

# Learning 2.0 – the use of social computing to enhance lifelong learning

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## Abstract

The rapid emergence of social computing applications is changing the ways people connect with each other, exchange and create knowledge in different spheres. In particular, young people entering higher education are integrating ICT seamlessly in their everyday life and call for educational institutions to support their digital learning styles. But also older people are increasingly taking up social computing applications in their work and leisure life. Social computing tools thus have a potential to support both, students in higher education institutions and workers updating their skills in new ways. However, research on the enabling and disabling factors for a successful deployment of social computing is scarce. IPTS is aiming to close this gap with this ongoing study on Learning 2.0 practices. Evidence indicates that social computing applications can support higher education institutions in their efforts to facilitate communication with and among students and staff and to improve learning processes and outcomes. Further research needs to concentrate on workplace learning and professional development as well as on ways of making the benefits Learning 2.0 available to learners of all ages and backgrounds.

**Keywords:** web 2.0, social computing, higher education, lifelong learning, social networking, virtual learning communities.

## 1. Introduction

Over the last years, social computing (SC) applications have seen an unprecedented uptake (Pascu, 2008). A large share of internet users are contributing to social networking and media sharing sites, especially young users (Cachia, 2008). Different types of collaborative content applications, such as blogs and wikis, are used by people of all ages, supporting the collaborative creation and sharing of knowledge between young and old, students and experts, inside and outside organisations and educational institutions (Ala-Mutka, 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, 2007). 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. SC 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).

In order to gather evidence and examples of the successful implementation of SC in learning, the Institute for Prospective Technological Studies (IPTS)<sup>1</sup> launched a study on innovative

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<sup>1</sup> IPTS (Institute for Prospective Technological Studies) is one of the 7 research institutes of the Joint Research Centre of the European Commission, <http://ipts.jrc.ec.europa.eu/>.

“Learning 2.0” practices<sup>2</sup>, i.e. learning practices making use of SC. The study aims to propose suggestions for developing education and training systems to address and benefit from web 2.0 supported learning approaches in order to promote lifelong learning. The study will combine literature research with in-depth case analysis, aiming to assess the innovative and inclusive dimensions of Learning 2.0. This paper reports on the intermediate results of the study based on a literature review and an overview of over 200 Learning 2.0 projects in Europe, focusing on the higher education context.

Section 2 describes three typical ways in which SC tools are deployed in higher education. Section 3 discusses the added value that existing studies are reporting on enhancing learning processes using SC. Section 4 highlights the factors that have been recognized as essential for the successful implementation of SC approaches to enhance learning. Section 5 lists some of the major challenges for social computing in learning and section 6 concludes the paper.

## **2. The deployment of social computing tools in higher education**

There are at least three different – though in praxis overlapping – ways of deploying social computing (SC) tools in higher education: 1. As an **institutional tool**, replacing or extending the virtual learning environment (VLE); 2. 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; 3. as a methodological or **didactic tool** within certain disciplines, courses and classes, with a focus on improving, facilitating and enhancing knowledge acquisition.

### *2.1 The institutional stance*

Some higher education institutions are embracing social networking services primarily to present their institution, to connect with learners and to facilitate administrative procedures and information delivery. For example, the University of Warwick, UK, has set up MySpace profiles that provide information about the university and act as a meeting place for current, prospective and past Warwick students<sup>3</sup>. The Case Western Reserve University in the US uses the “Cleveland Plus” representation in Second Life to 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). While these more unconventional uses of SC tools exist, usually higher education institutions take a more comprehensive stance towards SC, trying to embed different SC tools into a common VLE – either by enlarging or replacing the VLE they previously used.

The University of Edinburgh’s Web 2.0 strategy exemplifies the perceived opportunities of SC applications to improve administrative procedures and the knowledge exchange between staff and students (Franklin & van Harmelen, 2007): 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 can be used to help build a sense of community amongst international postgraduate students prior to arrival. The University of Brighton, to give another example, implemented the social networking application Elgg across the University in September 2006, integrating it with their existing systems, so that the same automated procedures can be used to register students and course communities. Elgg is used formally within courses and modules and less formally

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<sup>2</sup> This study is conducted in cooperation with the European Commission, DG Education and Culture, Dir. A 2. For more information see: <http://is.jrc.ec.europa.eu/pages/Learning-2.0.html>.

<sup>3</sup> [www.myspace.com/warwickuniversity](http://www.myspace.com/warwickuniversity).

to bring together people with similar interests. (Cf. Franklin & van Harmelen, 2007; Childnet International, 2008)

There are many more projects trying to integrate SC tools into the overall higher education institutional architecture. However, most of them are still in a pilot stage, which makes it difficult, at this point in time, to assess factors for failure and success. Drawing on the analysis of several UK universities' experiences with SC applications, Franklin & van Harmelen (2007) point out that universities have to address a wide variety of issues in integrating web 2.0 tools, which impact take-up. In particular, they have to decide whether to link the tools directly to the VLE or make them more generally available. The latter option tends to increase participation while the former has practical advantages. Higher education institutions need to reflect on whether and how to allow and enable people from outside the university to contribute; how to monitor the systems for inappropriate use, and how to deal with such use; how to encourage uptake and use; whether to make activities student or staff led; and, how the use of SC tools will affect learning and teaching.

## *2.2 The social networking stance*

One of the strengths of SC tools lies in their potential to facilitate social networking, bringing together people with common interests and allowing them to exchange knowledge and intensify collaboration. Recently, efforts among researchers to pool resources and benefit from each others expertise using SC services have been intensified. ResearchGATE<sup>4</sup>, for example, is a very recent online social network for scientists aiming at establishing a global Facebook-like community for researchers. Also within higher education institutions, SC tools are used to foster communication and knowledge exchange among learners and between learners and teachers in a more informal manner with the aim of establishing social networks, which improve the communication among participants, offer assistance, orientation and support and ultimately enhance learning processes by creating a positive working atmosphere. (Cf. Franklin & van Harmelen, 2007; Childnet International, 2008).

The University of Brighton, for example, set up "Community@Brighton"<sup>5</sup>, a social networking system for students and staff at the University of Brighton. Students and staff 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. (cf. Franklin & van Harmelen, 2007; Childnet International 2008)

Similarly, the University of Warwick's (UK) service is offering all its students personal blogs on their in-house blogging system, since October 2004; the University of Leeds (UK), to give another example, installed MediaWiki as a wiki tool and Elgg for blogging for staff experimentation in October 2005. The blogging tools were used to supplement learning and teaching, to support staff groups, to share information across campus and to reflect or record progress. (Franklin & van Harmelen, 2007)

The University of Brighton's experiences with social networking 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.

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<sup>4</sup> <https://www.researchgate.net/>.

<sup>5</sup> <http://community.brighton.ac.uk/>.

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. (Franklin & van Harmelen, 2007)

In the case of the University of Leeds the introduction of SC 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.

### *2.3 The learning stance*

There are many examples illustrating the use of SC tools to directly enhance learning processes. Most of these small scale initiatives do not reflect an institutional strategy, but are implemented either within a discipline or subject or in a particular course or class. For example, the “Blog de Pedagogía Comunitaria”<sup>6</sup> 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 collaborative glossary with the most relevant terms of the discipline, guided by the teacher and according to basic rules for participation and collaborative writing.

Similarly, Porto (2008) 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.

These two examples illustrate complex ways in which the combination of different SC tools can lead to new ways of communicating and exchanging knowledge higher education, affecting teaching and learning procedures and emphasizing the collaborative aspect of knowledge generation and acquisition. Currently, experiments with SC tools tend to concentrate on the use of one tool for a single purpose. Personal learning portfolios, implemented in blogs, can, for example, be used to replace traditional assignments in a course, allowing for a greater degree of collaboration among students while respecting personal authorship (cf. Ellison & Wu, 2008). Podcasts, media-sharing services and bookmarking tools can be used in a variety of innovative ways to support teaching and learning (cf. Harris & Park, 2007) and wikis support collaborative knowledge management (Bartolomé, 2008; Alexander, 2006).

The vast number of experiments with SC tools in different courses and subjects indicates a huge potential of SC tools to enhance teaching and learning processes. Due to the novelty of

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<sup>6</sup> <http://pcomunitaria.wordpress.com/>.

the tools, research results on the enabling and disabling factors are still scarce and often conflicting. However, some characteristic properties and conditions for SC tools in enhancing learning can be identified, and will be discussed in the following sections.

### **3. Enhancing learning processes with social computing in higher education**

The outcome of SC projects seems to depend on a variety of factors, many of which are difficult to grasp and not yet well understood. While it may seem difficult to discern a clear pattern of successful usage, it is at least possible to outline different areas in which – at least in some cases – SC tools have been shown to effectively support learning processes. Broadly speaking, four main areas arise:

**(1) Generation and supply of learning material:** SC tools can facilitate learning processes by making study material more readily available, thus supporting different individual learning styles. In particular, RSS feeds together with podcasts assist in making learning material accessible, teacher or course blogs can be used to distribute information and wikis support collective resource building.

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

**(3) Subject specific skills:** SC tools lend themselves to some subject matters, supporting in particular, writing and language skills, but also facilitating the acquisition of more complex and abstract concepts in subjects like mathematics, architecture, philosophy and art;

**(4) Higher order (personal) skills:** Most importantly, SC tools can contribute to the development of higher order skills like reflection, meta-cognition, increasing motivation and individual empowerment, thus enabling individuals to better develop and realize their personal potential.

#### *3.1 Generation and supply of learning material*

SC 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; wikis can be employed to scaffold collaborative knowledge creation. Podcasts are most frequently used to provide students with lecture recordings and additional audio material, but also, e.g. to supply videos of experimental procedures for lab sessions (Franklin & van Harmelen, 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 (Morales & Moses, 2006).

Evans (2008) reports on a study on the effectiveness of podcasting in assisting exam revision, indicating that students believed podcasts to be more effective revision tools than their textbooks and more efficient than their own notes in helping them to learn. Students also indicated that they are more receptive to the learning material in the form of a podcast than a traditional lecture or textbook. Students felt that they needed less revision time, were able to take in more information and were more flexible in when, where and how to learn. These findings are confirmed by Cramer (2007). Although in this case 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.

#### *3.2 Knowledge exchange, resource management and personalisation*

SC 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. The

Penntags project at the University of Pennsylvania and Harvard's H2O are examples of platforms that act as an "outboard memory", a location to store links that might otherwise be lost (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; wikis can be used for the creation of annotated reading lists, subject encyclopaedias, the production of collaboratively edited material, or the collaborative creation of study guides for tests or class textbooks (cf. Franklin & van Harmelen, 2007). The "Soziologische Klassiker" wiki<sup>7</sup>, for example, 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 Public Administration School of Catalonia 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<sup>8</sup>. In these and many further cases, SC 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. It has also been shown that the collaborative work on a joint project that is facilitated by SC applications can significantly increase both the individual's and the group performance (cf. Liaw et al., 2008).

Research indicates furthermore that university students are embracing SC 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 SC tools in particular. One of the most striking features was the extent to which students were capitalising on SC 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.

### 3.3 Subject specific skills

The characteristic properties of certain SC tools can be exploited to support subject specific skills and learning processes. In particular, (1) SC sites supporting the production, publication, sharing and modification of audio, photo and video content can support a more 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.

Furthermore, (2) SC tools support the distribution of visual, audio and video material, making it easier for teachers to supplement their teaching with animated graphics, especially in subjects which draw upon dynamic and/or three-dimensional concepts. For example, **mathematics** professors at the University of Minnesota generated a 3-D animation to

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<sup>7</sup> cf. [http://de.wikibooks.org/wiki/Soziologische\\_Klassiker](http://de.wikibooks.org/wiki/Soziologische_Klassiker).

<sup>8</sup> cf. <http://eapc.continguts.net/doku.php>.

illustrate the complex concept of Möbius transformations and put it on YouTube (NMC & educause, 2008).

Moreover, (3) 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 a Canadian university, 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 one another (Rauch & Wang, 2007). Within its WISE project<sup>9</sup>, 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.

Finally, since wikis and blogs are fundamentally writing environments, they lend themselves to the acquisition of writing and **foreign language** skills. However, research results on the use of writing environments to support foreign language skills indicate that, on the whole, SC 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. 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 undergraduate students in an "English as a second language" (ESL) course, where students were encouraged to co-construct an understanding of an assigned novel and to exchange views with the author. While the collaborative environment enabled the students to practice their writing skills, the interaction between participants was far lower than expected.

### *3.4 Reflection and meta-cognition*

Blogs and similar online journal tools have been shown to successfully promote reflection and meta-cognition. Xie et al. (2008) found that the reflective thinking levels of undergraduate students were increased significantly by weekly updating their individual blogs over the course of one semester. 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 SC tools, among them in particular blogs and reflective work diaries in an Italian post-graduate online master program in education. 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. Also the participants themselves indicated the high usefulness of the work diaries for supporting their learning.

The last two examples illustrate that the effectiveness of online writing environments in promoting reflection in lifelong learning depends to a large extent 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

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<sup>9</sup> <http://www.w-i-s-e.net/>.

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.

### *3.5 Motivation, participation, individual empowerment*

There are a number of studies underlining the potential of SC tools to increase motivation and participation and empower 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. As has already been alluded to in section 3.2, wikis are especially suited to empower the individual to become a co-author of digital content. Research evidence further indicates that wiki environments encourage self-directed and reflection processes (Barth, 2007). However, other SC tools have also been shown to increase self-directed learning processes. 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.

Frydenberg (2007) asked 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. According to de Freitas (2007) immersive game environments also have the potential to empower learners to produce their own materials, share learning experiences and rehearse skills for the real world. They change the traditional role of the tutor towards that of a facilitator, collaborator, producer, and thus facilitate the empowerment of learners, strengthening the role and the interests of the student.

These observations are not surprising given the nature of SC tools. One of the main strengths of SC 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.

### *3.6 Summary*

Looking back at the areas in which SC facilitate learning processes, outlined above, three key features emerge as crucial properties of SC contributing to the development of new learning processes and skills in higher education and for lifelong learning. These are (a) the ease of producing and distributing **multi-media representations** by students and teachers which facilitate learning processes by supplying more easily accessible models and environments to scaffold learning processes; (b) the **collaborative** aspect of SC 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) the fact that SC 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.

## **4. Factors for a successful deployment of social computing in higher education**

The success of SC 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 for the outcome of SC projects in higher education appear to include (1) the **functionalities** of the tools employed, their suitability for

the chosen task and the learners' familiarity and acceptance of the tools; (2) the **students' attitudes** towards the respective SC tools and the extent to which they are able to appropriate them to their personal needs; (3) The participants' background of knowledge and skills, the group structure, and the **form of interaction** and communication among peers; and (4) the **scaffolding**, i.e. way in which SC tools are embedded within the course, including in particular guidance and support, the structure of the tasks and the mentor's ability to provide incentives for participation.

#### *4.1 SC tools: Choice, functionalities, user acquaintance and support*

A series of studies on the enabling and disabling factors for the deployment of SC tools in educational contexts point 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 SC 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) found five attitude factors which influence the efficient use of web-based collaborative learning systems, 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 SC tools or functionalities; (2) provide ample technical assistance and support and encourage students to voice technical problems; (3) choose a SC 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 SC 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 participants.

#### *4.2 Students' attitudes towards SC tools*

A series of studies indicate that student perception and acceptance of SC is extremely diverse, influencing not only their success in using the tools productively, but impacting also their performance in the course. Burgess (2006), for example, 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 SC 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 SC 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), Kerawella 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 SC as discussed above.

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

#### *4.3 Peer interaction patterns*

Research indicates that participants' knowledge and interaction patterns play a critical role in the success of collaborative projects facilitated by SC. 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 SC projects. 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 evolvment 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 SC 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).

#### *4.4 Scaffolding*

Research furthermore indicates that an adequate scaffolding of SC facilitated learning processes through the provision of guidance, incentives and support is crucial for the success of SC experiments. Drawing on experiences from iCamp, a cross-border European collaborative learning experiment using SC 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 utmost 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. 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).

As has been mentioned in section 3.4, if higher order thinking skills are to be supported by SC tools, the role of the teacher or mentor in providing a framework of questions and tasks is paramount to the success of the project. Thus, teaching presence is critical to the success of SC projects in higher education. However, teaching presence may express itself in different ways than in traditional classroom settings. 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 (cf. Blin & Munro, 2008).

### **5. Challenges**

A major challenge in developing better approaches with ICT, in this case social computing, is the possibility of increasing the divides between those with and without access and skills to these applications. When considering lifelong learning, especially some of the groups in need for learning, such as older people, unemployed people and workers with low education levels, tend to have reduced internet access and skills compared to the European average (cf. Eurostat data 2007). Attention needs to be put to closing the gap of basic access and ICT skills for all learner groups, enabling them to benefit from Learning 2.0 approaches.

When considering learners in higher education, young Europeans are actively using the internet and have good basic internet skills (cf. Eurostat data 2007). However, research results indicate that, for example, students with dyslexia are not able to benefit from text-

based internet learning approaches (Woodfine et al. 2008). Learners with disabilities might likewise face accessibility problems when using SC tools (Fisseler & Bühler 2007). 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 (Punie & Ala-Mutka, 2007).

As illustrated above, many decisive factors for the successful implementation of Learning 2.0 practices are related to teaching approaches and the teachers' ability to implement SC. This has been shown to be true with the effectiveness of ICT in education in other studies as well (Law et al., 2008). Hence, a challenge is to nurture the emergence of innovative learning approaches by ensuring that educators are aware of their potential, and support them in curricula, teaching guidelines and teacher training.

## 6. Conclusion

Social computing tools exhibit a huge potential for higher education institutions to face the challenges of changing learning contexts and to support lifelong learning. From an *institutional stance*, these tools can assist in better addressing the needs of current and prospective students. From a *networking perspective*, SC can serve as a means of establishing a lively and productive community of learners and researchers for knowledge creation and exchange. As far as *learning* is concerned, experiments with SC applications in higher education indicate a significant potential for enhancing learning processes and outcomes. SC tools in particular (1) facilitate the supply and dissemination of learning materials, (2) improve personal knowledge management and the generation of personal and collective learning resources, thus fostering the personalisation of learning processes; (3) support the acquisition of subject specific content; and (4) promote higher order skills like reflection and meta-cognition, motivation and participation, contributing to the empowerment of the learner.

However, on early evidence, a *structured approach* is critical for the success of Learning 2.0. Educators need to carefully select SC applications fitted to their learning objectives, their learners' experiences, attitudes and interaction patterns, as well as the overall framework in which SC is employed. The tasks implemented through SC need to be transparent, relevant and targeted to successfully improve student achievement and performance. The tools need to be embedded in a supportive environment of guidance and support to yield positive results. Further research should concentrate on identifying good practice, isolating factors for success and failure. Special attention needs to be paid to overcoming digital divides and enabling Learning 2.0 to enhance lifelong learning for everyone.

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