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Multimedia Scenario in a Primary School

-PIER as an Agent of Change

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Abstract

This thesis describes an evaluation of the first phase of the PIER approach as it was conducted in a school setting. PIER is a learning activity, which uses web-technology for collaborate learning based on four concepts. These concepts are Problem Based Learning (PBL), Experiential Learning, Interactive Multimedia, and Role-playing. The PIER approach has been successfully used in other settings. The aim of my study was to get an understanding of how IT is used in primary education and what can be done to improve that use from an informatics point of view. This method involved both a field study and a experiment at a school. In the learning activity, both students and a teacher participated. The PIER approach, which in this thesis dealt with issue of ethics and criticism of sources of information on the Internet, was partly successful. For complete success some critical conditions such as e.g. time, motivation and making the scenario communicable, which demands creativity rather than routine.

Advisor: Urban Nuldén Master Thesis VT 2000

ACKNOWLEDGEMENTS

This thesis is dedicated to my beloved mother, which I owe everything to. Her support and engagement helped me through my education. I am very sad that she is not longer with me.

I also thank my father for being who he is, an extraordinary person. I am proud of being his daughter. I love you.

There are a number of persons that I also would like to thank, first of all my advisor Urban Nuldén, who has been most supportive and of an enormous help throughout the work with this project and the thesis. Christian Hardless and Catrine Larsson for their support, Eivor Olow at Björketorp, and finally Christer Ferm for helping me establish contact with a school.

CONTENTS

1. INTRODUCTION

PIER is a methodology, which is the result of frustration, and a reaction to, how education is performed at the university (Nuldén & Sheepers, 1999). PIER is a learning activity based on Problem based learning (PBL), Interactive multimedia (IMM), Experiential learning and Role-playing. The learning activity is divided into four phases whereas the first phase is accomplished by using an interactive multimedia scenario to present a problem by making the participants experience the problem and to support collaborative learning. In this thesis only the first phase is carried out and evaluated. Furthermore, the use of information technology (IT) is central in the PIER approach and the term IT-use will in this thesis be used interchangeably with "educational technology", where the focus lies on IT integrated in educational activities.
A more extensive description of the PIER approach will be presented in section five.

1.1 Background

In the fall of 1999 I was involved in a project with the research group Interactive Learning at the Viktoria Institute. The project was carried out together with Skolverket (The Swedish Board of Education). The objective of that research was to design and develop an interactive learning activity based on the PIER approach. This learning activity is now available for the participating teachers in "IT i skolan" (ITiS), which is a national three-year project to enhance teachers IT competence in primary school and upper secondary school.
While involved in this research I became interested in the problems the schools in Sweden are facing in their use of information technology (IT) in educational practice. Therefore I started on a project to explore the current situation at a school and to evaluate PIER in a primary school setting, which had not earlier been done.

Contact was established with an IT-responsible person at a primary school in a small town called Björketorp in Marks's District, who showed interest in my idea and was ready to help me carry out the project documented in this thesis.

1.2 Problem Area

The overall situation of IT-use in school is problematic (Fredrickson, 1999). For example has the progress and development of the use of educational technology not yet reached the expectations that were put forward by legislators, school leaders and school personnel a few years ago. This is a controversial subject, which is frequently discussed in media. Many official reports have been produced in an attempt to bring clarity in the issue. One contributor is The Swedish Board of Education, whose primary task is to watch over the educational system in Sweden. Another important contributor is the KK-foundation, which has financed a substantial amount of research concerning IT-use in school.

A major problem with IT-use in school is to get it integrated in the way of working in order to benefit from its possibilities to support the students learning processes. Teachers not only need to know the so-called " computer literacy" skills (Fredrickson, 1999). They need to know how IT can be used. This assumes using new pedagogical approaches, which implies new ways of working that are put forward in the curriculum. And not integrate IT in traditional teaching, doing the new in the old way.
I suggest that this can be achieved using the PIER approach. The intention is not to look upon IT-use in school and the PIER approach as two phenomenons being isolated from each other. On the contrary, the PIER approach consists of some of the new pedagogical concepts that have emerged. In addition, PIER is in itself a concrete example of a "technique" where IT is integrated into the curriculum.

1.3 Objectives

The objective of this project was to evaluate the first phase of PIER in a school setting in trying to improve the use of IT in a primary school. To achieve this an understanding of the current situation in school concerning the use of IT was needed in order to intervene in a real situation, which the teachers and students found somewhat problematic. Therefore a field study was conducted prior to the intervention. The intervention was achieved by the learning activity, which students and a teacher later participated in. This learning activity is not to be seen as a solution to their problem but as a way to initiate a dialogue between students and teachers. In other words, a starting point or a catalyst for furthers learning.

Consequently, the research questions addressed in this thesis is:

Is the PIER approach useful in primary school, in supporting the interaction between the students and the teacher to make them discuss and reflect on their use of educational technology?

1.4 Delimitations

The work in this thesis only covers the design and evaluation of the first of four phases of the PIER approach due to limited time.
Furthermore, the IT-use is undergoing rapid development so I have tried to use as recent reports as possible, mostly from 1997 and later. In addition, I have mostly used Swedish research for this section as I have delimited my area of investigation to a Swedish school and wanted to create an understanding of the current situation in Sweden.

1.5 Disposition

First in section two the informatics perspective of education is described and is followed by a proposal of a working definition on educational IT as it is to be understood in this thesis. I continue with a brief description of the problem area.
The third section is a description of the method used.
The following section introduces and explains the theoretical framework that consists of the concepts that are central in this thesis. These are two aspects of learning and knowledge, which are the fundamental underlying assumptions of the process of learning in the PIER approach. In addition, Problem based learning; interactive multimedia, experiential learning and role-playing which are the central pedagogical concepts of PIER.
In section five there is a more extensive description of the PIER approach and previous research.
The results are presented in section six. The first part in this section describes the field study. The second part describes the development and content of the first phase of PIER, (the scenario) which was designed to deal with the identified problem from the field study. The observations from this learning activity, as it was performed in a school setting, are described in the third part of this section.
The discussion where the results related to the theoretical background are presented in section seven.
In the last section I present the answer to my research question and summarize the most important findings of this project.

2. IT-USE IN EDUCATION

In this section the aspects that I believe are important to understand when discussing the issue of IT-use in school, and as in my case an evaluation of an IT-supported learning activity, are brought forward. First a description of the informatics perspective in this thesis and proposal of a working definition of educational IT as it is to be understood in this thesis. I continue with a brief overall description of the problem area. This description is concentrated on the changes the school has undergone the last century and IT-use in an historical perspective. In addition, to what extent IT is considered useful in enhancing students learning processes.

2.1 The Informatics Perspective of Education

The approach in this thesis is in the perspective of "the New Informatics". Dahlbom defines the New Informatics as "…a theory and design-oriented study of information technology use, an artificial science with the intertwined complex of people and information technology as its subject matter" (Dahlbom, 1996). In addition, design is about shaping and introducing artifacts in social contexts. According to Dahlbom and Mathiassen (1993) there is a need for a better understanding of artifacts and how they are designed in social contexts. When introducing artifacts in an organization or in some other social context, there is an aim of improving the present state. Dahlbom (1996) says " We are interested in the use of technology because we are interested in changing and improving that use." In this project, my aim is to improve the educational practice concerning IT-use. Nevertheless, to be able to do this, there are more to consider than information technology and its use.

> *"The design and use of information technology in educational activities must be pedagogically well-grounded. Information technology as such will not solve the problems of education. From an informatics perspective, it is possible to take information technology as a point of departure. However, the design of educational information technology should always be validated by appropriate pedagogical models."*
>
> (Nuldén 1999, pp. 25)

2.2 Working Definition of Educational IT

IT can be defined in numerous ways. In this thesis, I propose a working definition for the term IT, as it is understood in an educational context. This definition of IT comprises telecommunications and computers, e.g. multimedia, e- mail, Internet, network, and CD-ROM. My wish is not to complicate the subject with a more established definition. However, I believe that it is important when discussing IT in the context of education that on one hand it can be looked upon as a very concrete matter, e.g. the technology mentioned above. On the other hand, there is vision about a better school for both teachers and students. This vision concerns where the education is going to take place and how to use IT in education as well as what to teach the students (Pedersen, 1998) and not least, solve the old and perhaps eternal pedagogical problems (Skolverket, 1998).

2.3 The School in change – integrating IT in the way of working

The education and the form of schools have stayed fairly unchanged over hundreds of years until the last 10-15 years (Skolverket, 1997). The school is changing and influenced by the surrounding society but also by new pedagogical approaches that are developed at schools and research institutes (Skolverket, 1998).

Since early after the Second World War the school has gradually been challenged with new tasks. The school has increasingly undertaken the role as the fosterer of young people since the family-structures has changed in the post-industrial society. The families are smaller and the numbers of single-parent families are increasing. Women are also largely gainfully employed. Institutions as day-care centers and after-school recreation centers have partly replaced the family as the social platform.
At the same time the school attendance has been prolonged which means the students spend more years in the educational system than ever before (Ibid.). The school is, of course, not the only place where learning takes place. But due to the increased time the students spend at school, the more important it is to focus on how the school is to prepare them for a future society.

However, the opinions vary between schools how to get the students prepared for a future society when talking about IT in education. An empirical investigation that included 48 schools (Almqvist et al., 1998) showed that all of the teachers and students agreed that the school has to follow these changes and prepare the students for the future society. Some students think that knowledge about how to control various programs,

operative systems (OS), etc. is sufficient. Others claim that how we use IT is more important, e.g. that the pupils learn the process of seeking information to create an opportunity for learning continuously (Ibid.). This, I believe shows the two aspects of IT. On one side "computer literacy" and on the other side IT as a pedagogical tool integrated in the way of working.

2.3.1 IT-use in an historical perspective

In a short historical perspective of the IT-use in schools, the computers first came to use in the beginning of the 80´s. In those days the students were taught to control the operating system (OS) and sometimes-simple programming. The computer was a subject to teach about and this activity was mostly conducted in special computer classrooms. As the computers became user-friendlier the usage came to cover word-processing, spreadsheets and databases. Since 1994 much has happened. When the Internet, as we know it today, as well as CD-ROM was introduced, it was possible for the students to seek information from other sources than textbooks and e.g. present their work using hypertext.

2.3.2 New pedagogical approaches

IT is rapidly changing and enhanced, creating new area of usage. It is not only the possibilities how IT can be used that are changing. New pedagogical approaches are also emerging over time. Pedagogical approaches concerns with how we look upon the concept on knowledge and what the students should learn and what kind of knowledge the students should have, and how this knowledge will be attained. These changes has brought forward modifications in the curriculums e.g. Lgr 80 and Lpo 94 (Skolverket, 1997). In Lgr80 "the investigating way of working" was emphasized and in Lpo94 the student was in focus and all the descriptions what the teacher is supposed to do are expressed in terms of what he or she are to do in relation to the student. For example, the teacher is to stimulate and give guidance and strengthen the student's own will to learn.

2.3.3 Advantages of using educational IT

By spokesmen of IT, there are many advantages of using IT in education. Pedersen (1998) mentions some of the most common advantages that are brought up when discussing this issue. These are; learning will occur in a shorter amount of time. Learning will be qualitatively better in some regards. The motivation among students will increase. Education costs might be lower, i.e. more computers and less teachers. Other advantages are,

education and learning will be enhanced through facilitated communication and writing. In addition, learning materials that are up to date can be accessed more easily. There are also an increased number of variations of how education can be conducted. (Ibid.). This has in later years been emphasized within the educational domain in order to increase the students' ability to learn as they are considered being individuals with different prerequisites. In addition there is a believe for different learning approaches according to what the students are to learn.

In a report conducted by Swedish Gallup for the KK- stiftelsen (Gallup, 1999), the result of six thousand telephone-interviews including both students and teachers was presented, one of the questions was: What do you believe are the greatest advantages of using IT in education?

Answers:

1. Gives natural computer-literacy
2. Facilitates learning in school
3. Increases motivation for schoolwork
4. Increases the collaborative work among students
5. Stimulates critical thinking
6. Other
7. Uncertain, does not know

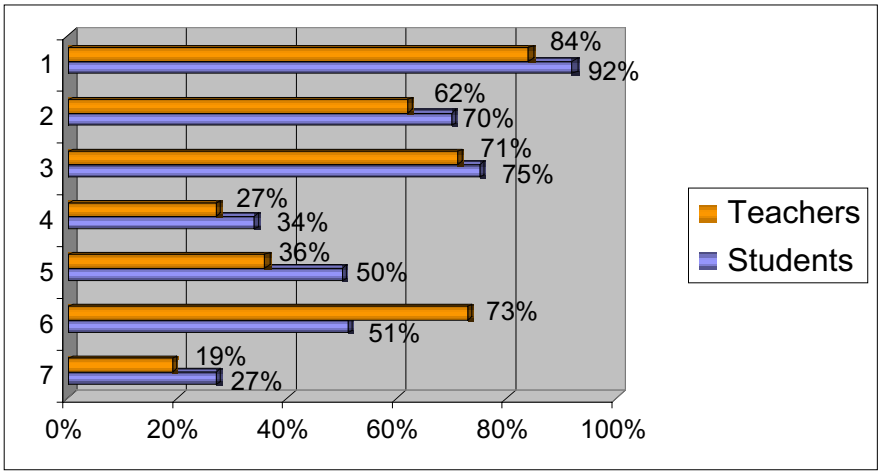

Figure 2.1. Gallup(1999) pp. 29

3. METHOD

In informatics research there is a pluralistic tradition of several methodological paradigms (Dahlbom, 1996). In recent years the "…design oriented study of information technology use with the intention to contribute to the development of both the use and the technology itself" (Ibid.) has influenced much of the development of the conducted research. And the central interest is to intervene and contribute to the process of change rather than to just observe and describe the process. In the line of informatics research, qualitative methods are used to contribute to both development of technology and the design of its use. Most commonly applied are ethnography and action research (Nuldén, 1999).

In this project, the aim was to improve the educational practice concerning IT-use and to evaluate the PIER in a school setting. The "action case approach" was the most suitable approach to achieve this. As it is a hybrid method involving both ethnography and action research, these are brought forward in this section before I describe my choice of approach in this thesis.

3.1 Philosophical views

Understanding the two main philosophical views are important when choosing research approach. It gives insight of what data, where to gather it from and how to interpret the data to give a good answer to the research question. However, it is about more than that; it states the whole form of the research (Easterby-Smith, M. et al, 1991).

The two main philosophical views are positivism and hermeneutics. Positivism means that you see the social world as something that exists externally and should be measured through objective methods. Objective methods can be characterized as quantitative methods e.g. the researcher is independent of what is being observed and by testing theories by taking large samples, this in order to be able to make reliable predictions and explanations (Vigden & Braa, 1997).
The hermeneutic view on the other hand implies that the world is socially constructed and subjective. The observer is part of what is being observed to gain an understanding of what is happening. Usually this means that small samples are investigated in depth or over time i.e. qualitative methods (Easterby-Smith, M. et al, 1991).

3.2 Research approaches

3.2.1 Ethnography

This method originates from ethnographic research studies, where the researcher spend extended periods of time in different societies making detailed observations of their practices (Silverman, 1993). “An ethnography is a written representation of a culture (or selected aspects of a culture).” (Van Maanen, 1987) Using ethnography the researcher seeks to present a description as it is seen and understood by those who work or live in the domain under observation (Hughes et al., 1994). This description is written and must represent the culture, not the fieldwork itself. It is about decoding one culture while recording it for another (Van Maanen, 1987).
Ethnographic research can be applied in short periods of time i.e. “quick and dirty ethnography”(Hughes et al., 1994). There is also a diversity of roles an observer can take in ethnographic research. According to Easterby-Smith et al. the roles ranges from having no interaction at all with the observed to a complete participator, working alongside with the other (Easterby-Smith, M. et al, 1991).

3.2.3 Action research

This is a research approach, which stresses the idea that if you want to understand something you should try changing it. Action research has collaborative features between the researcher and the researched and is often used in educational research (Easterby-Smith et al., 1991). The purpose is to experiment with education through intervention, and evaluation and reflection of the effects on the intervention (Nuldén, 1999). Action research can be described as a spiral of steps. Each step has four stages: planning, acting, observing and reflecting (McNiff, 1995).

The *planning* starts out with identifying a problem or an idea of improvement of present practice. Then you have to ask yourself what you could do about it and what kind of “evidence” to collect to be able to make a judgment about what is happening. There is also a need for how these evidence could be collected and how to check that your judgment about what has happened is reasonably and accurate. (Ibid.)

Next stage comprises *acting* in the direction of the imagined solution.

The third stage is *observing* and it is where the outcome of the solution is evaluated

The practice, plans and ideas are modified in the light of the evaluation in the last stage, *reflecting*.

The claims of validity that can be made in action research are about improvement in the researchers practice, the participators education and the researchers understanding. When it comes to generalization, traditional research is about making predictions from scientific results, which may be quantified, replication of experiments (McNiff, 1995). Action research is all about people explaining to themselves why they behave as they do, and enabling them to share this knowledge with others. Rather than seeing the idea of generalisability as an appropriate form of discourse, that is, ideas that can be read on a page or made in statements without a context of reality, " …action researchers see generalisability in terms of shared forms of life" (Ibid.).

3.2.4 Action Case Approach

The action case approach is a hybrid form of research method where a soft case study and action research is combined. In an article written by Vigden & Braa (1997), the authors describes the research framework as three different ideal approaches as to what the intended outcomes of the research are, i.e. the positivistic, interpretative and interventionary approach. This research framework is grounded upon the assumption, that within an organization there are constraints and possibilities of what kind of research that can be carried out. In addition, any research activity has the potential to initiate change to a greater or lesser extent. Below I have used their triangle to visualize the outcomes of the different approaches.

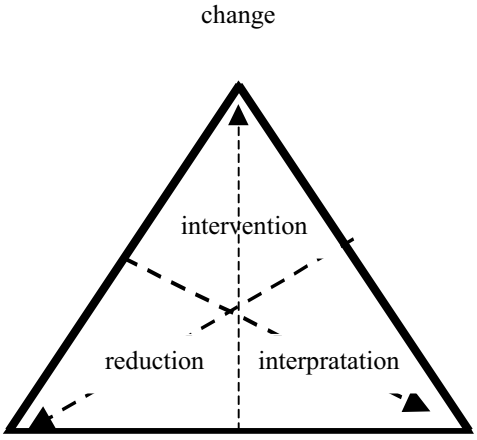

Figure 3.1 An IS research framework (Vigden & Braa, 1997 pp.3

The outcome is to gain understanding an interpretative approach is used. Moreover, to create change an interventionary approach is used. These are all ideal types and according to the authors not attainable in practice. When focusing on understanding and change as in the action case approach, it is "…a trade-off being an outside observer who can make interpretations

(understanding) and a researcher involved in creating change in practice." (Vigden & Braa, 1997) This dilemma is in the action case approach balanced with a small-scale intervention with a deep contextual understanding. A disadvantage of this hybrid method is that it can be criticized for the weaknesses of case study and action research in their purified forms. Vigden & Braa argue that "…action case should be seen as a response to the dilemma of interpretation and intervention as well as providing a pragmatic response to the issues of manageability of in-context research". Furthermore, the collection of data in soft case studies, which are based on ethnographic methods, can involve techniques, such as e.g. observation (Ibid.).

3.3 Choice of approach in this thesis

The aim of this project was to evaluate the first phase of PIER in a school setting in trying to improve the use of IT in a primary school. To achieve this an understanding of the current situation in the school concerning the use of IT was needed in order to intervene in a real situation, which the teachers and students found somewhat problematic. The approach most suitable for this aim was the "action case" approach, which in my case consisted of:

- Literature study
- Field study
- Interviews
- Action, design and development of the multimedia-scenario and observations from the scenario

3.3.1 Literature study

The initial work with this thesis involved a great deal of literature studies. It was necessary to gain an understanding of the pedagogical theories the PIER approach is based on and previous research made about PIER to see what had been done and to be able to relate to them. The literature study also comprised reports concerning the use of IT in education.

3.3.2 Field study

This field study was conducted during two days at a school making detailed observations of their practices. Through observations my aim was to get an understanding of how IT was used and what was satisfactory and what was

not, concerning that use and to present a description. I also wanted an understanding of the setting the learning activity would take place in. The observations were participative, which means I attended lessons as a student and observed how the work of both students and teachers were carried out.

3.3.3 Interviews

This method can range from highly formalized and structured to informalized, which is characterized by openness and flexibility, and it is the most fundamental of all qualitative methods (Easterby-Smith, M. et al, 1991). During the field study at Björketorp, I conducted an individual interview with the IT-responsible at the school. The interview was informal and focused on the work at the school in general and how IT was used in that work. To get a broader view of the use of IT among the teachers, informal conversations were conducted in their lounge, where they were asked how they use IT in their classes.
I also interviewed some of the students, to get their view to gain an overall satisfactory understanding.

3.3.4 Action

The model of action research used in this thesis consisted of four interrelated steps: planning, acting, observing, and reflecting. In the *first step*, I together with teachers and students identified a problem of practice they were interested in and devices a plan of action. This step was integrated with the final part of the field study, where conclusions were summed up, and the IT-responsible at the school and I made plans for future action. These plans were about what the interactive learning activity should deal with. Further plans were how many and which people were to take part in the action. The IT-responsible wanted the "IT-agents" (these will be explained further on in this thesis) to be part of the learning activity as it was related to IT-use and that little had been done for them in a while. We agreed on this and at least one teacher would participate in each session.
In the *second step*, I went home to design the learning activity based on web-technology, which I later will describe more extensively in this thesis. During this time, I corresponded with the IT-responsible through e-mail to get her opinion on the story and of the content in the learning activity.
The *third step* concluded the actual learning activity, which was observed and sound recorded. There were two groups participating in this activity.

First group: Five participants – four students, two girls and two boys from the grades five and six, and one teacher.

Second group: Five participants - four students, two girls and two boys from the grades three and four, and one teacher. It was the same teacher that participated in the first group, i.e. the IT- responsible.

The *fourth step* was reflecting and this part is presented in the section of discussion.

4. THEORETICAL FRAMEWORK

This section introduces and explains the concepts that are central in this thesis. First I will describe two aspects of learning and knowledge, which have become more focused in recent pedagogical research (Skolverket, 1997). These aspects are constructivistic learning and collaborative learning, which are the fundamental underlying assumptions of the process of learning in the PIER approach (Nuldén, 1999). I will also describe Problem based learning; interactive multimedia, experiential learning and role-playing which are the central pedagogical concepts of PIER.

4.1 Constructivistic Learning

This aspect of learning implies that knowledge is not a depiction of the world, but a way to make the world more understandable. “Knowledge is developed through the interaction between what a person wants to attain, the existing knowledge, the problems she believes she has according to the existing knowledge and what she experiences” (Skolverket, 1997).

Theories about learning, as well as other theories, are subjects for changes. Traditionally the aspect of learning has been the objectivistic model, which in short means that only knowledge formulated in words and formulas are to be regarded as knowledge (Skolverket, 1997). Knowledge in this view is transferred from teacher or book directly to the student. The knowledge is transmitted with little concern for the students understanding of the material. “Students then provide the teacher with evidence of learning by recitation; orally or in written exams” (Nuldén, 1999).

Today the concept of knowledge has been widened to imply both objectivistic and constructivist learning (Skolverket, 1997). Knowledge is no longer considered only cognitive and formal. The constructivist aspect of knowledge stresses the crucial relationship between new experiences and what is already known, since people only can understand what they have constructed themselves (Leidner and Jarvenpaa, 1995).

4.2 Collaborative Learning

Collaborative learning is another aspect of learning, sometimes also called cooperative learning. This is according to Leidner and Jarvenpaa (1995) an offspring of the constructivist aspect of learning. Constructivist learning is a process of constructing knowledge by an individual compared to the collaborative where learning emerges through shared understandings and interaction between individuals. The goal is to share alternative viewpoints and challenge as help develop each alternative viewpoints (Jonassen, 1996). The more it is shared, the more is learned. Other pedagogical assumptions are that involvement is critical to learning and that the learners have some prior knowledge (Leidner and Jarvenpaa, 1995).

4.3 Problem Based Learning

Problem Based Learning (PBL) is based on a different understanding about learning than traditional learning. PBL is based on the students' interests, previous knowledge, activity, and responsibility (Kjellgren, 1993). The role of the teacher is also different as to traditional learning. Teachers who use the concept of PBL are not taking on the role as being the one who has all the knowledge and are to pass this knowledge on to the students. Instead, the PBL teachers give the students guidance and encouragement. PBL is furthermore a concept that focuses on identifying problems. The students are to formulate the problem or problems themselves. It is the teacher's responsibility to present the problem area in a stimulating and relevant way. This is often done with a so-called vignette, which aims at getting the group started. A vignette can for example be a case or a scenario (Nuldén & Sheepers, 2000) and is an essential part of the PIER approach. When the students later have identified the problem, the search for information begins to solve the problem or to come closer to a solution. PBL implies that the student takes responsibility for her own learning.

4.4 Experiential Learning

Experiential learning is often referred to as "learning by doing" (Schank, 1997; Kolb, 1984) and assumes certain principles about learning.

> "Learning is the process whereby knowledge is created through the transformation of experience. This definition emphasizes several critical aspects of the learning process as viewed from the experiential perspective. First is the emphasis on the process of adaptation and learning as opposed to content and outcomes. Second is that knowledge is a transformation process, being continuously created and recreated, not an independent entity to be acquired or transmitted. Third, learning transforms experience

> in both its objective and subjective forms. Finally, to understand learning, we must understand the nature of knowledge, and vice versa."
>
> (Kolb, 1984 pp.38)

In experiential learning knowledge is created by experience. But, concrete experience does not automatically lead to knowledge. An experience must be reflected upon in order for learning to occur (Kolb, 1984). experiential learning can be practiced in different ways. Examples of experiential learning are live case, case studies, role-play, and simulation (Nuldén & Sheepers, 2000) and are often referred to as small group work (Marsick & O´Neil, 1999).

4.5 Interactive multimedia

In an educational context a great deal of attention has lately been focused on interactive multimedia (IMM). The innovations in technology has made it possible to store large amounts of information in computers, present it via video, text, sound and graphics and interact with the users in modes that seems natural and complex (Jonassen, 1996). IMM uses hypertext to permit links between pieces of information, which allow the user to "…explore ideas and pursue thoughts in a free and non-linear fashion" (Bieber & Kombrough, 1992, in Nuldén, 1999). This is a way of using technology as a tool for augmenting cognitive activity and thereby leading to organization and extension of our cognition (Jonassen, 1996). In that aspect, IMM is not used only as a tool, for the teacher, to provide a richer and more exciting learning environment.

Nuldén and Scheepers have, concerning the use of IMM (1999), observed three current trends, within education. First, the channel of distribution is moving from CD-ROM to the WWW. Second, the use is moving from individual learning towards groups of learners. The last trend is about the interactivity that has shifted from the learners and the computer, to interaction among the learners. These trends have in turn led to the development of PIER.

4.6 Role-playing

Role-plays can be described as dramas in which a number of participants are asked to portray a particular character, but no lines are provided as for

actors (Steinert, 1993). In a higher education context, role-play is used to prepare the students for their future profession. An area where role-plays are frequently used is medical education where the objective is to simulate and practice different patient-doctor situations. Role-playing helps the students to view situations from alternative perspectives. Besides medical education, other common areas are training in law, police, military service, and management (Ibid.).

The role-play can also be used as a technique to approach issues otherwise difficult to discuss. In a role-play where controversial issues are discussed, the participants can in their disguise of their roles elaborate with their own true conception, but without exposing themselves (Hardless & Nilsson, 2000). When acting in a role, individuals need to rethink their conceptions and understandings. Role-plays can in other situations be used to support the exchange of experience amongst the participants. The purpose and structure of a role-play can be to initiate discussions on issues directly related to for instance a group of a certain profession, e.g. project management (Ibid.).

5. PIER

PIER is an approach to learning based on Problem based learning, IMM, Experiental learning and Role-playing. Helana Scheepers and Urban Nuldén have developed this approach in their search for extending PBL and EL as university teachers. This extension, (or call it "boost") was achieved by using IMM and Role-playing (Nuldén, 1999). The use of IT is central in PIER and a more extensive description will follow in this section.

5.1 The approach

PIER consists of four phases:

1. Concrete **experience** through role-playing and acting with a multimedia scenario
2. A period of individual **reflection**
3. Seminar where the scenario is **discussed**
4. **Ongoing** and organized **learning** process

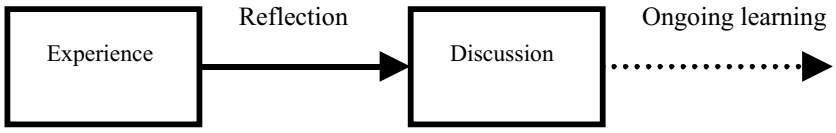

Figure 5.1 The four phases of PIER

5.1.1 Phase one

This activity is supposed to act like a vignette in PBL, where a problem or a problematic situation is presented to a group of 5-8 persons. The presentation of the problem is made through a multimedia scenario using web technology, which permits links between web pages where pieces of information, such as text, sound, graphics and movies, are embedded. The scenario structure reflects the passing of time i.e. the group navigates through the scenario and new events occur.

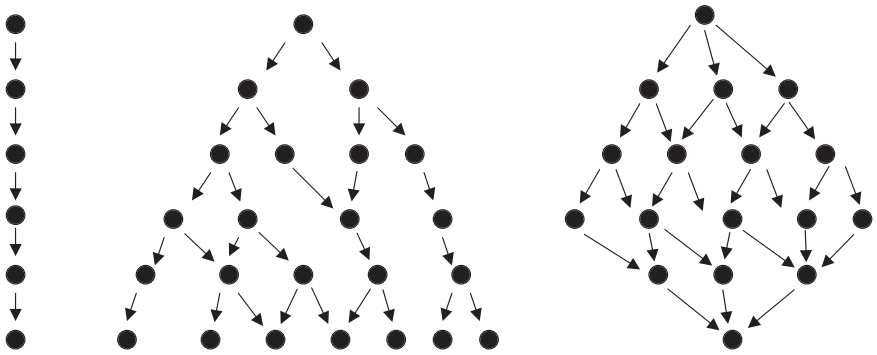

Figure 5.2 Interactive case (left) and two types of case-based simulation.

The scenario can have different overall structures as shown in figure 5.2. In the interactive case, navigation and presentation of information is in a linear fashion, while in the two types of case based simulations, the base-group relatively freely navigate their way through the case. The case based simulations differ in the way that one has an open ending of the scenario, and the other has a closed ending.

The scenario might be a fictive story or a course of events. The aim of the scenario is to illustrate one or a few, for the participants' relevant and important aspects, and to give the participators a sense of experience. It is important to know that the main purpose of the scenario is not to transfer information to the participators, but act as a starting point. This is a suitable approach when initiating learning and improvement of controversial topics within e.g. the university and in corporations (Hardless et al, 2000).

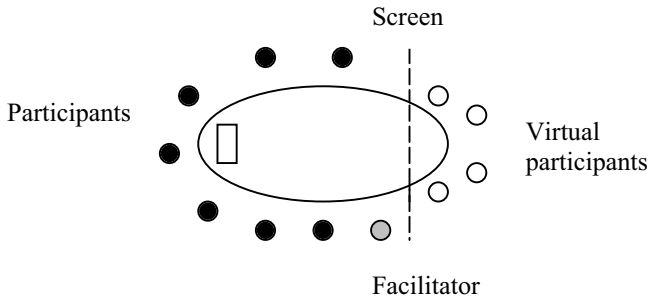

Figure 5.3 Overview of the physical setting

Figure 5.3 illustrates the physical setting. The scenario is projected on a big white screen with the help of a computer and a projector. The scenario itself and the facilitator initiate the interaction between the participators. The facilitator is the person who accompanies and gives support throughout the scenario. Each participator is also assigned a role and a role description to act according to, but is mainly to rely on previous personal knowledge and experiences. In the scenario, the group is confronted with events and decisions to make, which leads to discussions. During this interaction knowledge is shared. In addition, the group has to take the consequences of their decisions.
A scenario is to take about three hours and it should end in a way that leaves the participators with more questions than answers. In the movies, this is often referred to as a "cliff-hanger".

5.1.2 Phase two

Phase two is individual reflection for about one week. During this time the participants will have a chance to reflect individually on what happened in the scenario and they will hopefully relate their experiences from the scenario to their daily work.

5.1.3 Phase three

The third phase is a seminar together with the participants and facilitator. The purpose is to discuss the experiences the participants encountered during the scenario and relate them to their experiences from their daily work and the problem or problems are identified. Course of action is taken of what to do in the future and it is important that this build on the participants' own ambition and ideas.

5.1.4 Phase four

The fourth and last phase is where the participants use their own experiences from phase one to continue the work of change, i.e. ongoing and organized learning.

Phase one	A group of people together experiences a problematic situation through role-playing in the multimedia scenario. Approximately three hours duration
Phase two	Individual reflection for about a week.
Phase three	Recapitulation and discussion. The group meets with the facilitator and discuss what happened in the scenario and what course of action to take in the future.
Phase four	Reflection. The participators use their experiences from phase one to three to continue the work of change – learning and understanding.

Table 5.4 Framework of PIER

5.2 Related research – previous evaluations of PIER

The PIER approach has been applied in other learning contexts. In this section I will bring forward some findings in earlier research conducted with the PIER approach related to this thesis.

5.2.1 Copernicus- Experiencing a failing project and learning

The setting for this research was corporate involving a large organization. The purpose was to facilitate experience-sharing, discussion, and reflections with the intention to increase communication among project workers and in a longer perspective improve project management practices (Hardless et al., 2000). This research project lasted for about six months and involved four researchers. First they conducted interviews in order to create an understanding of the underlying organizational culture and to collect stories and anecdotes to be used in writing the stories. The actual design and implementation of the scenario was a joint effort between researchers and members of the organization.

There were 80 project workers participated in the learning activity and the first phase of PIER was located at the research institute whereas the seminar (third phase of PIER) was held at the corporation. The indications given by this research were very positive. A total of 68 surveys were completed at the end of activity three and showed that the participant's overall experience of the PIER approach was that it was a meaningful learning activity, and they were even more positive in recommending it to others. A majority of the participants felt that the scenario was customized to fit their individual needs and even more to the organization's needs.

5.2.2 System development simulation at universities in Sweden and South Africa

PIER has also been applied as a simulation in which failure and escalation in system development projects are introduced to Information System students. This research aimed at searching for models that allow genuine interaction in learning activities (Nuldén & Sheepers, 2000). There were 21 Informatics students participating at a university in South Africa and 10 at a university in Sweden. Feedback from the students was captured through a questionnaire that was handed out afterwards. They were very positive to this kind of learning activity. It was also found that the combined use of an IMM simulation and PIER was effective for learning about information system project failure and escalation.

6. RESULTS

The first part in this section describes the field study, which aimed at getting an understanding of the current situation in a school in Sweden that concerned the use of IT. Furthermore, it aimed at identifying a problem or a need for enhancement in their use of IT. The second part describes the development and content of the first phase of PIER, (the scenario) which was designed to deal with the identified problem from the field study. The observations from this learning activity, as it was performed in a school setting, are described in the third part of this section. The focus is on the participants' interaction with each other and with the multimedia scenario and to what extent the scenario supported and encouraged discussion.

6.1 The Results from the Field Study at Björketorp

The conditions for accomplishing the work presented in this thesis was to find a school that was interested and able to set off time for it. Two schools showed interest, a seventh to ninth-grade school and a one to sixth-grade school. The assistant principal at the seventh to ninth-grade school showed great interest. However, the teachers at the same school were not interested in the subject i.e. the use of IT in educational practice. They were too frustrated over the lack of computers and other peripheral devices. They told me that the few they had were often broken, and the printers did not function properly. They just could not see how this project could benefit them when they did not have the resources to bring the subject further.

The option left was the other school, called Björketorp. Below follows a description of the use of educational technology at Björketorp, which was attained by interviews and making observations during classes. This field-study was concentrated to the grades three to five.

Figure 6.1. Björketorp school

6.1.1 Interview with the IT-responsible

Early one morning I met with the IT-responsible person Eivor, at Björketorp. We had an informal conversation about the school and its IT-use. Below the discussion is summarized.

Björketorp is a one to sixth- grade school with approximately 140 pupils and 10 teachers. The two first grades (1-2) are integrated i.e. they are divided into two classes with first- and second-graders in the same class. The same accounts for third and fourth grade. At this school the fifth and sixth grades are not integrated. Björketorp has had computers for some years now. Most of the computers are old (the oldest are PC 286) and were donated from a company nearby when newer models were purchased. The older computers are mainly used for fill-in exercises in math and in Swedish. The applications available for those computers are text-based and are more a substitute for using paper and pencil.

The school has four new computers with a printer each and two of the computers also have access to the Internet. Eivor expressed a wish of having more computers with access to the Internet, but the yearly cost for every additional modem would amount to five thousand crowns. “This kind of money we just do not have” she said.

Consequently, they have one new computer each in the grades three to six (the older computers excluded). Only the new computers have the capacity to run programs that are more advanced. An example of an advanced program that is used is “Matador”. This program aims to make the students use different methods for solving various math-problems. It uses graphics to

visualize the problems. “The program gives the student the opportunity to learn the classroom material in a more meaningful way”.
Other subjects in whom they mainly use the computers are in science and in Swedish class. The applications used in those classes are also specialized for that particular subject. For example, in Swedish class they have “Svestav”, which is used to enhance spelling skills. In math they also have “Urkul” that is an application program to learn the clock.

Since eighteen months, the school has adopted a concept of IT-agents. This concept was a central decision from the Mark district to enhance the IT-use in the Schools by using students as IT-agents. At Björketorp, two students in each class are appointed IT-agents. These are agents throughout the years they attend this school. Eivor emphasized that these students were not appointed due to their previous computer literacy i.e. these students are not necessarily the “best” at computers in their classes. Furthermore, the IT-agents have received a basic course, conducted by Eivor, in how to use Windows and the various applications they use in class. IT-agents are to serve as extra resources in the classroom to help and to educate their classmates. This concept has through the passed one and a half-year showed to be a successful approach, taking a burden off from the teachers and making the pupils more aware of the possibilities and difficulties concerned with computers and their use in the classrooms.

Afterwards Eivor took me for a walk in order to show me the school premises. As we wandered about a teacher in a pre-school class said cheerfully, “ Did you get my e-mail?” “I did it all by myself!” she added. Eivor explained to me that she is also responsible of the enhancement of the teachers IT-competence and that they have recently received their own e-mail accounts.

6.1.2 Time for class

The school bell rang and we began to walk to her classroom, as she also is a teacher. It was time for the fifth graders and I to have English and after that math.

During English class the computers were not used, instead we did oral exercises and homework was checked (I had not done mine!). The next lesson was math. Eivor told the students what they were supposed to do and appointed one student to start working with Matador on the computer. It was a girl and I took the opportunity to follow her to the computer, which was situated in a room directly connected to the classroom. This seemed to be a

very good solution because the pupils working on the computer were not distracted by the noise from the other students in the classroom. The girl put on headphones and started Matador. She told me that oral instructions came from the program when help was needed. After about fifteen minutes, a girl opens the door, sticking in her head saying, “She has worked on the computer for almost fifteen minutes now! We are only supposed to work on it for ten minutes each”. The girl sitting at the computer ends her session and goes back into the classroom and another student sits down and starts his session.

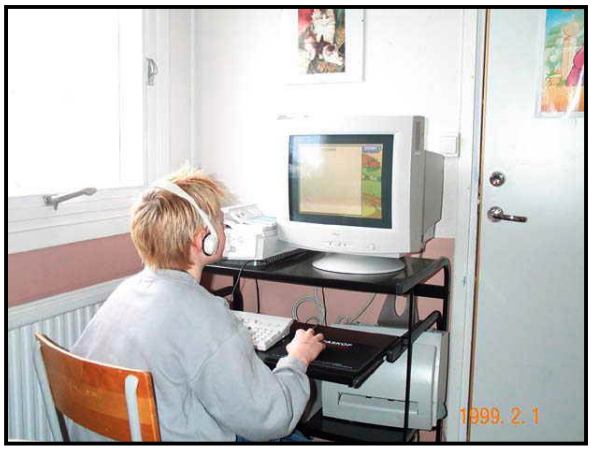

Figure 6.2 A fifth-grader working on the computer

As we were sitting there a few other students came into the room and sat down at a table. They said that they came to get some peace and quiet while doing math exercises. Unfortunately, they did not as I took the opportunity to talk with them. I asked the students if they use the Internet in their schoolwork, they answered that they very seldom do, but they wanted to do this more. They told me, that they mostly use Matador. This seemed to be a very popular program among the students. However, one fifth-grader frowned when Matador came up as a topic when we were talking. “I have a lot more exiting programs at home”, he said. He was not impressed. But when I asked him if he was to choose between doing math using his exercise book (which he at the moment actually was doing) or using Matador on the computer, he answered without hesitation and looking at me like I was from outer space; “Matador, of course”.
During this class only the new computer was used. The old computers, which were placed within the classroom, were not used, but Eivor assured me that they sometimes do.

Figure 6.3 Old computers at Björketorp

Soon after the bell rang and we all left the classroom and the teacher locked the door to the classroom. The main reason for this is to get the students out in the fresh air, but as I understood there is another reason too. Some students have visited X-rated sites on the Internet. Once two students were caught in action. Eivor also told me that she has checked the log file (the file where visited sites are logged), and she could see that this was done at several occasions. Because of this, the pupils are not allowed to use the computers with access to the Internet without an adult nearby. She told me "There are programs available that work like filters, but they can be very consequent when filtering. Using them can result in every page with for example the word sex is blocked out". Therefore, this solution seemed not to be an option. Eivor wished instead the students to be more aware of the criticism of the sources and ethics on the Internet.

Next day it was time for me to observe a third and fourth grade class and their use of educational IT.

It started out with the teacher reading one of the books about "Tzatziki" out loud. Afterwards something happened, which I first did not really grasp. When the teacher had finished reading she came with the program Matador on a CD-ROM and said that the other third and fourth grade-class was to work with Matador. So I went in to their classroom instead. Consequently, they only had one CD with the program Matador. The four classes, third to sixth grade, had to share it. This demands a certain co-operation and planning among the teachers. The IT-responsible later expressed a wish of getting a network installed, to overcome this problem.

In the third- and fourth-grade, the computer is placed within the classrooms. They have placed bookshelves to make the working-place more private.

The first student to work on the computer, using Matador was a girl who had no prior experience of this program. Therefore, one of the IT-agents accompanied her. He showed her how to start the program and how it worked. He stood beside her during her first session ready to assist if she ran into trouble.
After that ten-minute session, the girl noted in a binder which program she had used to keep track of her work and to reach a fair dispersion among the students.

Figure 6.4. An IT-agent is helping a girl to get started with the math program Matador

6.1.4 What can be done?

When summing up all the impressions from this field study, it was not too hard to see what was functioning well and what was not. Due to the constrained resources there was not much to do about the fact that they need more computers, software, and network. The school is understaffed but this is a national problem in Sweden. In spite of these scarce resources, the attitude towards using educational IT is positive and they make the most of what they have. This I believe is much thanks to the IT-responsible at this school and the assistant principle.
The problem the teachers felt was most urgent was to get the students to be more critical about sources and to be more aware of the ethical issues concerning the Internet. The pupils, on their side, wished to be able to use the Internet more in their schoolwork. What I wanted to do was to design a multimedia scenario that illustrates the problems of these issues. Both the assistant principal and the IT-responsible thought this was a good idea.

6.2 PIER in this thesis

When I outlined the project presented in thesis, one of my criteria's was that the learning activity (interactive multimedia-scenario) was to deal with an issue of IT-use in education, in order to try to enhance that use. Due to the result from the field study, the issue was criticism of sources of information and ethics on the Internet. I will also introduce the plot and how it is expressed by using multimedia.

6.2.1 Ethics and Criticism of sources of Information on the Internet

Ethics is about how we live our lives and our ideas about moral. Moral is on the other hand personal and private i.e. ethics in practice.
Internet has made it possible to get first-hand information from an enormous amount of sources as well as publish information oneself. This is a world students are to be prepared for. It is about how to find "good" sources of information, how to form an opinion of the quality, analyze and use the information. We are born curious but judgment demands practice and guidance. A lot of attention has recently been focused on this problem within the educational domain.

There are technologies to delimit access and distribution of forbidden or improper information on the Internet e.g. software. These are according to Rask (1999) not a solution to the problem. On the contrary, they will take responsibility away from the students and it might even work as a stimulant for trespassing. The responsibility lies in the hand of the user and the judgment should be integrated in the personality instead of the computer (Ibid.). He continues to say that the use of Internet in education can actually reinforce or in other words be used as a tool to enhance the students, and of course the teachers as well, ability to be more critical towards the sources of information in general.

With this in mind I started the design of the scenario.

6.2.2 My intentions of the design

What I wanted to do was to visualize the problems in a manner that would make the participants experience some of the problems attached to the issue in focus. In addition, make them discuss different aspects and reflect upon the experiences. Moreover, as the IT-responsible at the school and I had

planned the learning activity was to involve both students and teachers. The level of the scenario was to suit both children and adults.

An Idea I had about the role-play was to switch roles, i.e. teachers play roles as students and vice versa, this in order to make the participants view the aspects from another angle.

I also wanted voice-over in every scene in case there were students having problem reading. Below is the scenario structure to give a hint of how the scenes are linked together.

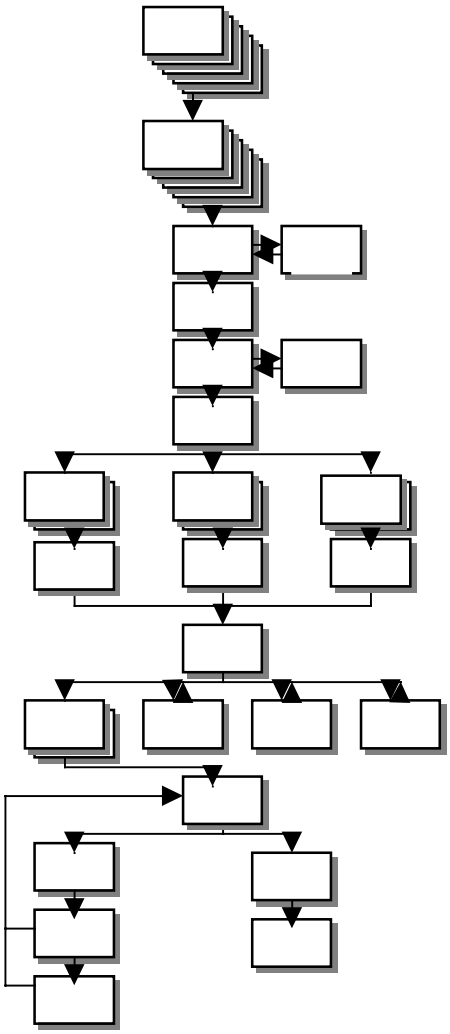

Figure 6.5 The overall structure of the scenario

6.2.3 The story

In the initial scenes the participants are introduced to the school they attend or work at in order to give them a background to act from. They get some information about the school, e.g. where and at what time of year the story takes place.

Figure 6.5 and 6.6 Two of the initial scenes where the participant get background information of the school

Figure 6.7 A scene with the purpose of a transition between the background information and the beginning of the story.

After that, the role-characters are handed out. There is a different character for each person and is written on a sheet of paper. The participators are given time to read the paper.

Next scene is in the classroom. The principle knocks on the door and has a message to the representatives of the student council and some of the

teachers (These characters are the ones that just were handed out to the participators). The message is that they are to meet in the conference room right after the lesson.

When they all are gathered in the conference room, they first have to introduce themselves to each other. There is also a virtual student present who also introduces herself.

The principal then continues to tell them that a problem has arisen at the school. Some students have misused the computers and visited improper sites on the Internet, and they have to do something. The virtual participant also talks about how she by mistake ended up on an X-rated site. The principal has already decided that software that works like a filter will be purchased in order to prevent improper use of the Internet. There are different kinds of software available and they work in different ways. The principal therefore wants the people gathered to choose from three alternatives.

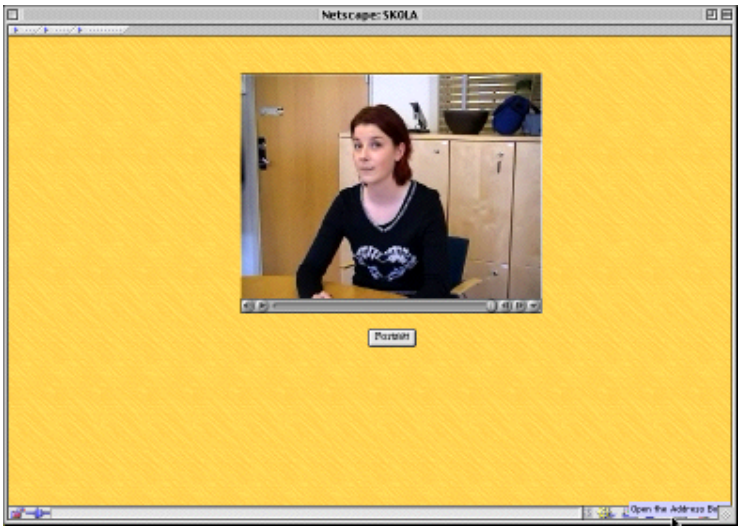

Figure 6.8 The principal telling the participators about the problem with misused computers

Figure 6.9 The three alternatives to choose from

After the participants have made a choice they are dismissed and they return to their classrooms.
Times go by and the software is installed

Figure 6.10 Time goes by…the principal calls for another meeting

According to what kind of software the participants chose, different problems arise soon after and the principal calls for another meeting.

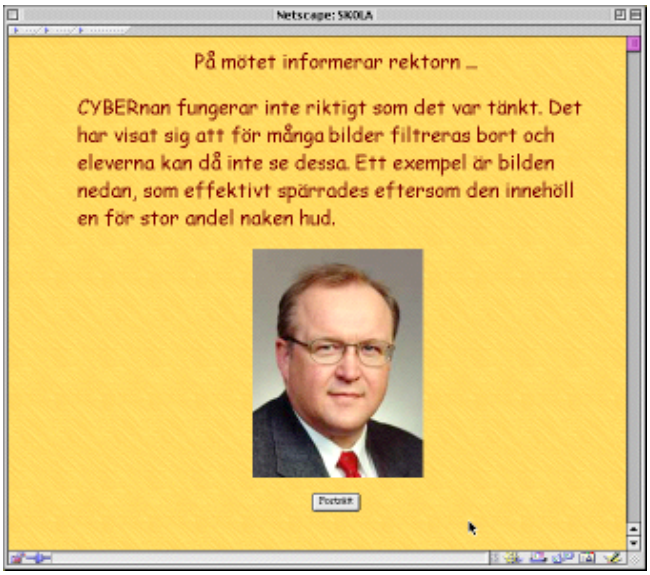

Figure 6.11 One of the possible problems that can occur

This time she wants the participators to fill in a questionnaire, watch some movies and discuss the issue of ethics and criticism of sources of information. First, they have to fill in the questionnaire individually (the questionnaire is actually handed out by the facilitator on a sheet of paper for the participators to fill in). When they are ready, they are to fill in the same questionnaire but this time on the screen.

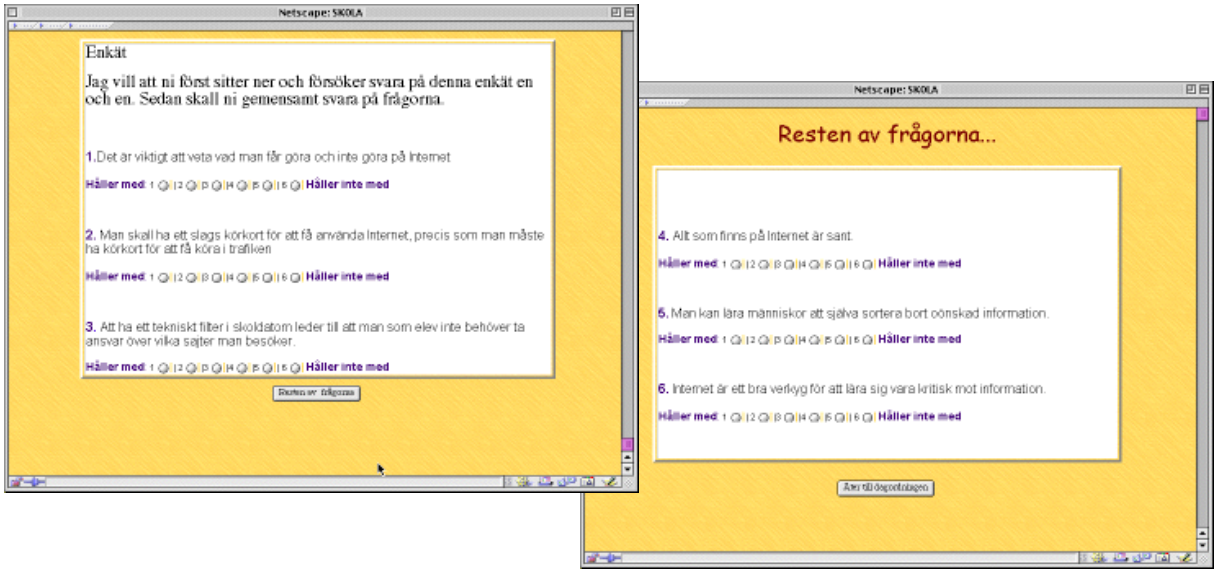

Figure 6.12 The questionnaire is divided into two scenes

This time the participators have to unite on the questions posed. After that they choose whether they want to watch movies or move on to the discussion. The first movie describes the enormous amount of information available on the Internet and ways to get the "good parts" out of it. The other movie is about the importance of knowing who is behind a site and the purpose of that site. After that (if the movies were chosen first), the next scenes show a number of statements the principal wants the participators to discuss.
When the discussion has come to an end the principal tells the participators that they are to meet next week to discuss this matter further… The End.

6.3 The results from the learning activity

What are described in this section are the results from the learning activity that took place at the school of Björketorp. The focus is on the participants' interaction with each other and with the multimedia scenario and to what extent the scenario supported and encouraged discussion and reflection about ethics and criticism of sources of information.

6.3.1 Setting

The activity took place in a room situated next to the fifth- and sixth-grade classrooms where a table was set up in front of a white wall. This wall was used to project the multimedia-scenario on. The participants were seated round the table and one of the students was given the responsibility to navigate through the scenario with a mouse attached to the portable computer.

The participants were divided into two groups of five people. In each group, there were four students and one teacher. It was the same teacher that (the IT-responsible) participated both times. The students were the appointed IT-agents from third to the sixth grade. This activity was carried out during daytime and the students were excused from their regular classes. The time planned for each activity was about one hour.

The participants did not exactly know what they were going to do in advance. They only knew that this was an activity exclusive for the IT-agents and had something to do with IT.

6.3.2 First group

The students in this group were two boys and two girls. Their ages ranged from eleven to twelve years.

The students recognized me from my earlier visit so I briefly introduced myself, why I was there and the purpose of the scenario. I explained to them what to expect from the scenario and what they were expected to do the next hour as for how to navigate by pressing the "next" button and that there were pictures that worked like links and that there were decisions to be made by them. I emphasized that this was a way to get them to talk about the subject at issue. I also talked about role-playing and that the role-descriptions were going to be handed out to them shortly after the start of the multimedia scenario.

In the initial part of the scenario, the participators all turned to me when they felt they were ready with each scene. Although I had explained to the participants before we started how the scenario worked, what they were to expect and what they were supposed to do, they still were eager to get my approval in every move they made to make sure they did it right. Further on they were all silent until I handed out the role-characters. My intention was to exchange the roles of the participators to some extent. The teacher and one student got the roles of students and the other three students were given roles as adults. They started to read and after a couple of minutes, one girl exclaimed. "Do I have to memorize all this?" She was frustrated with the information given to her and I explained that they did not have to memorize the role-character and that they were free to use the information given to them if they wanted, that there was no obligation of playing a role. The other students did not say much but it was obvious that they felt lost with this part.

When they reached the site where they all were to choose one of three different filters they, very quickly, chose the first alternative which was the one that excluded pictures and movies with "to much naked skin". They all agreed that would be the best solution to the schools problem with students visiting improper sites on the Internet.
The next major event in the scenario was the next meeting and the participators were first given a questionnaire each to fill in individually. This was done without anyone asking any questions. When they were ready, they continued to the next scene where they were to fill in the same questionnaire but this time on the screen. In order to do this they first had to come to an agreement on each question. At first, the students were very quiet and I thought for a time that this would never work. However, I was wrong, slowly they began to talk, but very quietly, sometimes it was hard for me to hear what they were saying. Their opinions varied a great deal and

they had difficulty in agreeing on the posed questions. Some of the students did not want to compromise when the opinions varied too much. The teacher was very active in this discussion, as she wanted the students that did not want to compromise to convince the others why their point of view was better. Eventually they came to an agreement on all of the questions. During this scene, some of the student expressed that they had some difficulties in understanding some of the questions in the questionnaire (the third and the last question).

The next discussion was largely colored by the earlier experiences of the participants. When discussing sites truthfulness on the Internet, one girl said, “If a home-page on the Internet says that Brad Pitt is a queer then it is not true!” Another boy used the example of a company that was selling trucks when talking about the purposes of different sites. He had himself visited such a site. Another example of topics that came up for discussion was the risk of giving phone-numbers away at chat-sites. During this discussion one participating boy left, he was needed for music-practice. During this learning activity, there were a couple of interruptions by both students and teachers that fetched books or other things form the room.

When I afterwards asked the students if they had played their roles, they answered that they had not. The participating teacher had played her role as a student, but from time to time, she was herself.
The school-bell rang just as the first group was ready. The discussion I had planned afterwards ended up very thin. The participating students were in their minds already out in the schoolyard. The duration of this seminar was about one hour and fifteen minutes

Afterwards the participating teacher and I discussed the role-playing part of the scenario. As the students did not seem to adopt this concept and it only made them confused we agreed on that I would not hand out the role-characters to the second group.

6.3.3 Second group

The second group consisted of one teacher and two girls and two boys. The ages of the students ranged from nine to ten years.

I introduced the scenario in the same manner as I did the first group, but this time I excluded telling them about role-playing.

Unfortunately, we ran into technical problems. The projector just would not work. After trying to fix it, without any success, we all sat down and used the portable computer to show the multimedia scenario on.

This group started out navigating the scenario without paying any attention to me, in contrast to the first group. When they reached the scene where they were to choose a certain filter for the Internet the choice fell on the third alternative after a minor discussion. The participants continued to click themselves through and when they reached the scene with the questionnaire, they started to read the questions on the piece of paper I had handed out. Almost immediately, they remarked that they had problem understanding two of the questions in the questionnaire. Not surprisingly, it was the same questions the first group had problem understanding. But, one of the students instantly explained the question in a most convincing and easy way. After a short while they continued to fill in the questionnaire on the computer screen. This group did not have the same problem agreeing on the questions as the first group had. The participants continued to click through the next scenes and watched the two movies without making any comments on the content. When they reached the scene where they were to comment on a set of statements they started to discuss immediately.

Below are examples of what the participants said during this scene; (To be noted, these comments are somewhat fragmented from the discussion and freely translated from Swedish.)

“You can be cheated on, on the Internet.”

”Maybe you can end up on one of those casino-sites which you don’t know what it is and loose money or something.”

“Sometimes when I’m on the Internet and checking my mail I think that there are a lot of bad sites.”

”You can end up on a site that is totally wrong ”

”You have to think of doing it right”

”You shouldn’t to do everything so fast, first you have to have time to read everything so you wont just press.”

”If you are to write something in school then maybe it (what is on the Internet) isn’t true.”

"You have to know what you are seeking so you don't seek on something totally weird."

"You don't have to use the Internet to seek Information, You can use books, newspapers and you can watch the news on TV."

"I'm rather on the Internet than reading a book."

"It is important to know who has written a homepage."

"What is a homepage?"

Afterwards one girl asked about a scene she did not understand in the scenario. It was the scene where the role-characters were supposed to be handed out. It became apparent that all of the students were very curious and wanted to know more about this part. Therefore, I told them about role-playing, as it was meant to be used in this scenario. I also handed out the sheets of paper with the written role-characters on. After a couple of minutes one boy read out loud, "You are married and have four children", he laughed and we all joined him. He obvious thought this was funny. I got the impression that he thought this was very difficult for him to imagine, being a ten year old kid.
The discussion continued to focus on what kind of roles they would like to play and the students all agreed on that the character had to be a smart and groovy person and as one boy said " …and have a nice car". When I asked what they did not like with the multimedia scenario, one boy pointed at the small screen of the portable computer and the others agreed. They had rather been looking at a large projected screen on the wall; they were really disappointed by this. I also asked if there was something they liked about the scenario a third-grade boy answered, "I thought it was good to know all this!"

It took one hour for this group to go through the scenario. During this hour there were also some interruption due to students and teachers walking into the room.

7. DISCUSSION

So far I have described the background of the problem at issue i.e. integrating technology into the curriculum instead of having schools focus on the technology itself. In addition, the theoretical background and the results from my field study and the design of the learning activity, which is the first phase of the PIER approach.
In this section I will discuss the results related to the theoretical background. First I bring up the issue of IT-use in the light of my field study. Second, I discuss the usefulness of the first phase of the PIER approach. Last, I bring up the prospects of using PIER in a lower education setting.

7.1 IT-USE

IT has made a difference in the way schoolwork can be conducted. The possibilities to store, process, and retrieve information effectively as well as to support communications are well-known features of IT. However IT costs and money is scarce in the schools in Sweden. The last ten years 25-45 percentage reduction of resources (Skolverket, 1998) has not made the development of educational IT any easier. Well aware of the experience I encountered at the first school I visited is not a part of my field study, I decided to bring it up anyway. The hostility towards IT among some of the teachers I met at that school was striking. The lack of equipment and that the few computers did not function properly, made the continuing enhancement of teachers IT-competence more difficult at this school. Dahlbom and Mathiassen (1993) say; “Technology is what we understand it to be. Only to that extent will we use it and experience it as useful”. It might be applicable even for the new pedagogical concepts as another interesting observation made at that school, was one of the teachers that frowned when PBL came up as a topic. She said, as she was holding up a pamphlet, “I would rather read one of these if I needed to learn more about something”. However, I am aware of no conclusions can be made of one teacher’s statement of how she wants to gain knowledge. Nevertheless, I believe that this is an interesting observation in the context of the issues that are brought forward in this thesis.

The maturity of IT-use and the technical resources are obviously varying from school to school. The IT at the school of my field study was mainly computers. These were used to learn about to the extent of getting the students to manage the computers themselves in order to be able to run the

available applications and accomplish the necessary tasks. In addition, computers were used, as a tool for promoting cognitive activity as, the math-exercise application, Matador, is a good example of. The results from my field study show that in spite of scarce resources, there can be a positive attitude towards the use of IT in schools. I got the impression that the IT-responsible at Björketorp was the driving force and her engagement and support in enhancing the students and the other teachers IT-competence she contributed to this attitude. Nevertheless, none of this would be possible without the support from the assisting principal. Her insight in how important and time consuming the work of being responsible of the IT surely made a difference.

7.2 Usefulness of the PIER approach

I will discuss the usefulness of the first phase in the PIER approach as it was performed in this thesis. The focus is on the participants' interaction with each other and with the multimedia scenario and to what extent the scenario supported and encouraged discussion and reflection about ethics and criticism of sources of information in the aspects of collaborative learning. Collaborative learning is an extension of constructivistic learning, which both are fundamental underlying assumptions of the process of learning in the PIER approach (Nuldén, 1999). My discussion will also be about the usefulness in the aspects of PBL; experiential learning, and role-playing which are the central pedagogical concepts of PIER.

7.2.1 Collaborative learning

One of the strengths of the scenario was its support for collaborative learning. Learning is an inherently social-dialogical process and the use of groups promotes the interchange and reflexivity in that process (Jonassen, 1996). The participants' previous experiences and knowledge colored the discussions and they were eager to share this with each other. For example, one student said he had problem understanding a question when another student instantly explained the question in a most convincing and easy way. They all contributed in the discussions; these contributions showed they had different understanding of the issues discussed. According to the model of collaborate learning the contribution of different understandings leads to a new, shared knowledge (Leidner & Jarvenpaa, 1995). The purpose of letting the participators unite on the questions posed in the questionnaire was to get the students defend and reason about their standpoints in different issues concerning the problem.

One boy who said he had very little experience with Internet was in fact able to contribute to the discussions as much as the others. In this case, the issues of criticism of sources and ethics are applicable in our daily lives, as we are confronted with information in various situations and not only on the Internet. He continues to say that Internet can even be a useful tool for the students to learn about ethics and criticism of sources. The use of Internet in education can actually reinforce or in other words be used as a tool to enhance the students, and of course the teachers as well, ability to be more critical towards the sources of information in general (Rask, 1999). Scenarios are suitable for controversial issues where there are no direct answers to the problems.

7.2.2 Experiential learning

In the aspect of experiential learning the scenario was not as fruitful as I had expected. The activity was carried out in a room next to the fifth- and sixth-grade classrooms. The lack of other rooms to be in made it unavoidable. Both teachers and other students that needed something from the room constantly interrupted the scenario. One participating boy in the first group was needed for music-practice, so he left in the last part of the scenario. All this interruption made the participating students unable to fully concentrate on what was happening in the scenario, and therefore much of the story telling part of the scenario was fragmented and lost its purpose. The purpose was to get the students involved in the action and a feeling of an experience. The importance of having a calm and quiet environment must be emphasized in a learning situation of this kind.
One can also question the scenario itself. It might be argued that it was not ”good enough” in getting the participants a feeling of experience. The same accounts for the duration of the scenario. It might not be sufficient with only one hour. On the other hand I strongly believe that a three-hour long session could be too long for the students in lower education in the regard of keeping their interest and engagement throughout the whole scenario. The reason for a shorter scenario was the amount of time available, for both teacher and students. Summing up the impressions from the two groups in the learning activity, the participators had time to get a good enough understanding of the problem to get them involved in fruitful discussions.

7.2.3 PBL

In the aspect of PBL, the role of the facilitator was important. Especially the first control-group needed guidance and help throughout the scenario. They assumed that I was the teacher and was there to teach them. I believe that the students were not used to this kind of pedagogical approach.

7.2.4 Role-playing

The aim of role-playing was to make the participators view situations in new angles. However, it was obviously too difficult for them to relate to the concept with changed roles, teacher being a student and vice versa. If role-playing is to be used and serve its purpose, the students must be more closely related to the characters in order to "live the part" more easily. As in the first group, who participated in the learning activity, the role-playing interfered too. Earlier research results, focused on the role-playing and how it affected group interaction show that it made the participants more open-minded and the discussions less prestigious (Hardless & Nilsson, 2000). To bear in mind those participants were exclusively adults.

As a result of the technical malfunction I ran into with the second group I was able to compare the scenario in the aspect of how the big screen opposed to the small screen on the portable computer imposed on the discussions. My impression is that it did not affect the interaction between the students and the teacher to make them discuss and reflect on their use of educational technology. But it certainly was a drawback on the fun-factor i.e. using the small screen.

7.3 The prospect of using PIER in education

7.3.1 Implications of the design

The most apparent limitations of using the PIER approach for school personnel or students are the lack of time and money.
The design of a multimedia scenario is very time consuming as it consists of different types of multimedia as e.g. movies, sounds and pictures that has to be produced. Moreover, creating a plot that is interesting and rewarding in the sense of illustrating the relevant and important aspects of the problem in focus, is very important. The aim is to engage and attract the participators in order to get the feeling of a mutual experience of the problem in focus. To achieve this takes considerable time, as in my case the need for me to get an overall understanding of the issues of ethics and criticism of sources was just the beginning of the design.

I have already described that the schools in Sweden are struggling with the available financial resources. I assume that not many schools have the equipment needed for putting together a multimedia scenario. The school I

visited had the possibility to borrow a projector but otherwise they lacked other devices as digital camera, video camera, and necessary software for processing the media.

Apart from the difficulties for teachers or other school personnel to be able to design such a learning activity described, there are advantages. The scenario is self-instructive e.g. the participators navigated the scenario with ease and the need for extensive computer skills were not needed. Furthermore, there is neither single correct interpretation nor answer in the scenario to be given to the facilitator. From the information, that they gathered through the scenario the students form their own ideas and thoughts, which they share with each other through discussions.
Another advantage is that the only software needed to be able to run the scenario, is a web browser and Quick Time to play the movies. To reuse this kind of learning activity is very easy and according to this aspect, PIER has great potential in a school setting.

7.3.2 Source of inspiration

This kind of learning activity, I believe, can very well serve as a source of inspiration for teachers. Beside the need for teachers to know how to integrate educational IT into the curriculum there is also a need for them to know a variety of techniques for implementing that integration effectively (Fredrickson, 1999). I also believe that PIER can be a source of inspiration for teachers to use collaborative learning, PBL or experiential learning as a pedagogical approach in a learning environment and not using information technology to do so. So in that sense IT as in this case the PIER approach, can enhance education if that is the same as using the new pedagogical approaches.

7.4 Limitations and reflections of this thesis

The time was very limited due to organizational constraints within the school and what you would call a very “quick and dirty ethnography” (Hughes et al., 1994). The teachers and students’ time are scarce they told me, and therefore I did not want to, or more accurate, I could not interfere too much in their work. In spite of the restrained amount of time spent at Björketorp, I do believe that this was enough time to gain an overall satisfying understanding in order to give a picture of how educational IT is used and of some of the problems this school encountered with educational IT.

If I were to redo this project, I would have changed my method slightly. First I would have interviewed more students in my field study and interviewed the students individually after their participation in the learning activity in order to get a richer picture of their view. I got the impression that they were not likely to speak as freely in a group, as they would have individually. Secondly, to observe and act as a facilitator at the same time was not a good idea. It was difficult to keep full attention on both things at the same time. Therefore, I should have used a video camera instead of a sound recorder during the learning activity. Some of the relevant interaction between the participants could have been missed out when only the sound was recorded. Furthermore, two of the questions in questionnaire were difficult for the student to understand. A reminder of the fact that I should have been more careful with the formulation of the questions, in a manner that even a nine-year old would understand.

A limitation is also that only one teacher participated. A more careful planning might have avoided this, and I emphasize might. The participating teacher was in fact present in her free time and the other teachers were all busy teaching.

8. CONCLUSIONS

The activity evaluated in this thesis is a multimedia scenario in a primary school. The aim of the scenario in this thesis is to illustrate a few, for the participants' relevant and important aspects of the use of Internet in School and to give the participators a sense of experience. The main purpose of the scenario is not to transfer information to the participators, but act as a starting point. It relies on previous personal knowledge and experiences among the participators. In the scenario, the group is confronted with events and decisions to make, which leads to discussions. During this interaction knowledge is shared. In this section I present the answer to my research question and summarize the most important findings of this project.

The research question in this thesis is;

Is the PIER approach useful in primary school, in supporting the interaction between the students and the teacher to make them discuss and reflect on their use of educational technology?

Yes, PIER can be useful and attractive if the following conditions are satisfied:

- The mission is dependant on time and room, this leads to that no scenario can be standardized, but should be established from the specific nature of the current situation.

- Time is a decisive factor in learning. However there are no guidance for estimating time in this aspect.

- The motivation of the participators is also a decisive factor in learning for a scenario to be useful. Nevertheless there are no guidance to conclude the degree of motivation when implementing a scenario.

- The design of a scenario demands creativity rather than routine. The more complicated issues and problems that are to be dealt with the more creativity are demanded to create a communicable scenario. For example, a scenario that deals with geology ought to be more a matter of routine than the issue of ethics.

- The degree of understanding of scenarios is dependent on partly the complexity of the issue and partly on the receiver, i.e. the

participator´s ability to process the information and take part in a delimited discussion. The ages of the participators in the project presented in this thesis plays a decisive role.

- The PIER approach uses scenarios to make knowledge communicable, comprehensible and shared. Nevertheless, today there are no guidance or instruments to measure this effect.

- On the basis of the existing theories of learning about the number of individuals that are to take part in a session plays a decisive role. At the same time we do not have guidance of the size of the group. Using IT we can reach out in the world, but a scenario is designed for a fixed number of participators. The greater the number of participator in a scenario the more trivial the scenario becomes.

B. Langefors´ Infological School, H. Simon´s cognition school, Argyris´ experiential school and R. Boland´s also support the conclusions above.

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Appendix I

Questionnaire that was handed out to the participants during the scenario.

Enkät

1.Det är viktigt att veta vad man får göra och inte göra på Internet

Håller med: 1 ○ | 2 ○ |3 ○ |4 ○ |5 ○ | 6 ○ **Håller inte med**

2. Man skall ha ett slags körkort för att få använda Internet, precis som man måste ha körkort för att få köra bil i trafiken.

Håller med: 1 ○ | 2 ○ |3 ○ |4 ○ |5 ○ | 6 ○ **Håller inte med**

3. Att ha ett tekniskt filter i skoldatorn leder till att man som elev inte behöver ta ansvar över vilka sajter man besöker.

Håller med: 1 ○ | 2 ○ |3 ○ |4 ○ |5 ○ | 6 ○ **Håller inte med**

4. Allt som finns på Internet är sant.

Håller med: 1 ○ | 2 ○ |3 ○ |4 ○ |5 ○ | 6 ○ **Håller inte med**

5. Man kan lära människor att själva sortera bort oönskad information.

Håller med: 1 ○ | 2 ○ |3 ○ |4 ○ |5 ○ | 6 ○ **Håller inte med**

6. Internet är ett bra verktyg för att lära sig vara kritisk mot information.

Håller med: 1 ○ | 2 ○ |3 ○ |4 ○ |5 ○ | 6 ○ **Håller inte med**

Appendix II

These scenes are shown in chronological order as they appear in the scenario. This does not account for some of them e.g. when choices are to be made there are a parallel order of the scenes that cannot be displayed here.

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

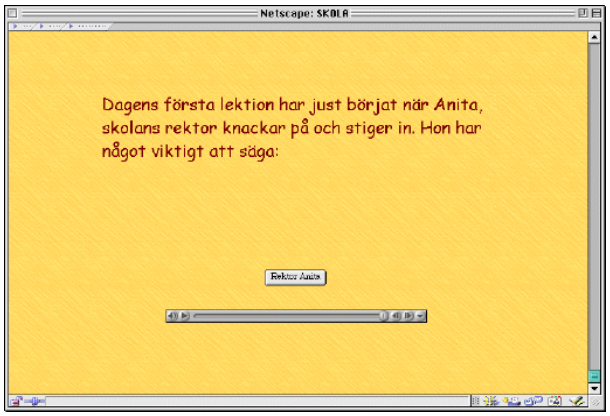
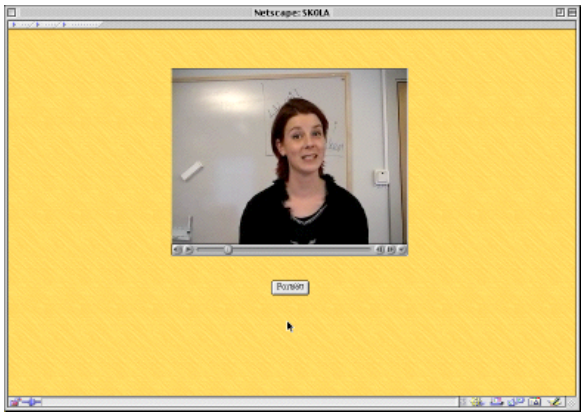


Figure 7



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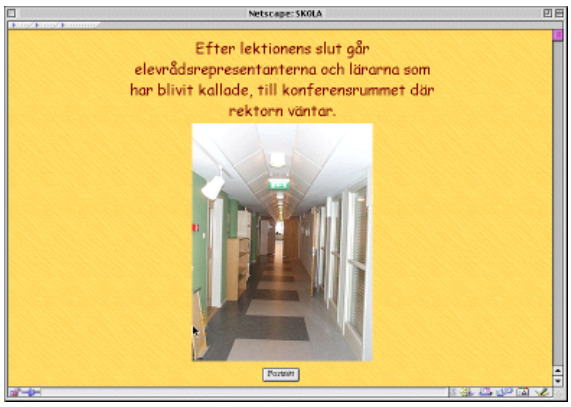
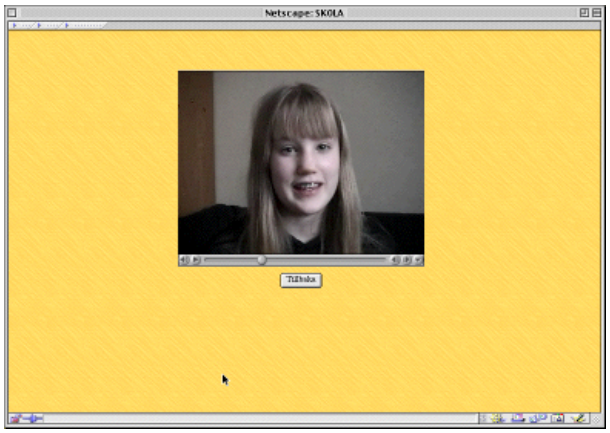


Figure 9

Figure 10



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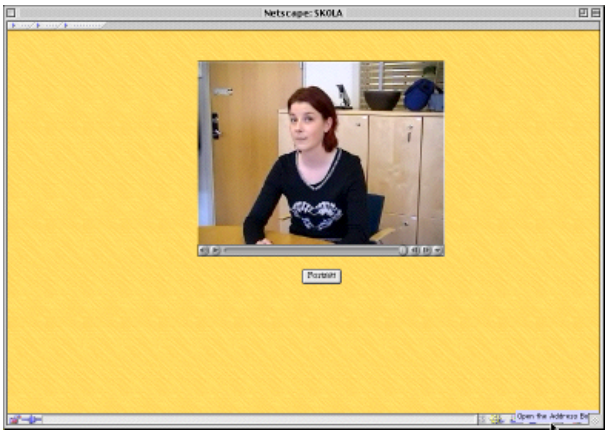


Figure 12

Figure 13

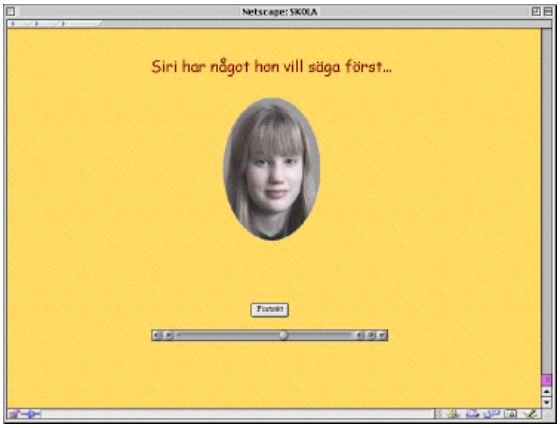


Figure 14

Figure 15

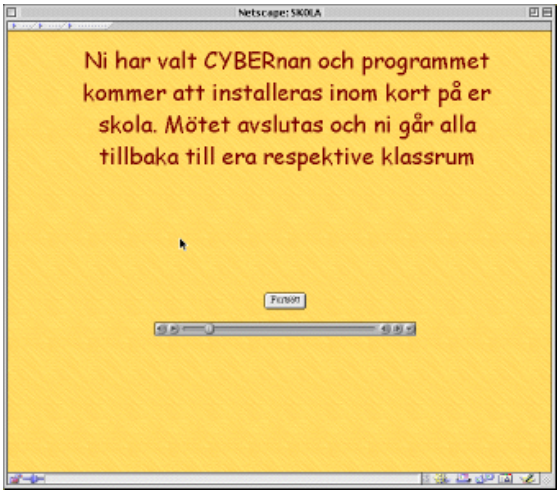
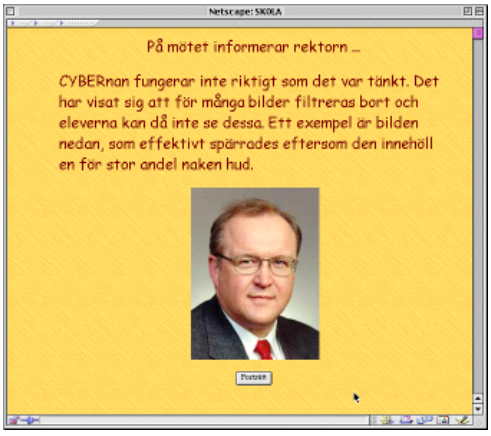


Figure 16.1

Figure17.1



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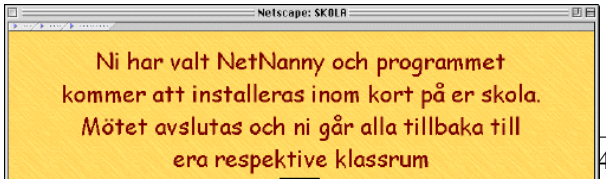


Figure 16.2

Figure 18.2

Figure 17.2

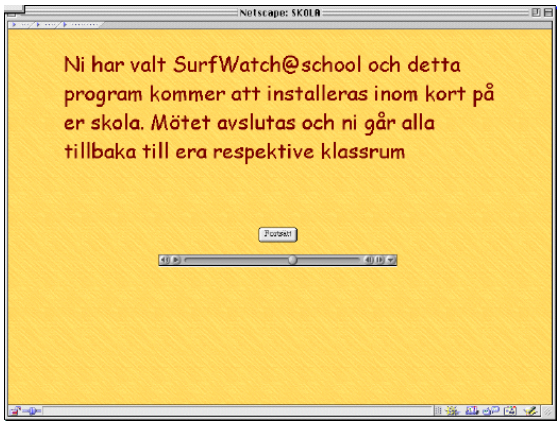
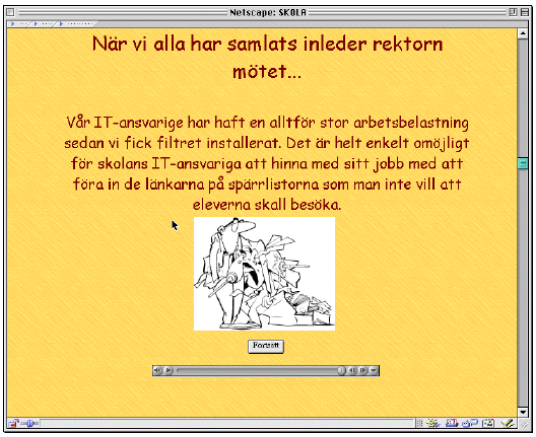


Figure 16.3

Figure 17.3



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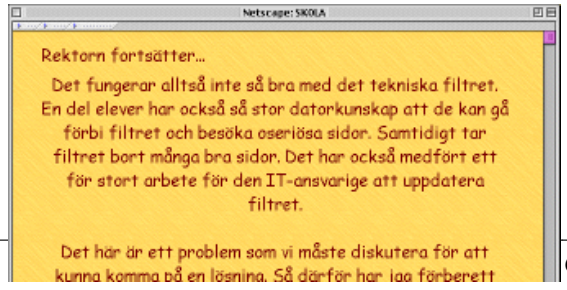
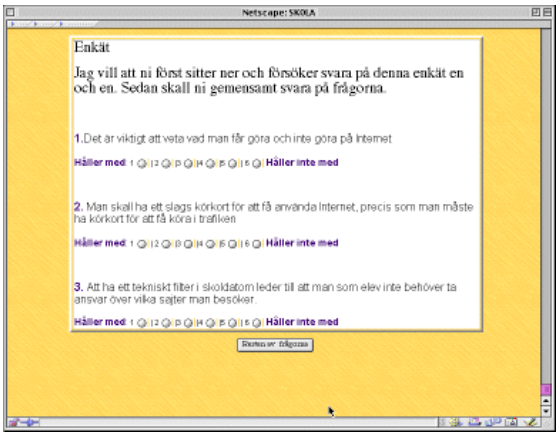


Figure 19

Figure 20



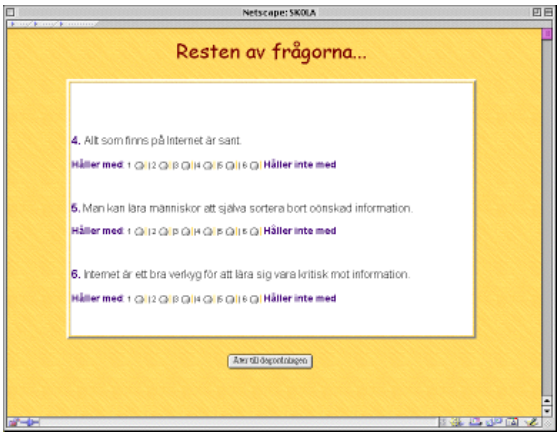


Figure 21

Figure 22

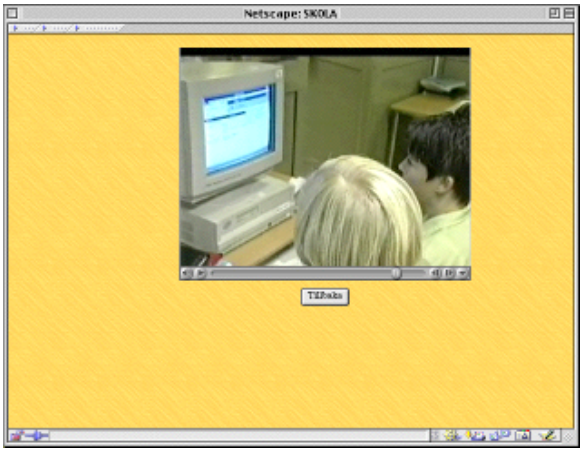


Figure 23

Figure 24

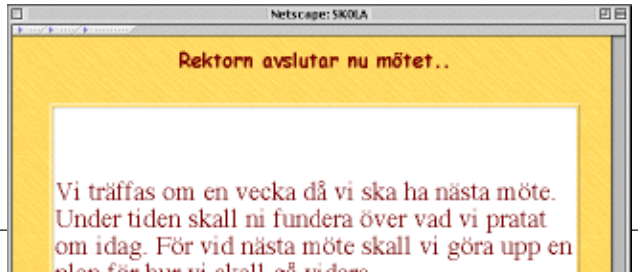


Figure 25