ICT SUPPORT FOR COLLABORATIVE LEARNING - A TALE OF TWO CITIES

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ABSTRACT

Based on experiences in teaching service design in a blended learning context, we developed an electronic learning environment (ELE) including features that turned out to be suitable for learners from different cultures. We used this ELE in Italy and in China. Students were guided through collaborative learning and mutual teaching. Students were supported by the teacher with the help of didactic technologies in a learning process that merged theoretical understanding with design for real life applications in their culture. In both student groups, our intended improvements seem to be acknowledged by the students' opinions.

KEYWORDS

Blended learning, e-learning, action research, electronic learning environment, collaborative learning, service design.

1. INTRODUCTION

Our research on ELE is performed in practice, during teaching and working with students. The only type of research possible in this circumstance is action research: we analyse problems, we consider relevant literature as well as the results of our own previous design, we plan improvements in our concepts of ELE and we apply them. Consequently, we assess our actions and start a new cycle.

The current report is an account of another cycle regarding the support of blended learning in the domain of service design. Previously (Consiglio and van der Veer, 2011) we discussed the intersection between technological innovations and adoption in society for the purpose of adult learning. Our aim was to develop an e-learning environment, to be available both as a standalone-learning marketplace and as support for classroom-based learning. Our intention was to use the open source process to improve the quality of learning anytime and anywhere and make it as flexible as possible towards the culture, learning style and age of the learners. Van der Veer, Consiglio, and Benvenuti (2011) showed how to adopt features in the ELE starting from the students' goals, in order to support them (and the other stakeholders in the learning process) to work in a real life context. These studies were a first attempt where the development of an ELE took place in a single context, a class of about 26 bachelor students in a Curriculum of Architecture and Design of an Italian University in the city of Alghero (Sardinia).

We took the chance to continue our action research approach by teaching the same course in a new context with an unknown cultural component: a group of 10 master students in a university in China in the city of Dalian, starting from the same ELE concept and the same learning resources. Our intention was to explore whether one can design a flexible ELE suitable for teaching in different educational cultures. We discuss our experiences with both cases where the same teacher adopts this technological resource to teach Service Design to Italian and Chinese students.

2. ICT AND E-LEARNING, OPPORTUNITIES FOR HIGHER EDUCATION

Our focus is on University level education and adult learning. At this level, learners and students are able and willing to set their own learning goals (Jones et al., 1994).

As far as they participate in a curriculum, the teacher and the educational institute will set learning goals as well. In well-designed education, all these learning goals will be consistent and motivating (Williams and Williams, 2011). The type of e-learning that we consider is a learning process where the teacher, the school, and the student all agree on the main goals, and where the students have specific goals related to their personal interests and context.

The development of information society gave rise to dynamic changes in the different tools and technologies available for support of the learning process (Redecker et al., 2009) . A couple of decades ago the idea of education provided through the Internet was only just in the beginning. Nowadays e-learning is a widespread practice. E-learning techniques allow delivering educational content through the Internet. For the user-learner this represents a flexible learning solution, highly customizable and easily accessible. For the user-content expert or the user-teacher this represents an equally flexible solution for collecting, formatting, structuring, updating, and maintaining learning resources. In this vision e-learning environments cover a wide range of resources, practice and training applications, and virtual classrooms (Sampson et al., 2002)

In rare cases it seems useful to replace traditional education by e-learning, e.g. when geographical distance or time-zone differences prohibit face-to-face teaching. In many cases it seems useful to complement traditional classroom teaching with e-learning, since it allows learners to (partly) work in their own pace, time, and context, to choose for individual or group learning, to decide on the amount of practice they need or the sequence of studying content. This combination is often labeled *blended learning* (Garrison and Kanuka, 2004).

Developing e-learning requires the combination and interaction between learning activities and teaching activities through electronic media. An e-learning environment should provide up to date resources as well as technologies, have a high level of usability and, above all, be adapted to different modes of learning, like inquiry-based learning or collaborative learning.

Effective teaching and learning through e-learning depends on many factors. We will discuss the educational and management viewpoint and refer to the barriers and preferences related to time and location.

2.1 Educational Viewpoint

The development and implementation of the e-learning part of a blended course should consider at least three closely related fundamental aspects: course structure; didactic methodology; and planning of different learning activities

The teaching strategy should consider that each student is different both in terms of cognitive and experiential learning and in availability of personal learning time (Boettcher, 2007). ICT-based interactivity may in fact accommodate the variable individual needs of teacher and student and the needs of communication and collaboration between teacher and student, as well as among students. It also may support flexible management of educational activities and flexibility in choosing place and time.

ICT allows a flexible combination of, and alternation between, synchronous and asynchronous communication, allowing all stakeholders to communicate with each other in real time through the use of tools such as chat or videoconference, as well as to participate individually at will any time using forums, blogs, wikis, or e-mail. Providing this multitude of opportunities for communication enhances participation, collaboration and involvement in the learning environment.

2.2 Management Viewpoint

E-learning allows extensive use of multimedia for the content to be delivered (audio, video, web pages, podcasts, etc.) and of environments suitable for learning management (LMS, Learning Management System) or content (LCMS, Learning Content Management System).

2.3 Barriers and Preferences

To overcome barriers of time and place that prevent access to education, students can attend courses they need or like even in remote areas far from universities, or at time available for those with full time jobs or who live in remote time zones.

E-learning also allows students to choose their own preferred moments (just-in-time learning) and their own pace, a valuable commodity in the case of students who must balance learning with work commitments and / or family.

2.4 Opportunities

New technology provides opportunities for, and triggers, modification of the methodological approaches and of the roles of teachers and students within the educational process. We take a constructivist perspective according to which learning is a dynamic process, which takes place either through the active engagement of the student or through interaction with others (Bruner, 1960). With e-learning opportunities the teacher's role increasingly develops into being a facilitator and learning tutor, an expert in communication, and a manager and monitor of knowledge acquisition, while at the same time fostering socialization and group dynamics. In this way, the teacher (or learning resource designer) helps students to build their personal knowledge and to contribute actively to the shared knowledge of the group. E-learning is effective when teacher-tutors, content experts, and students develop an interdependent creative and productive relationship.

3. THE COURSE DOMAIN: SERVICE DESIGN

Services are different from products that can be sold. Services are being provided and at the same time being used. After the service is provided the client does not own it, even if the service has been paid for. Production of the service and making use of it occur at the same time.

Service design means planning and organizing the different providers, the infrastructure, and the relevant communication. Relevant and appreciated services are often based on organizing multiple stakeholders who all contribute to the total service. A well designed service will provide, both a needed and appreciated help for the clients of the service, and a positive experience of being helped in a way that fits the clients' context and actual needs.

The activity of designing service was originally considered as part of the domain of marketing and management. Shostack (1982) proposed the integrated design of material components (products) and immaterial components (services). 2004, Service Design Network was launched (www.service-design-network.org). From this we learn that service design can involve the design of artifacts (physical and non-physical) as well as the organisation of communication, of the situation and environment and of ways to provide and to use the service. Because the actual service exists (only) at the moment of provision and use, designers can not exactly specify them: service design only can suggest scripts to the stakeholders and users involved. Service Design requires: identification of the stakeholders, including users; definition of the requirements for the service and the organizational structure; description of service scenarios with roles for the stakeholders; and representation of the service to communicate to all stakeholders and to guide the provision and use during the actual service.

4. THE CONTEXT: TWO CITIES

The first instance of our course in service design was taught in the spring semester of the year 2009/2010 to 30 bachelor students at the faculty of Architecture, University of Sassari (Italy), in the town of Alghero. In Alghero there is a tradition of guest students in the group, who manage by trying to communicate in Italian. English, spoken by guest professors, will be understood though speaking or writing in that language is somewhat problematic for part of the students. In our case the Dutch teacher was physically present 10 hours (in 2 days) every fortnight during the semester long (250 hours) course while in the remaining time students worked in teams of 4 or 5, and submitted their homework by email. The University provided an Italian speaking tutor who attended all classroom meetings and was available for the students at scheduled times when the teacher was not in the country, to support the students in understanding the learning resources provided by the teacher and the slides of the lectures.

Our course was structured along generally accepted approaches of user centred learning, adapted to the domain of Service Design, where collaboration with different types of stakeholders with varying goals, cultures, and professional visions is a main challenge. At all stages of the course, and all phases of the design process, we asked the student to consider and elaborate 3 aspects: (1) the context of current activities, including all relevant issues related to stakeholders; (2) the design space with all design question to be answered, all possible options, and all relevant criteria; and (3) creativity in considering ideas as well as combinations of ideas from all stakeholders concerned.

The general design method introduced by the teacher was based on DUTCH (Design for Users and Tasks from Concepts to Handles; Van der Veer and van Welie, 2003).

During this course face-to-face meetings between teacher and student occurred at relatively sparse periods when the teacher was in town. Alternative communication was by email. In addition, some of the students could not always be present when others presented work in progress, and expressed the wish to be able to still view their peers' presentations. We identified several issues that required improvement, related to the fact that synchronous communication only was possible during a small part of the time: during the course period, the students repeatedly showed a need for a preview of the structure for the remainder of the course, as well as a need for reviewing parts that were discussed before. Also, the students told us it would be appreciated if all content, as well as pointers to additional resources, could be found at a single central location that would be accessible any time. Summarizing: the students hinted at a central website for both review and preview as well as for all additional resources and pointers.

4.1 A Pilot Electronic Learning Environment

In the next iteration of the same course (academic year 2011/2012) 25 students were involved in a blended course. Based on the first empirical results we developed practical guidelines for the ELE, for the interaction of teachers and instructional designers with the ELE, as well as for the structure and format of learning resources in it. In order to support students to find their way in the ELE, a concept map was used to structure the digital environment, based on the lesson plan used in the previous year face-to-face course, see Figure 1.

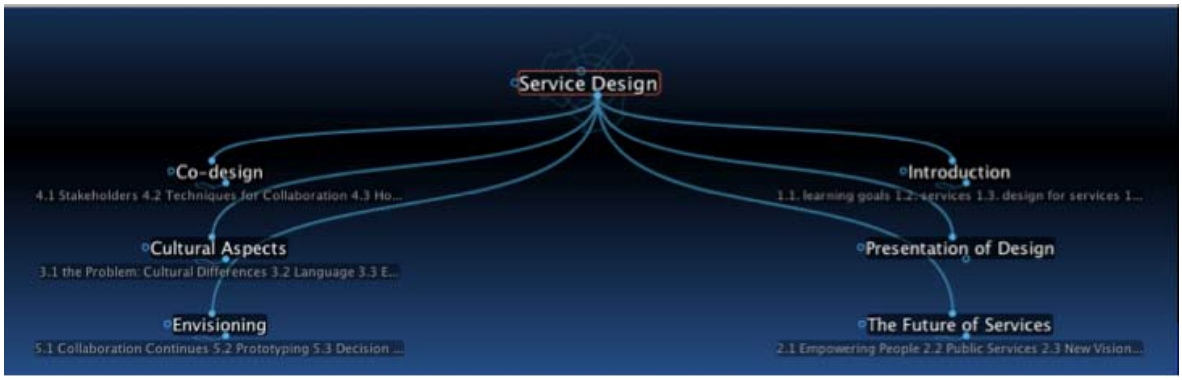

Figure 1. Concept Map of the ELE that Reflects the Structure of the Course

The structure of meetings with the teacher, teamwork, and availability of a tutor was identical to the previous version. The videos of the classroom meetings were uploaded to the ELE immediately after they had been captured see Figure 2. The alternating classroom meetings, team meetings, and the (individual as well as team based) use of the learning environment resulted as an opportunity for blended learning.

Another instance with roughly the same version of the course on service design was taught in China, at a group of 10 master students at the Dalian Maritime University, in October 2012. One of the students was not Chinese, there was a history of international guest professors, and all were used to speak English in the group and during lectures. In this case, the teacher was available during 7 consecutive days (including weekend days) for periods of 2 hours while the students were supposed to (and actually did) work for about 8 hours or more (60 hours in total). The ELE was improved based on or analysis of the previous version in Italy. There was no tutor available, and the students were completely happy to deal with the language issues involved.

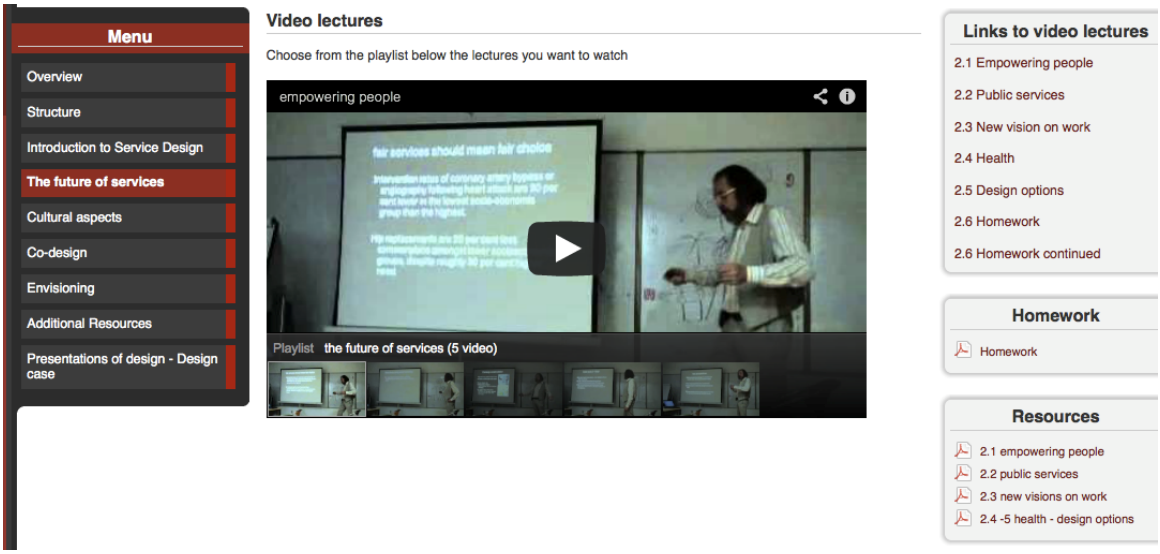

Figure 2. Lecture Videos Were Available Immediately at the ELE

5. THE COURSE WITH ELECRONIC LEARNING ENVIRONMENT

5.1 Global Approach

Like in the first version of the course (not supported by an electronic learning environment), the teacher left most of the teaching to the students. In fact he only explained a small number of service design techniques and tools giving pointers to resources, and each student got the task to find the best description of the other tools and techniques the teacher pointed to and to teach to the other students why and how to use these, the benefits, issues and problems, and the conditions for application, The students' presentations were put on a dedicated YouTube channel as a resource during the rest of the course. In order to stimulate the students to improve their mutual teaching, some *excellent* student presentations were identified, and the students got the assignment to review these and to analyze why this examples of teaching made sense to them, both from the content point of view and from the presentation (i.e., knowledge sharing) point of view.

5.2 Designing a Flexible Electronic Learning Environment

We designed the supporting ELE in two parts: technology and content. The first part is the technology of a standard learning environment, the second part is formed by the structure of the content by the learning materials. The service is designed to inform, inspire and facilitate the students in their classroom based learning, collaborative learning and in free individual learning. The content structure and format complement the efforts to provide user centered interaction design, offering a holistic learning experience.

Our system was structured based on the lesson plan used in the previous year for a fully classroom based learning process. It was expanded with additional opportunities for exploration, communication within teams and between multiple teams and teacher. We provided additional resources like online exercises and multiple different modalities of presentation of knowledge. E.g., we developed mini lectures (10 minute long teaching of a single technique like Cognitive Walkthrough, Moodboard, Persona) made available in different modalities: a) full text with pictorial illustrations; b) video recordings of actual teaching and c) slide shows with voice-over.

The alternating classroom meetings, team meetings, and the (individual as well as team based) use of the learning environment supported integration with online learning activities, resulting in opportunities for a blended learning process. Activities to build the learning service were diverse, requiring a variety of skills of the people involved. A close collaboration between teacher and instructional designer is needed particularly during the development phase.

They need to match the instructional design of the classroom-based sessions with the online learning activities.

During the course all lectures of the teacher were recorded on video and published embedded in the learning environment in addition to the presentation slides, to complement the notes that the students made during the lectures. This was especially important in this course because the lectures and class discussions were in English while the native language of the students was Italian or Chinese (in some cases another language like Spanish or Finnish). The recordings were additionally published on a YouTube dedicated channel to make them available on devices like smart phones. Special attention was paid on the way to structure the slides, the readability of text, and the visibility of face and gestures of the teacher in the video version.

In the case of the Dalian course we made slight adjustments to publish movies because YouTube is not available. Therefore we uploaded the video lectures on a private server and deliver the movies embedded in standard web pages.

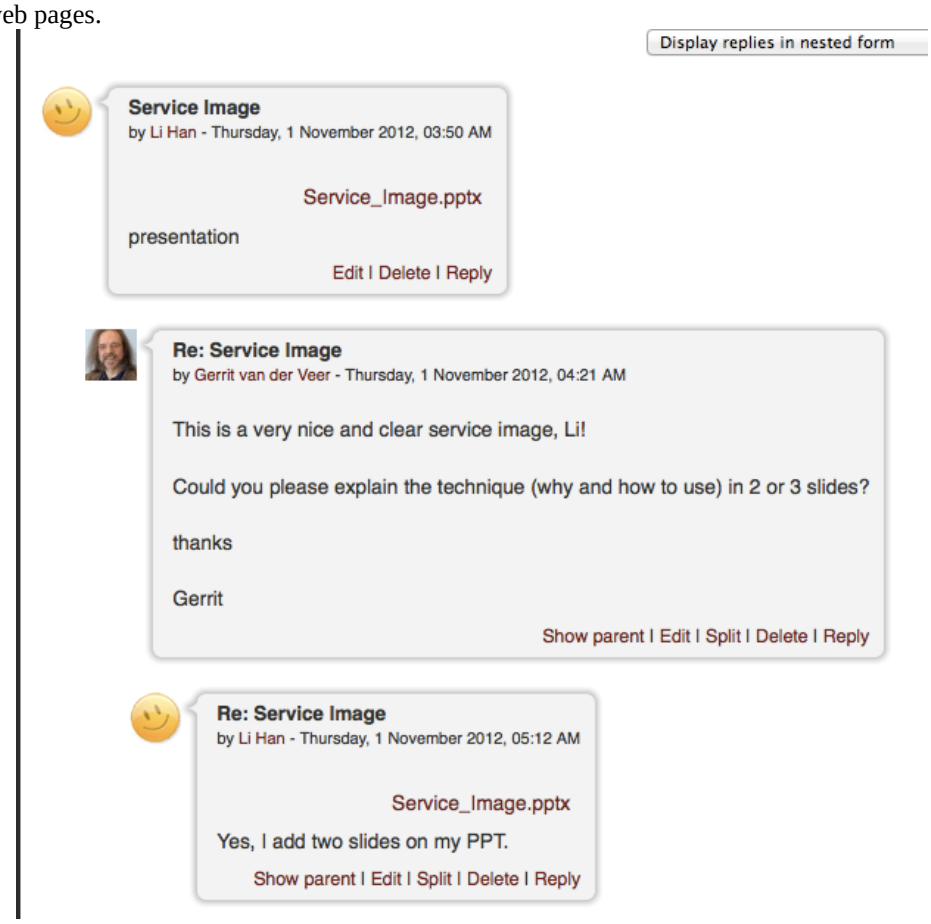

Figure 3. Forum in the ELE on Student Request, Allowing Discussion Prior To A Student Presentation

5.3 Adaptation to Each Individual Class is Needed

The way to prepare, to present, and to discuss sources for the learning environment requires special attention: classroom communication as well as on-line resources featuring in an actual individual course may have to be re-used later (life lectures turn out to survive as YouTube clips, short PDF files, voice-over presentations, citations in student generated learning resources, etc.) but other resources have to be personalized basing on needs of the classroom. Chinese students asked to be allowed to upload their presentation before the lecture, in a plenary forum where their peers and the teacher could discuss beforehand (see Figure 3) while for Italian students it was more suitable to have a dedicated space where they submitted their work individually as a design group to the teacher only, before the discussing it in the class.

Consistent with our constructivist perspective on learning, and based on request from some Italian students who could not attend classes where they were supposed to present, we decided to allow them to submit a home recorded video presentation of their mini lecture to the ELE.

5.4 Student Opinions on the ELE

At the end of both courses on Service Design that used the ELE we asked the students to answer a questionnaire. For the Italian students, we translated this questionnaire in Italian, the Chinese students were happy to answer English questions. The number of students that participated in the questionnaire 10 Chinese students and 13 Italian students) is too small to allow any statistical tests that would allow generalizations beyond the students in the two courses that we actually observed. However, the results certainly provide us with an interesting picture. Table 1 provides the answers that the students gave our list of questions.

Table 1. Survey Answers for Two Course Groups

Course group:	China (#10)	Italy(#13)
a. ELE did help during course?		
- yes	9	6
- a little	1	6
- no	0	1
b. ELE useful for:		
- finding teacher's slides?	10	8
- viewing teacher's presentation videos?	3	8
- finding URs for extra information?	8	7
c. wish further resources in the ELE?	9	7
d. did you watch video presentations:		
- of other students?	5	12
- your own?	6	10
e. what did you learn from watching peer presentations:		
- to make readable slides	not	6
- to speak to an audience	applicable	2
- to structure the presentation		6
f. ELE feasible for smart phones in the future:	6	9

Our Chinese group was more positive overall on the help that the ELE provided (question a). This may be related to their educational level (this where master students in their final year) as well as to their fluency in English. It may also be caused to improvements in the course website (we obviously continued to structure the ELE based on our experience with the previous course in Italy). Regarding the specific types of use (question b) we only identified one difference, the Chinese students in our group were less interested to review the teacher's presentation video. Our group of Chinese students was more eager than the Italians to find additional resources (question c), possibly related to their educational level as suggested above in relation to question a. Our group of Italians systematically watched their peers' presentations again (question d), probably because we asked them to do this in our attempt to have them reconsider their presentation performances. For the Chinese group we did not do this, since in fact we did not find too many good examples among the group to start with. In fact we provided some examples ourselves, telling them how we acted in presentation and why ("make sure you look at the audience, that helps make them pay attention, like I just am showing you now"). Because we made a special effort on making the Italian students aware of the presentation skills of some (in fact the best) of their peers, we asked our Italian students what they did learn from the other students' video presentations (question e). It seems only part of the students felt they learned something from their peers' examples. However, both authors, as well as the Italian tutor at this course, were convinced the presentations improved significantly for the large majority of the students in this group.

Since in both student groups smart phones seemed to be a natural extension to the students' hands we asked them if they would like to use smart phones for courses in the future (question f). Both groups showed a majority who thought this might be expected.

As stated at the start of this section, we would not dare to generalize. But surveys like this help us to find what worked in our current cases and helps us understand what the effect our effort is.

Based on that we make our plans for a next instantiation of our ELE. That is the essence of action research. And the difference between the Italian and the Chinese context did not seem a major source of different student behavior.

6. CONCLUSION

Our constructivist view on higher education and our action research approach towards iterative design and assessment of an ELE shows how new ICT may be applied to provide blended learning, adapted and adaptable to cultural as well as to individual context and learning needs. Service design was just an example, and in fact we are applying the same approach to other learning domains like task analysis, visual design, and the design for cultural heritage support. But that's another story.

REFERENCES

Boettcher, J. V., 2007. *Ten core principles for designing effective learning environments: Insights from brain research and pedagogical theory*. Innovate, 3(3). Retrieved May 20, 2009, from www.innovateonline.info/index.php

Bruner, J., 1960. *The process of education* - Harvard University Press.

Consiglio, T. and van der Veer, G.C., 2011. Designing an interactive learning environment for a worldwide distance adult learning community. In*: Anke Dittmar & Peter Forbrig (Eds) Designing Collaborative Activities - Proceedings of ECCE 2011*. Rostock. ACM Digital Library, pp.225-228.

Garrison, R. and Kanuka, H., 2004. *Blended learning: Uncovering its transformative potential in higher education*

The Internet and Higher Education Vol. 7, No. 2, 2nd Quarter 2004, pp.95–105.

Jones, B., Valdez, G., Nowakowski, J., & Rasmussen, C., 1994. *Designing Learning and Technology for Educational Reform*. Oak Brook, IL: North Central Regional Educational Laboratory.

Moritz, S., 2005. *Service design – Practical access to an evolving world.* Köln International School of Design (KISD), Köln, Germany.

Novak, J.D., Gowin, B.D., 1984. *Learning How To Learn*, Cambridge University Press.

Novak, J. D.,1999. *Learning, Creating, and Using Knowledge: Concept Maps As Facilitative Tools in Schools and Corporations*, Lawrence Erlbaum Associates.

Novak, J.D., Cañas, A., 2008. *The theory underlaying Concept Maps and How to Construct and Use Them*, Institute for Human and machine Cognition, Pensacola.

Prime Minister's Strategy Unit., 2007. *Building on progress:Public services*. Prime Minister's Strategy Unit, London, UK.

Redecker, C., Ala Mutka, K., Bacigalupo, M., Ferrari, A., Punie., 2009. Learning 2.0. *The impact of Web 2.0. Innovations on Education and Training in Europe – Final Report - JRC Scientific and Technical Reports*. ftp://ftp.jrc.es/pub/EURdoc/JRC55629.pdf (accessed 2/28/2013).

Rogers, E. M., 1995. *Diffusion of innovations (4th ed.).* New York: Free Press.

Sampson, D., Karagiannidis, C., and Kinshuk, 2002. *Personalised Learning: Educational, Technological and Standardisation Perspective.* Interactive Educational Multimedia, n.4 (April), pp. 24-39.

Segelström, F. and Holmlid, S., 2009. *Online services and cultural diversity: Applying Hofstede's framework to predict potential issues*. In Stauss, B, Brown, S.W., Edvardsson, B. and Johnston, R. (eds) *Proceedings of the QUIS 11 – Services Conference*, Wolfsburg, Germany, pp. 604-612.

Shostack, G. L., 1982. *How to Design a Service*, European Journal of Marketing, Vol. 16 No 1, pp.49 – 63.

Van der Veer G.C. and van Welie M., 2003. *DUTCH – Designing for Users and Tasks from Concepts to Handles.* In: The Handbook of Task Analysis for Human-Computer Interaction. Dan Diaper & Neville Stanton (Eds). Lawrence Erlbaum, *Chapter 7* pp 155-173.

Van der Veer, G.C., Consiglio, T. and Benvenuti, L., 2011. *Service Design - a structure for learning before teaching*. In Patrizia Marti, Alessandro Soro, Luciano Gamberini and Sebastiano Bagnara (Eds) Facing Complexity - Adjunct Proceedings CHItaly 2011. ACM Digital Library. pp. 144-147.

Vygotsky, L.S., 1962. *Thought and Language*. MIT Press, Cambridge, MA. (original work published 1934).

Williams, K.C and Williams, C., 2011. *Five Key Ingredients for Improving Student Motivation.* Research in Higher Education Journal, August- pp. 1-23.