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The Virtual Learning Environment

- Patterns for Structuring Web based Teaching

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ABSTRACT

Online education creates new demands on organization and structure in order to make use of its advantages with the technology for learning. Research in this area elucidates new possibilities with the computer as a medium, to individualize and make the learning more flexible. Meanwhile, the empirical study shows practical limitations, which affects the design of web-based teaching.

As a result, we have started to develop a guideline, which describes these new possibilities and common problems with the new learning environment. We have structured the guideline by first defining the problem area and then giving recommendation or in some cases proposal of improving the technique. The purpose with the guideline is to illustrate and support teachers with knowledge and inspiration to make the design of this new form of education suitable in its practice.

KEYWORDS: Web based teaching, the Computer as a Medium, Computational Power

1 INTRODUCTION

Our changed way of living as human beings and the new information society has affected the learning environment. Today people are in contact with education during their whole life in terms of school, work and spare time. This means that the school environment is no longer the only meeting place for learning and there have been developed alternatives to traditional teaching. Distance education is an alternative form that supports people to study from home. Distance tuition has existed for over a hundred years, and means a more flexible way of studying since it is independent of time and place. This form of study is useful for students with self-discipline since the study form often means a high demand on the student to take his/her own responsibility for their studies. During the last years, a new form of education called web based teaching has been developing with the use of the new information technology. The computer is the central tool and the new learning environment. This form of education has the possibility to create a community among the students without a physical contact, since the computer environment can support communication and sharing information among the students. Web based teaching means a change of the school sector that earlier has been characterized of a teacher – one classroom to decentralise responsible and new techniques. It is important to remember that knowledge is still a human process and that the technology does not replace existing ways of learning but might instead be a complement to create new and further opportunities for learning.

1.1 PROBLEM DESCRIPTION

Web based teaching creates new demands on organisations and structures in order to make use of its advantages with the technology for learning. Some teachers do not know how to organize and structure web based teaching or do not know how to make use of the techniques in this environment. This results in that those teachers reuse their traditional structure, which causes different standards and outcomes of online courses. Without making use of the advantages with the new learning environment, this form of study will be a useless alternative for students. To solve the problem a project called Kummel has started to create a web based course development model. The Kummel project consists of people from Blekinge Institute of Technology[1], Swedish University of Agricultural[2] and Luleå University of Technology[3]. During this master thesis, we have cooperated with this project to develop a model that can inspire and support teachers to plan and structure web based teaching. During the analytic part, we found a new angle of this problem as a complement to the model, which identifies existing problems and gives concretised solutions to facilitate for teachers both in the process of structuring and in its practice. The model that Kummel is working on, informs teachers about the basic information that is necessary when planning and organising online studies. It also provides a good overview of existing techniques in the computer. Our idea with a complement was to elucidate possibilities of how to make smart use of these techniques. From our material, we noticed that it was not enough to inform about existing techniques since the information technology is a new tool to handle among teachers. We found a need of a detailed description on how to use make use of the advantages in the computer environment. If the technique can become more than a support for the content of the course and for students and teachers to merge, then it is possible to use it for further development and to individualize the learning process.

[1] www.bth.se
[2] www.icp.slu.se
[3] www.luth.se

1.2 THE AIM OF THE PROJECT

Our focus in this thesis was to make a qualitative study to get an understanding about how to structure web based teaching for higher education. Our purpose was to create a guideline for teachers about how to use existing technologies in this environment, and their possibilities to improve online courses and facilitate the learning for students. We investigated the most common course production tools on today's market, the use of authoring systems, and how the computer environment support communication and information. The purpose with these investigations and the empirical study were to elucidate the computational power and inform teachers about how to make it suitable in a learning perspective. The guideline was not meant as an attempt to replace the teacher with technology, instead it is meant to give concrete recommendations or in some case proposal of improvements of the technique to the teachers about existing problems and limitations in the online environment.

1.3 DELIMITATION IN OUR WORK

This project spanned over 20 weeks and we had to manage time constraints so we delimited our work in accordance to make it manageable. Within the focus on how to structure web based teaching, we concentrated our effort at starting to develop a guideline for teachers to get ideas and knowledge about the computer environment and its way of handling virtual communication and information. The administration has a central part in an online education. Even though, it is an important part we have decided to delimit our work to the universal opinion among the teachers that we interviewed. We are not making an implementation of the recommendations or proposal of the technical improvements due to our theoretical focus. Instead, we describe our proposal and recommendations, by using high-level pattern, to inspire and change teachers' work process to new pedagogic methods.

1.4 THE PLAN OF THE THESIS

We have structured this thesis in the following way. We begin in chapter 2, with a brief overview of the computer in education to create an understanding about how history affects our design suggestions. We will also describe the use of computers in online education, with its support and possibilities to handle communication and information. This information is valuable for the guideline and elucidates new directions in this area. In chapter 3, we will give a technical review of existing course production tools to describe its use in the online environment. Chapter 4 will describe our empirical study with qualitative interviews. We will also describe what we found out from this study. This part elucidates the empirical situation, which supplies useful material to the guideline and a deeper understanding of existing online studies. Chapter 5 presents our result, how the existing platforms support our design suggestion. In this part, we combine our analysis and reflections of the material to a presentation of our guideline. Finally, in Chapter 6 we sum up our project with a conclusion and our ideas about future directions in the area.

2 LITERATURE STUDY

There exists much literature that concerns web based teaching. We wanted to take part of earlier experience from this broad area to combine a theoretical point of view with the material from our empirical study, to discover similarities and diversities. In this occasion Greg Kearsley with his book *"Online education – learning and teaching in cyberspace, 2000"* is one central book in our theoretical part. Kearsley has over 20 years of experience and recurs often as a co-author in research articles. In this chapter, we give a brief introduction of the computer as a medium in a learning perspective. We will start with a short review of the computer in education. How this situation affects its use in this new form of studies. Followed by a description of how this medium supports communication and information online, since it is useful information for teachers when planning and structuring an online course. We end this chapter by presenting possibilities to integrate different Medias and hypertext in the computer environment. These new possibilities affect an online course with its capacity to stimulate and motivate online students.

2.1 THE HISTORY OF COMPUTERS IN EDUCATION

Koschmann (1996) explains in his article *"Paradigm shift and instructional technology: An introduction"* that computers have been used for learning in many different ways, as computer-assisted instruction (CAI) or as computer-based instruction (CBI). The main idea with CAI/CBI was that computers could provide individualised learning experiences, including interactive sequences consisting of problems or questions with appropriate feedback. This idea based on behavioural and cognitive learning theory. It was empirical evidence, which showed that these concrete worked in terms of students' achievement scores or learning outcomes. Although, this approach had some limited value, it was not a powerful way to use computers in educations. The computer noticed as a perfect device for communication and information sharing among users. The use of it started to change and became computer-mediated communication (Kearsley, 2000). Both students and teachers were impressed by the capability to interact electronically and search through databases. Interactivity was still important but not the kind of interaction that CAI/CBI wanted. In the early 1990s when the World Wide Web appeared and made, it easy to create and access networked information and bring together different form of interpersonal interaction. Then all become clear about the computer as a tool for communication and information (Kearsley, 2000).

The computer-mediated communication (CMC) sees as a new paradigm shift from a teaching environment to a learning environment (Waterworth, 1992). For students this means new avenue for learning since it is not reliant on time, location, or instructor and it allows students to access information in an exploratory fashion. This learning environment permits flexibility and variety for instructors to meet numerous learning and personal needs, especially when working with individuals with special needs and those who are less mobile or shy. This environment also increases the opportunity for timely feedback, accessibility of faculty and resources outside of class hours. The idea with the CMC is that teachers use the computer to promote collaborations, cooperation, sharing ideas, and as an equalizing medium, which means that the roles of students and teachers will change. Teachers do no longer perceive as the sole experts and information providers, teachers become facilitators and guides since the students are no longer passive learners, attempting to mimic what they see and hear from the expert teacher. They become participants, collaborators in the creation of knowledge and meaning. Large expenditures on CMC for the classroom will not help unless teachers understand how the technology helps to fulfil the goals of the course.

2.2 COMMUNICATION

In online educations, there are limitations of physical meetings, which mean that teachers and students need to find new ways to communicate with each other. The computer environment supports different kind of opportunities to facilitate the virtual communication. Since e-mail, forum, video, and chat are the most common and useful tools in the online education we have delimited our research to focus on those. According to Collis et al (2001) it does not matter which tool is used, it is more important how it is used.

2.2.1 SOCIAL CONTACT

The social contact is important for online students. By letting them discuss, argue, negotiate, and reflect upon existing beliefs and knowledge it increases their motivation (Agostinho et al, 1997 cited by Vonderwell, 2002). That is why the social contacts need consideration when planning and structuring online educations. Wegegrif (1998 cited by Driver, 2001) means that the students need to get the feeling of belonging in a community otherwise; it is unlikely that they succeed in a virtual environment. Researches have been showing that people learn in collaboration and in dialogue with others and that is why it is important as a teacher to support students to create a feeling of group affiliation. In those groups students give each other feedback and comments on exercises, which can attain the feeling of a group belonging and their motivation increases (Haake et al, 2002). When students support each other, the stress diminishes for the teacher who can spend more time to keep a high quality of the course. Kearsley (2000) explains that with help of the computer as a medium, students can with different backgrounds and experiences from all over the world communicate and send information to support each other. They can get the feeling that they are fellow students and can take advantage of each other's knowledge.

Online education is often associated with limited physical contact with classmates and teachers; however, Eriksson et al (2000 cited by Driver, 2001) have discovered an advantage with this. Even if teachers and students have physical meetings, it does not mean that they have a social contact. It is common in high-level education that a course has over a hundred of registered students, which makes it impossible to have a private contact with each student. The authors mean with that, that the computer environment makes it easier to have a personal contact with the online students than with students at the campus since online students are often more active to ask questions. These two reasons together make it easier for teachers to discover if one student starts to loose motivation and the teacher is able to give this student extra attention. The disadvantage with this method is that it is time-consuming for teachers with large groups of students since it becomes difficult to satisfy everyone.

Everhart et al (2000) explains that in order to have an effective learning it requires some kind of social interaction and especially for online students. They need to have an active exchange with others to enhance their performance and satisfaction. To get effective learning, students need to activate by using different methods, depending on the situation. In some elements, it is more effective to have group works and in other more useful with individual tasks. Moore and Kearsley (1996 cited by Driver, 2001) describe three types of interaction models, *learner – content* where students work with course material, *learner – instructor*, the interaction between a student and a teacher, and the last one is *learner – learner*, which means the engagement between students. These interactions encourage students to be activated in both small and large groups, and to make use of others experience. It is not possible to recommend one type as more effective then the others. These models are all important to have in consideration, although in some situations it is possible to replace one type with another to save time for both students and teachers. In these three models, the teachers' role

has changed. Eriksson et al (2000) explain in their book about flexible learning, that students are not dependent of the teacher as a master instead they need a tutor.

2.2.2 COMMUNICATION INDEPENDENT OF TIME

The online education is an alternative solution to study for people who do not have the possibility to study fulltime or at a specific location. This form of education has to take the flexibility and the availability into consideration. Online students need to be able to mostly do their work whenever it suites them. In the online environment, students are able to use time independent communication tools. The most common tool of this purpose according to Kearsley (2000) is e-mail that still provides the same basic function as the earlier systems of the 1970s. This tool is the foundation for all forms of online learning and teaching because it is common and possible to use as a sole resource for communication among online students and teachers. The advantages with e-mail are that it is cost-effective, low demands on equipment, and software. Mostly it is used for private communication but it is possible to use it as a public tool, when the teacher creates a mailing list and all the list members can take part of the messages. Kearsley (2000) explains that e-mail makes everyone, including teachers, more accessible than in traditional forms of education. However, there are not always advantages with e-mail; it can take long time to get an answer because the receiver does not need to answer it at once like in a face-to-face communication.

Beside a mailing list for group communication in the online environment, forum is a useful tool for this purpose (Kearsley, 2000). There exists several different types of forums but they all have similar functions, a user sends a message with the sender's name, a subject title and the text of the message. All members in the group are able to see the contribution and can answer it, which often referred to as a thread. It is common that the teacher uses this tool when he or she wants to start a discussion about a subject and students have to be active in the conversation. Another advantage with a forum is its regulation of access (Kearsley, 2000). The teacher can take part of and follow all discussions meanwhile the students can have delimited access to their own discussions. This makes it possible for the students to have private group discussions, which the other students cannot take part of since it is possible to set restrictions on the threads.

2.2.3 COMMUNICATION IN REAL-TIME

Even if an online education is more independent of time in comparison to a campus education, there are elements that advantageous should be in real-time, as for example when students or teachers want to have spontaneous discussions. According to Kearsley (2000) is the simplest form of real-time conference chat and the principle is; one user sends a message, which the other users can notice as soon as it sent. Eriksson et al (2000) mean that the advantage is that discussions can be immediately of time in a chat, but on the other hand, it might be difficult to follow a specific discussion because it is common with several conversations at the same time. In online environments, Kearsley (2000) describes that teachers can use chat as an element in the course to create a real-time discussion about a topic between the students. Even if this is a real-time discussion, it is possible to save it and review it later. This element makes it possible to invite an expert in the area to answer the students' questions. This is easier in online education than in a traditional education since there is no need of a physical location or for the guest to travel. According to Kearsley (2000), both the guests and students find these occasions worthwhile and stimulating.

Videoconference is another real-time tool that can be used in online education, which gives the students an opportunity to see each other and have a face-to-face discussion. Students and teachers get a face on the person instead of only the name as the other communication tools offers. The participants in the conference are able to see each other and communicate via microphones or headsets. This communication tool demands expensive equipments and unfortunately, there is often a delay in time. This creates disappointments to them that use it as a substitute for the face-to-face communication. A participant who is working with modem has slow transmission and strict limitations, while a user with fast transmission can manage a larger number of images. Kearsley (2000) emphasizes that it is difficult to have a meaningful real-time conference with more than six participants at the same time.

2.2.4 COMMUNICATE WITH THE WRITTEN LANGUAGE

In online education, the written communication is important, which can be one of the reasons why students have difficulties with this form of education. Some students find it difficult to express their thoughts and ideas through writing. The consequence is that they avoid to communicate with other students through e-mails and to be engaged in discussions (Kearsley, 2000). In the same time, online learning provides much practice in writing, which results in that those students improve their written language. Another disadvantage is that it is difficult for students to have spontaneous discussions, since even if the virtual classroom offers students different tools for communication they are unfamiliar to use them in practice. If students diminish their exchange with other students, the consequence can be that these students loose their motivation and start to feel lonely. (Eriksson et al, 2000, Haake et al, 2002)

2.3 INFORMATION

Information sharing is one of the advantages with the computer environment. This environment has a wider range and possibilities to handle information than the traditional environment. We will try to create an understanding of how these possibilities are suitable in a learning perspective. The most important aspect is that teachers learn how to handle information in the online environment.

2.3.1 THE COMPUTER AS AN INFORMATION HANDLER

Before the technology was widely available, finding information was often a critical task. Today it is a smaller problem and a common way to find information is to search the Internet, which consists of large amounts of databases and other knowledge sources. Its content becomes quickly obsolete because of the high tempo of changes and wide range of new information. Everyone can be a publisher at the Internet. The web does not distinguish between documents created by Nobel laureates and fifth graders, which means that students need to learn how to learn and to learn to criticise. A student or a group of students need to be able to identify and formulate a problem in an unstructured situation, search and find information, test different alternative solutions against each other make consequent judgment and take a decision. (Eriksson et al, 2000).

The advantage with the computer is its possibility to handle, sort, and organise the information, which means that the computer has the capacity to handle lectures and the administration of a course (Eriksson et al, 2000). A lecture can be published on the Internet

and instead give the teacher more time for individual supervising, which is one way to increases the standard of the course. The information problem in online studies is when the information is presented both on the webpage of the university and the course platform. The university's Webpage informs the student about the plan of the course, a list of literature, schedule, contacts, and useful links, while the platform presents the main information about the course. Even though the university Webpage is more useful in the beginning of a course, it is important to update this page with new information. According to Eriksson et al (2000), it is better to delimit the number of places of information to reduce the confusions among students and teachers.

The computer does not only influence the education by having obtained information. With the availability of the Internet, the course gives in different perspectives of time. Online educations remove boundaries that have to do with where and when students learn, as well as who can be a learner (Kearsley, 2000). Some elements, school tasks, and other examinations will be done whenever it suits the student. According to Eriksson et al (2000), does the computer decrease the work for teachers but that also results in that teachers want to do a little bit more and do it better. It is important that teachers delimit their work and separate working hours and spare time, otherwise they have the possibility to always be available and contacted.

2.4 NEW WAYS OF STRUCTURING THE MATERIAL

The computer as a medium has the power to vary and improve the visualisation of information, to facilitate the learning in online education. According to Kearsley (2000), learning is more effective when it involves multiple sensory channels, visual colour, movement, sound, voice, touch, and smell. According to Farmer (1995), a mix of media can satisfy the many types of learning preferences, that one person may embody or that a class embodies. Multimedia technology can provide certain kinds of experience of multi sensory learning. These interactions are not as rich or complete as firsthand experiences, for example no touch or smell. They are often better than traditional classroom learning activities based on *"talk and chalk"* (Kearsley, 2000). Each individual has different sensory preference and vary in the aptitudes for learning, the willingness to learn, and the style or preference for how to learn (Jonassen & Grabowski, 1993).

Multimedia, Hypertext and Hypermedia are terms that occur when discussing electronic documents or interactive mediums. In the electronic document, there is no actual beginning and end at the document, the computer capacity can merge section of text by using links (DeRose & Durand, 1994). A similar possibility to create an environment with use of multimedia productions is to develop an authoring system. An authoring system means an opportunity to combine different Medias that provide an interactive and learner-controlled environment.

2.4.1 MULTIMEDIA

Multimedia is an integration of several Medias like text, picture, sound, video, and animation (Yager, 1993). Online environment for studies have a tendency to be boring since the computer is not a spontaneous individual. As a replacement for the spontaneous element in the traditional education, can this learning environment use stimulating and interesting multimedia element to get activated and motivated students. It is important to make a use of the advantages with the computer environment, with its possibility to create interactive programs or simulations that uses as a tool for thinking. This means that the computer is a tool for augment of the mental strength unlike for example the hammer that augments the physical strength. There are still limitations of Medias that the computer cannot handle for example smell and taste senses. Today affects the vision and hearing sense, and even in some virtual reality system, it is possible with helping tools for input and output to make use of feeling and balance senses.

2.4.2 HYPERTEXT

In 1987, Ted Nelson coined the term hypertext and he described it as a non-sequential writing, with branches that allows choices to the reader. For readers, this navigation involves actions as selecting parts of the hypertext. Deciding which other parts they want to jump to, and displaying the document in ways that make sense to them. Within hypertext, the reader can become a co-author because the order of a non-sequential document is determined only at the time of the reading (Barker, 1993). Hypertext is the format that has the possibility to make large amount of information manageable. Although, theorist with this aim deals with navigational challenges and to easy retrieve data when more and more information puts online.

Another problem with hypertext is its coherence strategies (Foltz, 1996). There is a lack of coherence between linked nodes, it is typically assume that because two nodes are link by some common piece of information, and the reader can generate the correct inference about the link and incorporate the new information into his or her representation of the text. What also is a problem area in hypertext is the bounded space that Nielsen (1990) has been study. He used the term *context-in-the-large* and *context-in-the-small*, which means large overview, which is maps, to guide users, and small-scale overview to help users keep track of their location. Nielson expressed that a loss of small context could damage overall usability more than the added context-in-large improves it. When reading hypertext the user needs both kinds of context, not just in large but also in the small. Conklin et al (1987) warned that the loss of context is one of the great issues in the hypertext theory. The hypertext differs from linear or traditional sequence, when some of the linear or traditional sequence is disrupted, the reader has to rejoin these pieces of the puzzle to make them completely again. The text has its own context, maintained in the traditional ways and the hypertext has its own context, maintained through graphic conventions, consistent names, and so on.

Navigation is an aspect of coherence so that the hyper textual structure contributes to the overall coherence of the information. Structure becomes a substitute for text, especially text that is usually devoted to transition and orientation in a traditional essay. Links, nodes, and cluster of nodes replace the conversions from traditional text to hypertext, conventions of coherence. It is not possible, in hypertext, to distinguish form from content because form is a part of the content (Conklin et al, 1987).

2.4.3 HYPERMEDIA

Hypermedia combines hypertext and multimedia and give further opportunity to vary the online teaching and make it more stimulating. Hypermedia bases on the constructivist theory of learning.

> *"Cognitive psychology is the scientific analysis of human mental process and structures with the aim of understanding human behaviour.* (Mayer, 1981)
>
> (Waterworth, 1992, p. 32)

Constructivism holds that the mind is instrumental and essential in interpreting the real world and that these interpretations are personal (Waterworth, 1992). Learners construct meaning from participating in instructional activities explains Simonson et al (1997). Hypermedia has proved to be a beneficial learning environment and has a potential to captivating students attention and presenting information in non-linear ways (Jonassen, 1988). This learning environment relies on user-controlled choices to access information in the form of various media. Regarding to Reed et al (1995) is the knowledge structure represented by hypermedia environments typically considered to resemble the way information is stored in the human memory system.

Researchers and educators have already noted the potential of hypermedia in education. Moore et al (1994) pointed out that the potential advantage of hypermedia includes interactive opportunities for the learners. The ability to structures the learner's learning approach, the ability of the system to "remember", the ability to follow cross-reference, and the increase of the learner's control over the subject matters. Hypermedia is a powerful medium and can re-shape the format of conventional instruction, such as textbooks and lecture.

Despite the advantage of using hypermedia in education, there are also disadvantages like, lack of computer skills, disorientation, over-rich information, and ineffective user-interface. Reed and Giessler (1995) found in their research about hypermedia that users with lack of computer skills could not take advantages of this medium. They may often do better in traditional delivery mode in comparison to the experienced learners who more often are using the non-linear mode. The non-linear and learner-controlled instructional environment characteristics match human met cognitive skills and assists users to understand what needs to be done in a particular situation and to navigate and process information (Reed & Giessler, 1995). This structure has the potential to disoriented users because a document contains of many nodes that are link to multiple other nodes. Learners have freedom to control the navigation between nodes without specifying objectives. To avoid disorientation the learner need to focus on the main structure and later concentrate on the details of important ideas and concepts (Beasley et al, 1996). This means that the design and organisation of hypermedia learning environment need to involve critical-thinking skills. The interface has to assist the learners to control their directions.

Over-rich information is another problem with the hypermedia instruction in Internet systems. In a hypermedia environment, the users are no longer merely consumer of information, they are also expecting to create and add their own knowledge to this system. This results in that the information sources become increasingly varied (Ayersman & Reed,

1998). There are four recognizable types, which can support this situation, concept maps, semantic network, frames (or scripts), and schemata. Despite these, the Internet search engines can also assist this situation but there is still a major problem with mismatch while searching and reorganizing information. Leidner et al (1995) also mean that over- rich information affects the learning process. When information overload occurs, the learning time will increase and learning motivation will decrease. Learning is the interpretation of knowledge by learners, and learning best occurs in the context that it uses. When information overloading occurs, learners find it more difficult to select and interpret information into their own knowledge. Yang (1996) thinks that it is important to remember that the hypermedia-based environment is an information base that provides interactive relationship among learners themselves, their collaborators, and their teachers. Therefore, when learners can receive and create information from the hypermedia- based environment it does not depend on that this system is learner-centred or knowledge-centred.

User interface design is a crucial role in hypermedia system, since tools as browsers search engines, concept maps, guide tours and metaphors are all user interfaces in hypermedia instruction. The quality at the user interface has a great deal to do with whether a new media program is easy to use and helpful or frustrating and irritating. The interface (even called information landscape) refers to the way information is organized and the interface through which the users have access to the information. The mismatch of the use of interaction can lead to loss of learners' attention, boredom, information overload, and frustration (Leidner et al, 1995).

2.4.4 AUTHORING SYSTEM

> *"The process of creating a hypertext or hypermedia system is usually undertaken using a suitable authoring system"*
>
> (Barker, 1993, p 64)

In an authoring system, it is possible to merge information, picture, and sound that have been creating and edited in software. Except these digital Medias, it can also include programs for structuring ideas, simulations and calculations. There exists authoring tools that supports creating and editing of simpler pictures. In an authoring system, the links between the nodes create the structure. This means that a picture or a button can be the link that has connection to another part in the authoring system. The graphical interface in an authoring system is mainly pictures and other objects like buttons and text fields. The layout differs among systems on CD-ROM and hard drive where these objects places all over the computer screen, while a code-based system like HTML at the World Wide Web is more limited. Beside the layout, it is other functions like for example search and backtrack in a graphical interface. It is common in an authoring system with script language that uses to create new functions and interactions possibilities.

There are different types of authoring systems depended on how the nodes are created. In the beginning of the development, authoring system was card based. A card-based system describes like a book and pages with the format of a packet of card. On the card picture, sound, video, button, and text field places. It is possible to reuse background and objects, which mean that several cards in a system can look the same. HyperCard, SuperCard, and HyperStudio are examples of card-based systems (Barker, 1993).

Another type of authoring system is the icon based. The icons with its different functions placed at a flow chart. The icon-based tool is a form of simple programming with symbols instead of commands. In these icons, it is possible to decide properties and one example is the placement of a picture or a text on the computer screen. Links are creating by moving forward in different flow charts. It is possible when an icon consist of a new flow chart to create a loop that performed several times. Author Ware is one example of an icon based authoring system.

An object oriented authoring system means different objects that represent pictures, sounds etc. These objects activates by events as for example the user presses the object, which linked to another place where all the objects represents called a stage. These objects have their own properties to be able to recognize different events. Links creates to jump between stages or to activate other objects. This type is quite similar to the icon based and card based systems. There is also a kind of programming with symbols of different properties as the icon based. However, object oriented excludes a flow chart and instead move forward through events when an object is active. Card based systems also compares with the object-oriented system since the cards compares with a stage where the objects presents. The difference is that in a card-based system the object on a card connects to this specific card. While, an object oriented system have more "free" objects and instance of them uses in different stages. Apple Media Tool, metropolis and iShell are example of object-oriented systems.

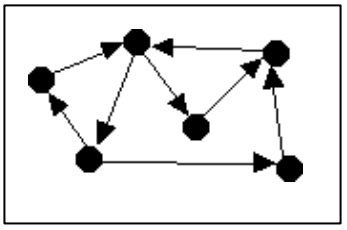
The next type is the time-based system. In comparison with other types of authoring systems is this useful to create animation. It is easier to create animation in a time-based system since there is a time line to follow. A frame that compared to a film-frame represents every point of time in this time line. A frame divides into several cannels where different objects places and in this way presented on the stage. The advantage with the other types of authoring systems is that they are more stable, since the event of the user that decides when to leave an object. A common authoring system that is a time based is Director.

The last type is the code-based system, which differs from the other because there is a code language to work with instead of symbols. The advantage with this is that it is platform independent, which means that this product (text files) presents in different computer environments. Another advantage is that the product divides into smaller files like for example texts and pictures. This authoring system also differs from the others because the multimedia presentation creates during the presentation of the product. It is not necessary to have all files to be able to present it on a computer screen. Two common code based systems are HTML and XML editors.

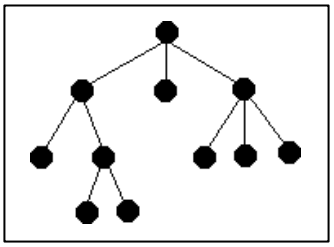
2.4.5 HYPER TEXTUAL STRUCTURE

In the computer environment, the information and hypermedia present in alternative structures as a complement to the linear (Barker, 1993). The way these are organised and stored can influence their meaning and the purpose for how they uses. It is common to use the computer as a typewriter and forget about its possibilities. Our idea is to provide teachers with new ideas about how to create both useful and interesting presentations by recreate standard presentations and discover advantages with these other structures.

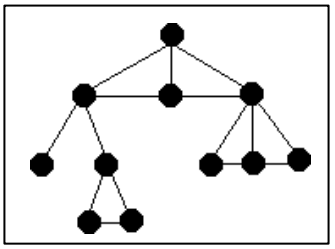
This structure calls graph, which means that it is no organised structure between the nodes. This is an uncommon structure in a multimedia system since it can feel messy and unstructured for users. It is important to be careful with cross-references since it can cause the same outcome. Some adventure games and the World Wide Web are using this structure. In adventure games, this structure is deliberately because it should be an adventure to find different places.



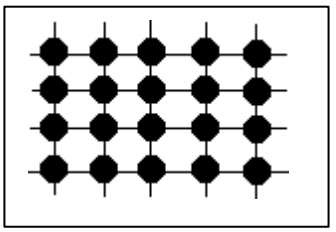
A more common structure in hypermedia system is the tree format that is easier for users to follow. A book and many WebPages have this structure because of its table and line of contents that represent the tree root, the node at the top. The different nodes place next to each other in a linear structure but through the table of content and the links back to the top of the page has this page even a tree structure.



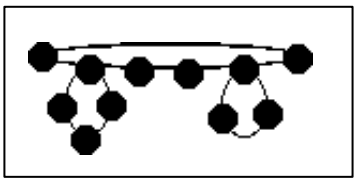
In the tree structure, it is a variation with horizontal possibilities. For example in a book where it is possible, to go on to the next chapter without go back to the table of content. The operating system in the computer does not allow this structure; it is not possible to go from one map to another without visit the map above. The tree structure is common with a start page and from this many alternative pages to visit.



The matrix structure is interesting in catalogue or information system where similar information presents for several alternatives. For example in an educational catalogue can the rows in the structure model consist of different educational programs. The different columns can consist of the educational content, goal, comments of students etc. In this structure, it is possible to move horizontal or vertical, which means that it is possible to move from one column or row to the next or the previous. Every row has a linear structure but there are links between the rows. These rows see as different parallel trace, which it is possible to jump between.



The circular structure is a variation of the linear structure, but the nodes connected into a circle. This means that when leaving the end node it automatically go back to the start node. It is common that it does not exists a start and end nodes, which mean that it is possible to start everywhere and from there, follow the circle forward or backward. This structure uses in lot of help system in multimedia programs. For example, what node that is connected depends on where in the program help needs. In the help system, it is possible to go further to the next section of text.



A combination of these structures is possible but it is important that the user can understand how to navigate through the information, since the non-linear structure performs interactively by the user (Barker, 1993).

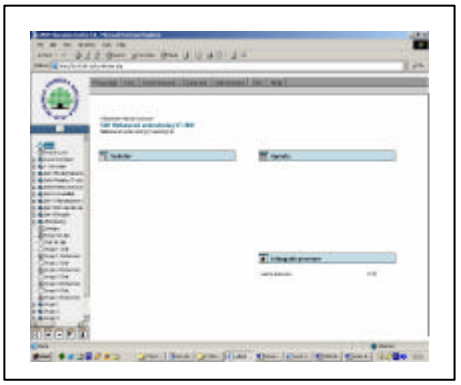
3 A TECHNICAL REVIEW- EXISTING PLATFORMS

The course production tools uses usually as a technical support in the online environments. We wanted to elucidate how these uses in an educational context and which elements they can support. We have concentrated our technical review at Luvit since the teachers that we interviewed were using this platform and it is from its functions we relate our design suggestions. We begin this chapter with a brief background of Luvit[4] and then continue with a description of the useful functions. We only mention some common competed platforms like Blackboard[5], WebCT[6], and FirstClass[7] to compare its design and functions.

3.1 LUVIT

This new form of education is using the computer and Internet as a substitute for the physical separation between the teacher and student. To support this new form of learning it has been developed web-based platforms. The web-based platform has supported functions for the student to get in connection with the course material, and the other students. The advantage with a platform is that the information and the possibility to communicate are always available. There exist several of these web-based platforms although they have the same purpose and similar functions.

Luvit creates in 1997 since the University of Lund wanted to find a support for online educations. The design of this platform was to provide students with or without earlier computer habits and still be able to use functions for communication and information sharing. Communication tools in this environment are chat, forum, and email, which support both real-time discussions and discussion messages. This environment is useful for visualization of information and it is possible to publish material with different types of document files, like word, Html and excel for both students and teachers.



The administrator of the platform gives the control to its structure and design. It is possible to keep this platform clean from unnecessary information and functions. For the administrator a useful function gives information about how students use the course material and an opportunity to save or printout conversions in the communication tools. There are different possibilities to structure the access in this environment. One construction is to create group maps, which only allowed the group members' access. Some situations, when it is necessary for all students to take part of the information like course material and other important information. The course production tools have functions that make it possible to view and share information to all students or a specific group at the same time. The user that presents the information has the access to change or delete the document. However, the user

[4] www.luvit.com, visited 2003-05-15
[5] www.blackboard.com, visited 2003-05-16
[6] www.webct.com, visited 2003-05-15
[7] www.softarc.com, visited 2003-05-16

needs to make changes in the original environment where this document was created and save it again in this new environment.

Luvit is a web-based platform, which means that there is no need to do any specific installations on the computer. This platform supports international standards and multiple languages and is able to integrate other applications both external and internal. What is specific for this platform is that the main issue is to improve usability. The competed platforms Blackboard, WebCT, and FirstClass have the same functions and similar design. Except that have WebCT and Blackboards possibility to sketch and make notes in the text wile the other users are watching, this function calls White Board. Unique part with WebCT is its e-pack function, which means that the teacher can choose between different templates, e-pack. These can help teachers to start teaching online without having to create a course from scratch.

Independent of which platform that is used the most essential thing is to have excellent contents of the course and well suited pedagogic elements.

4 PROBLEM WITH WEB BASED TEACHING

To be able to create a useful guideline for teachers about how the computer as a medium uses in online educations, we complement our literature study with an empirical study. It is important to get an understanding about online educations from the teachers' point of view, their use of the computer for learning, how they use it, why and if there are any problems with the use of it, to be able to create a good and suitable suggestion. During our empirical study, we used qualitative interviews to get this understanding. We found it useful to work parallel with materials from our interviews and earlier research within the area. By combining theses methods, our analysis's and reflections made us aware about the next step in the development process and our work during this thesis became an iterative process. In this chapter, we describe how we did the study and what we found out from the analysis of it.

4.1 GATHERING MATERIAL

We considered the interview as an important method during the whole project since our purpose was to get as close to them and their setting as possible to be able to create a support for teachers when structure and planning an online course. We wanted to get an understanding about how the computer as a medium supports communication and information form the teachers own perspectives. To find out that we decided to performed a number of qualitative interviews since we were interested in few exhaustive opinions that we could analysis and compare with earlier research in the area. The purpose was to discover similarities and patterns among the material. We adjusted the structure of the interviews to the specific situation. Garfinkel (1984) explains that methods are not templates ready to use and the use of them does not automatically reveal fantastic answers. In the beginning of the project, we used qualitative interviews with open-ended questions, this to avoid the mistakes of asking highly constrained questions before it is enough understood about the situation. This will likely produce poor quality answers (Blomberg, 1993). Instead of asking a lot of question, we let the interviewee decide what to talk about and take the role as a leader. In this way, we did not narrow down the question before the interviewees had talked about what were most important for them. This form of interviews was suitable to get a broad picture of technical limitations, advantages, and disadvantages with the computer in online educations as it is taking place today. The form of interviews changed when we had this broad picture of the computer in online studies and had decided on a focus. We needed information to our focus rather than general information. We started to constrain the questions and structured the interview more since we knew what kind of information we were looking for.

4.1.1 How we did the study

In this empirical study, we have interviewed seven teachers, mainly women, and one interviewee represented the technical support. Since it is impossible to make a universal guideline that suits every teacher's was our attempts to create a guideline that support as many as possible. The interviews consist of teacher with different backgrounds all from healthcare to computer engineering and four of them had experience of being a student in online courses. Our intention was to get the interview group as diverse as possible to get different perspective of this new form of education.

During the interviews, one of us acted as the interviewer while the other was concentrated on taking notes. We felt that this was a useful way to have a smooth conversion without notes interruption and the interview became more a discussion between two persons. The advantage with this way of making the interviews was that it was easier to catch an overall impression. We noticed the benefit of only concentrated on taking notes to catch the whole situation on a piece of paper, that later became our reminder for further reflection. We started to use the video camera but discovered that our interviewees felt uncomfortable with it. Since it did more harm than was useful for our studies, we decided to only concentrating on taking notes. An advantage with the camera that we are missing out is the possibility goes back and catches the details that we might have missed during the interviews while taking notes. Our solution on how to catch the whole situation and a possibility to go back was to create profiles for each person that we interviewed. The profile consists of a summary of the answers and these gave us a good overview of the teachers and their different opinions. Beside the profiles, we created and worked with a mind map to see and understand the connection between the interviews. By accomplish the interviews in this way we could collect the material and then analyze it to get an insight into new possibilities, advantages, and disadvantages with the computer environment for learning and how these teachers' used the computer in online educations.

In order to create a comprehensive view of this new environment for learning, we structure and organize our material in different areas to elucidate the different perspective, and the use of the computer as a medium for learning. The different perspectives were communication, feedback, information, platform, and authoring system. We divide these areas into a number of related issues, themes, and patterns.

4.2 COMMUNICATION

The interviewed teachers were quite satisfied with the possibility to communicate online and explained both the advantage and disadvantage with it. To communicate with other online students was a natural element for the teachers since they consider that people learn through discussions and conversions with others.

4.2.1 FACE-TO-FACE COMMUNICATION

In online education, it is difficult to have physical meetings because of the physical distance, working students, etc. Many students and teachers want to have more of these meetings since the communications facilitates in face-to-face situations. Physical meetings appreciate among both online students and the teacher. These meetings with online students are different in comparison with campus students since there are few of these elements in online educations. According to teachers, the students want to utilize the meeting as much as possible and they are often more prepared for the seminaries or a workshop. Four teachers recommended at least one physical assembly in the beginning of the course. The purpose with this is to increase the group belonging and get an opportunity to have an oral conversation. Students and teachers can see each other, which often facilitate further communication through the computer.

Teachers explained that it is important to be aware of that the computer cannot replace the physical face-to-face communication. Instead, this medium has new possibilities and advantages that teachers need to concentrate on, to create as useful alternatives as possible. The interviewees' explained that there are limitations to communicate in the virtual environment since it is difficult to have an oral communication. The only possibility for a face-to-face communication is to use videoconference, which only one of the interviewee had used. She was satisfied with it but pointed out that it is not possible to use it as a replacement for physical contacts. The others explained different reasons of why they did not use it. Some of them explained that there is a general resistance against using this method in online education since the equipment is expensive and it demand a fast transmission. There is still common with modem among the students, which causes limitations to utilize the power of the computer. Another resistance is the synchronization, which is irritating and frustrating with the delayed between picture and sound that disturb the conversation.

4.2.2 VIRTUAL COMMUNICATION

Group discussion is a common element in higher education. To perform it online the interviewees used chat or forum. Even though it is impossible to view the body language and facial expression, chat sees as the nearest replacement for an oral conversation because of the way it is uses. The chat language characterize of that the grammar does not need to be correct and short words are common since the principle is to have a quick conversation. They explained that this was suitable in small groups but not in real-time large groups, which none of them had found a solution for. Instead, they used forum for large group discussions. If the element supposes to be about scientific discussion is forum a suitable and the students have time to consider the contribution, before answer it. One teacher explained that with help of the computer for communication it is possible to get a feeling of nearness by expressing one self in words. It can be difficult to convey oneself with the written language and in the end; it is all about to be a good writer. Because of this limitation of only using the written language in online education is this not a suitable alternative for all students.

Unfortunately, it is difficult to get an active discussion among students. According to one teacher, it is important that teachers take the responsibility to start the discussion with the students. To that, a good example was to have compulsory elements in the beginning of the course and in this way force the students to learn and apply this tool. This teacher explained that once students start to use it and sees its advantages they use it for communication with other students. The students are mostly free to choose a communication tool that they feel comfortable with but when teachers need to take part of the discussion, the students have to use communication tool in the platform of the course like forum or chat.

According to one teacher is the advantage with the virtual communication instead of a face-to-face communication that most students feel comfortable and become more personal in a virtual discussion. In a virtual communication, students interact through the computer, which give the students time to think of formulation and they can ignore other students' impression of the comments. During our interviews, all teachers explained that their relations with online students were closer and more personal then with students at the campus. They believe it depends on that it is easier to express and be personal without having to stand in front of another person. However, also since online students usually are more active to use the possibility to communicate with the teacher and other students, than campus students are.

Teachers considered chat and forum are useful communication tools in a virtual environment, but they all agree about further development to reduce its limitations. One teacher complained about that it does not support creativity because it only accepts a linear structure of the text. That results in that it is difficult to emphasize a specific word or a sentence. Another teacher explained how hard it is to be fun in online conversions since the facial expression oneself and intonation fail to attend in this situation. This teacher thinks it would be useful with more functions on letters like for example colour, font, and size.

4.3 INFORMATION

In online education is the information easily available for the students. Except its advantage there is also disadvantages because the information can be unstructured, duplicated, and lead to confusions among the students. The teachers' experience covered both sides of it but it also showed difficulties to rethink and redesign their earlier way of handling the information.

4.3.1 VISUALISATION OF THE INFORMATION

In online educations, the presentation of the information is important. The teacher was satisfied with how easily the computer environment can visualize the information, but the opposite was that it creates confusions among the students. What the teacher meant was to disseminate the information in several locations, like emails, and course production tools, which can create confusions among the students of where to find the information of the course. The visualisation of information delimits to a computer screen, but it is important to limit the amount of information in a structured way. One teacher explained that her rule was to use the computer screen as a measurement, and only make a short introduction of the task. For further instruction of the introduction, it was connected links to support students with more information. The short introduction was a quotation, or a short description to attract the student's interest. According to all teachers, there is a resistance to read on the computer screen so they express their rule "*keep it small and simple*".

In online education, the information bases on the written language, which means that teachers need to formulate the problem or question carefully. The written language with possibilities of interpretations presented from two different perspectives, its problems, and possibilities. The interpretation problem can accord to some teachers, cause double workload when the formulation of the information is too indistinct. It can sometimes be impossible to figure out what is unclear and give a new explanation of the information. Another teacher saw possibilities with the written language since it open ups the creativity. All students have the possibility to parse the information from the student's own perspective and earlier knowledge.

4.3.2 SOURCES OF INFORMATION

Even though the computer can handle information and communication, the teachers that we interviewed had not found any substitute for a lecture in this environment. They all have replaced the lecture to a short introduction of the task with belonging literature. According to a teacher, it is difficult in a class with students that have different study backgrounds, without a common literature to discuss about. Despite, that Internet is a source of information it is not common to use it as a literature. The teacher explained that it depends on that the student need knowledge for the knowledge to choose literature and material on their on.

4.4 FEEDBACK AND DEADLINE A LEARNING PROCESS

For students to improve their skills and to develop new knowledge it is important with feedback. In all kind of educations, the students need to get their teachers opinion and comments. All teachers that we interviewed agreed about this but explained that it takes too much time to give feedback to their students. According to some teachers, this part differs from the traditional teaching because an oral report is much more comprehensive since it includes the body language. To formulate a written feedback is more complicated, since it must give explicit instructions that can lead to improvements. The disadvantage according to our interviewee is that it is not the same opportunity for students to questioning the comments or for teacher to expound the answers.

One of the teacher, who had experience of being an online student expressed that a successful element in her course was to give feedback to other students. Among online students, to exchange criticism appreciates. In this case, the task was to write an essay that evaluate and comment another student essays. According to this teacher was this element not only useful to get feedback on their own essay it was also useful to read and learn from other students' essay. To criticise other students' reports was a learning process since the students need to learn how to analyse and reflect on a paper and express these opinion in a professionalway.

Despite feedback, deadline was another important issue in online educations. Lot of smaller deadlines can create a common strain among the students that is naturally in the traditional school environment, which according to a teacher is important to reduce the number of dropouts. Already in the beginning of a course the students need to be activated, a recommendation from our interviewees were to give the students short task for handing in at an early stage. One teacher expressed that a good overview of the course element with its hand in is a necessary support for online students. As mentioned before even online students need a pressure from their surrounding, and a detailed plan can be a substitute.

4.5 PLATFORM

The use of a course production tool was common among the teachers that uses it to present information and makes it easy for students to communicate with each other. Teachers explained that a platform is useful in this new form of educations since it makes it possible to integrate students from all over the world, international and national with its support of several languages. The course production tool is the new school environment for online students; this means according to the teachers that this tool needs to be easy to use. The technology cannot be the obstacle to study an online course. One teacher expressed that it is not possible to get away from that the students need some computer skills but the main issue with online education is for students to learn the content of the course and not to improve their computer skills.

Luvit was the course production tool that uses, if they used one, and the reason for this was that Blekinge Institute of technology has licence for this platform in educations and offers the possibility to technical support. However, the opinions about its functionality were different between the teachers. Some thought it was too flexible with superfluous functions, while others complained about its strict structure. One teacher did not use a platform because she considered it was not stable enough and it takes too much time to sort out functions that were a useful support in class. Among some teachers, Luvit considered as unstructured; with duplicated documents and messages, that confuses the students. Several of our teachers mentioned missing functions like the possibility to confirm a submitted task and a filter function to exclude delayed tasks in Luvit. Another missing function was to integrate the visual schedule with the teachers' own calendar to reduce double bookings. This teacher also wished that the students could update their own projects but with delimit access to other students work. Another thought was to integrate SMS into this course production tool since nearly all students have their own cellular phone. A scenario according to this teacher was to send a message when cancelling a seminar.

A common opinion about Luvit was the lack of how it handles communication in large groups; it almost only supports visualisation of the information and small group communication. One possibility with Luvit was to share information, even though it is not possible to apply attachments in the email function. One interviewee explained about how frustrating this was since students need to use another email program outside the platform to attach files. Without possibility to share information and document, it is not the same use of email and no reason for students to turn to the course platform for this purpose.

4.6 AUTHORING SYSTEM

Two of the interviewees were teaching in the technical areas, which gave them another perspective of the computer. They saw its possibility when using the computer in educations instead of its limitations. One of these teachers explained his perspective of the computer in online educations. The existing course production tools were not suitable to support all different features in an online course. He could not see the reason of offering this tool to his students, since he thought that they finds there own ways and solutions to communicate. He wanted to develop a tool to support lectures and laboratory experiment, which he considered as a basic element in his course, which other element cannot replaced. His solution for this

was to develop an authoring system that combines different Medias, like static pictures, videos, sounds, and text as substitute for the lectures. It was important that the system allow interaction between students and the system but also between students and the teacher. He thought it was difficult to replace the spontaneous of the lecturer that gave the students opportunity to questioning and get further explanations. However, he also saw an advantage with the computer in comparison with the traditional lectures. The computer system can save a video record on the lecture, which means that the students can study it anytime and they can stop the video if there is something incomprehensible, and listen to it again. He had also thought about the possibility to questioning the lecturer during an online lecture, which breakpoints can solve. This means that the students can stop the record anytime and get a file on this sequence to write down thoughts and questions that come up. This file can be send to the teacher that can answer the questions and improve the online lecture.

He explained that the online lecture has the potential to individualise learning. He meant that the authoring system could handle information, which includes hypertext and hypermedia. This means that this system can offer different levels of the information to support novice to advanced students. In the computer environment, the student can skip some parts in a record lecture, which is impossible in the school environment. The teacher that we interviewed explained that the knowledge differs among the students and sometimes he wanted to explain further for some students while it is a waste of time for other students. Therefore, technology according to the teacher can be a suitable choice in this situation but he meant that the use of technology is not always suitable. The purpose is to understand the advantage with the computerised tool and to use these tools as a support and facilitate the learning in online education.

The other teacher had developed a virtual environment for laboratory experiment. According to this teacher, it is an advantage with the computer environment since it is always available. Laboratory experiment is a useful and necessary element in his technical area and a need for technical engineers to understanding the natural law. His virtual environment was similar to the reality and the students can control the components through the computer and decide the action. The experiment does not have terminates after four hour, which is common when it is in a physical location. The disadvantage that he mentioned was that computer environment could not replace "*hands-on element*", which means an actual experience that the computer environment only can simulate but never catch the general impression. Even though the virtual environment is useful, he expressed that it is important to complement it with physical meetings to make experiment with real components. The teacher expressed that "*the students need to burn themselves and feel the smell of burning material*". If it is possible for students to get the components and material, he always gives the students both the opportunity to work in the computer environment and to complement it with real things. According to this teacher, this is working well and a useful solution when it is expensive material to experiment with since these cannot break in the virtual environment. The expensive cost of material is a common problem in several educations.

5 TOWARDS A FLEXIBLE GUIDELINE FOR ONLINE TEACHING

The information from the literature study, empirical study and the technical review gave a good insight into the virtual learning environment. The common perspective in theses parts was to use the computer as a medium, with its possibilities to support communication and information. An interesting result was the mismatch between the literature study and the empirical study. The literature part elucidated new opportunities and directions with the computer in education while the empirical study highlighted the difficulties with online studies in its practice. In the literature study did not the online communication be such a problematic part meanwhile this element was the most complicated part in existing courses, the information part was the opposite. The problem with the information in the empirical material elucidates only of teachers that have been online students themselves while the literature material highlighted new possibilities to handle knowledge information. This mismatch showed that to design and structure web based teaching there is no need of a new technical tools like authoring systems or a platform. The current platform and the computer technology have the functionality and technique for this purpose. What we mean is that it exist useful techniques but we must teach our broad target group how to use it. What we found out from our material was how the computer knowledge and interest differs among the teachers, and that still is a resistant against using the technology. Our idea with this guideline is to support the universal of teachers by elucidate the identified problem and limitations hopefully can break down the resistance against the technology and improve web based teaching. To make this manageable we describe the problem area and give recommendations or proposal of improvements of the technique. In the solution part, we have considered both the social and technical design to be suitable for the situation.

In this chapter, we elucidate the problems in the online environment by using a high-level pattern to structure these problems and limitations.

> *"A pattern is a named description of a problem and solution that can be applied to new context; ideally, it provides advice in how to apply it in varying circumstances."*
>
> (Larman, 1998, p. 189)

We are using high-level pattern as a starting point for further development in the future and it means a possibility to complement with patterns of lower level. This structure supports different working areas despite the teachers like developer or other involved people in web based teaching, to use it as a foundation for designing their course and for further investigation. We see our collection of high-level patterns as a starting point that can or should be complemented based on teachers experiences. We begin this result chapter by describing how to structure web based teaching. Followed by how the computer as a medium can improve this form of education and we end the chapter with how it is possible to facilitate the learning by make use of different Medias that affect the human senses.

5.1 HOW TO STRUCTURE AN ONLINE EDUCATION

Depending on what type of course it is, it needs different kind of support. Each online course needs to be structured and organised to be suitable for its *content, target group* and the *learning environment.* What kind of support and how to structure is unique for each specific course although, the content is similar.

With the *content,* we mean that student need to get knowledge and skills about the course subject and it is the content that decides the element like for example laboratory or group work. The elements in the course need to be supported in the computer environment, sometimes this environment is too limited and then our recommendations is to go pass this specific element or find another solution.

The *learning environment* means that there must be a support for the element in the computer environment. For example, the computer environment cannot support element with a physical contact, which need consideration. In this case we recommend to arrange physical meetings even in an online course or at least complement the virtual environment with real material for students to be able to both visual and feel the material.

The *target group* differs depended of the type of the course. For example, when structuring a programming course the target group meant to work with this tool and the students' computer knowledge and skills is not an obstacle to take into consideration. In opposite to a humanity course, these students mainly use the computer as a tool to encounter the course subject. Then, it is important to be aware of and consider computer habits among theses students when planning this form of education.

Our recommendation on how to structuring and organising web based teaching is to make a research among similar courses to collect best practical. There exists a huge amount of tips and useful element in the computer environment but since we have investigated different kinds of courses, we cannot make example on all different types of elements. Good experience can be formulating as patterns to complement the ones given below. Our purpose is to make this a starting point for further reflection when planning web based teaching.

5.2 THE COMPUTER AS A MEDIUM FOR LEARNING

The computer as a medium has the potential to support online learning by its way of handling information and communication. Even though, our results elucidates that the technology exists and today's problems and limitations are more about how to make use of it in a smart and useful way. The commercial markets are concentrating on new functionalities in the learning environment like security of document, protection against virus and external integration of artefacts. These improvements certainly affect the online education but new technology is not a solution on how to support students to aquaria knowledge. We will present the problems and limitations that were most apparent during the study. There were mismatch between be aware of possibilities with virtual communication and information and how to use it to support online students to succeed in the computer environment.

5.2.1 COMMUNICATION

One important element to aquaria knowledge is to collaborate and cooperate with other people. Several of our teachers that we interviewed expressed *"learning establish in cooperation with others"* and they were quite satisfied with how the computer supports communication. The material from the studies emerge that it is possible to have a social contact in a virtual environment, with a persons increased anonymity and an easy way to contact another person. The computer environment supports both real-time discussions and conversions independent of time. Another advantage with the computational power is that it can support face-to-face communication although technical limitations create disappointments among the participants in the conference. To solve this disappointment one recommendation is to use static pictures, to get the look of a person. Without useful synchronisation between the talk and the body language, it is better with a static picture and instead makes use of the availability to use the spoken language. The disadvantage with the virtual communication is that it is no useful replacement to the physical contact. We recommend at least one physical meeting since research in this area and teachers experience of physical meetings give students a group feeling and it creates a community where all students can take part. This motivates online students to work with the other students and it creates a pressure on the student to do the work during the course.

Except that it is impossible to replace the physical, contact there is neither a support for large group discussion in real time. This will we elucidate further together with how to tackle that this learning environment mainly supports a strict written language. Moreover, we will also describe that although there is useful technique that support the virtual communication, there is a problem to get students to use these tools.

5.2.1.1 PROBLEM WITH THE WRITTEN LANGUAGE

In Luvit there is possible to both use chat and forum to communicate with the other students. The structure of theses tools are delimited which means that it is difficult to make a word or a sentence clearer. There is no functionality to point out a specific part in a text. These missing functions also results in problems to express feelings or tell jokes, which often result in misunderstandings between the actors.

SOLUTION

To catch the students' attention on a computer screen with a lot of text would be facilitate if the important part were separate from the rest of the text. By having, functions in the course production tool that can change the font on the text can solve this. With this function, it is possible to write a word bold and in another colour like for example **N.B.** instead of being limited to only be able to write N.B. By changing the font of the text, it is easier to get the students attention, which reduces the risk of missing important parts. This function is useful in situations when someone wants to tell a joke and together with a chat, language makes it even clearer.

5.2.1.2 PROBLEM WITH LARGE-GROUP DISCUSSIONS IN REAL-TIME

Both chat and forum handle discussions in small groups and large group discussions independent of time, but they do not support larger group discussions in real time. It would be possible to use chat for this element but that is nothing that we recommend. This kind of discussion bases usually on quick and short messages, which makes it difficult to follow if

there is too many involved. A scenario is, when a student has written an answer on a contribution three other students have already answered it. After the first student has sent the answer, the discussion is over and a new issue has started. This leads to an unstructured discussion with only a few engaged students.

SOLUTION

It is possible for students to have a large group discussion in real-time but the teacher has to think what is useful and how all student can be activated at the same time. One recommendation is to let the students discuss in small groups and choose one student to represent the group. After the discussion all representatives gathers and mediate the groups' opinions to the teacher and inform the rest of the group. The next step is that the representatives return to the original group and mediate what had said among the other representatives. In this way, students and teachers can take part of the relevant opinions in the whole class. Another solution is to have a talk show in the chat where the teacher first explains the conditions or give questions to answer. One group at the time has a time limit to deliver their opinions and when the time is up it is the next group. During this conversation, both students and teachers can take part of the discussion.

5.2.1.3 PROBLEMS TO MAKE STUDENTS COMMUNICATE BY USING EXISTING COMMUNICATION TOOLS.

A recurrent problem in online education is how to get students to start using forum and chat. The course production tool supports both discussions in real time and independent of time but many students see the advantages of using these tools. This results in that they do not use it, in situations when students could support each other they do not know how to reach each other, and instead they contact the teacher.

SOLUTION

The teacher can affect how students are going to use forum and chat in the beginning of the course. It is not enough to inform the students of theirs existence instead the teacher need to get the students to use them. To do that one recommendation is to have a compulsory task in the beginning of the course where the students present them selves. Another recommendation is to have a seminar where each student has to make at least five contributions during a discussion. The student has to send two messages with his/her own opinions, and make two comments on some one else's and finally respond the comments on the own contribution. In these elements, they get in contact with these communication tools and in a smooth way learn how to use it. However, if the introduction of these tools come too late, it is difficult to get acceptance among the students.

5.2.2 INFORMATION

The material from our studies elucidates different ways of how the computer handles information. The World Wide Web is an unlimited information resource, which means that it is easy to find material and information. Although, it is important to remember that all people are able to publish their work at the internet. To use www as a useful resource for information people need to get knowledge about the knowledge. Even though the World Wide Web is nothing that has come recently several Internet users are not aware about how to use search engines and when to use it. People's relation to information has changed because of the information society since there is not possible and no use for a human to catch the large amount of information. The computer can save large amount of information while

the human interaction makes it worthwhile. This is important to have in consideration when planning an online course. We will describe the identified problem of how to distribute and visualise the information and we will discuss what is necessary to be aware of when presenting the information on the computer screen.

5.2.2.1 DISTRIBUTION PROBLEM

To inform online students, teachers use the existing course production tool, email, and other tools to spread information. While, there is a flexible way to inform students, it is a problem with duplication and loss of updated versions. This problem leads to confusions among the students and a possibility to miss out important information. It is also time consuming for students to look for information in several places.

SOLUTION

To make use of the availability of the information it has to be visualising in a structured way. Despite how many tools that are used the information has to be the same. To avoid misunderstandings among the students the information always need to be presenting at a common platform of the course where the students always turn to or to always inform students by using email. The computational power in this situation has the potential to diminish the work for teachers since there are different tools easily available. The teacher can safeguard to inform all students by using more then one tool for this purpose.

5.2.2.2 THE VISUALIZATION PROBLEM

Another problem to solve is the presentation of the information for the students. The computer screen decides the amount of information but it is not useful to present information all over the computer screen. Among the students it is a resistance to read on the computer screen which results in that they prints out the text on a piece of paper.

SOLUTION

We recommend teachers to keep the information small and simple because it is possible to reduce the amount of text by using hypertext and different architectural structures. When handling hyperlinks, it is important to remember the coherence strategies. It is not possible to assume that only because two nodes linked together, they have information that match so that the student can generate the correct inference about the link and incorporate the new information into the student's representation of the text. By knowing how to handle this problem, the hypertext can be a useful support in online educations. This function can create a presentation of information in different levels, which means that students with different knowledge and skills can choose between different alternatives. In this way, there is no need for all students to go through the same information.

For a teacher to design a useful presentation of the course information with use of hypertext there is also important to think of context in large and context in small. Context in large are maps that guides the students, for example a course presentation. While a context in small can for example be the course schedule and it is important that the design of the schedule supports students to keep track of their location. The hypertext structure differs from the linear or traditional sequence since this structure is unorganised and more difficult to navigate. Navigation and to easy retrieval data are still research problems according to theorists in the area.

5.2.2.3 INTERPRETATION OF THE INFORMATION

In this form of education is the only way to inform through the written language. To formulate explicit and avoid misunderstandings is sometimes difficult. A common mistake in online courses is that teachers reuse the material from the traditional teaching without changing it. It is important to understand that a presentation with the teachers' owns notes are useful when the situation give the teacher the opportunities to explain these notes. Even though this situation cannot be supporting in the online environment, it is a common element with this type of presentations.

SOLUTION

This problem solves if teachers are aware of that they have to rethink and make the information suitable in this environment. In a situation like this is the difference between these study environments obvious. Meanwhile scrubby notes can be useful in traditional teaching it is no use for online students without further explanations. Our recommendation is to make use of the computational power by create a presentation with sounds, pictures and other details that make this presentation useful for online students. Despite technical limitations, this environment offers a wider range of Medias that can improve and design interesting presentations.

5.3 MAKING USE OF HYPERMEDIA TO PRESENT LEARNING MATERIAL

The literature study elucidated new directions and possibilities with the computer for learning. The computer as a medium means more flexibility for students. It is an ambition to suit the studies to the individuals. Another perspective of the use is that the computer environment includes different Medias that affects the human senses and facilitate the learning.

Multimedia production is one example of how to make use of the computational power in online teaching. It is meant as complement to create a more flexible and individualised learning environment not as a substitute for a teacher. Multimedia can integrate several Medias that stimulate the human senses and with theoretical evidence, it facilitates the learning for students. There is still limitation to stimulate the taste and smell senses in a computer environment but feeling, vision, and hearing senses can be affecting in software systems. Interactive systems and simulation are useful tools for thinking. With the opportunities for visualisation can the students create a deeper understanding. By using this computational power, it is possible to perform a practical exercise in the virtual environment. A simulation or interactive system can visualise the needed equipment, which the students can control. Sometimes is the physical equipments to expensive for all students to elaborate with it and then the virtual environment is a useful substitute. However, exercise is not complete since it is impossible to stimulate the Hand-on element, which is a necessary element in some courses.

Research about hypermedia elucidates its potential in educations. By using multimedia and hypermedia can the computer environment create activated elements for the student. Different Medias and hypertext can captivate students' attention when presenting the information since it is the students' action and control that access the information. Despite the advantages, hypermedia has disadvantages to take into consideration when using it in educations. Hypermedia is more useful and suitable for students with experience of this medium, or from other computer environments. For newcomer it is common with disorientation and navigation problems. Our idea was to inform teachers about the different structures meanwhile it is important to remember the problems and disadvantages. The hyper textual structure and computational power can facilitate the learning by the way the knowledge information is presenting. However, these are not substitute for the interactive relationship among learners themselves, their collaborators, and their teachers.

6 CONCLUSION

In this thesis, we have given a description of what we have found out from our qualitative study. We have compared our material from the empirical study with earlier research in the area, which has resulted in a guideline to support teachers when structuring web based teaching. The guideline consists of identified problems that we considered as important parts in web based teaching. We have decided to concentrate the solution part to give recommendation and in some cases proposal of technical improvements to support the universal of teachers. With this structure, it is possible to complement the guideline with information that concerned each specific course. Our idea with this guideline is to give teachers a starting point where we arouse an interest to work further in their planning of an online course, and complement the set of patterns for others.

When structuring an online course it is always a balance between pedagogic methods and the supporting technique. Even though, the technical part brings new demands of computational skills to the teachers, the planning is still the central part. The course needs to be planning after the students' computer skill and have a content that is suitable for the subject. However, this new form of study brings both teachers' and students' to an unfamiliar learning environment, where they become newcomers. Teachers' are insecure on how to handle this tool, which affects the teachers creativity since the focus will be on the technology. From this point of view, we have found a need to support teachers with their planning. We have noticed that teachers need to learn how to make use of the possibilities in this learning environment. It is not enough to inform about existing technology instead they need to be inform and create an understanding among teachers about how to deploy it and use the technique in a smart way in its practice. They need to create suitable elements that motivate and activate the students to succeed in this form of education. The organization and structure is time consuming but it is important that the teacher plan it carefully since web based teaching is sensitive and one mistake can be enough to get displeased students.

We have noticed that the computer brings new advantages and disadvantages to the learning environment, which teachers are not use to. The main purpose with all educations is to guide the students to get an understanding of the subject and all elements is a way to transform this knowledge to the student. The computer does not have the power to replace all kinds of elements but that does not mean that there is a need to exclude the element. The teacher has to circumvent the problem and find alternatives. We are aware of that this is difficult to perform and it demands practice to find the best solutions.

This area is far from completed and our attempt with this guideline was only to create a starting point for further development. We have noticed that web based teaching is a broad area and the guideline needs to be complemented with further research. A constant problem when designing an online course is the technical conditions. Even though, some teachers have visions of how they want to design their online course; they are often delimit to the technique. We believe that this is going to be solved in the future since the technique frequently improves and that students are going to have more availability to faster broad band then they have today. In the nearest future, we consider that both online communication and information need more investigation to open up new angle on how to increase the standard of web based teaching.

We consider that changes that time and it is first when teachers and students can see the advantages and the possibilities with the computer for learning, then it can uses in an effective way and facilitate the learning for students. We also consider the content in our guideline as a step forward in the right direction to support teachers to structure and organize this new form of education.

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