICT take-up in a number of schools in the Grahamstown District, South Africa. The aims of e-Yethu project were to support local schools as much as possible by developing communities of practice, aiding schools in sourcing computer and other ICT equipment; supporting schools technically while providing transfer of technical skills to teachers and learners; facilitating collaboration amongst schools; and providing ICT literacy training for teachers and learners. To facilitate collaboration, face-to-face meetings were extended to the use of a mailing list and a wiki to which all members of e-Yethu group had editing rights. According to Hodgkinson-Williams et al. (2008) the project succeeded in providing opportunities for collaborative learning within higher education institutions, and between them and the local community, using ICT.

As these examples illustrate, social computing tools are extremely well suited to overcome institutional, geographical and cultural barriers in a vast variety of ways. Many of the projects mentioned have a dual aim: they open up the classroom doors to the outer world to establish new spheres of inspiration, collaboration and reflection, but at the same time they connect these new insights back to certain topics or subject specific questions. Thus the projects themselves employ a *learning* stance as much as a *diversity* stance. What differentiates them from other initiatives following a learning approach and discussed in the chapter 6, is the role that social computing plays in the learning process as an enabler for intercultural exchange and collaboration rather than as a tool to directly facilitate individual learning processes. Networking is one of the key features of all of the projects presented above. However, the examples presented in this subchapter use networking as a means of overcoming and negotiating differences, while the projects that will be presented under the *networking* stance in the following subchapter have their origin in a common interests and needs.

5.4. Networking & Community Building

One of the strengths of social computing tools lies in their potential to facilitate social networking, bringing together people with common interests and allowing them to exchange knowledge and intensify collaboration (Cachia, 2008). Not surprisingly, these services have recently also been appropriated by educators, learners, researchers and other parties interested in building networks for the exchange of knowledge and experiences connected to learning.

Recently, efforts among researchers to pool resources and benefit from each others expertise using social computing services have been intensified. ResearchGATE[72], for example, is a very recent online social network for scientists aiming at establishing a global Facebook-like community for researchers. The aim of the platform is to provide a global and powerful scientific web-based environment, in which scientists can interact, exchange knowledge and collaborate with researchers of different fields. Similarly, the Eurotrainer Virtual Community is a virtual learning network for vocational education and training (VET) professionals offering the possibility to share experiences and opinions, capitalize knowledge, and to work in partnership on common documents in the field of competence management of VET professionals.[73]

Social computing services are used widely to facilitate network building among (primary and secondary school) teachers. The Finnish BIGnet project[74], for example, is a network of

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[72] https://www.researchgate.net/.
[73] http://community.eurotrainers.net/; www.eurotrainer.org/.
[74] Cf. Wulff et al. (2007); www.isoverkosto.fi.

teachers in remote areas, which started in, 2004 with 36 institutes and comprised, in, 2007, teachers of 67 secondary and 3 vocational schools. The main goals of this project are to support (small and geographically dispersed) secondary education institutes, increase collaboration among secondary education teachers, to provide flexible and high-quality educational services, and to support teachers in adapting to a new operational culture. Within the project, a material bank, so-called BIGpool[75], has been developed, where individual teachers can contribute, find and comment on peer-reviewed learning material.

The majority of these networks, however, are shaped by a specific common interest. In many cases, these networks are targeted at teachers of a certain subject or subject domain, encouraging them to exchange ideas, opinions, information, didactic material and good practices, in some cases including the collaboration on projects. The European Schoolnet (EUN) supports a number of online communities in which teachers of certain subject areas or of common educational interest form a social network, exchanging experiences and good practice and contributing to a common workspace[76]. As one example, the EUN eCLIL community[77] is a European virtual community among science teachers to share ideas and materials, exchange experiences and promote the use of English as a medium language. The aim of this community is to exchange experiences in teaching science subjects using English as a working language, or language of instruction. Teachers will develop CLIL materials and lesson plans, share them with the other colleges, and have them tried and tested with their own students. Targeted at teachers in training, the Share project[78], a multilingual exchange and collaboration platform initiated by the University of Cologne (Germany), encourages the sharing, collaborative production and re-usage of educational materials. Several tools are offered to support teamwork, collaborative writing, copyright handling, and open content. A document repository, open to all interested teachers, is provided. The eTwinning Teacher Blog[79], while employing a blog environment, is at its core a social networking site where teachers in Europe can discuss their experiences with eTwinning programs, exchanging experiences.

Some services focus on help, advice and peer support rather than subject oriented knowledge exchange. The "Classroom 2.0" site[80], for example, is a social networking site for teachers, offering help and advice with online tools, discussion forums and other opportunities to exchange views and experiences, and access to web 2.0 tools for learning. The network currently comprises 8520 members worldwide. The German "Lehrerforum"[81] uses a more traditional forum-approach to build a network of peer support around common – often social, psychological or legal – problems encountered by teachers in their daily lives. Talkabout Primary MFL[82], started in the UK in, 2007, is a social network run on Ning for people teaching, or considering teaching, foreign languages in primary school. It is a place to share worries and successes with supportive colleagues.

While the networking approach is less common among learners, the project "Escoles en Xarxa" (Schools on the Net) illustrates the potential in this area (cf. Geser, 2007b). Within this initiative an online community based on the Catalan language in secondary schools has

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[75] www.isoverkosto.fi/pooli/.
[76] Cf. http://community.eun.org/eunCommunity/manual/EN/index.html and
http://community.eun.org/eunCommunity/enter_old.cfm?cat=yes.
[77] http://community.eun.org/entry_page.cfm?area=1912.
[78] http://www.share.uni-koeln.de/
[79] http://blog.eun.org/etwinning/.
[80] http://www.classroom20.com.
[81] www.lehrerforum.de.
[82] http://primarymfl.ning.com.

been created. In the first half of, 2006, 53 schools were already connected to the project, which also helps spread social values. Students use blogs to report on developments in the social environment of their school and to debate social problems, for example experiences of people arriving in Spain from third world countries. (cf. EUN, Insight, 2006).

Furthermore, networking offers opportunities for vocational training, providing peer support for students during intern- and traineeships. Within the EU funded Socrates-Minerva ESMOS project, for example, a group blog was employed among a group of students from the BSc Adult Nursing degree at the University of Salford during their practical internship in the UK and abroad. The aim of the blog was to nurture an online community of practice which would enable geographically dispersed students to discuss and reflect on their placement learning experiences, offering one another feedback and sharing key observations. The preliminary qualitative evaluation indicates that the student-tutor and peer-to-peer communication via the blogs is an effective way of enhancing academic, practical, social and psychological support, particularly for those students who travelled abroad for their clinical placement. As these students became more psychologically stressed, their regularity of posting increased. The blog was additionally used as a collaborative bibliography and a reflective 'space' for the group, who also uploaded their final seminar presentations so that other members of the group could ask questions and provide feedback (cf. Keegan, 2007). This example illustrates how the different educational perspectives on social computing – *learning*, *networking* and (to a certain extend) embracing *diversity* – might well be united in one and the same application.

In addition to these open approaches to social networking, higher education institutions, in particular, are starting to offer social computing tools within their virtual learning environment with the aim of creating research and learning communities in a more informal manner. The underlying objective is to establish social networks within the institution, which improve the communication among participants, offer assistance, orientation and support, and ultimately enhance learning processes by creating a positive working atmosphere. While knowledge exchange might take place within these networks, the main focus lies on creating an environment of understanding and assistance.

The University of Brighton, for example, set up "Community@Brighton"[83], a social networking system for students and staff, who are using it as an online social community, for shared academic interest, for personal development planning, and for the creation of e-Portfolios. Students are also able to incorporate material from other social networking platforms such as MySpace. All course cohorts are automatically added as communities, though students and staff are free to create their own communities, which many of the student societies have done. New forms of student support are provided by students or student services responding to students who blog about problems with their studies.[84] Similarly, the University of Leeds (UK) uses Elgg to build a community of staff and students based on the creation of personal and community blogs[85]. "Connect", a more recent initiative at the University of Westminster, "is a pilot project to create a social network for students and staff at the University of Westminster - a democratic space where you can blog, share files and videos, meet new friends and talk about your life and studies"[86]. Here a more encompassing system, including different social computing tools, is envisaged.

Higher Education institutions in other European countries are also starting to use social computing tools to facilitate learner and teacher interaction. For example, the "Puikkari"

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[83]   http://community.brighton.ac.uk/.
[84]   Cf. Franklin & van Harmelen, 2007; Childnet International, 2008.
[85]   Cf. https://elgg.leeds.ac.uk/; http://www.lts.leeds.ac.uk/elgg/.
[86]   https://connect.wmin.ac.uk/.

project among three Finnish Universities of Applied Sciences aims to set up an open, collaborative and accumulating eLearning environment for knowledge sharing and networking, supplying teachers and learners with tools for online collaboration and networking (Suhonen & Uimonen, 2007). The Italian initiative "LTEver", which started in January, 2007, aims at joining students and alumni interested in continuing self-training within an online community. Students, alumni, teachers and collaborators of LTE can have their own personal space for free, they can create a blog, subscribe to pages (e.g. of their friends) and build communities (Calvani et al., 2007).

The University of Brighton's experiences underline some of the main challenges for the deployment of social networking applications as platforms for institutional networks in education. One of the main obstacles is a lack of interest: While all staff and students have accounts, only a small proportion of accounts are active, although the share of active accounts has grown from around 0.2% to about 4.5%, 6 months after implementation. The University of Warwick noticed that its blogging system has positively changed social interaction, but uptake for teaching has not followed through, in part because teaching staff have not incorporated the tools into their teaching. Both universities observed initial occurrences of inappropriate use, most of which disappeared within minutes due to peer pressure. In the case of the University of Leeds the introduction of social computing tools was staff-led, so that students tended to see them as part of their learning and teaching environment and were less likely to abuse them. Here, major advantages were perceived to lie in the flexibility of the tools, their ease of use and their compatibility with other services offered by the University, e.g. for enrolment (Franklin & van Harmelen, 2007). The diversity of observations alludes to the fact that take-up and usage seem to be influenced by many different factors, that will have to be studied more extensively.

Looking back at these diverse cases of Learning 2.0 one common feature appears which unites them under the *networking* stance. While in each case social computing might be internally or externally linked to other functions and embedded in different learning contexts, the main focus of the deployment of social computing services lies in the establishment of a virtual community – among teachers, among learners and uniting teachers and learners. Whether and how learning occurs within these networks is secondary to the fact that the networks facilitate other learning activities, external to the network itself, mainly by providing peer support and assistance. Thus these networks create a social and affective environment that scaffolds different learning processes within traditional education.

5.5.   Summary: Learning 2.0 Strategies for Organisational Innovation

The examples presented in this chapter illustrate the potential of social computing for creating a learning environment that is open to society, transparent and accommodating to all individuals involved in and affected by organised learning. They illustrate how social computing can contribute to organisational innovation in E&T.

Networking within institutions and outside of them leads to the emergence of new communities for learning, disconnected from place and time, in which participants to organised learning can transcend the limits of traditional communication between and among learners and teachers, developing new learning strategies and forms together with their peers. Embracing *Diversity* as a source of new insights and inspirations does not only widen the learners' horizons, but causes educational institutions to intensify their collaboration with other organisations, across borders, language barriers, and sectors. An intensified activity in this area will let educational institutions realize, that they are embedded in a globalised and constantly evolving knowledge society and that, as a consequence, they will have to redefine

their role within society and within the learning process. Therefore, one of the strength of social computing in promoting organisational innovation lies in building networks of learners inside and outside organised learning, converting the educational into a social sphere with participants from all over the world.

Furthermore, the way in which social computing is used to overcome institutional barriers and to make learning more transparent and accessible to *Society*, symbolizes and epitomizes a recent change in the way educational organisations interact with their clientele, redefining roles and dependencies. Social computing promotes organisational innovation in this area by allowing institutions to put into practice the more recent change in corporate strategy, which considers students and parents as customers to the learning service and respects their need for information, easy access and quality control. Social computing is not only particularly suited to support these mechanisms for transparency and accessibility, but also emphasizes the concurrent change in philosophy by allowing education institutions to meet their clients on their terms, in their spheres, instead of forcing them to enter the organisation's world with its rules and procedures.

Thus, social computing supports organisational innovation by re-integrating the institution into the community (S), transcending borders between organisations, countries and cultures (D) and strengthening the social interactions between all participants involved in the learning process, transforming E&T institutions into communities (N).

6.   Learning 2.0 Strategies for Pedagogical Innovation

The previous chapter illustrated the potential of social computing for promoting organisational innovation in E&T by creating a learning environment that is open to society, transparent and accommodating to all individuals involved in and affected by organised learning. However, besides *organisational innovation*, social computing can also be used to support *innovation in learning*, i.e. *pedagogical innovation*, by disrupting traditional learning and teaching patterns and giving rise to new and innovative ways of acquiring and managing knowledge. The aim of this chapter is to analyse and discuss this perspective of Learning 2.0, the *Learning & Achieving* stance, i.e. the ways in which social computing enhances learning processes and outcomes.

While the social computing activities discussed in this chapter overlap with those already mentioned in chapter 5, the focus is now on the individual learner and his personal learning process – often in a particular subject. For example, *networking* is not considered as a means of situating the individual within a supportive community, but as a process supporting the collaboration of learners on a specific task, affecting their individual learning process and possibly also the learning result; similarly, accessing material on an institution's website, for example, is not discussed under the *societal* aspect of how individual and institution interact, but under the perspective of how new sources and resources for subject specific information affect the individual students' learning strategies.

As has been pointed out in chapter 4.2 social computing tools are expected to enhance learning processes and outcomes in a number of ways: Firstly they are projected to respond better to the changed cognitive processes and learning patterns that have evolved due to the ubiquity and widespread use of information and communication technologies, thus facilitating knowledge acquisition. Moreover, they reflect current communication and working patterns and are thus better fitted to prepare them for societal demands and endow them with the necessary skills for a successful professional career. Furthermore, social computing tools recognize the diversity of users and are thus expected to contribute to the personalisation of educational experiences, offering opportunities for flexible, distributed learning, which could provide learners with more varied opportunities to engage with learning. Thus social computing applications are expected to promote independent, autonomous and self-directed learners endowed with a variety of social skills that enable them to connect, interact and collaborate successfully with a variety of people on different tasks and in diverse environments.

This chapter will try to provide evidence on the actual potential of social computing in promoting and supporting these and further skills and learning pathways. Most of the experiments currently carried out target at least one of these different objectives. Given the variety of learning contexts, it is difficult to discern a clear pattern of usage. Yet certain prototypical areas in which social computing tools are commonly used in characteristic ways and with specific learning objectives can be isolated. Broadly speaking the following main areas arise:

(7) **Supply of and access to learning material:** Social computing tools can facilitate learning processes by making study material more readily available, thus supporting different individual learning styles. In particular, teacher or course blogs can be used to distribute information, wikis support collective resource building, and podcasts assist in making learning material accessible, increasing flexibility and personalisation.

(8) **Personal knowledge management and resource network building:** Social computing tools allow for an improved knowledge exchange, which supports the individual's

personal knowledge and resource management und contributes to the personalisation of learning processes;

(9) **Subject specific methods and tools:** Some social computing applications, particularly immersive environments and media-sharing services, can be used to create innovative ways for attaining subject specific skills, changing learning methods and procedures in subjects like medicine, environmental studies, law, architecture, history and arts. As a consequence, new pedagogical and scientific methods evolve that change the way in which a particular subject is learned and taught.

(10)   **Improving personal achievement:** Social computing tools can contribute to increasing the individual's performance and academic achievement. On the one hand, they are suited to support basic skills and competences, like digital skills, writing skills and foreign language skills; on the other hand their potential to increase collaboration and personalisation can open up new learning opportunities in any subject, which are better suited to the individuals' needs and therefore improve their performance and achievement.

(11)   **Personal skills:** Apart from supporting cognitive skills and academic achievement, social computing can also enhance the individuals' motivation, improve their participation and foster social and learning skills. The **affective** and **social** dimension of the learning process can be exploited to allow the learner to not only enjoy learning, but acquire skills that empower him to actively engage in the development of his personal skills and competences.

(12)   **Higher order skills & meta-competences:** Social computing tools can contribute to the development of higher order **cognitive** skills like reflection and meta-cognition, increasing self-directed learning skills and enabling individuals to better develop and realize their personal potential.
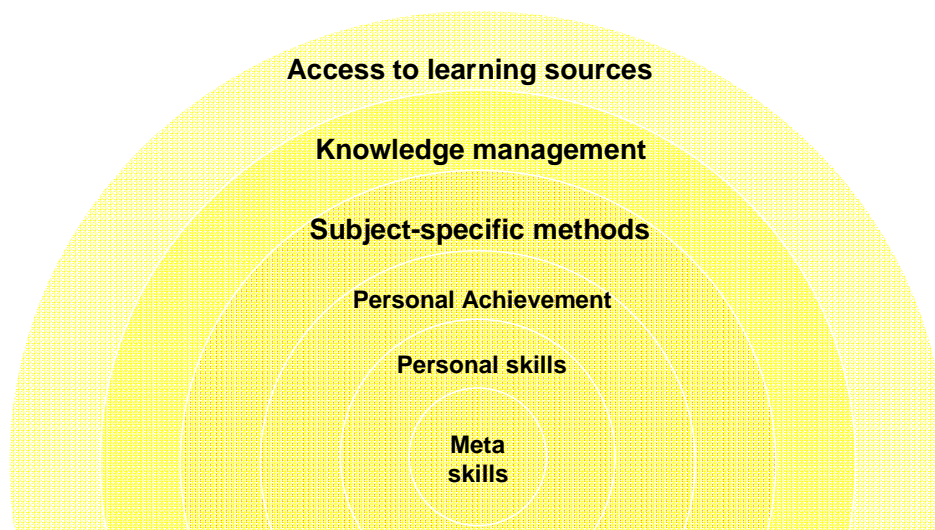

Figure 6-1: Learning & Achieving with Social Computing Tools

In the following, each of these spheres of Learning 2.0 will be illustrated with examples and discussed more in depth. The findings presented will then be used to assess whether the projected potential of Learning 2.0 can be confirmed by current practice. Reflecting on the learning activities involved in each of the areas, three main "building blocks" of Learning 2.0 will be identified.

6.1. Access to Learning Material

Social computing tools are an easy way for educators to generate content and make learning materials available to students (Bartolomé, 2008). Blogs, e.g., can be used by teachers for course announcements, news and feedback to students, as well as for supplying learning materials and links to further resources. Wang et al (2007), for example, designed a "blog-based dynamic learning map", which employs both information retrieval and automated scheduling techniques, to enable lecturers at a (Taiwanese) university to provide students with a more focused view on course requirements.

Most often platforms for the distribution of material are implemented either within a discipline or subject or in a particular course or class. For example, the "Blog de Pedagogía Comunitaria" project at the University of Salamanca (Spain) employs a blog environment together with a wiki and other tools such as Youtube, Slideshare or chat to facilitate learning exchanges between students and teachers of the subject "Community Pedagogy". Teachers can store and manage learning materials and information relevant to the subject on the blog, which is updated periodically and distributed through RSS. Students can share their insights, assignments and practices and comment on other students' content, improving their collaboration and writing skills. Through the Wiki, students develop a collaboratively glossary with the most relevant terms of the discipline.

Porto (2008), for example, uses blogs, podcasts and group discussions in an US distance master course to facilitate information exchange. She employs a class blog to post information, provide links and add audio-clips in the form of podcasts, by recording her messages over the phone using a toll-free number. Students receive alerts of any new information added on their computers or iPods and can post follow-up comments. Free podcasts and videos from YouTube, linked to the class blog, are part of the course materials. Through a "blogroll" inside the classroom blog, all participants are able to keep up with a collection of all learning logs. All class documents, including instructions for assignments are developed using Google Documents, which allows for faster and easier editing and sharing, facilitating student collaboration and the teacher's assessment of individual progress.

In higher education, podcasts are frequently used to provide students with lecture recordings and additional audio and/or video material. Recording and distributing class lectures is the most common use for podcasts, and at the same time also among the most requested by students and the easiest to implement (cf. Deal, 2007). Podcasts are attractive to learners because they allow learning at one's own pace, listening to the audio or video content as many times as necessary, even using commuting time to learn (Edirisingha & Salmon, 2007; Morales & Moses, 2006). In addition to picking and choosing which lectures to review, many students also scan the lectures, fast-forwarding to specific points or sections, and listening to particular portions multiple times (Lane, 2006).

Many higher education institutions have customized their own YouTube channels to allow teachers to distribute learning material in the form of podcasts.[87] Others, like the Stanford University[88], use the iTunes platform to distribute lecture recordings and course material. There are also joint projects by several universities, like the German-language Podcampus[89] podcasting platform for publishing audio and video research contributions. Participating universities are in Germany, Austria and Switzerland. The material published includes mainly

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[87] See for example: University of California, Berkeley: www.youtube.com/ucberkeley; University of Stanford: University of Maryland Baltimore (UMBCtube): www.youtube.com/umbc; University of New South Wales: http://au.youtube.com/user/unsw; Universitat Oberta de Catalunya (Spain): http://es.youtube.com/uoc.

[88] http://itunes.stanford.edu/.

[89] http://www.podcampus.de.

lectures and scientific presentations or speeches. Some of the podcasts are directed at a broader audience, others supplement university courses.

These few examples already indicate that social computing can open up a vast variety of new channels for knowledge distribution, which substantially facilitate the access to and exchange of learning materials. As social computing applications are very versatile, the supply of learning material is in general connected with other, more engaging social computing activities. In particular in primary and secondary education, the importance of the interactive and collaborative aspects of social computing generally supersedes the fact that knowledge distribution and exchange does also take place. Relevant cases will therefore be presented in one of the following subchapters.

6.2.   Personal Knowledge Management

Social computing applications lend themselves to being used as research and knowledge management tools. Tagging and bookmarking services in particular allow teachers and learners to build individual or collective collections of resources, share personally classified bookmarks, recommend, comment and rate sources, and set up reading and resource lists (cf. Vuorikari, 2007). The Penntags project at the University of Pennsylvania[90] is an example of an internal bookmarking platform, where links can be stored, tagged, organised and exchanged (cf. Alexander, 2006).

Similarly, blogs can be used among a group of learners, using their individual blogs, to build up a corpus of interrelated knowledge via posts and comments (cf. Baggetun & Wasson, 2006). However, the most frequently used tools to set up knowledge repositories targeted at the specific needs of a group of learners are wikis. Wikis are especially very well suited for collections of materials, arranging different contributions in an organized way. The German ZUM-wiki project[91] for secondary schools teachers employs a wiki to allow teachers to collect ideas, materials and links for education, creating a resource that is permanently kept up-to-date and can easily be extended. The Glarnerschulen wiki[92] is a collection of learning material and ideas, edited in form of a wiki, to which anybody can contribute. Among others, school and classprojects, didactic material, and student's work are shared. The project is initiated by the teachers of the Canton Glarus, Switzerland.

Similarly, the German "Zentrale für Unterrichtsmedien im Internet e. V." (ZUM) set up the ZUM-Grundschulwiki[93] for primary schools, which encourages primary students, assisted by their teachers, to contribute to setting up a children's encyclopaedia.

Wikis can also be used as a knowledge repository and common knowledge base in certain school subjects. The "19th century wiki" project[94] at an Isrealian Junior High School collects inventions and discoveries in the 19th century using an Edu-wiki. The content is written and edited by students which results in combined responsibility and involvement. "Welker's Wikinomics"[95] is a wiki-project initiated by the Zurich International School in cooperation with the Shanghai American School, in which upper secondary school students jointly set up an online resource for economics students and teachers, currently comprising 195 pages

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[90]   http://tags.library.upenn.edu/.
[91]   http://wiki.zum.de/ZUM-Wiki:%C3%9Cber_ZUM-Wiki.
[92]   http://www.prowiki2.org/glarnerschulen/wiki.cgi?TourBusHaltestelle;
      http://www.prowiki2.org/glarnerschulen/wiki.cgi.
[93]   http://grundschulwiki.zum.de/index.php/Hauptseite and http://wiki.zum.de/ZUM-Grundschulwiki.
[94]   http://edu-wiki.net/rogozina/index.php/דומע_ראשי.
[95]   http://welkerswikinomics.wetpaint.com/?t=anon.

covering every topic of the micro and macroeconomics AP syllabus. It is planned for the wiki to expand to include units on International and Development Economics. As the project advanced new features were added to the wiki, such as the "Student Thought Forum", the "AP Econ in the News" pages, the "Test Review Center" (where live chats the nights before tests are hosted), and many other interactive and engaging features aimed at enhancing and extending the collaboration and learning. Future additions will include an economics forum for discussing and debating controversial economic issues, a "graph gallery" including every graph students need to know for their AP or IB Economics exams, quiz, test and exam review materials etc.

In higher education, wikis are likewise used to support encyclopaedia projects. The "Soziologische Klassiker" wiki[96] is a collaborative "Wikibook" project among students of sociology at the University of Salzburg (Austria), with the aim to set up an encyclopaedia of important sociologists. The project started in, 2006 with a group of 70 students working on articles and was enlarged and improved in the following year by another set of 60 students.

Targeted in particular at teachers in teacher training, the Icelandic "Wikilessons" project[97] comprises a collection of over 100 wikilessons written by teacher education students and their instructors. Higher education instructors are also embracing wikis to set up repositories for learning materials. The Public Administration School of Catalonia, for example, has recently launched a wiki for the design of e-learning materials for its courses with the aim of providing teachers, trainers, and course editors with an environment that allows them to place their knowledge and ideas into a common structured and shareable space.

In these and many further cases, social computing tools are used to gather the collective work of a group of students or teachers, empowering the individual participants to become authors of content, but at the same time integrating them into a network of peer reflection and support. In a study on the role of a wiki as a knowledge management and problem solving tool, Barth (2007) found that students appreciated the ease of building up a substantial knowledge base and the collaborative mode of operation. The wiki proved especially useful for solving complex problems and for handling different forms of knowledge.

Research indicates furthermore that university students are embracing social computing tools on their own account to support their research network building, personalising their knowledge and resource management. In an empirical study among UK university students, Conole et al. (2008) investigated how university students' learning patterns are influenced by the presence and availability of ICT in general and of social computing tools in particular. One of the most striking features was the extent to which students were capitalising on social computing applications for peer support and communication. These observations are confirmed by a study of Baggetun & Wasson (2006), who analysed students employing blogs to support their learning activities, on their own initiative. They found that blogging supports self-regulated learning in various ways, in particular (1) by reflecting publicly on a topic, (2) as filters for links, using the blog to build a personal knowledge base, (3) as a knowledge repository, where students test their knowledge, post solutions to problems they have struggled with and theorise about issues, displaying their knowledge.

6.3.   Subject Specific Methods & Tools

The characteristic properties of certain social computing tools can be exploited to provide innovative ways and methods of learning that better reflect the nature of the subject matter

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[96]   http://de.wikibooks.org/wiki/Soziologische_Klassiker.
[97]   http://is.wikibooks.org/wiki/Námsefni; http://is.wikibooks.org/wiki/N%C3%A1msefni/Wikilessons.

under study. In particular, social computing sites supporting the production, publication, sharing and modification of audio, photo and video content can support more creative and active student engagement in arts, design, music, composition, etc. Reid (2008) reports, e.g., on the incorporation of "iTunes University" in combinations with other web 2.0 tools, into writing and new media composition instruction in a US university, linking student activity closer to the subject matter. Similarly, at the University of Mary Washington, students in the course "Approaches to Video Art" study video as an art form and then create short video pieces as final projects[98].

Moreover, 3D virtual worlds, like Second Life, are suited to replicate and investigate a three-dimensional reality as is done in architecture, geography, art history and the study of metaphysics. Reihman (2007), for example, used Second Life in a US philosophy course to support the study of philosophical theories on reality and existence. In his opinion, Second Life facilitated the acquisition of metaphysical concepts and clarified ontological views. At the University of British Columbia (Canada), students in Art History, Classical Studies and First Nations Studies may navigate through game-like 3D virtual learning environments which display ancient sites, annotating, critiquing, and amending them in collaboration with their peers (cf. Rauch & Wang, 2007)[99]. Within its WISE project, the German RWTH Aachen School of Architecture set up SecondReiff, a virtual extension of the university's architecture campus in SecondLife. One of the three zones of SecondReiff contains a workbench, a 1:1 scale modelling environment enabling the students to collaboratively design their artefacts in real time and full scale in a virtual environment. Architectural drawings can be uploaded and transformed; the "terraformer" tool helps students to manipulate the topography.

Thus, immersion can be used as a basis for 3D real world simulations that assist in integrating scientific practice into theoretical training (Chittaro & Ranon, 2007). Ramasundaram et al. (2005), for example, developed a Web3D-based virtual field laboratory that provides students with a simulation environment to study environmental processes in space and time; Campbell et al. (2002) report on the "Virtual Big Beef Creek" project, where a real estuary has been reconstructed to allow users to learn about ocean science, using different avatars (human beings, fish, etc.) whose viewpoints and navigation constraints are different. Similarly, the WebTOP system helps in learning about waves and optics by visually presenting various kind of physical phenomena, such as reflection and refraction (cf. Mzoughi et al., 2007).Web3D technologies are used frequently and effectively in medical training, providing complex 3D animations of anatomical models and bodily movements as well as allowing to simulate surgical procedures (cf. John, 2007).

At the Glasgow Graduate School of Law (GGSL) at the University of Strathclyde the virtual town of Ardcalloch[100] was set up with the objective to facilitate the transition from academic law studies to vocational legal practice in Scotland. It allows learners to take up the role of legal practitioners operating in Ardcalloch, supported by databases of legal documents and templates, forums for discussion with practitioners as tutors, video course lectures and other additional multimedia tools. Initially students had some concerns with the departure from the normal methods of teaching and learning. However, student feedback is mostly positive, indicating that students appreciate the tools value in supporting transactional learning (de Freitas, 2007).

In all of these cases, social computing tools are used primarily to replicate reality, tying learning experiences and procedures back to the nature of the subject at study and

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[98] Course blog at cgar.umwblogs.org/.
[99] See: http://ancient.arts.ubc.ca/ and http://artsmetaverse.arts.ubc.ca/.
[100] See http://www.ukcle.ac.uk/vle/bespoke/ggsl/ and http://www.ukcle.ac.uk/vle/bespoke/ggsl/ardcalloch/view.

professional reality. Thus, social computing can contribute to overcoming the discrepancies between theoretical training and professional practice by supplying innovative ways of integrating practice into training.

As the examples presented illustrate, this aspect of Learning 2.0 is especially valuable in higher education and vocational training. While immersive environments are very powerful tools for primary and secondary education, the main objective in these cases is not to provide a more realistic representation of the subject to be studied (which in turn gives rise to new scientific methods and skills), but to increase motivation and participation by supplying a more attractive and flexible learning environment. These cases will therefore be discussed in subchapter 6.5.

6.4.   Personal Achievement

Most importantly, social computing tools can contribute to innovating learning processes in such a way that the learners' individual performance and academic achievement are elevated. Broadly speaking three different areas for enhancing learning outcomes can be discerned: (1) Using social computing tools to support certain subject specific skills and basic competences; (2) raising performance levels by fostering the personalisation of learning processes; and (3) employing collaboration and networking strategies to broaden the individuals' knowledge base and provide peer support on assignments.

6.4.1. Subject specific skills

Some projects, particularly in primary and secondary education, employ social computing tools to increase **digital skills** and facilitate **e-learning**. The eTwinning DigiSkills project[101], for example aims at promoting social computing tools as learning and teaching methods. Teachers and students from 10 secondary schools in 8 European countries are working on tools regarding electronic learning environments ejournals, webquests, weblogs, websites, video conferences, voip, photo imaging etc. As an example, students from all partner schools added content about "A guide to my city" to the MagazineFactory eZine[102]. A blog[103] and a wiki[104] keep partners informed about ongoing projects; on the social networking site[105] 365 members keep in touch. Furthermore, a Google group[106] has been set up and additional tools are provided to encourage using podcasts[107], Squidoo[108], search engines[109], Voicethread, Slideroll, Mindmeister, online-presentations, eyejot, E-mail, Video and slideshows. The Austrian "eLSA" project, a pilot project for students aged 10-14 years in 65 primary and secondary schools in all nine Austrian provinces, aims at promoting e-learning and e-teaching. The project started with "blackboard" and is currently using "moodle" and other web 2.0 platforms and tools (cf. Stemmer & Hummer, 2007).

However, there are many small and large-scale projects that try to descend the realm of implementing ICT and acquiring digital skills, by using social computing tools as a means to contribute to other educational objectives.

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[101] www.e-digiskills.eu.
[102] http://www2.edu.fi/magazinefactory/magazines/e_digiskills/.
[103] http://e-competences.blogspot.com.
[104] http://e-digiskills.wikispaces.com.
[105] http://classroom20.ning.com/group/digiskills.
[106] http://groups.google.com/group/e-digiskills.
[107] http://edigiskills.podomatic.com.
[108] http://www.squidoo.com/sixapart..digiskills/.
[109] http://digiswicki-swicki.eurekster.com.

Since wikis and blogs are fundamentally writing environments, they lend themselves to the acquisition of **reading and writing skills,** encouraging primarily school students to publish their written work on the net. For example, the Ministry of Education of Catalonia also initiated the "La Prestatgeria" (The Bookshelf) project[110], based on the open-source project "OurScrapBook"[111], which allows schools to create "virtual books" and invite pupils to write pages on if. The pages can have rich content and multimedia elements. The platform provides connection between the books, done by means of tags. Books with common tags (like poetry, history, tales...) are assorted to the same bookshelf. The "Wikis for writing" project[112] employs at an Austrian middle school ("Hauptschule") invites pupils to collaboratively write a criminal story using a wiki. Each team or single author is allocated a sub-story which is embedded per hyperlink into the overall story. Starting from a common introduction, the reader can click through different chapters and discover different variants of the story.

The Icelandic "Bookworms" tool[113] is designed to help teachers encourage (primarily primary school) students to share their reading experiences by publishing their own authentic descriptions and opinions of books they read, thus improving reading and writing skills. Entries by group members are displayed in a gradually growing column with the graphical appearance of a worm. Worms, titles and authors can be compared statistically and viewed both at random or categorically allowing for interesting inquiries reflecting contributions of readers of different ages and varied abilities. Printable worksheets, drawings and posters encourage further classroom activities tied to reading and literature.

In a similar UK project, the "SJCS Book Review Wiki"[114], primary and secondary school students at St John's school are encouraged to write reviews of books that they have read. The intended audience for the reviews are the children's peers to help them with their choice of books to read and for parents wishing to purchase or borrow books for their children.

Online writing environments like blogs and wikis are also used widely to increase **foreign language skills**, mainly in English (cf. Kovacic et al., 2007, 2008; Mancho, 2007; Mancho & Larkin, 2008). The "Wikispace for English"[115] project initiated by the secondary school Liceo Amaldi di Alzano (Italy), for example, aims at giving students a better opportunity to learn English online and to promote tandem projects with schools from all over the world. Like many eTwinning projects, the "Learning and Sharing: A Virtual Street Corner" eTwinning project[116] between a Finnish and Norwegian school encourages 10-13 year old students to interact and collaborate in forums and chats, using English as a working language. Student motivation is high; most enjoy chatting with their friends abroad and willingly spend time in a completely English environment, studying and learning English in their free time.

As the cooperation between a French and an Italian secondary school on their "Latin Blog"[117] illustrates, social computing can also be used to revive an ancient language by encouraging students to communicate and collaborate using Latin as a working language. Students post letters and descriptions of their region and comment on each others' posts in Latin.

Research findings indicate that social computing tools can in fact improve writing and publishing skills. Chang et al. (2008) conducted a study among fifty-one first-year

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[110] http://phobos.xtec.cat/llibres.
[111] http://sourceforge.net/projects/ourscrapbook.
[112] http://wiki.storage-space.org/wiki/index.php/Hauptseite.
[113] http://bokaormar.khi.is/.
[114] http://childrenreviewingbooks.wikispaces.com/.
[115] https://amaldi-english-corner.wikispaces.com/.
[116] http://www.orivedenkoulut.net/moodle/.
[117] http://blogs.ac-amiens.fr/etablissements/0801439E_blog_latin_moreuil/.

undergraduate computer science students in Taiwan, implementing web-based coursework environment ("Coursework Journal"), meant to support the construction of an online journal-publishing community. The results of the data analysis and questionnaires indicate that the collaborative environment promoted knowledge sharing effectively, improved the quality of students' coursework, and advanced learning performance. However, research results on the use of online writing environments to enhance foreign language skills indicate that, on the whole, social computing applications have not been able to live up to expectations in this area. Ducate & Lomicka (2008) conducted an empirical study on blog use to enhance foreign language learning among 29 US university students enrolled in German or French. They observed that, while not all students enjoyed using blogs and the insights into the foreign language culture were less intense than had been hoped for, the blogs were successful in increasing motivation, promoting ownership and creativity. Hirvela (2007) investigated the use of an asynchronous writing environment to enhance collaboration among 108 US undergraduate students in an ESL ("English as a second language") writing course. Students were encouraged to co-construct an understanding of an assigned novel and to exchange views with the author. In purely numerical terms, it had been hoped that students had posted more messages than they did, especially in response to each others' comments and to the author of the novel. Likewise, longer postings had been hoped for. While the project allowed the students to engage in some useful pre-writing about the novel, students did not seize the unique and presumably enticing opportunity to discuss a literary work with its author.

6.4.2. Personalisation

As has been pointed out in previous subchapters, social computing tools are often employed to make learning material more readily available to students, thus promoting individual learning strategies (see 6.1); they are furthermore used to support individual knowledge management strategies, by supplying new research network building tools and allowing for the establishment of personalised knowledge repositories (see 6.2). Research findings indicate that these Learning 2.0 strategies, fostering personalisation, can also contribute to improving learning outcomes.

Evans (2008) reports on a study on the effectiveness of podcasting in assisting exam revision, conducted among 196 first-year undergraduates in Business and Management at a university in London, UK. Statistical analysis of the results of the subsequent questionnaire indicates that students believe podcasts to be a more effective revision tools than their textbooks and more efficient than their own notes in helping them to learn. They also indicate that they are more receptive to the learning material in the form of a podcast than a traditional lecture or textbook. The results suggests additional benefits as perceived by undergraduate students in terms of the time they take to revise, how much they feel they can learn and the flexibility in when, where and how to learn. These findings are confirmed by Cramer (2007). Although in this case study student use of the lecture recordings was low, results indicate that students who used the "virtual lecture hall" for 100 minutes or more scored, on average, 15% higher in their second midterm exam, compared to their individual performance in previous midterm evaluations.

Research further indicates that Learning 2.0 strategies in general can support individual learning outcomes by allowing students to personalise their learning strategies Carletti et al. (2008), for example, found that online group activities and the use of conceptual artefacts for individual reflections allowed their learners – in this case teachers participating in a professional development program – to develop and personalise their learning strategies, which consequently improved learning results. The participants themselves also indicated the high usefulness of the tools used for personalising their learning.

6.4.3. Collaboration

There are numerous initiatives employing social computing tools to facilitate collaboration among peers, thus allowing learners to extend their personal knowledge base, benefit from peer support and develop their skills through a more active engagement in the collaborative process.

The Catalonian "Ciberaula de filosofia" project[118], for example, encourages learners of *philosophy* at secondary school level to collaborate and interact on philosophical topics. The project employs a wiki, blogs, discussion fora and a repository with learning materials. At a Spanish secondary school[119] Moodle is used together with forums and wikis in a *mathematics* class with 15-16 year old students, in order to improve cooperative work and individual skills. Apart from mathematics, linguistic and social skills are supported and interdisciplinary ideas are promoted. The "Wiki meets youtube" project[120] at the Delft University of Technology (The Netherlands) (August, 2007-May, 2008) encouraged the participating 100 students to explain the teaching material of the course "Advances in Networking" using movies, graphics etc. While students found it difficult to find and use visual information, they were satisfied about using the wiki as a collaboration environment. The instructor appreciated being able to monitor the learning process of his students through the wiki. At the same university, master students in the Systems Engineering, Policy Analysis and Management programme use a wiki (Twiki) for collaboration and knowledge sharing in a 14 week R&D project, which runs each year from February till June in a course with 20-25 participants[121]. The TWiki serves as a platform for collaboration, as a memory of the Grounded Theory process employed in the project and for preparing case studies and writing a communal report.

Collaboration among teachers on assessment and grading can also be supported using social computing, as is illustrated by the "WebCEF" project[122]. The European project promotes the collaborative assessment of oral language skills through the web. Language teachers and learners can evaluate their own video and audio samples together with colleagues and peers across Europe. Language teachers have the opportunity to collaborate with colleagues across Europe and to improve their skills in the use of the CEF assessment scales. Also among university lecturers, social computing can significantly enhance collaboration and knowledge exchange. At the Open University of Catalonia (UOC), Spain, two groups of 80 university lecturers, teaching two cross-curricular subjects, collaborated via various virtual spaces to improve course content and the management of courses. According to Guitert et al. (2007) the success of the collaborative exercise was boosted by the high level of knowledge exchange and peer support as well as socializing activities, which strengthened interpersonal bonds, increased the positive working atmosphere and promoted a sense of community.

Collaboration projects between different education institutions can also contribute to promoting subject specific skills. In the "Secretos de Argos" project[123] students from three different Spanish secondary schools collaborate on searching, writing and sharing knowledge on the classical tradition and the influence of *Greek and Roman culture* on the European world, using a blog. Students have to find and explain to their peers the traces the classical ancient world has left in Spanish culture: in films, in literature, in music, in architecture, in

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[118] http://www.infofilosofia.info/ciberaula.
[119] Cf. www.iesvalsequillo.org.
[120] http://wiki.e-merge.nu/bin/view/TUDelftET4285.
[121] Cf. http://twiki.e-merge.nu/bin/view/TuDelftSPM9618/WebHome.
[122] http://www.webcef.eu/. For more information see: http://www.webcef.eu/files/FlyerA5_final.pdf.
[123] http://sogradargos.blogspot.com.

painting, etc. The "Mostra de fotofilosofia"project[124] is a collaboration project between several secondary schools in Catalonia (Spain), where philosophy students post a philosophic question illustrated by a picture to their school or class blog, which is linked to the other participating school blogs. Students can comment on each others' pictures and questions and get inspiration from the contribution of their peers. At the deadline, they choose the best posts according to explicit criteria.

These examples illustrate some of the manifold uses of social computing applications to facilitate the collaboration of learners on a certain subject or joint project with the aim to increase the individuals' knowledge, skills and competences. Research results indicate that social computing tools assist in overcoming the weaknesses usually encountered in collaborative projects, such as coordination, communication, organization of materials, negotiation, interactivity and lack of mobility (cf. Zurita & Nussbaum, 2004; Désilets & Paquet, 2005; Antoniou & Siskos, 2007).

Evidence further suggests that collaboration facilitated by social computing can significantly increase learning outcomes. Cavallaro & Tan (2006) conducted an online collaborative writing project among two first year university report writing classes from different higher education institutions in Singapore. Their findings indicate that the online collaboration substantially raised the quality of the work. Gibson (2004) developed a distributed learning blogosphere for 31 non-technical students at the University of Michigan, USA. 86% of the 845 posts were comments, indicating a high level of interaction and collaboration. His research revealed that 95% of participants felt that the blogging exercise had improved their learning (Gibson, 2005). Makri & Kynios (2007) used a blog both as a medium for asynchronous communication, and as a mechanism for provoking professional reflection in a six-month academic (MA) course with 48 mathematics teachers (presumably in Greece). Their results indicate that blogs successfully enabled a structured cognitive presence, with teachers enriching the discussion with a combination of factual, conceptual and theoretical knowledge.

Laurinen &Marttunen (2007) examined the quality of argumentation in students' chat debates among a group of 24 secondary education students (aged 16–17 years) in Finland, engaged in two different debates as part of a course in argumentation. They found that the chat environment supported a high level of collaboration, irrespective of the quality of argumentation. Analysis and categorization of the contributions revealed a high level of quality with 67.2% of the speech acts in the first debate and 47.8% in the second being classified as "argumentative". Cobos & Pifarré (2008) carried out a research study among 31 students at the Universitat de Lleida, Spain, on collaborative knowledge construction, supported by a *CSCL* system which supports the sharing, rating and commenting of documents by adding "notes". The frequent comments students left on each others' documents – categorized as "addition" notes (50% of all notes), "correction", "delete" and "explanation" notes – indicate according to Cobos & Pifarré (2008) external regulation processes in which students' plan and monitor the others' work. The subsequent revision of documents, in 68% of cases explicitly addressing peer comments, significantly improved quality, with "add" and "correction" notes being most useful for improving a document. In a study conducted among 178 students at a Taiwanese university, Liaw at al. (2008), found that both, the overall individual performance and the quality of the team product, were significantly improved by online group discussions (cf. Liaw et al., 2008).

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[124] http://blocs.xtec.cat/filoconvocatoria; for examples see: http://filoangeletaferrer.blogspot.com/.

6.5.   Motivation & Personal Learning Skills

Social computing tools are used extensively to increase student motivation and participation by promoting collaboration, creativity and active authorship. They furthermore support the development of social and personal learning skills by providing more engaging learning experiences.

Immersive environments are particularly suited to support experimental and experience-based learning, promoting and improving motivation and learner involvement (cf. Punie et al., 2006: 11). Virtual games can support education and training in general by, e.g. motivating, engaging and empowering learners (cf. de Freitas, 2007; Horizon Report, 2007). As an example, the "aVataR@School" project[125], an EU-Minerva project involving schools in the UK, Romania, Germany, Italy and Spain, in employs virtual role plays to assist in dealing with social conflicts arising in secondary schools, like social exclusion, school bullying and violence, racism, absenteeism, vandalism, problems with multiracial and gender integration. The overall objective of the project is to use virtual role plays (VRP) to find a new way of conflict resolutions with a playful and cooperative approach, using peer mediation techniques. The main target groups are pupils, teachers, mediators and others (such as parents, principals, counsellors, etc.) that are involved in typical conflict situation in secondary schools, with an emphasis on pupils or teachers involved in or trained as mediators within their schools.

At the University of Glamorgan, UK, a simulation game engine[126] was developed with the aim of engaging, motivating and retaining learners on the course (de Freitas, 2007). It utilizes an animation style 3D visual interface with different avatars, who ask questions and provide answers for questions selected by the learner. The game engine, originally designed for use in Business Studies, has since been used to create a virtual ward for use in the School of Care Sciences where paediatric nursing students practice admitting and then treating a child suffering from fever.

Furthermore, 3D virtual worlds like Second life can be employed to create online virtual spaces for learning, where the learners, represented through avatars, take part in online courses, classes, meetings, projects. Peter Twining of the UK's Open University, for example, directs the Schome Park project[127], a closed community run within Teen Second Life for 13- to 17-year-olds. The project explores the potential of the virtual world as a creative and engaging alternative to traditional schooling environments. Educational Activities on Schome Park include a wiki pages and discussions on archaeology, ethics and philosophy, physics, languages, research, media and design, a writers'corner and a space project.

"Campus: Second Life" is an initiative to support schools, colleges and universities to utilize Second Life to teach different subjects. As an example, Bradley University offers a course in field research methods in Second Life[128]. Similarly, the Rochester Institute of Technology has developed a custom collaborative virtual environment where students can program and interact with virtual objects as well as create two and three-dimensional data visualization schemes[129]. These communities are operating in new and often creative ways to support a range of learning processes that are usually not curriculum based (de Freitas, 2007).

Reflecting on the use of Second Life to enhance learning and teaching, Julie Nicholson Bujtas, an English teacher at a US middle school[130], argues that student participation is

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[125]   http://www.avataratschool.eu/.
[126]   Cf. http://e-st.glam.ac.uk/simulationgames/GameSim_1.htm.
[127]   Cf. http://www.schome.ac.uk/ and http://www.schome.ac.uk/wiki/Schome_Park.
[128]   Cf. The Horizon Report, 2007; slane.bradley.edu/com/faculty/lamoureux/website2/slstuff.html.
[129]   Cf. Horison Report, 2007; muppets.rit.edu.
[130]   Project documented in a blog: http://ramapoislands.edublogs.org.

higher, due to the fact that students aged 13-15 feel more comfortable speaking through an avatar than in front of the class[131]. Diane Whiting, an eight grade health educator at the same school, was surprised by the high level of communication in Second Life that she believed could not have happened in a traditional classroom[132].

De Freitas (2007) reports on a simulation game engine developed at the University of Glamorgan, UK[133]. The game was introduced with the aim of engaging, motivating and retaining learners on the course. It utilizes an animation style 3D visual interface with different avatars, who ask questions and provide answers for questions selected by the learner. The game engine, originally designed for use in Business Studies, has since been used to create a virtual ward for use in the School of Care Sciences where paediatric nursing students practice admitting and then treating a child suffering from fever. The research team found that in order for learning outcomes to be achieved it is necessary to reinforce learning that has taken place in the virtual world through meta-reflection and post exercise consideration. This may be done through replaying the simulation, discussion, and dedicated activities that aim to highlight key aspects of the learning. Without this learners may not reinforce the learning process and gains made may be lost. This process allows the learner to make sense of how the tasks and activities enacted in the immersive world may take on relevance (or a connection) with tasks and activities to be performed in the real or lived world.

Virtual realities can also promote the increase the participation in professional development activities and make these more rewarding. The Norwegian "InterAct" *role-play project*[134], in which different small groups workers interact online to collaboratively solve a (fictitious) real life "problem", related to their work, is an example of promoting participation in professional development programs. The four day simulation exercise aimed to increase the basic communication and digital skills of the cleaning staff of Akershus University Hospital. The participants had no or very low ICT skills and poor Norwegian language skills, especially in reading and writing, when starting the training. The evaluation of the simulation revealed that the participants had indeed improved their cooperation skills, learned to use the internet and acquired certain basic ICT skills. The simulation proved a successful and motivating tool for learning to these participants. Their initial fear of computers had disappeared after only two days. According to the hospital management, the former participants are now more self assured and confident in using computers.

Online writing environments and podcasts are equally suited to promote motivation and personal and social skills. Langhorst (2006), for example, employed blogs in two school projects with (US) junior high school students, where a *historic novel* was read, commented by their students in a (collective) book blog, involving parents, other community members and the author of the novel. He records the involvement of the author and the parents as most rewarding, as they significantly enhanced student motivation. A US primary school implemented part of their environmental education curriculum by setting up a blog with stories around "Daisy the Duck" who happened to build her nest on the school ground. The "Duck Diaries" blog[135] and the subsequent "Trout Diary" blog[136] combine written stories and poems with podcasts and vodcasts, including contributions of kindergarten students using Voicethread. 6th grade students are encouraged to answer questions posted on the blog by their peers. Student participation and motivation is very high, prompted by both, the media

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[131] Cf. http://smsteacherspeak.blogspot.com/.
[132] Cf. http://smsteacherspeak.blogspot.com/.
[133] Cf. http://e-st.glam.ac.uk/simulationgames/GameSim_1.htm.
[134] www.statvoks.no/InterAct.
[135] http://duckdiaries.edublogs.org/.
[136] http://www.mcdsblogs.org/trout.

tools used and the collaboration between different age groups and subjects on a common topic of interest.

Similarly, in the "Blog in der Grundschule" project[137], the 27 students of the forth grade of a German primary school weekly contribute to a blog, by posting *stories*. Teacher and students are encouraged to comment on posts. According to the initiators, the blog contributes to the personalisation of learning processes, increases motivation by making the stories publicly available, and contributes to the acquisition of the rules of orthography.

Research findings confirm that the use of social computing in learning can enhance motivation and participation. De Laat (2007) investigated how participants in an online Master's programme in E-Learning at the University of Sheffield, who were expected to participate and organise community activities build up a learning community. His findings indicate that the students were actively engaged in collaborative learning activities, developed an open learning climate, motivated and encourage each other to contribute, think and co-design course activities, develop tasks and plan and discuss group activities together.

Using reflective online journals in a Greek distance postgraduate programme in physical education, Antoniou & Siskos (2007) found that reflective online writing encourages active participation and contributes to beating isolation by promoting communication and interaction between tutor and students, thus generating the necessary feedback for both the learning process and the quality of the lesson, ultimately also enhancing learning outcomes. In two empirical studies, respectively involving 176 and 46 vocational high school students in Taiwan, Rau et al. (2008) found that instant messaging combined with internet communication media, can significantly increase student extrinsic motivation. These findings are confirmed by a study by Cavallaro & Tan (2006) on online collaborative writing. Similarly, the evaluation report[138] of the "Web 2.0 Klasse"[139] project among students in 9 Austrian middle schools ("Hauptschulen), where a wiki was used to investigate the topic "National Parcs in Austria", revealed that the wiki significantly improved the motivation and performance of weak students.

Podcasts can also be used to increase motivation, make learning more enjoyable and support different perspective on a subject matter. The Italian Videopoesia project[140] tries to teach poetry to secondary school children by encouraging the production of YouTube videos. The video production is employed as a technological tool to motivate students, to enhance comprehension and metacognition and implement "learning by doing" strategies. Cruz & Carvalho (2007) present and discuss a podcast project conducted among the 27 pupils of a 9th grade History class at the school of Viana do Castelo (Portugal), where students collaboratively created their own podcast episodes. They observe that students were responsible and engaged in their learning. Most of the students (59.2%) said that listen to the podcast increased their interest about the activities proposed and 40.7% of the students partially agreed with this statement. For 88.8% of the students, the use of podcast as a resource of learning in History class is not only one useful resource for motivated pupils but it is also useful for pupils with difficulties. The great majority of students (77.7%) said they preferred listening to podcasts to reading the content in a book.

Social computing can furthermore contribute to enhancing social and learning skills. Lee et al. (2008) report on a project among a group of Australian first year undergraduate students who volunteered to engage in a collaborative task of scripting and creating educational podcasts

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[137] http://tagebuch.gsgtgssaarlouis.de/.
[138] in German: http://web20klasse.weblife.at/static/web20klasse/media/Evalutationsbericht-Web-2-0-online.pdf.
[139] Cf.: http://web20klasse.weblife.at/; http://www.web20klasse.at/schoolwiki/index.php/Hauptseite.
[140] http://www.cyberscuola.it/podcast/wordpress/?page_id=10.

for their peers. Their findings suggest that the production of podcasts by students is a powerful way of stimulating both individual and collective learning, as well as supporting social processes of perspective-taking and negotiation of meaning that underpin knowledge creation. Frydenberg (2007) asked higher education students to summarize course content by creating podcasts. He observed that the students were thus empowered to assume responsibility for the course and to become both, teachers and multimedia producers. Lee et al. (2008) report on a project among a group of (Australian) first year undergraduate students who volunteered to engage in a collaborative task of scripting and creating educational podcasts for their peers. Their findings suggest that the production of podcasts by students is a powerful way of stimulating both individual and collective learning, as well as supporting social processes of perspective-taking and negotiation.

There are a number of studies underlining the potential of social computing tools to increase self-directed learning skills, empowering students not only to take responsibility for their personal learning process, but also to endow them with the feeling of authorship and ownership of digital content. Analysing 32 independent studies on ICT facilitated collaborative learning activities, de Laat (2007) observes that all studies present some empirical evidence that students are actively taking control of their learning agenda and indicate that students are thinking about how to approach their learning task. They all indicate that individual interests and learning goals are the main drivers and that peer feedback and help is appreciated to support one's own learning. Personal interests and goals can be negotiated and married into a shared collaborative project.

As has already been alluded to in section 6.2, wikis are especially suited to empower the individual to become a co-author of digital content. Research evidence further indicates that social computing encourages self-directed learning and reflection processes (cf. Barth, 2007). Akbulut (2007), for example, observes that the strength of blogs lies in the fact that students acquire a personal identity along with a sense of empowerment through trying to interact with others in relevant contexts.

These observations are not surprising given the nature of social computing tools. One of the main strengths of social computing lies in the fact that the individual user is enabled to become a (co-)producer of digital content instead of a passive consumer of information. In learning processes, students thus become empowered to contribute not only to the course learning materials, but to collaboratively create a course tailored to their needs.

6.6.   Higher Order Skills

Online collaboration in learning projects requires and fosters the development of metacognitive knowledge and skills: Knowledge alone about one's own learning style is not enough; awareness of other's learning styles and strategies is important (de Laat, 2007).

Blogs and similar online journal tools have been shown to successfully promote reflection and meta-cognition. Xie et al. (2008) used an empirical design to investigate the interaction effects of peer-feedback and blogging on 44 US first and second year undergraduate college students' reflective thinking skills and their learning approaches. They found that over the period of one semester, in which the students had to update their individual blogs on a weekly basis, the students' reflective thinking levels had increased significantly. In his empirical study on the role of a wiki as a knowledge management tool in the acquisition of competencies, Barth (2007) found that the wiki environment supported the acquisition of competencies by encouraging self-directed processes and enhancing reflection processes.

Antoniou & Siskos (2007) studied the use of pre-structured reflective online journals in a Greek distance education postgraduate programme in physical education. Their findings suggest that online writing encourages active participation, meta-cognition and critical thinking. Additionally, it contributed to overcoming isolation and promoting communication and interaction between tutor and students. Carletti et al. (2008) studied the use of different social computing tools, among them in particular blogs and reflective work diaries in an Italian post-graduate online master program in education, which was attended by a total of 280 teachers from primary and secondary schools. While blog entries showed a relatively low level of reflective activity, the rigidly structured reflective work diaries displayed a noticeable shift from practical and technical concerns towards reflective activities, supporting the development of meta-competences, which provided the basis for the teachers' development of professional competences.

The last two examples illustrate that the effectiveness of online writing environments in promoting reflection in lifelong learning depends to a large extend on the structure provided. A study by Kanuka et al. (2007) underlines the need to provide for a structured approach if higher order cognitive skills are to be attained. Analysing postings of undergraduate students in an online discussion environment, they found that the proportion and number of contributions categorised in the highest phases of cognitive presence were highest during activities that were characterized by the following three qualities: (1) Being well structured; (2) providing a clear definition of roles and responsibilities; and (3) provoking students to explicitly confront others' opinions.

6.7. Conclusion: The Building Blocks of Learning 2.0

As has been shown in the previous subsections, Learning 2.0 gives rise to innovation in learning in a variety of ways:

(1) Social computing tools open up new channels for knowledge distribution and acquisition (6.1) and allow for an individualised knowledge management, which draws on the collective creativity and knowledge exchange of a networked group of learners (6.2). Both strategies support the personalisation of learning processes and, as preliminary evidence suggests, raise individual performance levels (6.4.2).

(2) Social computing applications give rise to new learning and research methods that are more adequately fitted to the subject at study, allow students a more realistic, complex and complete investigation of the subject matter and build a bridge between theoretical study and professional practice (6.3);

(3) Social computing tools can contribute to increasing the individual's performance and academic achievement as well as supporting personal and higher order skills. They lead to an empowerment of the learners, increasing their self-directed learning skills and enabling individuals to better develop and realize their personal potential.

Juxtaposing the insights collected in this and the previous chapter with the projected potential of Learning 2.0, formulated in particular in 4.2, the following observations arise:

- Social computing is in fact a powerful tool for diversifying and simplifying instruction, allowing for a greater variety of learning methods and opening new channels for the distribution, compilation and adaptation of learning materials (6.1).

- Social computing seems to offer more flexible and distributed forms of acquiring, communicating and organising knowledge, providing learners with more varied opportunities to engage with learning (6.1, 6.2).

- Several of the cases discussed in this chapter provide evidence on the potential of Learning 2.0 to increase motivation, participation and personal communication skills (6.5).

- Given the strength of social computing tools in promoting personal skills and meta-competences (6.5 & 6.6), the preliminary findings presented here indicate that there is in fact a great potential of Learning 2.0 to support self-directed learning processes, putting the learners at the centre of the learning process and empowering them to become autonomous and independent.

- Learning 2.0 approaches not only employ collaboration as a means for acquiring knowledge (6.4.3), but at the same time increase the collaboration and networking skills of the learners (6.2 & 6.5), thus endowing them with the necessary skills for a successful life and career in a knowledge-based society.

- The cases discussed in this and the previous chapter suggest that Learning 2.0 encourages students to connect, interact and collaborate with a variety of people on different tasks and in diverse environments, thus endowing them with the necessary communication skills in a globalized world.

- Considering the nature of the various learning processes presented in this study, the assumption that Learning 2.0 is suited to respond to the changed cognitive processes and learning patterns in a digital era, can be confirmed. Learning 2.0 in particular addresses the fact that the current generation of students is more susceptible to multi-media presentations, necessitates different stimuli to be motivated, lives and works in networks of peers, and prefers an active learning-by-doing approach.

However, not all hypotheses on the potential of Learning 2.0 can be verified by the present overview of practices. Whether peer learning and the empowerment of the learner will lead to a change in the roles of teachers and learners cannot be decided on the basis of the scarce evidence available. The following chapter will draw attention to the importance of reconsidering the role of the teacher to facilitate a successful appropriation of social computing tools to learning processes, but it is too early to draw any conclusions on a possible change of social roles. Furthermore, while there is some evidence to the effect that Learning 2.0 can contribute to enabling individuals to take care of their own learning processes though out their life, the question of whether and in how far social computing will and can facilitate lifelong learning beyond organised learning will have to be postponed. It is to be assumed that the strength of social computing in encouraging teacher cooperation and opening new opportunities for informal knowledge exchange among educators will be reflected by the communities of practice established among other professional and occupational groups, but it is beyond the scope of this study to draw any conclusions on this.

Looking back at the different areas in which social computing facilitates learning processes presented in this chapter, three key features emerge as crucial properties of social computing contributing to the development of new learning processes and outcomes. These "building blocks" are

(a) **Multimedia:** the ease of producing, distributing and consuming multi-media representations by students and teachers which facilitates learning processes by making

learning material more readily available, addressing new sensory channels and alternative cognitive skills and increasing student motivation;

(b) **Collaboration:** the collaborative aspect of social computing tools which provides the individual learners not only with a social network of peer support and assistance, but also engages them in a productive discourse, critically reflecting their own ideas and reacting towards the ideas of others; and

(c) **Learner as producer:** the fact that social computing tools encourage and support active authorship, supporting the learner as a producer of content and giving him a sense of ownership and responsibility of learning materials and procedures.

These three factors are constitutive for each of the different learning objectives considered in the previous subchapters. They might be balanced in different ways to yield different results, emphasizing in some cases the collaborative and collective aspect of the learning process rather than the individual's contribution, whereas in others the multi-media aspect prevails or the individual's creative power is at stake. However, the full potential of Learning 2.0 can only be embraced if the interplay of all three aspects is respected and promoted.

7. Enabling and Disabling Factors for Learning 2.0

The success of social computing tools in facilitating and improving learning processes and outcomes depends on a variety of factors, which might well be contingent to the specificities of each case. However, some of the more salient aspects relevant for the outcome of social computing projects appear to include (1) the availability and accessibility of social computing tools by teachers and learners; (2) the functionalities of the tools employed, their suitability for the chosen task and the learners' familiarity and acceptance of the tools; (3) the students' attitudes towards the respective social computing tools and the extend to which they are able to appropriate them to their personal needs; (4) The participants' background of knowledge and skills, the group structure, and the form of interaction and communication among peers; and (5) the scaffolding, i.e. way in which social computing tools are embedded within the course, subject or institutional environment, including in particular guidance and support, the structure of the tasks and the teacher's ability encourage participation and embed the tools in the learning process.

7.1. Access to Learning 2.0 Tools

By now, resources for Learning 2.0 activities, information and training for teachers and social computing applications tailored to particular educational objectives are widely and freely available and accessible. In several countries there are initiatives promoting, encouraging and assisting in the deployment of social computing tools in primary and secondary education. For example, the Portuguese "INTERACTiC 2.0"project[141] aims to demonstrate how educators can create projects with social computing tools in different educational contexts. Proposals for tuition plans, methodologies and activities that promote the critical, constructive and collaborative among students and teachers, are proposed to promote new approaches to learning and the culture of a new school. Similarly, the German "Schule2.0" project[142] offers teachers the opportunity to get to know social computing applications, by supplying information, links and authentic examples from educational practice. The Kingswear Ning Network (UK) supplies remote rural school with the tools to learn to use social networking in a safe environment. All KS2 & staff have own blog pages; homework, links, letters etc and comments used for communication between home, school & students are supplied.

Some of these initiatives are targeting certain social computing tools in particular. Several national and regional initiatives in Europe are promoting the use of blogs in primary and secondary schools and offering blog services tailored at the educational needs of these age groups. For example, "XTEC-Blocs"[143] is a public service of blog-hosting provided by the Ministry of Education of Catalonia. Schools and teachers can create educational blogs and invite pupils and other teachers to post contents on it. Since its opening in November, 2007, more than 10,000 blogs have been created. There are different types of educational blogs: school news, classroom diaries, project blogs, literary notebooks etc. The platform provides connections between blogs by means of tags, and cross-search capabilities. It has also a user's forum and several tutorials. It is based on the open-source project "WordPress Multiple".

Similarly, the Italian "BlogER"[144] project, initiated by the region of Emilia-Romagna, promotes the use of blogs to a) improve building online communities, through interaction and collaboration in the classrooms, among different schools and different areas and countries; b)

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[141] http://interactic.ning.com/.
[142] http://schulezwonull.de.
[143] http://blocs.xtec.cat.
[144] http://blog.scuolaer.it/BlogER.

promote interaction between teachers, students and parents, both within the classroom and between classroom activities and home activities; c) improve creativity, writing and communication skills as a means of motivation; and d) to enhance Learning environments. The BlogER project has been running for five years (since, 2003) with currently more than 1000 projects and 6312 active posts.[145]

The recently launched EDU3.cat project[146] of the Spanish regional government of Catalonia aims at offering audiovisual material for educational use. The resource section of the portal consists of a catalogue of interesting web educational references that cover webtv, radio, cinema, photography and other new formats, to disseminate relevant and interesting experiences as well as foster the meaningful use of ICT in the teaching practice. There are also sites facilitating the distribution of school lessons via podcast. For example, the "SmartBoard lesson podcast" website[147], hosted by two Canadian primary school teachers, promotes the sharing of podcasts of SMARTboard lessons among teachers. Teachers can freely up- and download Interactive Whiteboard lessons, including a lesson podcast and user comments. The service is used worldwide, including many EU countries, but most contributions come from Canada, USA, Australia, UK.

In most countries, social computing tools are therefore easily accessible for educators and often adapted to their specific needs. As has been emphasized in 4.3.1, digital divides between different regions, school forms and student groups might impede take-up. However, if the institutional infrastructure is mature enough to ascertain access to ICT and supporting facilities for all participants in a planned Learning 2.0 project, the availability of adequate social computing tools for learning purposes should not pose a problem.

7.2. Tool Functionalities & User Skills

A series of studies on the enabling and disabling factors for the deployment of social computing tools in educational contexts points to the importance of the tools' functionalities. Scantlebury et al. (2008) investigated the use of a range of social networking tools for supporting professional development among lecturers and staff at the Open University, UK. One of the main observations made in the evaluation of the project was that even more technology experienced users needed time to familiarise with the full range of functionalities that social computing tools offer them for their personal development. Participants were frustrated and confused with the complexities and performance of some of the tools. Similarly, Chuang (2008) found that although the majority of the participants to a blog project had personal weblogs, most students needed face-to-face support in maintaining blogs as e-portfolios.

Divitini et al. (2005) confirm these observations, outlining as the main factors for the failure of a blog project in a university course on the one hand the functionalities of the tool, i.e. the chronological structure of the blog and the uncontrolled accessibility, and on the other, a lack of time, prior knowledge, interest and effort on the part of the students. They observe that students were not given enough time to accustom to the tool and the objectives of using the tool within the class had not been made transparent enough. Liaw et al. (2008) isolate five attitude factors which influence the efficient use of web-based collaborative learning systems,

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[145] For more information see: 1. Report on BlogER: http://www.scuolaer.it/page.asp?IDCategoria=139&IDSezione=3329; 2.Case study on BlogER: http://www.scuolaer.it/page.asp?IDCategoria=139&IDSezione=1399&ID=39030; 3.Video on BlogER: http://www.scuolaer.it/page.asp?IDCategoria=139&IDSezione=1399&ID=39767.

[146] http://www.edu3.cat. See also the project's blog: http://blocs.xtec.cat/edu3cat.

[147] http://pdtogo.com/smart/?page_id=2.

concerning on the one hand system functions, system satisfaction and system acceptance among participants and on the other hand the kind of collaborative activities and the underlying learners' characteristics. Again, the tools' characteristics played a critical role in student acceptance and performance.

These results suggest that the prevailing assumption that students are acquainted with web 2.0 services through their private use of the internet should not be taken to imply that they will not face difficulties in using the tools productively. Teachers and trainers will therefore have to ensure (1) not to use too many and too complex social computing tools or functionalities; (2) provide ample technical assistance and support and encourage students to voice technical problems; (3) choose a social computing tool that is suited to support the subject studied and clearly facilitates (certain aspects of) the learning process; (4) make explicit the advantages of the tool for the individual's learning process. Hence, it seems to be important for the success of social computing tools in higher education to fit the tool to the needs of the group, the planned activities and the objectives of the course and to ensure that the tool is easily accessible and understandable by all participants.

7.3. Students' attitudes towards Social Computing

A series of studies indicate that student perception and acceptance of social computing is extremely diverse, influencing not only their success in using the tools productively, but impacting also their performance in the course. Makri & Kynios (2007), for example, observed three different blogging profiles among Greek mathematics teachers: the "blog enthusiast", the "blog frequent visitor" and the "blog sceptic". Burgess (2006) observed that some of his students "took to blogging like ducks to water, while others were bemused, reluctant, or downright hostile to the idea". He noticed further that the use of blogs seemed to amplify the effects of learner engagement: the more motivated the students the more effective their learning through blogs. Williams and Jacobs (2004) found that their graduate students preferred not to participate in the blogs offered as part of their studies, either because they considered the additional marks not worth the effort or they were not sure whether they had anything valuable to contribute. Therefore, the success or failure of social computing tools in enhancing learning processes seems to be in large part dependent on the students' acceptance of the tool and, in particular, their general attitude, preferences and needs.

Furthermore, students appear to use social computing tools in different ways, appropriating them to their individual needs and thus supporting diverse aspects of their personal learning process. In an online distance learning course at the OU (UK), Kerawalla et al (2008) were able to isolate distinct types of blogging behaviours. They found that some students used the tool primarily to establish an emotional network of mutual support, while others used it to build a more subject specific resource network with the aim to benefit from the ideas and comments of their peers. A third group used the tool mainly as a means of self-reflection. These different personal uses of blogs reflect some of the key areas supported by social computing as discussed above. These findings are supported by Farmer et al. (2008) who conducted a study on blog usage among 225 first year university students enrolled in cultural studies at the University of Melbourne (Australia). Their results indicate a striking difference in tone, style and approach between the various learners participating in the exercise.

These findings suggest, on the one hand, that the individual learners' general attitude towards the social computing tool in question is critical for their success in using the tool to improve learning processes and outcomes. On the other hand, social computing tools lend themselves to being adapted in a very personal way to the individual users' needs. Consequently, students

might benefit from the tools employed in diverse and unexpected ways, not always targeting the learning processes and outcomes intended by the teacher.

7.4.   Peer interaction patterns

Research indicates that participants' knowledge and interaction patterns play a critical role in the success of collaborative projects facilitated by social computing. Scantlebury et al (2008) found that while the tool functionalities were decisive in take up, they were secondary in terms of developing strong social networks. The real "glue" was the enthusiasm and sense of shared interests of the practitioners driving their use. A clear focus, shared goals, support and mediation seem crucial to the success of social computing projects. Collaborative learning activities are dynamic, groups therefore might develop their own working rhythm; disappointment in the quality, direction or engagement of fellow students' input and engagement may lead to decreasing participation (de Laat, 2007). Analyzing the collaborative use of online tools on the design of aerospace systems among senior and graduate engineering students, Cho et al. (2007) conclude that both individual and structural factors (i.e., communication styles and pre-existing friendship networks) significantly affected the way in which collaborative networks were developed. Furthermore, the resultant social network properties significantly influenced learners' performance to the extent that central actors in the emergent collaborative social network tended to get higher final grades.

Different peer interaction patterns have been discerned in several studies that can become critical for the success of collaboration projects. Liu & Tsai (2008) analyzed peer interaction patterns in on-line discussion forums among undergraduate computer science students. Their analysis suggests that students' abilities played an important role in the evolvement of knowledge exchange. Certain configurations of students' background abilities tended to lead to particular communication patterns. For example, groups with peer members of high achievement or heterogeneous abilities got stalled in their collaboration process and needed substantial teacher support to advance the project. Similarly Lin et al. (2008) found six types of interaction patterns in a teacher's virtual community for professional development in Taiwan. Broadly speaking, the types differ in the participants' propensity to cooperate and with respect to the team's cohesiveness, i.e. the social structure and emotional atmosphere characterizing group interactions.

Drawing on these insights, the following key factors for the success of social computing tools in facilitation collaborative learning processes emerge: (1) a propensity and willingness of all participants to contribute with questions and answers, sharing their knowledge (and lack thereof) liberally; (2) a sufficiently high minimum level of prior knowledge; and (3) a supportive working atmosphere. Leadership patterns and knowledge distribution in the team seem to be less decisive: some teams seem to profit from democratic working patterns while others function better with strong leadership and guidance (Lin et al., 2008). In general a relatively balanced distribution of knowledge or a similar level of skills is more beneficial to the overall team performance. However, teams are usually not successful if the team members' skills are below the level required for the task. Also, if all or most team members' skills are above average, there is a risk of the team becoming paralysed (Liu & Tsai, 2008).

7.5.   Scaffolding Learning Processes

Research furthermore indicates that an adequate scaffolding of social computing facilitated learning processes through the provision of guidance, incentives and support is crucial for the success of social computing experiments.

Investigating the perceived differences between online and face-to-face discussions in a classroom setting, Wang & Woo (2007) conclude that, compared to face-to-face settings, online discussions need a longer time frame and more structure and guidance. Research results by Divitini et al. (2005), Scantlebury et al. (2008), and other studies also underline the need to give students ample time to get accustomed to the functionalities of the respective tools and to provide support and guidance both in using the tools and complying with the tasks in question. Factors particular to the characteristics of the project or the group of participants might additionally call for support and guidance on part of the trainers, e.g. the geographical distribution of the learners (cf. Scantlebury et al., 2008). Ellison & Wu (2008) found that, to exploit the collaborative potential of blogs, university students needed more guidance regarding the process of reviewing and critiquing the work of peers. Reflecting on experiences with immersive learning environments, de Freitas (2007) emphasizes that the effective use needs to be carefully planned into group activities and social interactions, scaffolding learning, discussion and reflection.

As has been mentioned in chapter 6.6, if higher order thinking skills are to be supported by social computing tools, the role of the teacher or mentor in providing a framework of questions and tasks is paramount to the success of the project (cf. Antoniou & Siskos, 2007; Carletti et al., 2008; Kanuka et al., 2007).

Mancho (2007) conducted a the collaborative wiki experiment with engineering and computer science students, observing that while the motivation among those participating was high and the quality of contributions good, participation was low, possibly due to the fact that the activity was not assessed. He concludes that the project can be improved by (1) assessing the learning process and the learning outcome; (2) offering more guidance to students on how to profit from online collaboration for the individual learning process. In a similar vein, drawing on experiences from iCamp, a cross-border European collaborative learning experiment among university students using social computing tools extensively, Kuru et al. (2007) underline the importance of adequate planning. Apart from a supportive technological infrastructure and the familiarity with the tools by students and facilitators, the transparency of the tasks and similar levels of self-direction of teachers and students at all sites turned out to be essential. For the success of this project the collaboration of facilitators among each other and with students as well as student motivation proved to be of importance. Kuru et al. (2007) suggest to increase student motivation by incentive measures such as grading, and to take measures to encourage and increase participation and collaboration among both, learners and facilitators.

The organisers of the "Horizon project"[148], involving secondary students in different countries, observe that the level of student autonomy supported by social computing tools had its difficulties: students who were absent or slow to communicate would frustrate their overseas partner. Therefore, teachers had to monitor changes closely and adjust groups so that project deadlines could be met and collaboration ensured. Conversely, in the Austrian "Web 2.0 Klasse"[149] project (mentioned above), evaluation revealed that the success of the student wiki used as a key tool in the project depended to a large extend on the attitude and encouragement of the teachers[150].

Thus, teaching presence and guidance seems to be critical to the success of Learning 2.0 projects. However, teaching presence may express itself in different ways than in traditional

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[148] Cf. http://horizonproject.wikispaces.com; http://horizonproject.wikispaces.com/About+Us.
[149] Cf.: http://web20klasse.weblife.at/; http://www.web20klasse.at/schoolwiki/index.php/Hauptseite.
[150] See report (in German) at: http://web20klasse.weblife.at/static/web20klasse/media/Evalutationsbericht-Web-2-0-online.pdf.

classroom settings. In the beginning phase of a collaborative project active pedagogical guidance is needed and welcome, which can transform during the course into a more facilitative approach of the teacher. In this process-oriented teaching there is a need to manage the interplay between self-regulation and external regulation, which also gradually changes the teacher-student relationship (de Laat, 2007). In general, the role of the teacher is more that of a coordinator who supplies a framework in which participants collaborate more or less freely (cf. de Freitas, 2007). Within the project the teacher's role is that of a moderator and mentor. Since opportunities to directly intervene in collaborative processes are restricted, the teacher will have to carefully plan the tasks ahead in time. Teachers will also have to get accustomed to and trained on their new role as partners and facilitators in learning processes, rather than lecturers (Blin & Munro, 2008; de Laat, 2007).

7.6.   Summary

Social computing tools for learning purposes have by now become readily available. National and regional programmes encourage Learning 2.0 and provide teachers with support and training opportunities. Thus, in many European countries, the availability and accessibility of tools should not limit take up. However, the learning environment itself, and the roles, expectations and attitudes it evokes, might impede successful implementation. On early evidence, a *structured approach* is critical for the success of Learning 2.0. Educators need to carefully select social computing applications fitted to their learning objectives, their learners' experiences, attitudes and interaction patterns, as well as the overall framework. Ample technical support has to be provided. The tasks implemented through Learning 2.0 need to be transparent, relevant and targeted to successfully improve student achievement and performance. Students prior experiences with and attitudes towards social computing have to be taken into account. Students who are disadvantaged in participating in collaborative activities will need extra attention and support. The tools need to be embedded in a supportive environment of guidance and support to yield positive results. Although Learning 2.0 empowers students play a more active part in the learning process, the role of the teacher remains vital – or becomes even more important – for the success of the learning activities. The Learning 2.0 teacher has to assume the manifold roles of a designer, coordinator, moderator, mediator and mentor for the learning process.

8. Inclusion or New Digital Divides?

New technologies and learning approaches require new skills, both with digital tools and the way in which they are used (Punie and Ala-Mutka, 2008). Although the tools can promote access to learning for new groups, they can at the same time give rise to new digital divides.

Woodfine et al. (2008) emphasize that the use of online learning activities raises problems for higher education students with dyslexia far beyond accessibility and web design. They argue that social computing tools, while supporting different learning paces and cognitive styles in some cases, are at the same time producing close to insurmountable barriers to students with cognitive disabilities in general, and dyslexia specifically. They present the results of a research project in which several groups of (UK) higher education students engaged in online authentic text-based synchronous learning activities. Their results indicate that text-based synchronous learning environments can marginalise, demotivate and disappoint students with dyslexia, who have difficulties in reading, spelling, word order and argumentation. As additional impeding factors deficiencies in transposition, memory; organization and time management and a lack of confidence, were uncovered. Woodfine et al. (2008) conclude that students with dyslexia require specialized support and adjustments (technological or tutor support), otherwise they will feel excluded, ignored or even withdraw themselves away from the learning activity.

In a similar vein, Fisseler & Bühler (2007) outline possible barriers in e-learning and educational technologies for people with disabilities. They argue that especially current trends to the use of blogs, wikis and other social computing applications, towards e-assessment and e-portfolios, pose additional threats to accessibility for disabled people, as (1) the complex interrelation of different websites and services, mediated through RSS, makes it more difficult to ascertain accessibility and enforce standards; and (2) since users are content producers, they have to be supplied with and act in accordance with accessibility guidelines.

However, Fisseler & Bühler (2007) also point out that, over time, social computing applications might even serve to support accessibility for three reasons: (1) if a central interface for the disabled student is provided which represents the information accessed through different networks and services it in a way tailored at the individual's needs, accessibility will be facilitated; (2) standards for accessibility could be integrated in the layout of social computing services, making it easy, even for the ignorant user, to create fully accessible content, supporting accessible authoring practices; and (3) the presence of disabled persons on the net and their interaction, communication and collaboration with non-disabled students, will raise awareness for their needs; the correction options integrated in e.g. blogs and wikis will make it easy for users to remove inaccessibilities.

This ambiguous result already indicates that while social computing tools pose new challenges to inclusion, their potential for supporting and facilitating inclusion – once certain obstacles are overcome – is substantial. There are more research results that indicate and illustrate that social computing applications can facilitate inclusion in a broad variety of cases and settings, addressing different areas of social exclusion.

Ebenhofer & Knierzinger (2007) observe that ICT, by offering text, sound, picture and video resources, can support the integration process of *migrant children in primary schools*, by facilitating (1) foreign language acquisitions; (2) first language usage; and (3) intercultural learning. They argue that a computer is more motivating and versatile in supporting the simultaneous acquisition of oral and written foreign languages. Learning material in their first language (usually not spoken by the teacher or their peers) can be supplied, individualizing the learning process and making learning more accessible to students. ICT can furthermore be

used to access information on the children's countries of origin and support cross-border and school partnerships.

Tan & Cheung (2008) investigated the effects of computer collaborative group work, facilitated by an adult, on peer acceptance of a *7-year-old boy* with Attention Deficit Hyperactivity Disorder (*ADHD*) in a Singapore junior school. It aimed to ascertain whether collaborative group work on a computer, with the facilitation of an adult, could help to raise his peer acceptance among his classmates. The results indicate encouraging improvements in the raise of peer acceptance by classmates. Tan & Cheung (2008) argue, that although this was a discrete setting, the findings are promising and this strategy may be replicated in school to support mainstream inclusion for children with ADHD.

Observing that *hospitalized children* have a mayor predisposition towards school failure, Mora Plaza et al. (2002) developed a virtual eLearning platform using social computing applications to offer hospitalized children quality education and opportunities for social interaction with their peers and educational centres. The virtual learning environment was well-accepted by resident children, who appreciated being able to participate at least to some extend in the activities from which they are excluded during the period of time that are in hospital. The lack of direct human contact proved to be a disadvantage, which, however, could be alleviated by the participation of the child's school centre and the habitual teachers, achieving a successful integration.

There have been many projects over the past years, trying to make school education accessible via videoconferencing for children staying in hospital for longer periods[151]. Some of these projects are now adding social computing applications to enable hospitalized students to not only keep up to date with the learning material, but also to participate socially in a school environment. Thus, for example, the "Virtual Classroom"[152] of the Bonifacius Hospital in Lingen, Germany, offers not only videoconferencing tools, e-mail exchange and an online library, but also encourages hospitalized learners to interact with their classmates through online forum and chat facilities. The Áit Eile [Another World] project[153] in Ireland is an online community for children in hospitals which allows them (apart from accessing educational content) to communicate with one another, their classmates, families, and teachers via e-mail, live chat or video link. The Spanish "Mundo de Estrellas" project[154], apart from providing videoconferencing tools to connect patients to their regular schools, employs a virtual world environment to encourage its young patients create characters and stories, share activities, be part of a group, and share their hospital experiences. In the first phase of the project, a virtual classroom and a virtual surgery, both with interesting educational features, were created. First findings on the pilot project in the Hospital Universitario Virgen de Rocío (Seville), indicate that 98% of children users claim that this activity makes the day go by more quickly, almost 100% stated that thanks to Mundo de Estrellas their stay in hospital was more enjoyable, and 71% of parents noted that their children's spirits rose after the use of the pioneering programme (cf. eHospital Project, 2008).

There are some projects employing social computing tools to target *disengaged teenagers.* The "Digital Live Moisling" project, for example, is an initiative promoting video-blogging as

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[151] See the eHospital Project (2008) research report for examples; additionally there have been large-scale initiatives in Italy, namely "schoolhost" (www.ao-umbertoprimo.marche.it) and subsequently "HSH@Network" (http://hsh.istruzione.it/portal/home.jsp) and the "MyZone" project in Belgium, www.my-zone.be.

[152] Cf. http://virtuelles-klassenzimmer.connectiv.de/

[153] Cf. http://yuriko.cs.tcd.ie/.

[154] Cf. http://www.juntadeandalucia.es/servicioandaluzdesalud/principal/documentosAcc.asp?pagina= gr_sabermas_yademas1.

web-TV for underprivileged kids in the Lübeck suburb of Moisling, Germany (cf. Hasebrook et al., 2007). The project enables young people to express their views, develop their creative skills and build up self-esteem. The overarching objectives are social integration and crime prevention.

Mackenzie (2007) investigates whether it is possible to use game-based learning techniques to re-engage teenagers in learning, particularly boys between the ages of 12-15, who are alienated from the learning process in schools. He implemented the "InQuizitor" software in UK secondary schools. The primary aim to re-engage children in study and give them confidence in their ability to remember and learn key information, could be attained in the experimental setting. Mackenzie (2007) observed a steady increase in scores, demonstrating the gradual assimilation of information as the quizzes were played repeatedly. Additionally he found, that contrary to expectations, girls seem to be just as engaged with the product as boys. However, the first children to disengage (after around 80 minutes play) were high achieving girls aged 16 to 17. They asked for the game rewards to be switched off so that they could concentrate purely on answering questions on the subject content. This behaviour and reaction is consistent with the observation that getting a high mark in the academic content seemed to supersede the reward implemented through the mini-games as being the prime motivator in repeated games.

Notschool.net[155] is a national (UK) Internet based 'Virtual Online Community' offering an alternative to traditional education for *young people disengaged from classroom learning* because of illness, pregnancy, bullying, phobia, travelling, reluctance to learn, disaffection, exclusion. There is no intention to return these young people to school, but instead to provide a route to further and higher education and gainful, meaningful employment. All learning is done through a protected online platform. While each learner follows an individual learning plan, collaboration and interaction is encouraged and some social computing applications, like tagging tools, are employed. The core aims of the project are to re-engage teenagers in learning; to provide a secure, non-threatening environment without fear of failure; to rebuild confidence, self-esteem and social skills, to provide a pathway into further education, life-long learning and further qualifications. The initiative is aimed at teenagers aged 14-16, although younger children are occasionally accepted. Accreditation data collected between, 2003-2005 shows than 98% of Notschool.net learners demonstrate observable progress. In particular, substantial gains in literacy and ICT skills can be observed, social and collaboration skills, self-confidence and self-esteem are improved. Of the, 2004-2005 cohort of researchers, 50% moved into further education, 26% entered college related employment and 18% entered full time, gainful employment.[156]

The "Click2Meet" initiative[157] is a collaborative digital film project between two *learning disability classrooms* in Israel, one in a Jewish school and one in an Arab-Muslim school. During the school year, students documented both school and local community events using the digital camera, events that were selected according to shared categories, and then sent the pictures together with an explanation to their partners in the project. The digital album is documented on a shared dual-language (Hebrew/Arabic) website, and is the basis for a continued dialogue between students using an active Internet forum, distance online learning lessons, and face-to-face meetings at each school. The two schools succeeded in overcoming Hebrew-Arabic language barriers using ICT and even improved the foreign language levels at each school.

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[155] www.Notschool.net.
[156] Further research findings at: http://www.notschool.net/inclusiontrust.org/IT-media-papers.html.
[157] http://www.carmelvayam.org.il/click_f/.

In higher education, social computing tools can contribute to the integration of *learners with special needs*. Santos & Boticario (2006) present and discuss ALPE (Accessible eLearning Platform for Europe), an accessible, open source, standards based collaborative platform and learning management system developed at the Spanish National University and tailored to support the 3379 students (2% of total number of students) with different types of disabilities studying at the Spanish National University for Distance Education (UNED). The platform allows building accessible virtual communities where users with and without special needs can share common interests, ideas, and feelings, being aware of each other's presence on the web. Moreover, it allows building virtual learning communities including mechanisms to adapt the response to the students needs, so that students with and without special needs can organize themselves in communities of interest and promote dynamics in learning.

Grant & Villalobos (2008) report on several Futurelab projects aiming at increasing *social justice* using digital technologies[158]. "London Digital Dialogues", for example, was a six-month programme for groups deemed to be in danger of *digital exclusion* through economic, cultural or financial reasons in Lambeth, London, UK. Projects included film-making with digital cameras and mobile phones, the creation of podcasts with local community groups, bio-mapping and creating live feeds for an artist's performance. The participants from all the projects came together for a party in the Hayward Gallery that showcased their work and, ultimately, brought the disparate and diverse virtual networks into the real world in a fun way that celebrated the project and the communities that were part of it. This project used digital technologies as part of a new approach to learning, personalising each project to appeal to the specific group of people who would be using it, and using digital tools to facilitate creative expression in many different ways.

Deery (2007) discusses the example of Dunhill Multi-Education Centre, a *community-based adult learning facility located in rural southeast Ireland*. The mission of the centre is to "provide opportunities for learning for all sections of the community" and to be inclusive of individuals from disadvantaged groups. Based in a village of 300 individuals, Dunhill serves the needs of approximately 25,000 people within a 50 kilometre radius. Since its inception, the centre has worked to foster relationships with postsecondary educational institutions to address niche education gaps using a learner-centred approach, develop working partnerships with a range of education & training providers, and conduct research & training programmes to meet evolving needs of the community. Rather than merely providing one day seminars and conferences, a cooperation with the University of Wisconsin-Stout (USA) assists Dunhill Multi-Education Centre in conducting needs assessments and helps to build relevant training programmes using the wide array of skill sets available through university faculty. Through the use of videoconferencing technology and online education platforms (e.g., Blackboard.com; Desire2Learn.com), students are able to participate in training programmes that are unavailable locally due to lack of expertise or opportunity. Learning takes place through multiple formats, depending on specific needs of the group.

Bruce et al. (2007) report Cultural Awareness in Technical and Industrial Training Project (CATIT), an initiative to improve vocational training for *immigrants and ethnic minorities* with the aid of interactive web-base communication structures (Moodle) to support the training of teachers and tutors. The project was launched in, 2005 under the leadership of Adulta, the Finnish national organization for adult learning, and funded under the EU Leonardo da Vinci program. Through the initiative training materials have been produced with the co-operation of four other European countries (Ireland, Germany, Spain and the Czech Republic). The tailored course is designed to enable tutors of specialized technical

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[158] For these and further case studies see: www.futurelab.org.uk/themes/digital_inclusion/project_showcase.

subjects to use effective tools and methods for the meaningful professional development of immigrants. A focus was put on enhanced technologies to develop and deliver training in remote locations (Lapland, Euzkadi and western Ireland).

The "Make IT Yours"[159] project uses digital technologies to facilitate new approaches to learning for adults with *mental health* issues, supporting creative expression through digital photography and editing technologies, additionally facilitating communication through e-mail. According to Grant & Villalobos (2008) the project highlights the huge potential for developing confidence and skills through creative use of technologies.

A study by Hogan-Royle (2006) underlines the potential of digital technologies to facilitate the inclusion of *disabled people* and in particular their access to learning opportunities. In a pilot study "iVocalize", a web based, voice based assistive tool was employed to support 100 blind and visually impaired people in Canada by making learning opportunities on the internet accessible to them and by establishing, among others, an online community of blind learner. First results indicate that the project increased self-esteem and community building among participants. Unmet social, learning and employments needs were identified, which can now be addressed by policy makers and implemented through "iVocalize".

De Freitas (2007) discusses the deployment of the virtual world Second Life for therapeutic purposes, as for example in Brigadoon[160], an island in Second Life that provides its (currently 12) members, who have *autism or Asperger's Syndrome*, with an environment within which they can interact with one another, learn to communicate in different ways and develop social skills in a safe and risk free context. Community members find this a more comfortable training context – less threatening than direct face-to-face contact. Another Second Life environment de Freitas lists, is the Live2Give[161], which supports an online virtual community of people dealing with *cerebral palsy* and similar physically disabling conditions, encouraging them to share their thoughts, experiences and feelings.

Since the use of Learning 2.0 strategies for inclusion is only slowly starting to emerge, there are a number of projects and initiatives planned or in the early stages of implementation in Europe. For example, Fedeli & Rossi (2008) present an Italian research project at high school level, which aims to exploit the advantages of social computing tools to guarantee a representation of minorities through a direct self expression. The project was prompted by the huge success of social network called "Rete G2 seconde generazioni"[162], which was created by young people of foreign origin in Rome in, 2005 and soon disseminated through the whole country, emphasizing the need of expression among young immigrants and ethnic minorities. The project employs blogs and wikis to promote collaborative writing, a social network site supporting different languages, podcasting and slidecasting facilities. It aims at encouraging immigrant (and native) students to produce and share stories, practice different creative and language skills, and collaborate with others, promoting cultural exchange and self expression.

None of these Learning 2.0 projects has reached a maturity stage yet so that it is not possible to verify the assumption that social computing applications can indeed improve access and alleviate problems encountered by disadvantaged learners. While more research to this effect is needed, the potential of social computing to facilitate access to learning opportunities for individuals at risk of exclusion seems to be significant. However, it should be born in mind that at the same time Learning 2.0 strategies may increase existing barriers if no precautionary measures are put in place.

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[159] See www.windmillhillcityfarm.org.uk/miy for examples of the participants' work and more information.
[160] http://braintalk.blogs.com/brigadoon/2005/01/more_about_brig.html.
[161] http://braintalk.blogs.com/live2give/2005/01/all_about_live2.html.
[162] http://www.secondegenerazioni.it/.

9.   Conclusion

Pedagogical innovation. Social computing tools support innovation in learning, i.e. pedagogical innovation, in a number of ways:

- Social computing applications acknowledge the fact that learning processes are increasingly characterized by **collaboration and networking**. One of the main assets of these tools is therefore their potential to promote and increase collaboration, empowering the individual as a producer, but at the same time embedding his creative potential in a network of mutual assistance and support;

- Social computing is projected to respond better to the **changed cognitive processes and learning patterns** that have evolved due to the ubiquity and widespread use of information and communication technologies, offering a wider variety of stimuli, promoting the flexible use and combination of different sources and tools, supplying immediate responses, and promoting an active and collaborative approach to learning;

- Social computing applications can be very powerful tools for diversifying and simplifying instruction, facilitating and improving in particular teaching methods potentially giving rise to **new didactics** which put the learner more firmly at the centre of the learning process.

- Furthermore, social computing tools **recognize** the **diversity** of users and contribute to the personalisation of educational experiences. They offer opportunities for flexible, distributed learning, which could provide learners with more varied opportunities to engage with learning.

- As a consequence, social computing applications are expected to promote independent, autonomous and **self-directed learners** endowed with a variety of social skills that enable them to connect, interact and collaborate successfully with a variety of people on different tasks and in diverse environments.

- Due to the lowered barrier to entry, social computing applications can increase **motivation, participation** and the development of new cultural forms of expressions. They promote **reflection** and **meta-cognition**, enabling learners to take care of their own learning processes.

- Additionally, social computing tools have the potential to attract learners who are currently disengaged or disconnected from (organised) learning and are projected to make learning opportunities more easily accessible for people in employment, thus **facilitating lifelong learning**.

Organisational innovation. Furthermore, Learning 2.0 strategies can contribute to support organisational innovation. Social computing applications enable education institutions to become more transparent and increase their visibility and influence in the wider community in which their students are living. Education institutions can also seize the opportunity to broaden students' horizons by collaborating with institutions in other countries or sectors, or by involving outside experts and other third parties, e.g. parents, in their teaching. Social computing offers organised learning new opportunities of connecting the different parties to the learning process, creating learning communities that are flexible, supportive and open in their communication behaviour. Thus, social computing supports organisational innovation by re-integrating the institution into the community (S), transcending borders between organisations, countries and cultures (D) and strengthening the social interactions between all participants involved in the learning process, transforming E&T institutions into communities (N).

Challenges. Though there are several challenges and obstacles to be overcome in the implementation and adaptation of social computing to educational contexts, the main challenge to be addressed is accessibility. Old and new digital divides privileging the already privileged have to be avoided. Policy support is needed to enable every learner to benefit from Learning 2.0. Even young people accustomed to ICT may lack essential components of digital competence, such as critical evaluation skills for online information and personal knowledge management skills to benefit from Learning 2.0 (Punie & Ala-Mutka, 2007).

One of the main obstacles to exploiting social computing in learning is the need for scaffolding and support: Social computing services have to be chosen with care and adapted adequately to the respective learning context. Ample support is needed to address possible technical problems and acquaint all users with the functionalities of the tools and the objective of their use in the given learning context. Different learning and interaction patterns as well as diverse ways of appropriating the tools by the individual users have to be anticipated by the teacher. Measures to avoid dysfunctional interaction or usage of the tools have to be considered. If student achievement and higher order skills are to be supported, a structured approach is to be preferred. Hence, while Learning 2.0 puts the learners at the centre of the learning process, increasing their learning opportunities and improving their personal achievement, the role of the teacher as a designer, coordinator, moderator, mediator and mentor, is paramount to the learners' success in seizing these new opportunities.

Inclusion. Research results indicate that, learners with special needs might not be able to benefit from Learning 2.0 approaches. Students with dyslexia are disadvantaged when using online writing tools (Woodfine et al., 2008) and learners with disabilities might face accessibility problems (Fisseler & Bühler, 2007). However, social computing also has the potential to alleviate access and participation for learners with disabilities and learning difficulties. Yet tools have to be used appropriately and prudently, adequate assistive technologies will have to be developed and equity standards will have to be implemented. Some learners will still need extra support and guidance. Teachers and tutors will have to develop a new sensitivity for the problems incurrent in the design of web 2.0 tools for learning. Again, teacher training will be essential in mediating the new role of teachers as enablers for learning.

Individuals currently disconnected from learning opportunities and at risk of exclusion from the knowledge society face particular difficulties in embracing the learning potential of ICT. However, as some of the examples presented and discussed above indicate, projects using Learning 2.0 strategies have a high potential to re-engage these people in learning. The low barrier to entry, the playful and interactive character of social computing applications, the pre-valence of visual, audio and video material make Learning 2.0 attractive to learners with a fragmented learning biography. However, research on the potential of Learning 2.0 to support lifelong learning is still scarce. Policy support is needed to close the gap of basic access and ICT skills for all learner groups, enabling them to benefit from lifelong learning 2.0 approaches.

Assessment and Outlook. The experiences collected in isolated cases and preliminary research findings suggest, that, while success is not automatic and depends on many variables, on the whole, social computing applications display an enormous potential for education and training institutions in addressing the changed learning paradigms and educational needs in a knowledge society. Learners and educators are already embracing the new learning opportunities offered by social computing technologies. Due to the novelty of social

computing, more experiences will have to be collected, and certain obstacles have to be overcome before Learning 2.0 will become common practice.

Higher education systems are well on their way in addressing the challenges created by the proliferation of social computing and seizing the unique opportunities to improve learning. Social computing offers equally enticing opportunities for innovative ways of learning in secondary and primary education. In particular, social computing can be exploited to offer alternative methods and ways of learning, supporting learners that are more responsive to visual or audio learning material, addressing the special needs of some learners thus increasing differentiation and personalisation. Apart from accommodating for learners' changed learning styles, social computing applications also support established social and cultural values, like collaboration and sharing, team work and engagement. Additionally, they promote the key competences and skills needed in a knowledge-based society. Thus, education institutions and systems have to pool more resources to bring about change. While there have been many interesting pilot studies and various fascinating school projects using social computing, no truly integrated approaches to social computing are visible.

Vocational training and lifelong learning, while especially susceptive to adaptive learning tools that support the collaboration of individuals not present in the same class, or at least not all of the time, have been neglected in the research literature. Far more experimentation and in particular documentation is needed to start the process of understanding the particular use and impact of social computing in these learning settings.

Since teachers are the key enablers for the introduction of ICT into learning contexts, teacher training, especially for established teachers, will need to be increased to foster the introduction of social computing tools into the classroom. However, apart from concrete training needs, more research efforts should be devoted to the question of how to support collaboration and professional development among teachers by supplying adequate platforms and tools for information retrieval, promoting knowledge exchange, dissemination of good practices, support, collaboration and networking.

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