JYVÄSKYLÄ STUDIES IN COMPUTING
207

Pekka Makkonen

Collaborative Screen Capture Video Based Learning in Information Systems Science

JYVÄSKYLÄN YLIOPISTO

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ABSTRACT

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The rapid development of e-learning causes the need of research. By e-learning it is possible to improve both performance and motivation in learning and this study understand learning in this way. The study combines educational principles from constructivism and problem-based learning with screen-capture videos, an e-learning platform, and wiki environment. The start point is the strategic approach to the globalized e-learning without boundaries. Followed with general approach the study includes three e-learning cases in which the pedagogical and technological approach of this study has been improved. The empirical part of this study show that our three cases improve the effectiveness and performance in information systems science principles learning. In three assignments for this study the students worked mostly in small groups. In all three cases of this study in the first phase the students composed screen-capture videos and the second and latter phase they commented on what other groups have produced. In all the cases the effect on performance in the learning of IS areas improved. The result supports blended learning compared the traditional teaching and learning methods. The limitation of the study is that only quantitative research methods have been used.

Keywords: learning, learning of concept, constructivist learning, problem-based learning, e-learning, critical success factors of e-learning, screen-capture videos, e-learning platform, wiki

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LIST OF INCLUDED ARTICLES

1. Aggarwal, A. and Makkonen, P. 2009. Critical success factors for successful globalised e-learning. International Journal of Innovation and Learning (IJIL) 6 (1), 92-100.
2. Makkonen, P. 2007. Student-created screen capture videos as a part of information systems science course: Learning in the spirit of YouTube. In Hoxmeier, J. and Hayne, S. (Eds.) Proceedings of the 13th Americas Conference on Information Systems (AMCIS), Reaching New Heights, [CD-ROM], Keystone, Colorado, August 9-12, 2007.
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5. Makkonen, P. 2009. Student-created screen capture videos as a technology for collaborative learning. In Proceedings of the 7th International Conference on Education and Information System, Technologies and Applications (EISTA), [CD-ROM], Orlando, Florida, August 10-13, 2009.
6. Makkonen, P. 2010. Videowiki as a tool in an information systems science course. In Proceedings of the 45th Decision Sciences Institute Annual Meeting, [CD-ROM], San Diego, California, November 20-23, 2010.
7. Makkonen, P. 2012. Opportunities of Videowiki in Information Systems Education. In Amiel, T and Wilson, B. (Eds.) Proceedings of the ED-MEDIA-World Conference on Educational Multimedia, Hypermedia and Telecommunications (pp. 401-409). USA: Association for the Advancement of Computing in Education (AACE).
8. Makkonen, P., Siakas, K., Pirhonen, A., Vaidya, S. and Siakas E. 2013. Videowikis for improved (Constructivist) Learning: A Case Study Regarding Basics of Information Systems Science. International Journal of Advanced Computer Science, 3(1), 1-9.

FIGURE

TABLE

CONTENTS

1 MOTIVATION OF THIS STUDY

The role of e-learning environments have become a part of every-day activities in higher education during the first decade of new millenium. At the same time other shifts have been occurred in the field of ICT use in education. Video has become the comtemporary part of education and social media has changed the human's way of communication. Latter has changed the education as well.

The thesis is operating between these three ingredients. The main attempt is showing the practices to run IS/ICT education based on three different teaching cases. As an academic thesis this thesis compares three ways to provide screen-capture video based education.

Our cases combine educational theories and contemporary ICT tools. Therefore first, in this introductory part we introduce the educational principles for this PhD thesis. This is followed by discussion on the use of the technologies in this thesis. Third, I present our research papers for this study and at the end of this introductory part I draw conclusions based on this introductory part and our original research papers.

The main research problem for this study can be defined in this way:

Does collaborative learning with the screen-capture videos improve the learning of information systems science basic ideas?

In addition the thesis includes these sub problems

Does Jigsaw pedagogical method improve learning in our context?

Does the use of a wiki-platform improve learning instead of the use of a contemporary e-learning platform?

In this thesis learning is understood based on learning goals and motivation.

2 EDUCATIONAL THEORIES BEYOND THIS THESIS

Learning is the main activity in this thesis. Thus, it is essential to define what learning is in our context. In this section we discuss the character of learning of basic concepts. We stress how we comprehend both knowledge and the learning of basic concepts. Secondly, we define and discuss problem-based learning. Thirdly in this section, we discuss the paradigms (views) of learning, since it affects our research framework notably. This thesis compares traditional learning to learning based on knowledge construction using screen-capture videos and e-learning platforms (standard platform and a wiki platform).

2.1 Learning of basic concepts

The earlier defined concept knowledge and its nature are associated with knowledge acquiring and solving problems (Enkenberg, 1990, pp. 9-18). In this subsection we define the concepts from the perspective of this thesis.

In this thesis the object of learning are concepts and concept structures. Thus, in this sense learning is learning of facts and interrelationships between facts. According to Hiebert and Lefevre (1986), conceptual knowledge is knowledge about interdependencies, which forms networks in which the parts are linked together. Thus, we can claim learning of concepts is becoming better understood based on these interdependencies between the concepts.

Comprehending knowledge as structures is also notable in another sense. We can recognize three types of knowledge: declarative knowledge, procedural knowledge and structural knowledge (Jonassen, 1993). Declarative knowledge represents cognizance or awareness of some object, event, or idea. Ryle (1949) describes this type of knowledge as knowing that. Procedural knowledge, on the other hand, describes how learners use or apply their declarative knowledge (Jonassen, 1993). The third type of knowledge, structural knowledge, is the knowledge that mediates the translation of declarative into procedural knowledge and facilitates the application of procedural knowledge (Jonassen, 1993). Thus, knowledge structures or structural knowledge is an important measure when we evaluate how well a student has learned concepts. A number

of research studies have shown indirectly that knowledge structures are important in problem solving (Chi and Glaser, 1985).

As mentioned in this subsection the term "Knowledge" is important, since cognitive psychology comprehends learning as the process of knowledge instead of changing behavior. Based on this several approaches can be found to teach or learn knowledge in the literature of education. Concepts and things can be taught or learnt using different approaches and one can be more effective than another one in one context because based on the situated action theory learning is context dependent (Agre and Chapman, 1987; Suchman, 1987). The approaches or views or paradigms of teaching and learning have affected computer-supported learning notably. Thus, it is essential to comprehend these views in our context.

2.2 Problem-based learning and jigsaw method

Hmelo-Silver (2004) has summarized the history of problem-based learning (PBL). According to her, in PBL students learn through problem solving and in this way they can learn both content and learning strategies. We can claim that by using PBL learners become better learners.

The Jigsaw can be seen a variant of problem-based learning. In this method students are the experts of the certain areas and the students collaboratively teach each other (Aronson et al., 1978).

2.3 Views of learning

This study is affected by the views of learning in other words learning paradigms. The approach in this study has been that training is affected both pedagogical principles and technology use. In this subsection we review the learning paradigms in the light of this study.

Different definitions exist for classifying views of learning (see for example Risku, 1992 pp. 3-27 and Rauste-von Wright & von Wright, 1994, pp. 103-133 and Leidner & Jarvenpaa, 1995). Learning can usually be comprehended as knowledge construction process and computers as cognitive tools. Thus, it sensible to define views of learning as follows: (1) behaviorist way of learning, i. e. behaviorism, (2) objectivist way, i. e. objectitivism, (3) cognitive way, i. e. cognitivism, and (4) constructivist way, i. e. constructivism (Jonassen, 1992). Widely known and discussed views in regard to computer supported learning are behaviorism and constructivism (Jonassen, 1992). Figure 1 (see next page) illustrates views of learning and the ways of learning based on the discussion by Jonassen (1992). Programmed instruction is both objectivist and behaviorist emphasizing learning by manipulating a learner's behavioral patterns. Cognitive tools (like tools for creating hypertext) are based upon a constructivist epis-

temology as well as cognitive learning theory emphasizing learning as knowledge construction and the development of a learner's personal knowledge presentations.

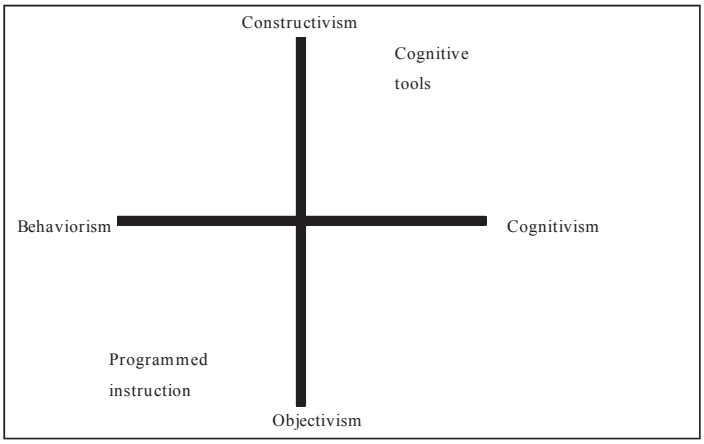

FIGURE 1 Views of learning (Jonassen, 1992, p. 6)

In addition to the discussion by Jonassen (1992), we should discuss the connectivism, which has been evaluated a learning paradigm clarifying web 2.0-based on the learning in the best way. This study relies on the constructivism, but in the next steps of studying this subject connectivism and other new learning theories must be taken to clarifying technology-based learning.

2.3.1 Behaviorism

The idea of behaviorism in computer-supported learning is to divide area to learn into little pieces (Risku, 1992, pp. 4-6). The task of a student is to train matters piece by piece. In using educational software based on behaviorism students are required to train by answering the questions. The questions are asked by an application and the application simply informs whether it is a right or wrong answer. According to Risku (1992, pp. 7-9), the benefit of behaviorist-oriented educational software can be proved statistically based on the numbers of right answers. However, this approach does not teach students to learn "to use their own brains" and a student remains to be the passive receiver of information (Risku, 1992, pp. 7-9).

2.3.2 Objectivism

We supposed that programmed instruction is partly based on behaviorism. Additionally, it is based on objectivism. This view treats knowledge as externally mediated information which is generated by a teacher and transmitted to learners (Jonassen, 1992). The purpose of education is for the

learner to acquire the knowledge of the teacher - to assimilate the knowledge of the teacher or expert. Objectivism equates information and knowledge as far as the learner is concerned. According to an objectivist epistemology, the teacher and not the learner determine knowledge. There is an external reality that each individual can come to know in the same way. Knowledge is externally referenced rather than internally generated. An instructionist approach is close to objectivism. It emphasizes that the focus of education has been restricted to the transmission of information from teachers to students.

2.3.3 Cognitivism

According to Jonassen (1992), cognitive learning theory assumes that learners interact with information, interpret it, and build personal knowledge representations after relating that information to their prior knowledge. The information with which learners construct their reality represents the external reality. However, this information itself does not represent knowledge. Information is a stimuli that are perceived and recorded by the mind resulting personal knowledge representations (Jonassen, 1992).

2.3.4 Constructivism

In a constructivist learning environment a student is a creator of concepts (Risku, 1992, pp. 18-22). The difference between cognitivism and constructivism is that cognitive view is concentrated more on changes in personal knowledge representations and constructivism is concentrated more on in which ways these changes in knowledge representations occur. Constructivism holds that instruction is less a process in which knowledge is communicated to learners, and more a matter of nurturing the ongoing processes whereby learners come to understand the world in which they live (Cunningham et al., 1993). In this view, knowledge is an active process of construction, not the receipt of information from external sources. The role of textbooks and other instructional media shifts from one that seeks to maximize the communication of fixed content and/or skills to one in which students engage in the knowledge construction process. This includes constructing interpretations, appreciating multiple perspectives, developing and defending their own positions while recognizing other views, and becoming aware of and able to manipulate the knowledge construction process itself. An important aspect of this approach is the insistence that learning takes place embedded in the contexts to which it is most relevant in everyday life and with which the students are personally involved.

2.3.5 Two Schools of Constructivism

Within this the constructivist theory falls into two schools of thought, social constructivism and cognitive constructivism (Confrey, 1995). According to Confrey (1995), although these theories differ, they fall within the same basic assumption about learning: The child's individual development is at the center of

instruction. The development theory proposed by Piaget (1977) has been widely discussed in both psychology and education fields. He stressed the holistic approach concerning learning. A child constructs understanding through many channels: reading, listening, exploring and experiencing his or her environment (Piaget, 1977). On the other hand, Vygotsky (1978) is most often associated with the social constructivist theory. He emphasizes the influences of cultural and social contexts in learning and supports a discovery model of learning. This type of model places the teacher in an active role while the students' mental abilities develop naturally through various paths of discovery.

2.3.6 Connectivism

The era of web 2.0 has been changed the behavior of humans. Siemens (2005) claims that this shift changes humans' brains and in this affects humans' learning processes. This has affected to technology-supported learning as well.

The need of connectivism starts from the criticism of the learning theories of the 90s presented in thesis. Siemens (2005) has listed these problems:

- Learning is not linear process anymore.
- More humans' cognitive operations are performed by devices.
- Technology ecosystems develop rapidly.
- Performance is needed to complete understanding.
- The impact of networks and complexity to learning.
- Impact of chaos on learning.
- Impact of interconnections between fields on learning.

Based on this problem list the key principles of connectivsim have been created (Siemens, 2005). These principles are as follows:

- Learning is based on different views.
- In learning humans aggregate information from different sources.
- Learning can also occur outside of single human brains.
- Learning should occur in nonstop manner.
- In learning the important aspect an ability to make connections
- Accuracy of knowledge improves learning.
- Decision-making as a part of learning process.

According to Siemens (2005), one implication of connectivism is that it should have its implication to the design of learning environments.

2.4 Summary

How we comprehend learning has been changed over the years. Both expanded awareness on psychological facts affecting learning and technological progress have been the drivers of this shift. Earlier learning is understood in the teacher-centered way. Then in the 90s cognitivism and constructivism transformed educational awareness to student-centered and collaborative learning techniques. At the same time with this Internet started to change the world and

ways of learning. Web 2.0 brought the new ways for using the web with users' as content creator and social media. This affects the learning paradigms and learning should be in the line with connectivism (Siemens, 2005).

In the study of this thesis the tools in use are natural for connectivist learning. However, the approach in this study is comprehending learning based on constructivist principles. Learning is the combination of cognitive and social constructivism.

3 E-LEARNING TECHNOLOGIES IN THIS CONTEXT

This study deals with the use of screen capture video technologies in collaborative learning on the web. In this section we clarify all the technologies in the use related to this study. Three fundamental technologies in this study are screen-capture video decoders, e-learning environments, and social media in which especially wiki environments. With these technologies in this study constructivist learning theory has been applied.

3.1 Screen-capture video encoders in education

A screen-capture video encoder enables capturing a presenter's voice and the events happening on the presenter's screen. This technology can be applied for training in two ways. First, a trainer can create video training by recording and the audience can watch these presentations at any time. Second, the students can create their own presentations and teach each other by distributing these presentations.

In video capturing analog signal is converted to digital signals. This enables converting video files to other video formats and editing video files. The Windows Media Encoder used in this study produces WMV files as default.

The use of screen-capture videos has been studied in the library context. The use makes the librarians' work easier because the use steps of the online library services can be repeated many times in many ways (Imler & Eichelberg, 2011).

In the context of this study we applied a screen-capture video encoder based on the collaborative problem-based learning.

3.2 E-learning platforms

The definition of e-learning has been under change, because of rapid development of technology (Lam & Kwok, 2005). Hovart and Teles (1999) define e-education as a type of education in which the www and the Internet are the vehicles for information dissemination and retrieval, and also for networking and collaboration. E-learning is a related term to e-education. E-learning includes electronic forms, which support learning and teaching (Tavangarian, 2004). ICT, whether networked or not, serve as specific media to support the learning process. Web-based learning refers to the use of Internet technologies for delivering instruction (Huerta et al., 2003).

E-education and e-learning have been criticized because of some drawbacks including social isolation (Klein and Ware, 2003, Hameed et al., 2008). Thus, blended learning has been suggested as an alternative (Klein and Ware, 2003) and a lot of evidence exists to support blended learning (Hameed et al., 2008). Blended learning combines e-learning components with traditional classroom components to produce the most effective education (Hameed et al., 2008). Thus, one main point is that successful virtual learning is the combination of educational (or human) and technological points.

E-learning platforms appeared in the late 90s. The idea was providing comprehensive course websites for registered users including course material in different formats, assignments, and grading. According to Hertfordshire Grid for Learning (2005), e-learning platform can be defined as "a learning platform is an application that enables students and staff to share information and use the school network to its full advantage. School work can be accessed from home as well as from school and many reporting and monitoring tasks can be integrated into the system".

3.3 Social media in education

Social media refers to the era of Web 2.0. Web 2.0 means that the users of web services are the content creators. The use of social media has been expanded in education and this makes this study significant for understanding possibilities of social media. According to Lau et al. (2014), social media in education consists of following elements: the use of communication channels including both the Internet and mobile networks, user groups and communities on networks.

Seaman and Tinti-Kane (2013) has studied the use of social media in teaching and learning. The positive impact on learning communities is significant based the volume of social media use. Especially, blogs and wikis have affected teaching activities notably and on the other hand podcasts, LinkedIn, Facebook and Twitter are less significant (Seaman and Tinti-Kane, pp. 7-9). Other side of the paper is the quality of learning. According to Lau et al. (2014) the studies

show the significant effects on the quality in learning. This occurs based on the learning performance and motivation.

4 SUMMARY OF WORK

The main part of the work consists of the papers presented after this introduction. Here in this section I briefly summarized what I have created in three cases on e-learning. Before these three cases in article 1 the approach to run e-learning has been created by discussing e-learning success factors. Article 2 and article 3 deal with our first case combining e-learning platform, screen capture video creation and problem-based learning. Article 4 and article 5 deal with our second case in which the Jigsaw collaborative learning method has been applied. Articles 6 to 8 deal with case three in which e-learning platform has been replaced by an open wiki platform (Wetpaint). Learning methods and technologies used in the three teaching case of this study have been presented in table 1.

TABLE 1 Learning methods and major technologies in use

	Problem-based learning	Jigsaw collaborative learning method	Screen capture video creation software (Windows media encoder)	E-learning platform (Optima)	Wiki (Wetpaint)
Case 1	X		X	X	
Case 2	X	X	X	X	
Case 3	X	X	X		X

4.1 Article 1: "Critical success factors for successful globalised e-learning."

Aggarwal, A. and Makkonen, P. 2009. Critical success factors for successful globalised e-learning. International Journal of Innovation and Learning (IJIL) 6 (1), 92-100.

4.1.1 Research objectives and method

I/we introduce the general approach of borderless e-learning. The article provides based on the literature review and earlier studies strategic approach and a checklist to run e-learning especially at the institutional level.

4.1.2 Findings

The main idea of this paper was that e-educators should look at the pioneers of the e-learning and on the other hand they should have a vision on the future of education.

4.1.3 Summary and the relation to the whole

The paper provides an umbrella for the whole study.

4.2 Article 2: "Student-created screen capture videos as a part of information systems science course: Learning in the spirit of YouTube."

Makkonen, P. 2007. Student-created screen capture videos as a part of information systems science course: Learning in the spirit of YouTube. In Hoxmeier, J. and Hayne, S. (Eds.) Proceedings of the 13th Americas Conference on Information Systems (AMCIS), Reaching New Heights, [CD-ROM], Keystone, Colorado, August 9-12, 2007.

4.2.1 Research objectives and method

I introduce the idea of student-created screen-capture videos in the collaborative learning of information systems science. There are three research objectives in this article. First, I was interested in how the students' knowledge in four areas of information systems basic course was developed. Second, I was interested in how the students experienced the screen-capture-video-based exercise in our course. Third, I was interested in whether or not age and group size affect the learning.

In the course assignment the student tried to find 5 difficult matters which should be better clarified. Based on these problems they searched for more information from the web to understand the possible difficult matters in our material. The students needed to report what useful links they found by using search engines and directories.

Forty-three students, 12 females and 31 males, whose mean age was 23 years (range 18-39 years), participated in the experimental group including the problem-based seminar on the web. 7 students studied informatics as a minor and 36 students as a major. 10 of them completed the coursework individually,

21 in groups of two students, and 12 in groups of three students. We call this group the video group in this thesis.

Thirty-five additional students, 13 females and 22 males, whose mean age was 25 years (range 19-52 years), were involved in the control group. 13 students studied informatics as a minor and 32 students as a major. We call this group the non-video group in this thesis. The students in the control group completed the course without this assignment including video making.

From sixteen students, who complete the course and one of these assignments, we did not assign adequate data for these descriptive statistics of this study.

4.2.2 Findings

The main result of this paper was that the students' attitude concerning the assignment conducted during an information systems science course was positive. It reflects improved motivation.

When I compared knowledge at the video group at the beginning of the course to the end of the course, the statistical analysis shows that differences were very significant ($p<.001$) in the learning of all the themes. However, in the non-video group these differences were varying from .001 to .008.

4.2.3 Summary and the relation to the whole

The paper provides comprehensive review on the screen-capture-video-based assignment. However, the effectiveness of the different phases of the assignment was not included.

4.3 Article 3: "Is a seminar based on student-created screen capture videos a meaningful way of learning?"

Makkonen, P. 2009. Is a seminar based on student-created screen capture videos a meaningful way of learning? Journal of Education, Informatics, and Cybernetics 1 (1), 34-37.

4.3.1 Research objectives and method

The article expands the results of the presented experience in article 2. Again I introduce the idea of student-created screen-capture videos in the collaborative learning of information systems science. In this article I study the phases of the assignment more particularly. The assignment what we had with screen-capture videos included two phases. In phase 1 the students produced videos and published these through the Optima e-learning platform. In phase 2 the students were expected to watch other videos (at least three) discuss each oth-

er's outcomes through the Optima. In addition, I was interested in the e-learning platform skills.

4.3.2 Findings

The main result of this paper was that both phases were equally beneficial in our assignment. There was no difference between e-learning platform use skills when comparing the test group to the control group.

We compared the means of the students' ratings concerning two basic features of the coursework. Since the data did not agree with the normal distribution, the Wilcoxon Signed -Rank test was appropriate for comparing two phases of the course. The test did not find significant difference between the ratings of video making and commenting on the videos (p=.225). The both phases are equally beneficial for learning.

4.3.3 Summary and the relation to the whole

The paper provides more detailed research information from our assignment. Both phases motivate the students to learn effectively. The experiment setting is the same as in the paper of article 2.

4.4 Article 4: "Student-created screen capture videos as a part of information systems science: Collaborative learning in the spirit of YouTube."

Makkonen, P. 2008. Student-created screen capture videos as a part of information systems science: Collaborative learning in the spirit of YouTube. In Proceedings of the 43th Decision Sciences Institute Annual Meeting, Vol. 2 (pp. 1327-1332). Red Hook, NY: Curran Associates, Inc.

4.4.1 Research objectives and method

I introduce the first variant of the screen-capture-video-based assignment. In this variant I applied for the Jigsaw collaborative learning method. The idea was that the course content consisted of four main themes. The idea in this compared to the original format of the assignment was that the students selected the most unclear area from four main areas and composed the videos from this. Inside this area the students selected five unclear concepts to the special attention.

Thirty-four students, 12 females and 22 males, whose mean age was 24 years (range 18-50 years), participated in the experimental group including the problem-based seminar on the web. 4 students studied informatics as a minor and 30 students as a major. 5 of them completed the coursework individually,

and 29 of them groups of two to four students. We call this group the video group in this paper.

Twenty-six additional students, 7 females and 19 males, whose mean age was 25 years (range 19-39 years), were involved in the control group. 7 students studied informatics as a minor and 19 students as a major. We call this group the non-video group in this paper. The students in the control group completed the course without this assignment including video making.

From thirty-seven students, who complete the course and one of these assignments, we did not assign adequate data for these descriptive statistics of this study.

4.4.2 Findings

The main result of this paper was that the Jigsaw does not significantly improve the results of students' knowledge development. The development of the students' knowledge is the same in both groups. In the same way when we compared knowledge at the video group at the beginning of the course to the end of the course, the statistical analysis shows that differences were very significant ($p<.001$) in the learning of all the themes. However, in the non-video group these differences were varying from .001 to .002 based on the re-analysis of the data based on the Mann-Whitney test.

4.4.3 Summary and the relation to the whole

The paper provides the description how we improved our first assignment as by applying the Jigsaw. It confirmed our collaborative video making as a successful method to learn the basics of information system science.

4.5 Article 5: "Student-created screen capture videos as a technology for collaborative learning."

Makkonen, P. 2009. Student-created screen capture videos as a technology for collaborative learning. In Proceedings of the 7th International Conference on Education and Information System, Technologies and Applications (EISTA), [CD-ROM], Orlando, Florida, August 10-13, 2009.

4.5.1 Research objectives and method

The article expands the results of the presented experience in article 4. I analyze the benefit of our problem-based coursework on the web by comparing the different phases of it.

4.5.2 Findings

The main result of this paper was that both phases were equally beneficial in our assignment. There was no difference between e-learning platform use skills when comparing the test group to the control group.

We compared the means of the students' ratings concerning two basic features of the coursework. Since the data did not agree with the normal distribution, the Wilcoxon Signed -Rank test was appropriate for comparing two phases of the course. The test did not find significant difference between the ratings of authoring the coursework and commenting on the coursework reports (p=.414). The both phases are equally beneficial for learning.

4.5.3 Summary and the relation to the whole

The paper provides more detailed research information from our assignment. Both phases motivate the students to learn effectively. The experiment setting is the same as in the paper of article 3. We obtained the same results in the earlier variant of this assignment (see article 3).

4.6 Article 6: "Videowiki as a tool in an information systems science course."

Makkonen, P. 2010. Videowiki as a tool in an information systems science course. In Proceedings of the 45th Decision Sciences Institute Annual Meeting, [CD-ROM], San Diego, California, November 20-23, 2010.

4.6.1 Research objectives and method

The paper introduces our third approach to carry out a web-supported coursework and seminar. Instead of e-learning platform we used a wiki platform. Additionally, it provides the analysis of the approach by focusing on the success of our coursework and seminar from the perspective of the goals of the course. To achieve this, we compared the ratings of the students who completed the web-supported coursework to the ratings of the students who did not participate in this coursework.

Sixty students, 22 females and 38 males, whose mean age was 22 years (range 18-39 years), participated in the experimental group including the problem-based seminar on the web. In total 9 students studied information systems science as a minor and 51 students as a major subject. Totally 8 students completed the coursework individually, and 52 in groups of two to five students.

Twenty additional students, 0 females and 20 males, whose mean age was 26 years (range 20-40 years), were involved in the control group. They all studied information systems science as a major. The students in the control group

completed the course without the assignment including video making and the use of a wiki.

From twenty-three students, who complete the course and one of these assignments, we did not assign adequate data for these descriptive statistics of this study.

4.6.2 Findings

We compared knowledge at the video group at the beginning of the course to the end of the course, the statistical analysis shows that differences were highly significant ($p<.001$) in the learning of all the themes. However, in the non-video group these differences were varying from less than .001 (one theme) to .021.

4.6.3 Summary and the relation to the whole

The analysis in this paper confirmed the results from article 2 and 4. The main finding is that the level of knowledge is improved by the coursework of the phases. There is no difference whether Jigsaw was used or not or whether e-learning platform or wiki environment was used or not.

4.7 Article 7: "Opportunities of Videowiki in Information Systems Education."

Makkonen, P. 2012. Opportunities of Videowiki in Information Systems Education. In Amiel, T and Wilson, B. (Eds.) Proceedings of the ED-MEDIA-World Conference on Educational Multimedia, Hypermedia and Telecommunications (pp. 401-409). USA: Association for the Advancement of Computing in Education (AACE).

4.7.1 Research objectives and method

The article provides the analysis of the approach by focusing on the success the different phases of our wiki-based assignment. To achieve this, we compared the ratings of the students at the end of the video producing (phase 1 in our assignment) to the ratings at the end of the whole coursework.

4.7.2 Findings

We compared the means of the students' ratings concerning two basic features of the coursework (making the videos and commenting on the videos on the wiki). Since the data agreed with the normal distribution, the paired–samples T-test was appropriate for comparing two phases of the course. The test found significant difference between the ratings of authoring the coursework and commenting on the videos ($p<.001$). We can claim based on the results that

video making has more effect on learning than participating in discussion on a wiki.

4.7.3 Summary and the relation to the whole

The most significant result is that the both phases of the assignment are useful. However, in this case the meaning of the video publishing becomes more important. In our previous variants of this assignment watching and commenting on videos were more useful.

4.8 Article 8: "Videowikis for improved (Constructivist) Learning: A Case Study Regarding Basics of Information Systems Science."

Makkonen, P., Siakas, K., Pirhonen, A., Vaidya, S. and Siakas E. 2013. Videowikis for improved (Constructivist) Learning: A Case Study Regarding Basics of Information Systems Science. International Journal of Advanced Computer Science, 3(1), 1-9.

4.8.1 Research objectives and method

The article provides the additional analysis of this wiki-based e-learning approach from the perspective of motivation.

4.8.2 Findings

The main finding of this study is that the wiki-based e-learning approach supports the effective knowledge building rather than the enjoyable learning experience with high motivation.

4.8.3 Summary and the relation to the whole

The meaning of the article was providing the view which includes both learning outcomes and the motivational factors. This was needed since the current era includes this kind of activities on social media (Facebook, Google Plus, Twitter). The relation to two earlier variants of this coursework is thin from the perspective of the motivation issues studied in this article.

4.9 About the joint articles

The author of this thesis wrote Articles from 2 to 7 by himself. In the other papers, the author´s contribution was the following:

The theoretical background for Article 1 was done in co-operation with Anil Aggarwal, Anil Aggarwal being the main author. The main idea in the article, which was applying strategy level to planning e-learning, was created by Anil Aggarwal. The author's contribution was writing on Finnish and European perspectives on the critical success factors of global e-learning.

In article 8 the author was responsible for the core of the article. The other authors wrote on motivation with more detail in section 4. In addition section 7 and 8 are produced by other authors.

5 DISCUSSION OF THE RESULTS

The meaning of this dissertation is to explore how IS education can be supported by video and web technologies to reach better results. I relied on the claim that the constructivist learning theory and its two formats cognitive constructivism and social constructivism give the pedagogical foundation for our three cases.

Despite of the collaborative learning benefits other related studies show that it is not always possible to enhance learning by collaborative learning techniques in information systems science. In a study by Wersh (2002) collaborative learning techniques did not have a positive effect on individual student learning. Later in a study by Liaw et al. (2008) is shown that critical issues exist to run successful collaborative learning. When the students are not technologically ready for collaborative learning with computers this learning method does not work.

This study in thesis shows that the Internet- and computer-supported collaborative learning affects positively the effectiveness of learning in information systems science basic issues. The motivation was studied, but the effect of it is less significant and the students are equally motivated when they learnt traditionally.

The results give more evidence supporting blended learning. The IS teachers should plan pedagogical issues at the same time with the use of technology.

When comparing the results from these three cases main difference between cases was that in case 3 the video producing was the most significant part. This reflects that we can recommend screen-capture videos making as a learning tool, because in video-making and -publishing have been expanded in the era of web 2.0.

6 CONCLUSIONS, LIMITATIONS, AND FURTHER STUDY

6.1 Contribution to the research and practice

This study presented the ways to run computer-supported collaborative learning. The research can benefit this study while discussing learning theories in education in general and in ICT education especially.

The study shows the possible ways to all instructions to run e-learning as a part of the course. In IS education the learning methods presented in this study are natural, because IS students are competent in these tools presented in this paper. In addition, the expansion of these tools in primary and secondary education makes possible to use these tools for non-IS tools and non-IS/ICT topics.

6.2 Limitations

Concerning research methods the study relies on empirical methods and processing data with statistical methods. Qualitative methods would have been brought more information on the reasons of the learning results. This could had been included the factors which improves the learning result during the process and the factors which should look at while planning this kind of assignments based on screen capture videos and e-learning or social media platforms.

This study and its design rely on the constructivist learning theory. This is the lack from the perspective of the current educational research on web- and e-learning.

The study has been conducted with information systems at a university. The results may be different while running the same experiment at other level educational institutions.

6.3 Further study

As argued in section 6.2 the study and especially its case 3 should be studied according to these guidelines based on qualitative methods as well.

In e-learning research the driving forces are new technologies. This includes both hardware and software. The expansion of social media services is one shift which has occurred. Another shift is the expansion of portable smart devices such as mobile phones and tablets.

In this study the focus has been working with any kind of PCs connected to Internet. In further study should include three basic elements. These are new portable devices, social media services, learning theories and especially connectivism. The study has shown the gap between the students and the capacity in the use of social media issue, and this causes that this issue is worth of studying.

YHTEENVETO (FINNISH SUMMARY)

Nopea sähköisten oppimisympäristöjen kehitys aiheuttaa tutkimuksen tarpeen. Tämä tutkimus ymmärtää oppimisen määrällisten oppimistavoitteiden ja motivaation näkökulmasta. Tutkimus yhdistää konstruktivisesta ja ongelmalähtöisestä oppimisesta lähtevät opetukselliset periaatteet kuvaruutukaappausvideoiden, sähköisen oppimisen alustan ja wiki-ympäristön kanssa. Tutkimuksen alkukohta on strateginen lähestymistapa rajattoman maailmanlaajuisen sähköisen oppimisen totuttamiseen. Tämän jälkeen tutkimuksessa on toteutettu kolme sähköisen oppimisen opetuskokeilua, jossa yhdistetään opiskelijoiden tuottamien videoiden tuotanto sähköisen oppimisen alustoihin ja kolmannessa kokeilussa wiki-ympäristöön. Tutkimuksen empiirinen osa osoittaa, että tutkimuksen kolme kokeilua parantaa oppimisen määrällisiä tuloksia kohdekurssin Tietohallinto ja tietojärjestelmän kehittämisen aihealueista. Näissä kolmessa kokeilussa opiskelijat työskentelivät pääasiassa pienissä ryhmissä. Tutkimuksen kaikissa kolmessa kokeilussa opiskelijat tuottivat ensimmäisessä vaiheessa kuvaruutukaappausvideot aihealueestaan. Toisessa vaiheessa opiskelijat kommentoivat toinen toistensa videoita joko sähköisen oppimisen alustalla tai kolmannessa kokeilussa wiki-ympäristössä. Tutkimuksen päätulos on se, että oppimisen määrälliset tavoitteet saavutetaan paremmin kuvaruutukaappausvideopohjaisella opiskelulla. Tutkimuksen tulos tukee ja painottaa sulautuvan oppimisen käsitteen huomioimista tietojärjestelmätieteen kurssien suunnittelussa. Tutkimus perustuu kvantitatiiviseen tutkimusotteeseen ja se on sen rajoite.

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ORIGINAL PAPERS

I

CRITICAL SUCCESS FACTORS FOR SUCCESSFUL GLOBALISED E-LEARNING

by

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Critical success factors for successful globalised e-learning

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Abstract: As we move from an information-based to a knowledge-based society, the need for reengineering, retraining and restructuring is emerging. Online programme development/enhancement requires experience and planning. Since e-learning entry requires little investments, it can be tempting to start programmes without appropriate infrastructure or planning, resulting in huge losses and in many cases closure. The new entrants can learn from the early adopters of online learning and from their experiences, both good and bad without reinventing the wheel. This paper discusses factors that must be considered and planned before venturing into e-learning. These factors are derived from discussions with faculty teaching online classes, business advisory board members, administrators involved in e-learning and literature. Major contributions of this paper are twofold: first, new entrants can learn from early entrants' experiences, and the second contribution is a list of factors that new entrant should consider for 'future' diffusion.

Keywords: electronic-learning; e-learning; globalised issues; critical success factors; web-based education.

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1 Introduction

E-learning is global in the sense that any authorised person can access contents from anywhere in the world. E-learning by very definition is global and all factors discussed here apply to global diffusion. As benefits of e-learning are becoming obvious, many traditional and non-traditional institutions are planning to join the bandwagon. E-learning is growing at an annual rate of almost 24% and every year many new universities are either starting or enhancing online programs. India, Bangladesh, Nepal and many African countries are either already experimenting or are planning to enter the e-learning market. This paper discusses our experiences with e-learning, provides examples and a comprehensive list of factors that must be considered for a successful e-learning program.

2 E-learning

E-learning started as a fad but now is becoming as a reality. There is a general feeling that e-learning can be a big money-making venture. This is not the case. In fact in most cases both for-profit and non-profit institutions have lost money in the first few years. E-learning is asynchronous and makes education available to individuals irrespective of 'time' or 'distance' (Hiltz and Turoff, 2005; Turoff *et al*., 2004; Aggarwal and Legon, 2003; Alavi and Leidner, 2001). E-learning allows students to learn contents at their convenience. Many researchers have used different names (asynchronous learning, online learning, web-based learning, networked learning, and blended learning) for e-learning but they have following common attributes (Turoff *et al*., 2004):

- Equal opportunity education – Possibly the most unbiased form of education. It allows education and interaction irrespective of national origin, religion, gender, race, *etc*.
- Time and place independence – Allows individual to learn at their pace on their time and place. No need to come to campus for a lecture.
- Customer (student)-centred – Contents are individualised to allow specialised learning. It focuses on two-way individualised learning instead of one-way static learning.

- Nonlinear – Encourages nonlinear learning through the use of hypertext and hypermedia.
- Self motivated – It is self driven and motivated. Not suited for every student. Faculty only acts as a coach, facilitator and a mentor.
- Just-in-time – E-learning moves learning from static to dynamic environment by allowing 'currency' of contents and information as the course progresses.

The following section briefly describes e-learning evolution.

2.1 Stages of e-learning

E-learning, like any new product or service is paralleling product growth cycle. Asynchronous learning is moving from innovation to growth to consolidation (or the third stage) stage. Turoff *et al*. (2004) have categorised these stages as:

- First stage: innovation
- Second stage: growth and diffusion
- Third stage: diffusion and consolidation
- Future stages: distinctiveness, innovation, growth and stabilisation.

These stages also mirror the past: how e-learning started (Stage 1), present: where we are currently (Stages 2 and 3) and future: where we will be in the 21st century (Stages 3 and 4). Currently, we are in the transition stage from the third to the fourth (future) stage.

In the first stage, the emphasis was on innovation and e-learning was technology-driven. It was a new concept, and only a few innovators like University of Phoenix, New Jersey Institute of Technology (NJIT) and the University of Baltimore (UB) experimented with it. There were more sceptics than believers and quality of education was always an issue. In the second stage emphasis was on growth as the demand for asynchronous learning skyrocketed. It happened because students became aware of 'time' and 'place' independence of asynchronous learning. Instead of travelling to campus students were able to get education from their home or workplace at their own convenience. In this stage asynchronous learning became market-driven**.** Students and content designers were demanding sophisticated end-user friendly design tools from software developers. Asynchronous learning started diffusing across schools and international boundaries. Many third world countries started developing their own versions of asynchronous learning, for example: Africa (Akst and Jensen, 2001), Caribbean Universities Project for Intergrated Education, School net Africa,[1] Sri Lanka[2] and India[3] to name a few. Though reliable statistics are hard to obtain, conservative estimates by Sloan-C and others place annual growth in the number of credit hours being generated by fully asynchronous courses in the 20% ranges (Sloan-C, 2003). It is safe to say that asynchronous instruction will continue to grow and capture an increasing share of the higher education market. Our projection is that the asynchronous 'market share' of higher education enrolment and revenue will grow to between 20% and 30% of the higher education market in the next decade. Many virtual 'for-profit' universities started emerging. Asynchronous learning is continuing to grow and capturing an increasing share of the higher education market as we move to the next stage. The third stage is

competition-driven and is emphasising strategic partnerships and stabilisation. Universities are in the process of consolidation and streamlining operations. The future stages will be survival-driven and will continue to emphasise on the blend of innovation, growth and stabilisation. Distinctiveness and efficiency will become major driving issues in the fourth stage.

In the future, e-learning will become like a revolving door, where many new institutions will join and many old ones will leave. Many for profit universities are already folding, due to lack of name recognition and quality. Several local and international universities are striving to join the bandwagon but have little know how or capital, forcing them to create strategic alliance or partnerships with front-runners and pioneers in this area. Developing and understanding e-learning related issues bring stability to asynchronous learning environment and acceptance in the corporate world. Quality, assessment, economics (bottom line), planning, assessment and cooperative learning are some of the critical issues for stepping into e-learning.

As already mentioned, e-learning is following a typical product life cycle moving from initial stage (tech-centred) to second stage (student-centred) to the third stage (survival-centred). Universities are developing specialised quality programmes to distinguish their 'product' from others to survive in this fiercely competitive market. Universities planning to enter the e-learning market must learn from the mistakes of early adopters. In addition, flexibility is becoming important for stakeholders. Universities and even governments are developing portable programs across universities. For example, in Finland, a small country of five million people, the government of Finland and local universities are working on establishing virtual universities covering the entire country. This means that students can freely take virtual courses from any university. This flexibility opens more possibilities for students. Students can acquire special skills by taking courses in local languages offered by high-level professionals from any university. Flexibility will also create growing blended learning environment. Blended learning combines traditional learning and virtual course. This can occur in two ways: First, by giving students the option for either traditional or virtual courses; second, by providing flexible virtual arrangements in the spirit of constructivism. This can enable better engagement because interpersonal ties are stronger. Haythornthwaite (2001) stresses the importance of interpersonal ties that affect the character of web-based communication. According to her, strong ties between students improve web-based communication implying hybrid learning will be needed as part of a course. As e-learning diffuses to smaller universities and across third world, there is a need for set of factors that new entrants can follow in developing their own e-learning programs. In a global environment it becomes important to use local as well as global knowledge to stay competitive (Gottschalk and Sollis-Sather, 2007; Melton *et al*., 2006). Keeping this in mind a set of critical factors was developed.

3 Critical success factors

Critical success factors were developed from authors' several years of e-learning experiences, inputs from several colleagues worldwide, administrators, technical staff and informal focus groups. In addition, seminars, panels and student's input were also used to consolidate these factors. These are minimal requirements for a successful web-based

learning program. These factors were further categorised based on taxonomy presented by Sprague and Watson (1993). This taxonomy is useful as it clearly identifies hierarchy, time span and personnel involved in the planning, building, launching and maintaining the web-based learning process. The next section describes the critical factors to launch a successful e-learning:

- strategic
- control/tactical
- operations.

Strategic factors relate to overall decisions that have long term implications like to venture into e-learning or not; to develop strategic partnership, extend of diffusion and economic alternatives. Control factors relate to medium term issues like what Course Management System (CMS) to invest, what programmes to offer, who are the qualified faculty, class sizes, tuition infrastructure, *etc*. Operational issues relate to short term issues like class sizes, content management, nature of technical support, *etc*. (see Table 1).

Table 1 Levels, factors and outcomes

Levels	*Decisions*	*Outcome*
Strategic	Visionary senior management	Top management commitment
	Plan for initial investment	Champion
	Institutional resistance	Enthusiastic stakeholders
	Changing organisational culture	Long term e-learning diffusion plan
Tactical	*Management:*	
	• Built an e-learning team	e-Readiness
	• One size does not fit all	Value-benefit analysis
	• Develop custom-centric approach	Identify potential markets
	• E-learning is not for everybody	Motivated students
		Reliable infrastructure
	Faculty:	24/7 technical support
	• E-teaching is not for everybody	State-of-the art infrastructure
	• Share knowledge	Skilled workforce
		Continuous e-training
		Seminars and conferences
Operational	Develop e-learning environment	Globally accredited programmes
	Develop course content and management policies	Standardised courses
		Quality programmes/courses
	Think ‘globally’ but act ‘locally’	Continuous improvement
	Develop e-learning infrastructure	
	Develop ongoing assessment plans:	
	• Course	
	• Program	
	• Faculty	

Table 1 relates decision-making levels, factors and possible outcomes. The next sections describe the factors in more details and supplement it with examples where feasible.

3.1 Strategic factors

These factors relate to long-term policies and direction of e-learning that a school wants to take. They include issues like strategic alliances with businesses, other schools or even governments, implication of e-learning on enrolment, stakeholder's needs and long term goals. We describe these below:

3.1.1 Visionary senior management

It takes senior management to visualise area of growth. This is very important in case of a new venture where failure rates are high. Senior management commitment and guidance is almost a prerequisite for e-learning success (Evans, 2005). They are the champions who steer departments and universities to commit to online learning (Turoff *et al*., 2004). Their support is necessary to overcome resistive faculty and administration. Senior management plans, creates a strategic vision and quality values that serve as a basis for all decisions in the e-learning program development. They should set directions and create a student-focused, learning-oriented climate. The senior management clearly must define the objective and scope for developing e-learning on campus. Many universities are making e-learning as part of their long-term strategic plans (Allen and Seaman, 2003). In addition, major commitment of resources is required for an e-learning initiative, which is not feasible without the leadership of senior management. It is no secret that many universities are losing money on their web programs. Even the leader, University of Phoenix, lost money for the first six years. Many start-ups, like Bigwords.com, have shut down and many others are losing money and withdrawing from web education. A flexible plan, appropriate pricing and target audience must be identified before joining the e-learning bandwagon. A strategic plan must be developed that has a senior manager as a champion with initial and long-term diffusion plans. In one university the provost was the champion. He identified new markets and initiated e-learning project. This resulted in a strategic plan which was implemented within a year and the university currently has almost half of its students online. The plan identified one key area for implementation (webMBA) and with its success, is now diffusing to other schools within the university. In third world countries where bureaucracy exists at every level, universities must make sure to have politicians, in addition to senior management, as champions who are committed to e-learning.

3.1.2 Plan for initial investment

Initial investment in e-learning could drive many adopters away. Expenses need to be planned properly. E-learning must be dictated by university's long-term strategy. It is recommended not to plan for campus wide diffusion from start. A piece meal approach may be desirable due to following concerns:

- inexperienced administration and faculty
- slow acceptance of e-learning

- lack of capital
- lack of student's interest
- too much competition.

E-learning is expensive, as it requires 'new' investment in IT portals, administrative and technical staff and faculty (WCET, 2004). Technical staff is needed 24/7 to provide 'help' and 'technical' assistance to student and faculty and to ensure smooth content delivery. Another major cost factor is class size. In face-to-face class size is considerably larger (30–40) than web classes (15–20). This increases per student faculty cost. How can we have similar returns in a web class with smaller class size? However, many universities are overcoming this by charging web students, a higher fee calling it a 'convenience' fee. In some cases administrations are increasing class sizes comparable to face-to-face classes. This, however, is not advisable due to the 'individualised' and 'customised' nature of e-learning. Large class size will make tremendous demand on faculty time possibly resulting in compromised quality.

Some universities are taking opposite approach and eliminating differences between local, out of state and international rates. They are calling them e-tuition rates and in many cases mandated by state legislators. This approach assumes mass diffusion of e-learning across borders resulting in increase revenues.

Web program administrators must be willing to commit resources and look beyond cost-benefit analysis. Resources are a critical issue when determining if the institution can afford to implement e-learning. Online programs and courses provide the university or college the opportunity to increase enrolment but on the flipside, development costs and associated 'business costs' of marketing the institution both locally and internationally may offset initial monetary gains. Universities and colleges entering in the third stage of e-learning will need to consider strategic partnerships and alliances for collaborative development and marketing with other academic institutions and/or outsourcing to the private sector. The above mentioned university realised its break-even point within two years as opposed to four years in the strategic plan. This of course was feasible due to continuous momentum generated by the senior management. In third world countries funding is always a problem. However lately many industries are offering partnerships and many government agencies both local and global are offering assistance in developing e-learning. UNESCO has many projects that provide assistance in this regard. Many countries are using Indira Gandhi National Open University's[4] model which uses satellites to reach as many students as possible and provides tutoring as needed at designated local sites.

3.1.3 Institutional resistance

Change creates resistance. For some faculty, the initial reaction to the concept of teaching without face-to-face interaction is unthinkable. There is fear of job loss, insecurity of the 'unknown' and above all lack of e-learning understanding. This maybe true of faculty that is well established (tenured) and lacks initiative to change. Monetary compensation may be offered to motivate faculty to develop, teach and monitor courses. In some cases, it may be necessary to build alliances with other universities if the faculty is unwilling to adapt to change. The leadership must not underestimate internal resistance to change and must be willing to create an attractive e-learning environment from whatever feasible

means possible. This may include monitory compensation, awards and institution wide recognition. This resistance can also be lessened by selecting champions at the tactical and operational levels. Francis (2001) suggests using the Theory of Constraint processes (TOC) thinking processes that provide a coordinated set of tools to help take full advantage of 'resistance to change' to not only improve the original proposal, but also assure effective implementation. He suggests focusing on three questions: What to change? To what to change to? How to make the change happen? These questions were studied extensively at the above mentioned university where the provost was clear about developing on line classes, using cohort structure with innovative faculty to develop webMBA program. To attract faculty to e-learning environment, they were given course release time and compensation at the initial stages of e-learning (Aggarwal and Adlakha, 2006). This proved to be so popular that faculty members were competing to develop and teach online courses.

3.1.4 Changing organisation culture

For dynamic institutions, change is inevitable. New domains, markets, strategies or efforts approaches require new skills, new pedagogies and tactical and operational support. Strategic plans in a university environment require 'stakeholder-centric' approach. In recent years this has changed dramatically with number of stakeholders increasing and their demands changing. For examples, students are demanding seamless education at their convenience, accreditation agencies like the AACSB in the USA are demanding quality assessment, global and ethical curriculum in the curriculum, businesses are demanding graduates that have just-in-time job-related skills and politicians are demanding accountability. All this is creating ripples in a stable educational environment. Organisations, and communication between stakeholders is becoming virtual and globalisation is becoming norm. This requires a change in organisation culture Changes should be planned bottom up where local champions advocate change.

Challenges come from all stakeholders in terms of economics (politicians and administrators), Quality (students and perspective employers) 24×7 viability (IT staff) and content preparations (faculty and IT staff). It is desirable to have a long-term plan for diffusion and break even point. It is recommended that to meet long term challenges, a slow diffusion approach be used. This would allow stakeholders to adapt to changes at their pace without fear of job loss due to following concerns.

Milestones should be established. For example, at one of the above mentioned university, first milestone was selection of a web program, second was selection of appropriate CMS and third was identifying local champions, develop courses, decide on outsourcing versus in-house development and finally launching the program on a limited basis. This is an iterative process and must be continued until a desirable diffusion level is achieved. Need for a champion and knowledge transfer becomes even more important in an international environment (Hyde, 2006; Ovidiu, 2003) where need to embed local culture and knowledge becomes important.

Next section summarises tactical factors.

3.2 Tactical factors

These factors refer to medium term planning in terms of selection of CMS, e-learning and its diffusion across departments and schools. Following section describes them in more details.

3.2.1 Build an e-learning team

Though commitment from senior administration is required, a champion cannot do it alone. A quote from former first lady Hillary Clinton Rodham, "It takes a village to teach a child" is equally true for e-learning, which requires a cooperative effort of administration, faculty, technical personnel and above all businesses. Developing an e-learning strategy involves many stakeholders: teachers; students and IT staff are obvious, but also vital are the senior administrators, businesses and politicians. It is recommended a team be build to study the viability of e-learning. The team should as a minimum have experts from each area:

- Senior administrator (champion)
- Business member(s)
- Dean or their representative
- IT Specialist
- Faculty
- Student.

This team should conduct focus groups to study requirements for their campus and learn from other institution's experiences about the viability of e-learning for their institution. As a minimum team will have to make decisions on the following:

- Course Management Software (CMS)
- Identification of target market/diffusion strategy
- Program selection
- Selection of interested faculty, 'local' champions
- In-house or outsource
- Funding.

The following describes a minimum cooperative effort needed from each stakeholder:

- Administrators set the direction, support resources, identify local champions
- Faculty develops and delivers content
- Technical personnel provide web authoring tools and delivery related infrastructure
- Help personnel provide 24/7 support
- Businesses provide IT to support e-learning and provides directions for strategic alliances (Berghel and Sallach, 2004)
- Students provide their expectations.

This team would help plan, develop and provide a 'seamless' environment. Several decisions need to be made early in the program. What should be outsourced and what can be done in-house. Is it feasible to provide 24 × 7 support in-house? Many times this is not feasible due to lack of expertise of shortage of IT personnel. It is recommended that content development and maintenance should stay in-house with experts but most support services, especially 24 × 7 support should be outsourced. It is not recommended that universities engage in developing in-house support services which would amount to developing a word processor in-house when many robust word processor are available off-shelf.

At one of the author's institute the team consisted of the provost (champion), associate dean, CIO and faculty. Their job was to identify market, develop short-term strategy, study break-even point, select web product and identify interested faculty. The team selected cohort webMBA and launched a full-scale program in 1999. In addition following decisions (milestones) were also made:

- Selection of CMS platform; EDUPRISE system (now part of Blackboard) was selected after several vendor demonstrations
- 24 × 7 IT support was outsourced to EDUPRISE Inc.
- Faculty was identified and given incentives to develop initial core courses
- Student Services Support was developed in-house
- Student admission and registration processes was developed in-house
- Due to emerging nature of e-learning a cohort model was used to allow webMBA to reach a steady state.

3.2.2 One size does not fit all

E-learning requires little effort and resources in the sense that anybody can start a website, a web education program or a web store. In the early twentieth century, this attracted many venture capitalists who thought of making quick money. However, as traditional universities started getting into e-learning 'quality' and value (through AACSB or other international accreditation institutions) became important. Education requires recognition, quality, and accreditation from appropriate world bodies. As already mentioned many for-profits universities have already folded for lack of quality and name recognition, and ultimately lack of capital. Several authors have discussed quality (Turoff *et al*., 2004; Tribus, 2004) in context of e-learning.

Students are comparing and demanding 'customised' product delivered by qualified faculty. Quality and product differentiation are becoming important (Aggarwal and Adlakha, 2006). E-learning requires quality program that has appropriately qualified and trained faculty to deliver state of the art courses. Since e-learning is still evolving there are no benchmarks available and administration should avoid mass customisation policy of 'one-size-fits' all as it will assure failure. A quality-oriented customised offering is required to distinguish one program from another.

3.2.3 Develop 'custom-centric' approach

E-learning is like e-business. Many universities are creating parallel structures for online and face-to-face education and in many cases treating online as 'for-profit' business. Irrespective of the nature of education, there is fierce competition for 'customer'. A program must be better or be able to differentiate itself to attract customers, *i.e.*, students. It is important to identify target markets. Working adults will require different time and place flexibility compared to full time students or housewives. Like an enterprise, customer is always right motto must be followed. This does not imply that customers know everything and a university should be everything to every student. This would lead to mediocrity or even failure. It is important to identify and create market niche. For example, at one of the author's university, the focus is on working mature adults, adults amidst career change, housewives or returning students and the programs are designed to accommodate them. For example, assignment deadline are created to allow students to work over the weekend. Regular surveys and focus groups provide input for continuous improvements and customisation. It is important to identify target market early in the planning process to allow for appropriate marketing. Flexibility is the key in accommodating the niche market. However this does not imply loosening standards but merely flexibility to accommodate exceptions.

3.2.4 E-learning is NOT for everybody

Though e-learning can reach everybody across boundaries, it is NOT meant for every student (Zhang *et al*., 2004). E-learning objective and target audience must be identified. If the intent is mass penetration and information dissemination, then it is similar to T.V. or video broadcasting, where there is one-way delivery. However if the intent is mass delivery with evaluation, then assessment methods must be developed before entering this market. Many countries, especially the third world countries, feel that e-learning is the answer to 'all' the problems. It is not true. Countries, with the help of UNESCO and many other agencies, are providing broadband access to reach remote villages where an illiterate customer can access latest information, however, e-learning has limitations since it is self-driven. These villagers need to be motivated and must have a desire to 'learn'. This requires a cooperative effort from various stakeholders. E-learning is typically most successful with mature adults who are busy travelling, live outside the urban areas and cannot commute to campus at designated time (Turoff *et al*., 2004).

In addition to management issues there are many faculty issues like changing role of faculty, faculty training and sharing of e-teaching resources. We discuss them below.

3.2.5 E-teaching is not for everybody

Just like e-learning is not for every student similarly e-teaching is not for every instructor. E-teaching requires a virtual approach. Many authors (Aggarwal and Legon, 2003; Liu *et al*., 2005) have described the changing role of faculty in e-learning environment. Faculty becomes facilitators, coach and participants. Learning becomes student-driven. Virtual learning requires virtual monitoring and virtual assessment. It is important for administrators to select innovative and tech savvy faculty who are willing to learn 'new' virtual pedagogy. Instructors need to learn to deliver content in a virtual environment that teaches same principles and values as in face-to-face learning environment. This requires mentoring and facilitating skills. Instructor may require training in conducting large

virtual groups. Several commercial software are available that can train faculty in this regard. Group monitoring becomes even more complex in a global environment. In distributed global groups, culture becomes one of the behaviour determinants. Instructor, themselves, may need training in various cultures to accommodate such groups.

Generally, ICT technologies transform the status of teacher. He or she is a mentor, mediator and/or a facilitator. For example, the pedagogical idea of Finnish-based DIANA model is that both students and teachers learn by studying together (Aarnio and Enqvist, 2002). The DIANA model, which provides a comprehensive framework for adults' e-learning, includes determination different roles: teachers' role, students' role and the role of technology. It consists of four cornerstones (see Table 2). These cornerstones are connected together. Cornerstone A is a starting point for e-learning activities and Cornerstone D is the end as a starting point for the round of learning.

Table 2 DIANA model

Cornerstone A	*Cornerstone B*
Creating common ground for the learning on the net A1 The idea of authentic dialogical learning on the net A2 Coaching and training for the learning on the net A3 Structuring and the start of the working on the net	Authenticity of the learning on the net B1 Student-centred search and formulation of proper study problems out of real work situations B2 Utilising sources of information and generating and building material about one's own substance field
Cornerstone C	*Cornerstone D*
Dialogical learning activities on the net C1 Dialogical problem solving within a learning community C2 Dialogical helping and supporting in a learning community C3 Dialogical inquiring in problem solving	Finding new direction for learning and developing competence D1 Reformulating the study problems and focusing them further into real work situations D2 The idea of evaluation

3.2.6 Share knowledge (learning communities)

E-learning is moving from introductory to growth stage and many new issues are emerging. Issues like face-to-face versus e-learning have been studied extensively in the literature in the introductory stage and it is established that e-learning, if not better, is at least as good as traditional face-to-face learning (Turoff *et al*., 2004; Aggarwal and Legon, 2003). However there are still many issues, like virtual groups, class size, assessment, quality, group size, webcasting, *etc*., and their impact on e-learning that need to be studied. There is sporadic research in this area but there is no established repository or consensus. It is very important to disseminate whatever research is available to colleagues through seminars, journals and conferences. Faculty learns from other faculty and sharing knowledge provides new ideas and new approaches. This becomes more complex in a globalised environment where sharing knowledge through seminars and conferences can be a problematic. Universities or professional societies can develop online repositories to disseminate e-learning research.

Sharing knowledge requires good communication and interaction skills (Hyde, 2006; Davenport and Prusak, 1998). We can divide sharing knowledge into two forms: organised and unorganised. Both forms should be supported by using different modes: conventional communication and network-based services. Knowledge management is connected to sharing knowledge. For example in the field of mobile learning Chan and Leung (2003) emphasise that the understanding of knowledge management and learning communities are needed if we want to carry out successful mobile learning. By combining mobile learning with knowledge management instantaneous and real-time information and expertise can be brought to everyone and everywhere. In the mobile learning community, learner can get information by working with others. In general, by combining network-based learning and knowledge management more effective learning can be achieved (Choenni *et al.*, 2001; Schmidt, 2005).

3.3 Operational factors

Operational factors refer to day-to-day operational details. They refer to tasks such as content development, content management and assessment process.

3.3.1 Create e-learning environment on the web

It is neither possible nor advisable to mimic face-to-face learning environment in e-learning. This is probably the biggest mistake a content developer can make. Face-to-face learning is very different than web-based learning (Turoff *et al*., 2004). In e-learning, there is no face-to-face contact and all communication (learning) is achieved through discussion forum. Though the learning concepts do not change, methodology does. In face-to-face faculty delivers and there is mostly one-way communication. On web there is 24/7 two-way communication and faculty 'facilitates' learning by guiding students through forum in the right (or correct) direction. Constant communication and feedback with students is a must.

Content preparations require creative thinking. It should include the following:

- the content explanation as opposed to PowerPoint slides
- embedded exercises
- FAQ's
- additional readings.

Multimedia content or streaming videos can provide better information but faculty must remain aware of band width requirements that may unnecessary slow some students, especially in third world countries. Faculty need to think: how can we teach a concept without ever seeing students. Teaching approach may have to be drastically different from face-to-face teaching environment. Since learning is discussion based it may be useful to use cases, group exercises and current situation to teach concepts that typically may be taught using hands-on exercise in a face-to-face class. This has worked quite well and in many cases learning has enhanced for many students (Aggarwal and Legon, 2003).

3.3.2 Develop course content and management policies

Content development and management is a broad area by itself and much has been written in the literature about it. We are highlighting only some of the critical factors that are a prerequisite for a successful content development, delivery and management. It is critical to communicate course requirements and policies well in advance to allow students to comprehend and requirements of the course. This is necessary since instructors have different pedagogical approaches and student must be aware and be prepared for them. Course requirements and syllabi should be made available well in advance of the class start date. To develop cordial learning environment students should be asked to introduce themselves on the forum. Net etiquettes, what is acceptable and what is not acceptable, must be provided in advance.

Course contents should never be outsourced. It must be developed by qualified faculty who are responsible for content, pedagogy and deliverability of the content. Weekly lectures must be more than PowerPoint slides. They must include detailed, problems and embedded exercises. As a minimum, policies must be defined for the following items:

- e-mail
- discussion
  - a weekly deadlines
  - b participation
- home work/exam deadline
- academic integrity and honesty
- grading
- university appeal
- syllabi changes/revisions during semester.

3.3.3 Think 'globally' and act 'locally'

E-learning works best when customer (student) interest is of utmost importance. To be successful in a global environment it is essential to think in 'local' terms:

- local customs
- local laws
- local differences
- local culture.

It is important to understand local norms and jargon (*i.e.*, lift vs. elevator; soccer vs. football; *etc*.) and not to use or undermine local laws. Content should be sensitive to local needs, norms and customs. What may be offensive in one culture may be acceptable in another and conflicts must be avoided.

If no information technology competency or requirements are specified, then lectures should be prepared to allow for slow downloading especially for students in third world countries. Chats, if in synchronous mode, must be scheduled at different times to allow for time differences. Text and flash versions of lectures maybe needed to accommodate global students. Cyber office hours should be announced well in advance to allow students to adjust their work and family schedules. Each student should feel that course is designed to meet their needs.

3.3.4 Develop e-learning infrastructure

The biggest mistake a university can make is to use the current IT infrastructure to support e-learning. This includes servers, software and technical and other support staff. Current staff, typically, is not trained to handle virtual students. Universities may need to create a parallel structure or outsource some of these functions. It is recommended that student management be handled internally but technical maintenance and 24/7 technical support be outsourced. This reduces the need for in-house specialists and allow for quick response to changing student needs. Specialists can provide economy of scale if they are providing similar support to other universities. Irrespective of in-house or outsourcing, developing an infrastructure requires an initial investment of resources and commitment from administrators. There should be a dedicated e-learning server and internal or external staff to provide 24/7 content delivery and maintenance. CMS should be periodically examined for stakeholder's needs and updates. In many third world countries land lines are not reliable and it maybe preferable to develop online courses on wireless media. This, in future, could be used for real time podcasting and webcasting. Young *et al*. (2007) provides an interesting learning paradigm based on wireless classroom and hand held devices.

3.3.5 Ongoing learning assessment process

E-learning is rapidly moving from static to dynamic stages. It is an ongoing learning processes as today's pedagogies become obsolete and new ones emerge. Technology is changing at an unprecedented pace as competition is providing more and more user friendly platforms. This requires dynamicity from everyone involved in e-learning. E-learning is dynamic so people involved must also be dynamic. As e-learning spreads and matures a kiosk-based education may become a reality. This is creating anxiety among stakeholders in terms of 'quality' of education. Many accreditation societies are demanding assessment plans before granting accreditation. There is a scramble on part of many universities to develop plans for course and for programs assessment. Student questionnaires have been typically used for faculty evaluation but there is lack of course and program assessments techniques. Many universities have already started total quality approach for e-learning. Aggarwal and Adlakha (2006) discuss quality management for web-based courses and Aggarwal and Lynn (2006) discuss rubric and measurement of IT competency in introductory MIS courses. These attempts, though a good start, require a coordinated effort of administrators at all levels. Benchmarks need to be developed to assess outcomes and continuous implementation. Benchmarking becomes even more important in a global environment where quality control maybe more difficult.

The Inter-European Menon (2005) organisation for e-learning has launched the Helios project which has developed the goals for evaluating e-learning as:

- To what extent e-learning is an effective means to improve access to learning opportunities?
- How much e-learning helping European citizens to achieve better employability?
- In which way is e-learning contributing to personal development and citizenship in a Lifelong Learning perspective?
- Is e-learning a facilitator of organisational change in e-learning user's organisations, such as companies, public administration, educational institutions?
- Which impact has e-learning on the internationalisation of E&T systems in Europe?
- How and how much e-learning is supporting innovation processes in E&T organisations?

The Helios project aims to study these questions by experimenting across Europe.

In summary, a university wide plan should be developed as a collective effort of administration, faculty and technical staff. Though we have categorised factors here but they are not mutually exclusive. For example, a CMS selection process could be at strategic, control or even at operational level.

4 Conclusion

This paper has provided a list of critical factors needed to provide a successful e-learning. The list will keep changing as new ideas emerge and existing one are resolved. Colleges and universities of all sizes are facing many challenges and opportunities offered by this new technology-based concept. We have argued that the faculty must be technically savvy and willing to learn web-based teaching philosophies. Administration must develop a plan and institutionalise e-learning slowly and slowly. For example, existing administration and management of enrolment, student services and technical support will need to be enhanced and perhaps overhauled. Moreover, standards for the design, development and delivery of e-learning will need to be addressed. In many cases a parallel structure to the existing administrative structure maybe needed to support e-learning. Inadequate skills and/or lack of knowledge about e-learning within the institution may be a major hurdle.

Like any emerging technology, e-learning is not free of problems, controversies, and challenges. Higher education institutions considering e-learning will likely need to reform conventional processes, policies and practices by creating new parallel structures. The first wave of e-learning concentrated on 'what' of e-learning and the next generation is focusing on 'How' of e-learning. There is no 'when' of e-learning anymore. New entrants can learn from old entrants.

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Notes

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II

STUDENT-CREATED SCREEN CAPTURE VIDEOS AS A PART OF INFORMATION SYSTEMS SCIENCE COURSE: LEARNING IN THE SPIRIT OF YOUTUBE

by

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III

IS A SEMINAR BASED ON STUDENT-CREATED SCREEN CAPTURE VIDEOS A MEANINGFUL WAY OF LEARNING?

by

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Is a seminar based on student-created screen capture videos a meaningful way of learning?

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ABSTRACT

We ran a problem-based seminar with screen capture videos. The students worked in small groups of two or three students or they completed the coursework individually. In this seminar the students had a workspace in the Optima environment for publishing their coursework videos. At the final phase of the course the students were expected to familiarize themselves with the presentations of other groups. In this paper we analyze the benefit of our problem-based coursework on the web by comparing the different phases of it. After each phase the students were expected to analyze the benefit of it for their learning.

Keywords: Learning of information systems, screen capture videos, web-based learning environment, constructivist learning, problem-based learning.

1. INTRODUCTION

In the constructivist approach learning is comprehended as the development of mental models. Brandt [1] emphasizes that constructivism is an essential basis when applying the web for teaching and learning. It provides the teacher with a structure for teaching. By focusing on concepts and connecting them to mental models, teachers can gain both confidence and control over the amount of material they cover in the small blocks of time usually allotted to teaching and training. Integrated with experiences that learners use to alter and strengthen mental models, the constructivist approach to teaching information retrieval also gives users the structure needed to get the most out of the Internet.

The era of the web 2.0 has brought new ways to publish works on the web [11]. The web can be seen an active tool supporting collaboration. One of these new ways for publishing is videos. YouTube video service has promoted this significantly. In the spirit of the YouTube student can compose videos by themselves and publish them on the web. In this way they can use video making tools in the spirit of constructivism allowing active learning experiences. One tool for video-making is Windows Media Encoder (WME) which enables capturing screen and voice narration at the same time. These videos are playable in most media players including, for example, Windows Media Player.

Based on the aforementioned we use a problem-based coursework focusing on the problematic concepts of the learning area. First in this coursework, students need to report what these difficult concepts are by familiarizing themselves with a lecture handout. Second, the students need to search area-related information on the web and give some examples of learning. In this way the students can focus on the main concepts and enrich their learning in a constructivist way and the web can help them learn difficult concepts in particular. Based on this acquisition of information students can compose WME videos in which they teach other students to understand these problematic concepts better.

The social constructivist learning theory emphasizes the meaning of interaction in successful learning. For realizing these benefits in our web-supported coursework we suggest the use of a virtual learning environment (Optima) and its shared workspace feature. This occurs by publishing videos; by commenting on seminar works created by other students (or groups) and by reading comments expressed by other students. By using a virtual learning environment the students can use their own language to teach each other to understand problematic concepts.

This paper introduces our approach to carry out a web-based coursework and seminar. Additionally, it provides the analysis of it focusing on the successfulness of our coursework and seminar. Our analysis has many goals. We want to know

- how the students experienced the coursework,
- how the students experienced making a coursework video, and
- how the students experienced watching other's coursework videos.

Before discussing the study itself, we first provide an overview of constructivism and the WWW in learning from the perspective of our study.

2. CONSTRUCTIVISM

Jonassen [4] summarizes what he refers to as "the implications of constructivism for instructional design". The following principles illustrate how knowledge construction can be facilitated by:

- providing multiple representations of reality,
- representing the natural complexity of the real world,
- focusing on knowledge construction, not reproduction,
- presenting authentic tasks (contextualizing rather than abstracting instruction),
- providing real-world, case-based learning environments, rather than pre-determined instructional sequences,

- fostering reflective practice,
- enabling context-and content dependent knowledge construction, and
- supporting collaborative construction of knowledge through social negotiation.

According to Brandt [1], constructivism asserts that learners construct knowledge by making sense of experiences in terms of what is already known. In constructivist learning the concept of a mental model is essential. Learning is comprehended as the development of a learner's mental models (or a student's knowledge structures). Brandt [1] emphasizes that constructivism is an essential basis when applying the WWW for teaching and learning. While the goal of constructivism is to recognize and help to facilitate a learner's ability to construct knowledge when applied to teaching information retrieval on the Internet, it also provides the teacher with a structure for teaching. By focusing on concepts and connecting them to mental models, instructors and teachers can gain both confidence and control over the amount of material they cover in the small blocks of time usually allotted to teaching and training. Integrated with experiences that learners use to alter and strengthen mental models, the constructivist approach to teaching information retrieval also gives users the structure needed to get the most out of the Internet.

The WWW and its hypermedia nature enable learning by constructing knowledge in the sprit of the cognitive school of constructivism. Cognitive constructivism emphasizes that learning occurs through many channels: reading, listening, exploring and experiencing his or her environment [7]. Furthermore, the WWW and web-based learning environments support learning based on social constructivism by providing different ways of communication. The social constructivist theory emphasizes the influences of cultural and social contexts and interaction in learning [10].

Problem-based learning is one implementation of the constructivist model of learning and the practical implementations of it can vary [6]. By applying problem-based learning to constructivist learning students can concentrate on what is really difficult. According to Ellis et al. [2], in a problem-based learning environment, students work in groups on real-life problems and have the opportunity to determine for themselves what they need to learn in the relevant subject area(s). Based on the aforementioned one approach to problem-based learning can be familiarizing with an area to learn first. This phase can be followed by determining difficult concepts to learn and this could be the basis for an assignment. The assignment can occur on the web using different resources, such as search engines and directories. In this way students can bring fresh and clarifying views for themselves and fellow students in their own language.

3. THE WWW IN LEARNING IN OUR CONTEXT

In the case of coursework one approach may be by seeing Internet tools as cognitive tools, in other words, tools for knowledge construction. A cognitive tool is a term introduced by Jonassen in his discussion of hypermedia tools [3]. He claims that cognitive tools actively engage learners in the creation of knowledge that reflects their comprehension and conception of the information rather than focusing on the presentation of objective knowledge.

In the same way, web-based tools, like Optima, can be seen in an active context. The students can use Optima and its presentation feature for introducing their ideas, receiving feedback, and managing coursework. This leads to learning by constructing knowledge based on both a student's own ideas and other students' ideas. Additionally, by publishing video clips students can learn a subject area under the rules of cognitive constructivism.

4. METHODS

We pursued the study, including a problem-based coursework, and using Windows Media Encoder as well as the Optima environment. In this section we describe our experiment, sample, and results.

Experiment

At the University of Jyväskylä, the themes of the course Information management and information systems development are (1) administrative view to information resources management, (2) technological view to information resources management, (3) building information systems, and (4) organizational applications. The course was inspired by a textbook, Information Technology for Management: Transforming Business in the Digital Economy [9]. The course usually lasts for seven weeks including lectures (36 hours), coursework (feasibility study) as well as the final exam. The course given in fall 2006 also lasted for this length of time and included the above-mentioned activities and in addition material and activities on the WWW to support the lectures in the constructivist fashion combining both cognitive and social constructivism as well as problem-based learning.

To realize the benefit of problem-based learning and constructivism we organized a coursework in which students were expected to learn difficult course themes based on self-defined problems. The students were expected to familiarize themselves with the lecture handout of the course (128 pages) and try to find 5 difficult matters which should be better clarified. Based on these problems they searched for more information from the web to understand the possible difficult matters in our material. The students needed to report what useful links they found by using search engines and directories. They were expected make Powerpoint slides that included examples of what they have learned. The Powerpoint slides were the basis for videos. Videos were composed by using Windows Media Encoder and they contained Powerpoint slides and narration. The students were expected to clarify to other students what they can learn by seeing examples on the web. This part of the coursework was designed by combining problem-based learning and cognitive constructivist learning theory focusing on the concepts of the content area.

To promote the students' participation in the optional coursework, the students got credits for the final examination by completing the coursework. Although the coursework is a constructivist part of the course, the teacher's office hours were available as an additional resource to promote their work as well as scaffolding support. The students had six and a half weeks for the coursework before the final examination. The work was expected to be conducted as an individual task or in groups of two or three students.

The groups placed the videos on a web server. In the web-based workspace on Optima learning environment (see more details on the product at http://www.discendum.com/english/index.html) students created links to the videos on different servers and in this way the Optima enabled the single-point access to all the video material created by the students. Other groups were expected to familiarize themselves with these presentations. Additionally, it was possible to attach comments regarding any work of other groups on this workspace. For making the videos, the groups had six weeks. After these six weeks the groups were expected to comment on three other coursework presentations. These comments were placed in the Optima workspace. The students had one week for this. In the comments the students were expected to clarify what they learned by watching other students' videos. This part of the coursework was designed in the spirit of the social constructivist learning theory.

Figure 1 shows the first view of students' workspace on Optima. With the help of this outlook the students had a possibility to create links to videos on other servers and see and comment on the presentations created by other groups. By clicking a yellow button after the name of a presentation the students were able to comment on the videos of other groups. The commenting could occur either by typing plain text or using attachment.

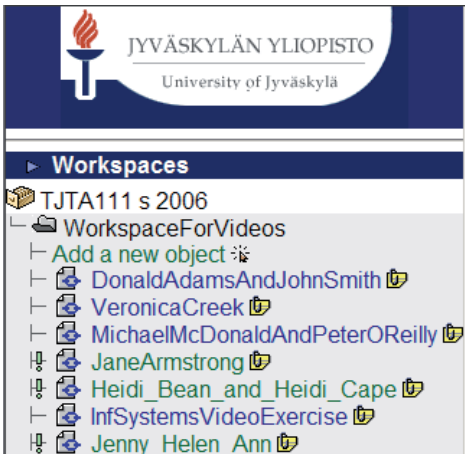

Figure 1. Single-point access to videos of coursework.

Sample

Forty-three students, 12 females and 31 males, whose mean age was 23 years (range 18-39 years), participated in the experimental group including the problem-based seminar on the web. 7 students studied informatics as a minor and 36 students as a major. 10 of them completed the coursework individually, 21 in groups of two students, and 12 in groups of three students. We call this group the WWW group in this paper.

Thirty-five additional students, 13 females and 22 males, whose mean age was 25 years (range 19-52 years), were involved in the control group. 13 students studied informatics as a minor and 32 students as a major. We call this group the non-WWW group in this paper.

Both the students of the WWW group and non-WWW group were expected to use the Optima learning environment for retrieving the course material. The pre-questionnaire conducted at the beginning of the course showed that the students both in the experimental group and the control group were at the same knowledge level concerning the main topics of the course: (1) administrative view to information resources management, (2) technological view to information resources management, (3) building information systems, and (4) organizational applications.

Results

As a part of the coursework the students evaluated two main phases of the coursework. This included the ratings of how beneficial they experienced (a) video making and (b) commenting on the videos of other students (where 1=very insignificant in learning and 5=very significant in learning). In this subsection we show the results based on this information. Additionally, we compare the effect of these two ways on learning and analyze the effect of our e-learning platform on learning.

How students experienced coursework in general: Table 1 shows the students of the WWW-group ratings on the coursework and seminar in general. The students were expected to rate how they experienced the coursework generally at the end of the course. The result shows that their attitude is mainly positive in both groups concerning the coursework generally.

n	43
Mean	3.88
Very insignificant	0
Insignificant	3
Moderately significant	7
Significant	25
Very significant	8

Table 1: Coursework generally.

Making videos: Table 2 shows the students' ratings concerning the benefit of video making. The students rated the benefit when they had created a link to the video from the Optima workspace. The result shows that this phase was beneficial for most students.

n	40
Mean	3.75
Very insignificant	0
Insignificant	1
Moderate significant	11
Significant	25
Very significant	3

Table 2: Benefit of video making.

Commenting on videos: Table 3 (see next page) shows the students' ratings concerning commenting and its effect on learning. The students were expected to rate how they experienced this phase at the end of the course. This phase was the most beneficial for the students.

n	37
Mean	3.94
Very insignificant	1
Insignificant	0
Moderate significant	4
Significant	27
Very significant	5

Table 3: Benefit of commenting on videos.

Comparing main features: We compared the means of the students' ratings concerning two basic features of the coursework. Since the data did not agree with the normal distribution, the Wilcoxon Signed -Rank test was appropriate for comparing two phases of the course. The test did not find significant difference between the ratings of video making and commenting on the videos (p=.225). The both phases are equally beneficial for learning.

How the students evaluated their competence level of e-learning platform use: We compared the means of the students' ratings concerning the competence level of e-learning platform use. Since the data did not agree with the normal distribution, the Mann-Whitney test was appropriate for analyzing data. The test did not find significant differences between the experimental group and the control group (p was .359 at the beginning of the course and .596 at the end of the course). Thus, the use of an e-learning tool is not the only critical matter while creating learning activities on the web. Pedagogical design is needed as well.

5. DISCUSSION

In this paper we analyzed a web-supported coursework focusing on the effect on the topics to learn. The results show that our screen capture video -based coursework including a seminar is a potential way to organize a coursework if we have a crowded course. Our comparison shows that the video making is the most fruitful part of our web-based coursework. In our coursework the video making phase represented cognitive constructivism and the commenting phase is connected to the social constructivist learning theory. We can claim that the approach presented in this paper supports the previously mentioned type of constructivism in the best way.

However, these phases together brought more value for learners and this result supports [4] general discussion on constructivist learning. A course with e-learning activities should include different engaging activities.

In the fall of 2005 we ran the same coursework without video [5]. In this assignment the students were expected to create HTML documents instead of videos. The results of this coursework showed that the authoring phase of the coursework is more important in learning than the commenting phase. Based on this we can claim that video has improved the usefulness of the commenting phase. The students of the year 2006 experienced the coursework more effective for their learning concerning both phases. Thus, video making improves the usefulness of both phases.

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IV

STUDENT-CREATED SCREEN CAPTURE VIDEOS AS A PART OF INFORMATION SYSTEMS SCIENCE: COLLABORATIVE LEARNING IN THE SPIRIT OF YOUTUBE

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VII

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VIII

VIDEOWIKIS FOR IMPROVED (CONSTRUCTIVIST) LEARNING: A CASE STUDY REGARDING BASICS OF INFORMATION SYSTEMS SCIENCE

by

Pekka Makkonen, Kerstin Siakas, Antti Pirhonen, Shakespeare Vaidya & Errikos Siakas, 2013.

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Videowikis for Improved Problem-based Collaborative Learning: Engaging Information Systems Science Students

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Learning of information systems, screen capture video, wiki, constructivist learning, connectivism, problem-based learning

***Abstract*— The contemporary era of social media and web 2.0 has enabled a bottom-up on-line collaborative approach with easy content creation and subsequent knowledge sharing. The technically literate students of today and the changes in pedagogy towards a user-centred approach, where learners engage in the learning process by constructing new ideas and concepts based on their current or past knowledge facilitate the use of social media in learning environments.**

This paper describes the combination of a wiki and screen capture videos as a complementary addition to conventional lectures in an information management and information systems development course. The basis for our approach was collaborative problem-based learning with concrete problems defined by students. In order to activate students they were asked to identify unclear concepts or issues from four not well-defined or clarified lecture themes. The students worked in small groups. After the groups selected the theme which was most unclear to them they created presentations associated with these issues. Our intention was to facilitate collaborative learning by using the principles of the Jigsaw method. The results from the experiment showed that videowiki-based coursework affects both external and internal motivation equally in most cases. This reflects that from the perspective of constructivism the videowiki-based assignment is equally effective compared to learning without this setting. However, the development of knowledge concerning different course themes was positive in groups of students who completed this videowiki assignment.

1. Introduction

In the constructivist approach learning is comprehended as the development of mental models. Brandt [1] emphasizes that constructivism is an essential basis when applying the web for teaching and learning. It provides a structure for teaching. By focusing on concepts and connecting them to mental models, teachers can gain both confidence and control over the amount of material they cover in the small blocks of time usually allotted to teaching and training. Integrated with experiences that learners use to alter and strengthen mental models, the constructivist approach to teaching information retrieval also gives users the structure needed to get the most out of the Internet.

The constructivist learning theory presented in this paper is not an ideal theoretical framework for the era of the web 2.0. In this era learning is more targeted and includes various sources and processes. Connectivism has been suggested as an alternative for current theories (behaviorism, cognitivism, and constructivism) [2]. However, since connectivism has not been acknowledged as a theoretical framework by the research community (see e.g. [3]), we apply constructivism as the basis of theoretical reasoning in the current study. Another motivation factor for this is that in constructivism a user-centred approach is encouraged in contrast to course-driven design. Learners engage in the learning process by constructing new ideas and concepts based on their current or past knowledge [4]. In this study the students were asked to construct concepts and new knowledge according to their understanding of problems.

The era of the web 2.0 has brought new ways for publishing works on the web. The web can be seen as a tool supporting active collaboration. One of these new ways is publishing videos. YouTube video service has promoted this significantly. In the spirit of the YouTube students can compose videos by themselves and publish them on the web. In this way they can use video making tools in the spirit of constructivism allowing active learning experiences. One tool for video-making is Windows Media Encoder (WME) which enables capturing screen and voice narration at the same time. These videos are playable in most media players including, for example, Windows Media Player.

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Based on the aforementioned we use a problem-based coursework focusing on the problematic concepts of the learning area that engages students in solving authentic and contextualized problems. First in this coursework, students report what difficult concepts they identify by familiarizing themselves with a lecture handout. Second, the students search content-related information on the web and give examples of the content in a way they consider that they better understand and thus better facilitate their learning. In this way the students can focus on the main concepts and enrich their learning in a constructivist way and the web can help them to learn particular difficult concepts and share this knowledge with other students. Based on this acquisition of information students compose WME videos in which they teach other students to understand these problematic concepts better. The students can utilize this video material at their own pace, any time and place. In this way WME videos can be considered more useful in education compared to traditional live presentations.

The social constructivist learning theory emphasizes the meaning of interaction in successful learning. For realizing these benefits in our video-supported coursework we suggest the use of a wiki environment (Wetpaint in our case) and its power to share knowledge through single-point access. This occurs by publishing seminar videos, by commenting on seminar videos created by other students (or groups) and by reading comments expressed by other students. By using a wiki environment the students can use their own language to teach each other to understand problematic concepts.

The shortage of the existing studies of web-video use in education is that these are based on web-based distance learning paradigm, apparently applying behaviorist strategies. Such methods include blogs, simulations, pod casting, and video games (see for example [5-7]). The problem of these experiments seems to be that they forget the connectivist nature of the web use.

This paper introduces a constructivist approach to carry out a videowiki-supported coursework and seminar. This paper has two purposes. First, it introduces our videowiki-based coursework as a way to apply the WWW in the learning of basic concepts and issues in information systems science. Second, it includes an evaluation of how dedicated the students who completed the optional WWW-based coursework were learning different areas of information system science. Additionally, the paper contains an evaluation of how the knowledge of four different main areas was developed during the course. We made all the evaluations by comparing the students who completed the coursework to the students who did not participate in the coursework.

The paper is organized as follows: section two describes constructivism as an alternative view of learning. In section three we discuss the opportunities of the WWW in learning. In section four we describe the meaning of engagement and motivation in learning. The fifth section presents our research objectives based on the theoretical discussion conducted earlier in this paper. The sixth section presents the evaluation of our assignment from the perspective of engagement and motivation as well as from the perspective of knowledge development. In section seven we summarize the results of the study and draw conclusions and in section eight we reflect on the application of learning theories. Finally in section nine we provide thoughts about potential future work.

2. Constructivism

Widely known and discussed views associated with computer-supported learning include behaviorism and constructivism. Behaviorism is as a learning paradigm derived from positivistic paradigm of science. It discards mental issues as scientific topics, and relies purely on observable phenomena. In the behavioristic view learning is conceptualized as student's reactions to teaching based on the activation of subjective knowledge construction (stimulus). Whether learning has taken place or not is evaluated solely on the basis of observable behavior of the student. Constructivism, in contrary, is derived from cognitivist views of human cognition, thus focusing on mental events rather than outer behavior as learning outcome. In constructivism learning is fundamentally seen as subjective, active knowledge construction. As teaching strategy, it is interested in the mental processes which affect the behavior of a student [8]. Most forms of learning and instruction can be implemented according to any learning paradigm, i.e., a traditional lecture as well as courseware and projects may be carried out according to behavioristic strategies or by intentionally supporting the construction of knowledge in the cognition of the learner. However, most existing web-based instructions are based on behaviorism [9].

Jonassen [10] summarizes what he refers to as "*the implications of constructivism for instructional design*". The following principles illustrate how knowledge construction can be facilitated by:

- providing multiple representations of reality;
- representing the natural complexity of the real world;
- focusing on knowledge construction, not reproduction;
- presenting authentic tasks (contextualizing rather than abstracting instruction);
- providing real-world, case-based learning environments, rather than pre-determined instructional sequences;
- fostering reflective practice;
- enabling context-and content dependent knowledge construction;
- supporting collaborative construction of knowledge through social negotiation.

According to Brandt [1], constructivism asserts that learners construct knowledge by making sense of experiences in terms of what is already known. In constructivist learning the concept of a mental model is essential. Learning is comprehended as the development of a learner's mental models (or a student's knowledge structures). Brandt [1] emphasizes that constructivism is an

essential basis when applying the web for teaching and learning. While the goal of constructivism is to recognize and help to facilitate a learner's ability to construct knowledge when applied to teaching information retrieval on the Internet, it also provides the teacher with a structure for teaching. By focusing on concepts and connecting them to mental models, instructors and teachers can gain both confidence and control over the amount of material they cover in the small blocks of time usually allotted to teaching and training. Integrated with experiences that learners use to alter and strengthen mental models, the constructivist approach to teaching information retrieval also gives users the structure needed to get the most out of the Internet.

The web and its hypermedia nature enable learning by constructing knowledge in the spirit of the cognitive school of constructivism. Cognitive constructivism emphasizes that learning occurs through many channels: reading, listening, exploring and experiencing the environment of the learner and the learning content [11]. Furthermore, the web, web-based learning environments, and wikis support learning based on social constructivism by providing different ways of communication. The social constructivist theory emphasizes the influences of cultural and social contexts and interaction in learning [12].

Problem-based learning is one implementation of the constructivist model of learning and the practical implementations of it can vary [13]. By applying problem-based learning to constructivist learning students can concentrate on what they consider the most difficult issues. According to Ellis et al. [14], in a problem-based learning environment, students work in groups on real-life problems and have the opportunity to determine for themselves what they need to learn in the relevant subject area(s). Based on the aforementioned approach to problem-based learning familiarizing with an area can be the first step of learning. This phase can be followed by determining difficult concepts to understand and this could be the basis for an assignment. The assignment can include the use of different resources on the web, such as search engines and directories. In this way students engage in complex, challenging problems and collaboratively work toward their resolution and bring fresh and clarifying views, which they can discuss in their group and use for preparing their assignment to be used for knowledge sharing between themselves and fellow students in their own language. The motivation to solve a problem becomes the motivation to learn. Simultaneously problem solving skills are developed and learning becomes an active, integrated and constructive process influenced by social and contextual factors.

3. The Use of theWeb for Learning in our Context

Vast information resources are available to teachers and students via the web. However, the problems inherent in any information system include disorientation, navigation inefficiency and cognitive overload. On the Internet these problems are multiplied [1]. In educational settings these problems can be decreased or even overcome by using suitable pedagogical approaches and/or appropriate tools.

One potential approach in educational settings and coursework may be considering Internet tools as cognitive tools, in other words, tools for knowledge construction. A cognitive tool is a term introduced by Jonassen in his discussion of hypermedia tools [15]. He claims that cognitive tools actively engage learners in the creation of knowledge that reflects their comprehension and conception of the information rather than focusing on the presentation of "objective" knowledge. These tools are learner driven and controlled, opposed to teacher or technology driven. The use of a cognitive tool changes the role of the student into an active learner. Figure 1 shows cognitive tools in the general three-dimensional framework for computer-based learning [15]. These dimensions are generativity, control, and engagement.

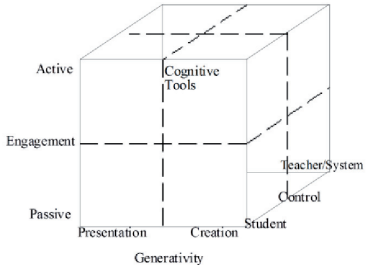

Fig. 1 Cognitive tools in computer-based learning

In the same way, web-based tools, such as wikis, can be seen in an active context. The students can use wikis for introducing their ideas, receiving feedback, and managing coursework. This facilitates learning by learners constructing new knowledge based on interaction among themselves.

In the case of a web-based seminar it is useful to discuss the use of the web from the perspective of media research. Haythornthwaite [16] stresses the interpersonal ties that affect the character of web-based communication. According to her, strong ties between students/learners improve web-based communication. In virtual environment team cohesion and group identity is difficult to achieve, if there are no earlier ties between team members. The reason is that virtual team members seldom meet face-to-face and thus informal communication is reduced. A successful leader of a virtual team (the teacher as facilitator) must excel in applying the right choice of communication means along with a profound knowledge of the effect of applying it. One of the strengths of team work is the exploitation of knowledge sharing and the dynamics of the team. If communication and trust are limited only partial knowledge sharing will take place and the potential added value (learning in our case) will not be achieved. The main differences between collated teams (team-members working in the same office/location) and distributed teams (team-members working on the same project/assignment in different locations) are within communications and trust [17]. Taking this into consideration and our own

experiences from higher educational environments in different cultural contexts we strongly believe that physical face-to-face interaction is needed as a part of a course, in particular in the beginning. Face-to-face interaction develops ties between students/learners/team members in a way that is not possible in a totally virtual training setting [18]. By meeting the students/learning face-to-face in the early stages of assignments contexts can be created in which effective web-based learning is facilitated.

Based on the above, it is important to appreciate these views of learning and to understand the use of the web in learning while outlining courses. Three issues, important to take into consideration are:

1. Discussion/reflection regarding the right amount of face-to-face based learning is necessary [19].
2. Analyzes of an accurate way to use the web. Active learning must be promoted and situations conducive for successful web-based learning must be created.
3. Scaffolding support is needed to support constructivist learning based on the web. We claim that most information systems science courses can be built on the constructivist approach of learning. Practically, this occurs e.g. by organizing a comprehensive coursework that works as the core of a course. This coursework should cover as many course topics as possible.
4. As an outcome of the underlying abstraction we decided to apply the Jigsaw collaborative learning method for our assignment [20]. The Jigsaw method divides the area the students are expected to learn into smaller pieces. In our case these pieces were four main themes of the course. The students were expected to create a presentation regarding one selected theme. In the next stage the students were expected to watch videos that the other student groups had created from three other themes. In this way students both create own knowledge and learn from other students. This was considered to be an effective way of problem-based learning in order to comprehend the whole course content.

4. Engagement and Motivation

Jonassen [15] claims that by using cognitive tools in learning, a student's engagement in learning is better. Thus, it is important to evaluate motivation in order to show the depth of engagement in this way.

Most commonly in learning from text, motivation and learning style is understood both internally and externally [21-24]. Internal motivation (or intrinsic motivation) reflects the own personal interest of the student/learner in regard to espousing new knowledge. It is associated with a human's high-level needs such as self-actualization. External motivation (or extrinsic motivation) reflects the need to reach goals set by others. This is connected to a human's low-level needs such as security and survival. Motivation in learning from text can be evaluated as shown in figure 2. Pre-motivation is the sum of pre-interest and pre-benefit. Post-motivation is the sum of post-interest and post-benefit. Internal motivation is the sum of pre-interest and post-interest. External motivation is the sum of pre-benefit and post-benefit.

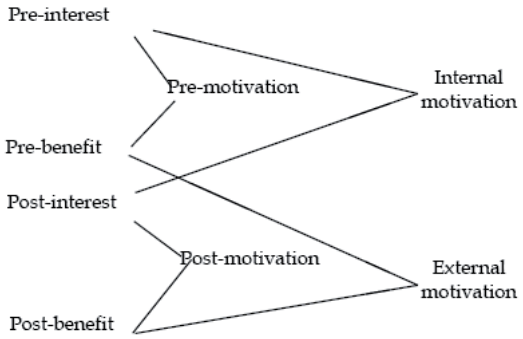

Fig. 2 Motivation of learning from text.

Biggs [21-22] created a Study Process Questionnaire (SPQ) to measure learning style. He found three qualitatively different learning approaches to studying, namely:

Surface learning: A student with the aim of achieving the minimum requirements learns in a superficial manner and uses a predominantly surface approach. The student is goal-oriented rather than focused on deriving any intrinsic meaning from the task.

Deep learning: The student is interested in reaching a meaningful understanding through extensive reading and research.

Achieving learning: The student is highly committed to gaining good grades and is likely to take a systematic approach to studying.

Every approach consists of a congruent motivational pressure and a corresponding study strategy. Biggs [21-22] articulates that students use predominantly one of these approaches to learning, and that these approaches are correlated to different performance outcomes. He claims that the identification of learning profiles is useful for identifying the compatibility of the student with a particular learning environment. In our case we did not take this into consideration, but future work will concentrate on identifying the learning style of students before creating the groups and measuring the outcome depending on the learning style preferences of the groups.

5. Teaching/Learning Methods

Taking the constructivist learning theory as the base for our pedagogical approach and combining contemporary trends in learning, we pursued the current study, including a problem-based coursework by using Windows Media Encoder as well as the Wetpaint wiki platform (see wetpaint.com). In this section we describe our experiment, sample, and results.

A. Experiment

At the University of Jyväskylä in Finland, the themes of the course information management and information systems development are (1) administrative view to information resources management, (2) technological view to information resources management, (3) building information systems, and (4) organizational applications. The course was inspired by a textbook, '*Information Technology for Management: Transforming Business in the Digital Economy*' [25]. The course usually lasts seven weeks including lectures (36 hours), coursework (feasibility study) as well as the final exam. The course given in the academic year 2008-2009 also lasted of the planned time and included the above-mentioned activities. In addition material and activities on the web was used to support the lectures in the constructivist fashion combining both cognitive and social constructivism as well as problem-based learning. Shorter versions of the course have been taught within the Erasmus Teaching Exchange programme to students at Johannes Kepler University in Linz, Vienna University of Technology and Alexander Technological Educational Institution of Thessaloniki, Greece in 2010 and 2011. Experiences have been reported at [26].

To realize the benefit of problem-based learning and constructivism we organized a coursework in which students were expected to learn difficult course themes based on self-defined problems. The students were expected to familiarize themselves with the lecture handout of the course (128 pages) and try to find 5 difficult matters which should be better clarified. Based on these problems they searched for more information from the web in order to find material supporting the comprehension of the student defined difficult matters in our material. The students needed to report what useful links they found by using search engines and directories. They were expected to create PowerPoint slides that included examples of content in a comprehensive way in order to demonstrate what they had learned and to be used by the other students to facilitate learning of the whole course material in an easy, fashionably and effective way. The PowerPoint slides were the basis for videos that students composed by using Windows Media Encoder. The videos contained PowerPoint slides and narration. The students were expected to clarify to other students what they can learn by using examples identified from the web. This part of the coursework was designed by combining problem-based learning and cognitive constructivist learning theory focusing on the concepts of the content area.

To promote the participation of the students in the optional coursework, the students achieved credits for the final examination by completing the coursework. Although the coursework is a constructivist part of the course, the office hours of the teacher were available as an additional resource to support the work of the students. The students had six and a half weeks for the coursework before the final examination. The work was expected to be conducted as an individual task or in groups of two or three students.

The groups placed the videos on a Wetpaint wiki website. On this workspace, students created links to the videos on different servers, and in this way Wetpaint enabled single-point access to all the video material created by the students. Other groups were expected to familiarize themselves with these presentations. Additionally, it was possible to attach comments in the discussion forums of Wetpaint regarding any work of other groups on this workspace. For making the videos, the groups had to finish within six weeks. After these six weeks the groups were expected to comment on three other coursework presentations. These comments were placed in the discussion forum of Wetpaint. The students had to finalize their comments on work of other groups within one week. In the comments the students were expected to clarify what they learned by watching videos of other students. This part of the coursework was designed in the spirit of the social constructivist learning theory.

Figure 3 demonstrates our single-point access to the videos and comments in our assignment. By utilizing the EasyEdit feature students were able to update wiki and create links to video material.

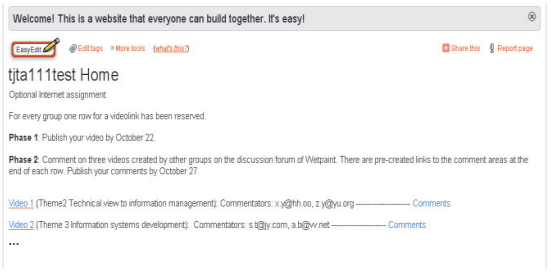

Fig. 3 Single-point access in our wiki-based coursework.

B. Sample

Sixty students, 22 females and 38 males, whose mean age was 22 years (range 18-39 years), participated in the experimental group including the problem-based seminar on the web. In total 9 students studied information systems science as a minor and 51 students as a major subject. Totally 8 students completed the coursework individually, and 52 in groups of two to five students. We call this group the video group in this paper.

Twenty additional students, 0 females and 20 males, whose mean age was 26 years (range 20-40 years), were involved in the control group. They all studied information systems science as a major. We call this group the non-video group in this paper. The students in the control group completed the course without the assignment including video making and the use of a wiki.

All the students had been initiated into the use of a PC and a web browser, and all of them were familiar with university lecturing. The pre-questionnaire conducted at the beginning of the course showed that the students both in the experimental group and the control group were approximately at the same knowledge level concerning the main topics of the course: (1) administrative view to information resources management, (2) technological view

to information resources management, (3) building information systems, and (4) organizational applications.

C. Collecting data

The data for this study was collected by administering a questionnaire both at the beginning and end of the course to both types of groups. The respondents rated each theme of the course with regard to (a) how interesting they considered the themes of the course (where 1=very uninteresting and 5=very interesting), and (b) how beneficial they considered the themes of the course (where 1=very useless and 5=very useful). The knowledge of the students/learners before taking the course and after having taken the course was measured through a subjective evaluation/ranking of their own skills or knowledge on a 5 point Likert scale (where 1=very poor and 5=very good) by the students themselves in the pre-questionnaire and the meta-questionnaire regarding the four learning objectives of the course, namely the creation and improvement of administrative views to information resources management, the technological views to information resources management, the skills of building information systems and the competences to comprehend organizational applications.

6. Results

A. Motivation

The Kolmogorov test showed that the data based on the responses of the students concerning the themes of the course agreed with the normal distribution. Thus, the one-way ANOVA test was appropriate for statistical analysis of the data.

We calculated the scores for pre-motivation, post-motivation, internal and external motivation of each theme. This was based on the framework presented in section two. The one-way ANOVA test did not show significant differences in pre-motivation between the Non-video group and the video group in regard to any theme of our course (p varying between .392 and .875).

Additionally, the one-way ANOVA test did not show significant differences in post-motivation between the Non-video group and the video group in regard to any theme of our course (p varying between .394 and .991). The one-way test did not either show significant differences between the genders in the video group (p varying between .150 and .999).

B. How students' knowledge was improved

Since the data based on the responses of the students concerning the goals of the course did not agree with the normal distribution, the Mann-Whitney test was appropriate for the analysis of the data. Additionally, because of our small sample size we selected this non-parametric test for analyzing the data. Concerning learning of different themes the study found that the problem-based coursework on the web was equally useful in the learning in of theme 3 (Building information systems) and theme 4 (Organizational applications). However, in the learning of theme 1 (Administrative view to information resources management) and theme 2 (Technological view to information resources management) the students of the video group showed more progress in learning compared to the non-video group. The details of the analysis concerning knowledge are shown in table 1.

TABLE 1.
ANALYZING THE STUDENTS' KNOWLEDGE OF DIFFERENT THEMES

	Mean at the beginning of the course			Mean at the end of the course		
	Non-video group	*video group*	*p*	*Non-video group*	*video group*	*p*
Administrative view to information resources management	2.60	1.96	.002	3.30	3.06	.165
Technological view to information resources management	2.50	1.78	.002	3.30	3.15	.379
Building information systems	2.50	2.04	.014	3.55	3.33	.238
Organizational applications	2.25	1.84	.041	2.85	2.73	.610

If we compare knowledge at the video group at the beginning of the course to the end of the course, the statistical analysis shows that differences were highly significant ($p<.001$) in the learning of all the themes). However, in the non-video group these differences were varying from .001 to .021.

7. Discussion

In this paper we analyzed the effect of our wiki-based coursework from the perspective of students' motivation and knowledge development. The results show that a wiki-based coursework including a seminar is a potential way to organize a web-based coursework if we have a crowded course. The results are promising because most teachers appreciate the cost-effectiveness of web-based education [9]. Our comparisons show that in the wiki-based coursework the most significant effect is the improvement of students' knowledge concerning the course themes. From this perspective our assignment is more suitable for the females. However, from the perspective of motivation students were equally motivated in both groups. This reflects that the main effect of this coursework is better learning without additional convenience.

We also claim that this wiki-based course setting works in the teaching of the knowledge management area of information systems [26-28]. Knowledge management comprises sharing of both explicit and tacit knowledge.

The limitation of the study is that we did not compare traditional live presentations to these web videos. However,

our approach can reveal many benefits compared to live presentations. The students can access videos as many times as they want. In traditional live presentations the students behave differently. According to Walter et al. [12], they can turn visual attention elsewhere (i.e., to static slide or to their notepaper) while maintaining auditory attention on the speaker. Based on these facts we can claim that videos on the web may be the effective way of learning compared to traditional live presentations.

Nevertheless, this paper demonstrates that a successful seminar for a crowded course is possible using Windows Media Encoder and a wiki environment. Windows Media Encoder and related tools bring videos in the active way into the education. Wetpaint or other related tools enable web-based communities. In this way the web brings new possibilities for education, and web-based communities are at least as effective as traditional learning settings.

8. Remark about the Application of Learning Theories

Learning and teaching are peculiar concepts. What we mean by them largely depends on the context of use. The confusing fact is that we use the same word in everyday language and theoretical reasoning, even if the contents of the concepts in everyday context and theoretical context do not necessarily have much in common. These peculiarities are reflected in the current study. As a post-analysis, we now analyze the concepts of learning and teaching from the point-of-view of this research report.

In the theoretical context, the precise definition of concepts has traditionally been found as a virtue in science. Therefore, even if learning and teaching sound extremely familiar and we assume that there exists a mutual understanding about their content, we argue that they deserve a closer look. According to Kuhn [24], the adopted paradigm is a fundamental issue in communication, but also in perception. In other words, if we are talking about learning in e.g. behavioristic vs. in constructivist framework, we mean different things and pay attention to completely different issues. This fundamental role of chosen paradigm is often disdained. Different learning paradigms are merely handled as different strategies for e.g. instructional design.

The reason for the confusion is the poor resolution in our concepts. In the behavioristic era, conditioning was proposed to form a basis for an exhaustive theory of learning. I.e., it was proposed that all kinds of learning could be ultimately explained in the conditioning framework. The same happened in the emerge of constructivist learning theories – we were told that learning used to mean one thing but from now on it means something else. In other words, even constructivists declared their view to cover all human learning. In the meantime, the content of the concept of learning among the men-in-the-street had not changed. On the other hand, researchers and practitioners of education, who have their background outside the core of learning theories, use the names of popular theories to justify their instructional design. The reference to the theories is sometimes quite superficial. Over-simplifications, about the relationship between the type of educational design and underlying conception of learning, are usual. For instance, if there is a teacher in front of a classroom and students are sitting in their desks listening to the oral presentation of the teacher, can we claim that the teacher applies certain learning paradigm? Certainly we cannot. The classroom setting described above can quite as well be intentionally used for the activation of subjective knowledge construction (constructivism) or to use the means available to make the students behave in a desired way in given context (behaviorism).

It is quite common sense that learning multiplication table by heart is a completely different task than learning the role of information systems in manufacturing industry. Is it even possible to refer to these two tasks with the same word ("learning")? Or should we enrich our vocabulary concerning learning to make a distinction to qualitatively different kinds of learning tasks? In that case, we would discard the idea of behaviorism, cognitivism and constructivism as learning paradigms and handle them merely as different views of learning or learning/teaching strategies. This has actually already been done by Merriam and Caffarella [9], but even they did not name this meta-view to contribute to the endless debate about what learning and teaching are fundamentally all about.

9. Conclusion and Future Work

The pedagogical trends today focus mainly on learning (opposed to teaching) and calls for flexibility in teaching methods. To this respect, the nature of the new information and communication technologies, including social media, helps considerably. In order to embrace the contemporary teaching and learning trends emphasis need to be placed on specific learning context and how real-world outcomes, both in short-term and long-term, are influenced by non-cognitive factors, such as rational and emotional components, personal background including interest, motivation, experience and competence.

The contemporary approach described in this paper demonstrated our experiences of problem based learning from a constructivist viewpoint. Wiki and screen capture videos, as cognitive tools for facilitating knowledge creation and sharing, were used to facilitate knowledge creation, knowledge sharing and learning.

The experiments will continue with emphasis on three new approaches, namely (a) in-depth comparison of traditional live presentations to web videos, (b) assessment of individual differences in learning profiles, such as learning styles and learning preferences, for identifying the compatibility of the student with a particular learning environment and (c) comparison of the outcomes of similar problem based approaches in different cultural contexts. The motivation for the third approach is that the authors from own experiences are convinced that different cultural contexts bring about differences in assumptions about learning, the expectations that students/learners have

regarding learning and teaching, the teaching model itself, the relationships between educator and learner, the way the technology itself is experienced, the pedagogical aspect, the design of online courses and the way in which individuals and groups communicate and respond to their environment.

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