

## **Blended learning with everyday technologies to activate students' collaborative learning**

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### **Abstract**

*Schools are facing challenges to meet the demands of the information society and the student generation of today. Not only are students carrying their mobile phones everywhere, they are also familiar with different online environments, especially social software. This situation can be seen both a challenge and a chance for schools, as mobile technologies and social software can be used as tools for building flexible learning environments to foster students' collaborative learning. This paper examines the possibilities of mobile technologies and social software in the contexts of blended learning and collaborative learning theories. The paper also provides two concrete examples of how these possibilities have been put into practice in higher education, namely teacher education. It provides ideas for the use of mobile technologies and social software in teaching and learning.*

**Keywords:** *Collaborative learning, technology education, ICT, shared notes, wiki, blended learning, net generation.*

### **Introduction**

This paper presents the background and two cases of the development work currently conducted at the University of Eastern Finland, School of Applied Educational Sciences and Teacher Education. The aim of this development work is to design and test new ways of teaching and learning using mobile technologies for supporting collaborative learning. Information and communication technologies (ICT) provide several possibilities for developing teaching and learning toward a more collaborative direction. Especially with mobile technologies, i.e. wireless networks and portable tools such as mini laptop computers (netbooks), we can expand face-to-face teaching with possibilities of different online environments, specifically social software. In this way we can easily and flexibly take advantage of ICT in various learning situations. In other words, the use of computers is not limited only to computer classes.

The information society poses new challenges for schools and teachers (Scardamalia, 2001; Starkey, 2010). Schools are adopting new technologies and changing their practices rather slowly indicating a need for well functioning pedagogical and technological practices (Scardamalia, 2001). Schools are also challenged by today's

students who are described as the net generation and digital natives, referring to the notion that they have lived their whole lives surrounded by a variety of technologies (Tapscott, 2009; Prensky 2001). Based on this notion there are assumptions that students are interested, capable and willing to use different technologies. Assumptions indicate that students are familiar with tools of social software (Hartman et al., 2007). According to Naismith et al. (2004), today's students more and more frequently bring their personal mobile technologies i.e. mobile phones, with them to the classrooms. These assumptions provide possibilities but also challenges for schools: how can schools take advantage of students' assumed skills, and how should teachers react to students bringing personal mobile technologies with them to schools? Are students' mobile phones a threat disturbing teaching or possibly an advantage, providing new tools for learning?

This article is to describe two different ways of using mobile technologies and social software to support students' collaborative learning. The aim is to stress the possibility to create flexible, collaborative learning environments using ICT where needed instead of traditional computer laboratories. These two cases provide examples for schools to develop to better meet the challenges of the knowledge society and the assumed net generation. They also provide ideas for developing teaching and learning practices to take advantage of everyday technologies, i.e. mobile technologies and social software, so as to foster students' collaborative learning.

### **Theoretical background**

The goal of blending traditional teaching and learning situations with technology are specifically to support students' and student groups' unique interpretations of the content and use these as a source for deeper learning and discussion. In this study, the aim of blending face-to-face teaching and learning situations with various technologies, especially social software, has in particular been capturing students' and student groups' unique interpretations to be utilised as a source for further learning and discussion. Next, we will consider the roles of collaborative learning, social software and blended learning and continue with presenting two blended learning case studies where face-to-face teaching and learning was combined with everyday technologies such as mini laptop computers and social software.

### **Collaborative learning**

The pedagogical framework for this developmental work mainly derives from collaborative learning theories. According to Dillenbourg et al. (1996), theoretical influences of collaborative learning mainly draw on socio-cultural and socio-constructivist approaches for learning. Both of these approaches emphasise students' collaborative work with their peers and active participation. Socio-cultural theory stresses the role of psychological tools, e.g. language, concepts, theories, use of software etc. as part of learning. Learning is described as participation into communities and in this way appropriating the tools. Appropriation refers to culturally mediated practical intersubjectivity, a process where both students and teacher have an active role in creating the learning environment with their earlier knowledge and ideas. Students are not just passively memorising facts presented by teachers but using their earlier knowledge and experiences to construct new

knowledge. In the process of appropriation, students develop the ability to carry out actions without any apparent external assistance (Dillon, 2004; Rogoff, 1995).

Socio-constructivist theory also emphasises collaboration, although concentrating more on an individual's knowledge structures that direct a person's awareness, interpretation of new situations and information. An essential part of learning can be described as cognitive conflicts, meaning situations where earlier knowledge structures are not sufficient or are contradictory to a new situation. In these situations, knowledge structures demand updating, searching for new knowledge or an explanation in order to assimilate or accommodate knowledge structures to respond to and work in a new situation. Collaborative situations with several opinions and different interpretations of the content to be learned provide triggering situations for cognitive conflicts and also, for locating cognitive gaps that need to be fixed. (Dillenbourg, 1999; Weinberger, 2003)

### **Social software**

From the point of view of socio-constructivist and socio-cultural approaches, mobile technologies and especially social software provide interesting possibilities for developing teaching and learning toward a more collaborative direction. While Shirky (2003) defines social software broadly as all the software that supports group interaction, other definitions are more specific. For example, Boyd (2003) specifies that social software supports conversational interaction and social networks and also social feedback. Dron (2007) defines social software as software that allows social construction of meaning and new way for collaboration. According to Alexander (2006), social software sets users in a more active role compared to traditional passive ways of using web pages. Instead of only providing readymade material and web pages, social software provides tools for creating and publishing new material. Users are not only consumers but instead, they create and participate, acting simultaneously as readers and writers (Sinclair, 2007; Maged et al., 2007). According to Owen et al. (2006), publishing material also enables communication between many people. Publishing and communicating between many allows working as an open process.

The above mentioned features of social software are coherent with features of collaborative learning (Ferdig, 2007). Theories of collaborative learning emphasise participation and creating materials which supports bringing up and sharing students' unique knowledge structures and knowledge gaps. Furthermore, this provides environments and tools for triggering cognitive conflicts by supporting students' exchange of ideas and interpretations. Similarly, social software allows students to actively participate, communicate and create their own materials. Social software can be also used as an environment for common projects, to foster communities of practice. Different types of social software can be used in several ways for supporting and triggering the mechanisms of learning described in section 2.1.

White (2007) has categorised tools of social software into 10 categories based on their purposes, such as for example communication, file sharing, blogs, social networking, collaborative authoring and image sharing. Social software can be used to support online and face-to-face teaching. Mobile technologies and wireless techniques, in particular, allow the creating of learning environments that provide new possibilities

for students' collaborative work and capturing the unique learning and thinking processes in several kinds of environments.

### **Blended learning**

As social software provides interesting possibilities for building collaborative learning environments, the wireless networks allow flexibility in setting up learning environments where needed. Connecting face-to-face teaching and learning with ICT refers to blended learning, i.e. different ways to blend face-to-face teaching and different online tools. According to Garrison and Kanuka (2004), the simplest model of blended learning "is the thoughtful integration of classroom face-to-face learning experiences with online learning experiences" aiming at taking advantage of a synchronous face-to-face situation and the asynchronous, text-based Internet. Typically, this means traditional face-to-face teaching or lecturing with additional materials and learning assignments online, using different learning management systems, such as Moodle. Köse (2010) provides a more advanced way of utilising the idea of blended learning by connecting the possibilities of face-to-face situation and online environments in several ways, both simultaneously and non-simultaneously.

Köse (2010) also takes advantage of different social software as tools for providing possibilities to produce material, to demonstrate their knowledge and to communicate. Typically, net generation students are quite familiar with social software. Thus, from the blended learning point of view, social software provides interesting opportunities to support collaborative learning (**Ferdig, 2007**). Also, an important aspect is that social software can be accessed and used online without installing specific software.

In our two cases of blended learning, utilising social software and ideas related to those provided by Köse (2010): The aim of bringing in online environments is not just to provide extra materials or separate assignments but to add a new "layer" to the face-to-face teaching and learning situation. The purpose is to use different online environments, and tools of social software, actively during the face-to-face session in order to capture students' thinking and their work. With social software the materials produced by students and teacher are also available after the class. Based on theories of collaborative learning, students' unique interpretations and ideas, ways to understand and also the resources produced by student groups are vital for learning, causing cognitive conflicts, locating knowledge gaps and providing possibilities for students' appropriation (Dillenbourg et al., 1996; Dillenbourg, 1999). With social software, we can better capture these unique ideas and use them for further learning and discussion. We call this advanced approach *Blended Learning 2.0*. Altogether, blended learning (2.0) provides interesting possibilities when considering the different ways to use mobile technologies. Using mobile technologies allows creating flexible ways to support learning, varying from simple drill-and-practice activities to collaborative learning practices (Naismith et al., 2004). With mobile technologies, i.e. wireless connections and portable equipments, we can take advantage of different online environments outside traditional computer laboratories, and have contextualized real life learning experiences supported by technologies (cf. Vesisenaho, 2009). The situation is especially interesting when considering today's students and today's technologies. It seems that students are more and more bringing

mobile technologies with them to classrooms and teachers should find ways to take advantage of that (Sharples, 2003).

### **Methodology**

This study outlines two cases of blended learning using social software. The aim of both cases is to foster students' collaborative learning. Both cases aim at supporting face-to-face teaching and learning by taking advantage of students' participation as producers of content individually and in small groups.

The first case is a lecture situation where students wrote their lecture notes into a shared online environment – a microblog. In the second case, students worked as groups, conducting laboratory experiments and writing their findings into a semi-structured wiki-environment. In both cases, a face-to-face teaching and learning situation was “expanded” to online environments using mini laptop computers in wireless networks.

Students' opinions and experiences of the two cases were analysed using both qualitative and quantitative methods. In case 1, students' online lecture notes were categorised, and reflections concerning the shared lecture notes approach were collected by interviewing four students after the course. Interviews were recorded and analysed using an open coding approach (Gibbs & Flick, 2007). The aim of the open coding was to catch students' experiences about the course and the use of shared lecture notes without ready-made categories to stress students' own experiences and ideas. Notes were further analysed using discourse analysis (Roth, 2005). The aim of this analysis was to describe different types of lecture notes produced by students.

Experiences from the second case were analysed using quantitative methods. Research material was gathered using an online questionnaire containing 40 Likert-type statements scaling from 1 to 5 (1=strongly disagree, 5=strongly agree). The analysis of data was undertaken using principal component analysis, aiming to condense information (Afifi & Clark, 1996). Separate statements were condensed into four subscales. Coefficients of reliability for all subscales were satisfactory; Cronbach's alpha values were over .60 in the case of each new variable (Metsämuuronen, 2006).

### **Results**

In this section, we provide more details of the two case studies and outline students' experiences of these cases. These cases can be seen as our first steps toward developing blended learning with social software for supporting collaborative learning. These results are also used for further research and development of the approach.

#### **Case study 1: Shared lecture notes**

**The first case** tested the idea of constructing shared lecture notes using mini laptop computers and social media. It consisted of nine contact sessions of early childhood pedagogy. The aim of this experiment was to find ways for capturing students' unique ways to interpret the lectures and to publish the interpretations for all the students as a further resource for learning and as materials for triggering cognitive conflicts. Each student brought their unique knowledge structures to lectures and these structures are

the resource by which they understand, or do not understand, the contents of the lecture. Because of unique knowledge structures, the interpretations will be unique also: they may be the interpretations that the teacher intended but they may also differ including false, or misunderstood interpretations. Even more, the interpretations could be new, meaning innovative ways to understand the lecture, based on student's earlier experiences. The interpretation could also be elaborated by or with fellow students.

The number of the primary teacher students varied from seven to twelve in the small group contact lectures. All of them were female. Each student had a mini laptop computer connected to the Internet using wireless network and used a micro-blog called Qaiku (<http://www.qaiku.com/> cf. Twitter). Qaiku provides possibilities for making notes of maximum length 140 characters (Figure 1). All students could see each others' notes. In the micro-blog, notes appear as a list, the latest comment on top and the list refreshes when a student posts a note or clicks the refresh button. A feature of the Qaiku micro-blog is also the possibility for students to retrieve a list of their own notes, making it possible to save one's own lecture notes. The teacher also had access to Qaiku, providing her with the possibility to see the students' notes. At the beginning of the course students were informed about the idea of making shared lecture notes and the possibilities and functions of the Qaiku micro-blog. In addition, teacher also provided students with paper copies of the PowerPoint slides of the lecture.



*Figure 1. Qaiku micro-blog as implemented in the study*

Typically, different ways to understand lectures have remained as students' own property but now with a shared environment for lecture notes, students can see different ideas and interpretations by their peers and use them as a source for learning. This method also provides interesting possibilities for teachers as they will be able to see how the content of their presentation reflects in students' notes. Teachers are able to see how their method works and whether there is a need for re-evaluation or changing teaching approaches.

Based on the interviews after the pilot study, it seems that students were comfortable with the idea of sharing their notes with their peers. This aligns with the assumptions concerning the net generation who are assumed to be ready to post their ideas and thoughts online (Tapscott, 2001).

Although students were comfortable with the idea of sharing their lecture notes, not all students were as productive. During the study, altogether 367 notes were produced and the amount of notes between students varied notably from over a hundred per student to hardly any notes at all for some students. A typical number of notes per student was 20 to 40. The notes could be divided into five categories:

- reproducing lecture content,
- summarizing,
- developing or reproducing lecture content,
- connecting key concepts, and
- questions arising from lecture content.

Reproducing and summarising lecture content present a rather mechanical way of note taking. Connecting key concepts and developing lecture content required student's further thinking highlighting student's unique interpretations and ideas. Also, questions arising from lecture content represented student's reflective thinking. The content of the notes varied, but the further development of peer students' ideas was scarce.

The interviews with the students indicated that the main reason for not writing notes was the software used. Students were not satisfied with suitability of the Qaiku microblog for writing lecture notes. The main difficulty seemed to be the inconvenience of writing the notes online separately from the paper copies of the PowerPoint slides. Based on these comments, the next step would be to find better suited software that would allow students to write their notes connected to electronic PowerPoint slides. This way, students can download or print teacher's slides with students' notes, comments and ideas after the lecture.

### **Case study 2: Semi-structured wiki-environments**

**The second case** tested mini laptop computers and wiki-environments for scaffolding collaborative learning in biology class. The aim of this case was to support students' participation in laboratory-like work of biologists and to become familiar with the tools of the biology community. The aim was thus to support students' appropriation of psychological tools of the biology community, e.g. ways of modeling nature's phenomena. The semi-structured wiki-environment provided students with scaffolds to complete their project, but it also provided possibilities for students to be creative in transforming the wiki-environment as their own environment. The wiki-environment gathered the learning process and also provided a shared environment for building a shared understanding. During a 6 hour laboratory session, students prepared a fish and "modelled" it in a wiki-environment using digital cameras, drawings, graphic software and text. There were altogether 114 mainly primary teacher students (75% female) in this study and they worked in groups of three to five students. Each group had a mini laptop computer and a digital camera. Each group also had their own, semi-structured wiki-environment on the topic of modeling as a

tool for biologist. The wiki used in this study was the free Wikispaces.com that enables a book-like structure so that the wiki contains several “pages” (Figure 2). The wiki-environments were set up by teachers beforehand to introduce the idea of modeling used in biology for describing nature’s structures and phenomena. They also included specific task instructions. Students, then, worked with their group preparing the fish, following the semi-structured instructions and scaffolds in the wiki-environment.

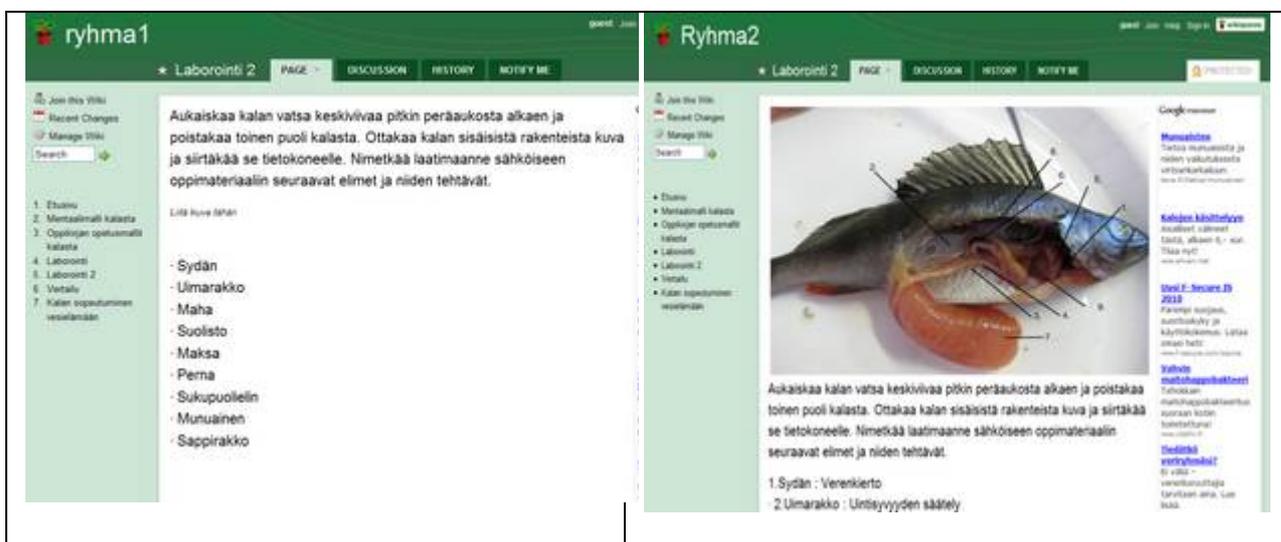


Figure 2. The semi-structured wiki: Before – after students' work

After the study, students (N=109-113) responded to an online questionnaire. The questionnaire contained 40 Likert-type statements (1 to 5) concerning the use of ICT and wiki as part of the course, 1 indicating strong disagreement and 5 indicating strong agreement. The questionnaire data was analysed using principle component analysis in order to condense research data into subscales (Table I). Two of these were of particular interest and focused on this research, subscales concentrated on students' experiences of using ICT and wiki environment for learning: *Contextual support for learning* and *Usability of technology for studying*. Tables II and III provide a more detailed insight into these two components related to students' opinions on using ICT and Wiki environment as tools for learning in this case study. Students saw that the technology was motivating and positive for learning (mean values between 3.5-3.7). They also thought that the approach slightly supported collaborative learning (mean 3.2), and that the tools of the experiment were suitable for the content and learning purpose (mean 3.7-3.8). Further, the environment supported understanding of the topic (mean 3.7-3.8).

Table 1. The components on how the students saw technology supporting during the course

Component	Alpha value	Mean values	Std. deviation
Visual modeling by ICT	$\alpha = 0,931$	3,99	.615
<i>Contextual support for learning (wiki)</i>	$\alpha = 0,845$	3.86	.672
<i>Usability of technology for studying (e.g. mini laptops as tools)</i>	$\alpha = 0,726$	3.59	.657
Intentional learning	$\alpha = 0,646$	3,36	.552

Table 2. Usability of technology for studying (1 = strong disagreement, 5 = strong agreement)

<b>Usability of technology for studying</b>	<b>Mean</b>	<b>Std. deviation</b>	<b>N</b>
Learning with ICT was meaningful	3.6	.94	109
Learning with ICT was fun	3.6	.93	109
Learning with ICT was motivating	3.6	.89	109
Learning with ICT was not frustrating (*)	3.7	1.02	109
Learning with ICT suited well with my ways of learning	3.5	.94	109
Mini laptop computer used suited well within the course	3.7	.93	109
The use of ICT encouraged me to participate into collaborative learning activities	3.2	.90	109
The use of mini laptop computers was not just an useless extra (*)	3.3	.85	109
The use of mini laptop computers suit well with studying in high schools	4.0	.79	109
Cameras and mini laptop computers did not interrupt my concentration to the content (*)	3.9	.96	109

(\*) statement reversed

Table 3. Contextual support for learning, Wiki environment (1 = strong disagreement, 5 = strong agreement)

<b>Contextual support for learning</b>	<b>Mean</b>	<b>Std. deviation</b>	<b>N</b>
Semi-structured wiki environment helped me to understand the topic	3.8	.87	113
Semi-structured wiki environment helped me to understand the central concepts of the topic	3.7	.87	113
Used software (wiki and picture editing software) suited well with the studied topic	3.8	.85	113
Wiki environments designed by teacher did not restricted my work during the course (*)	4.1	.84	113
Wiki environments designed by teacher suited well with the topic	3.8	.85	113

(\*) statements reversed

The results indicate in general students' opinions concerning the ICT and wiki-environments as part of their course were mainly positive. The mean values from both subcomponents (Table II and Table III) were above three, indicating positive reactions for using mini laptop computers combined with wiki-environment. Especially positive was the suitability of mini laptop computers for high school learning (mean 4.0).

These results provide an overall picture about students' ideas and opinions about the pilot. It seems that from the students' point of view, this way of using mobile technologies and social software seems plausible. One of the next steps will be joining further analyses of students' learning outcomes regarding the content area to these results.

## **Conclusion**

While set computer laboratories are functional and well justified in today's schools, there are several ways to integrate ICT in a wider variety of ways into the daily teaching and learning situations at schools. Where today's youth, the net generation, are swiftly moving within the information society with all the possibilities of wireless networking and social software (Tapscott, 2009), schools are only slowly finding the

advantages of these everyday technologies in authentic teaching and learning. Current everyday mobile technology allows

- (a) the bringing of ICT from the computer facilities to where it is needed, and
- (b) social software to bring a new dimension to collaborative learning.

The two case studies introduced show how face-to-face teaching can be blended with wireless technologies outside computer laboratories (cf. Naismith et al., 2004). Both cases describe ways to support collaborative learning by setting student in the role of producer of content. This role is essential for collaborative learning where elaborating unique ideas and interpretations are brought up as source for conversation, as source for further learning (cf. Dillenbourg et al., 1996). For this purpose, social software is applicable as it supports interaction and users' communal active role (cf. Alexander, 2006). Technologies and social software allow capturing students' ideas and unique interpretations and using them as a further source of advanced steps of learning, even improvisation in learning. Particularly lecture-based teaching situations benefit from mobile technologies and social software as they provide a means for realizing theories of collaboration which previously has been challenging.

Mobile technologies and social software allow new ways for designing teaching and learning situations. We see that the simplest model of blended learning, "the thoughtful integration of classroom face-to-face learning experiences with online learning experiences" as suggested by Garrison and Kanuka (2004) can be further elaborated. Our suggestion for Blended Learning 2.0 is that "thoughtful integration" means stressing students' active and collaborative role, i.e. drawing on the theories of collaborative learning. Mobile technology and social software could be used as tools for blended learning, for triggering the mechanisms of collaborative learning as suggested by Ferdig (2007).

Further research concerning different ways and different software for supporting students' collaborative learning is needed. Mobile technologies and social software pose challenges especially for teachers to design and conduct courses in alignment with collaborative learning theories, taking advantage of students' unique ideas and interpretations. However, the challenge is to be met as it is important to be aware of the possibilities and have the capability to respond to the demands of the information society and the net generation.

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