Telematics in Schools

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1.   Introduction

Information and Communication Technologies are rapidly growing together: Starting from this hypothesis I will demonstrate consequences for teaching and learning, when the "Computer" is converting to a "Communicator": the new label for the compound is "Telematics". The technical possibilities are changing the forms of communication and initiate new attitudes towards teaching and learning. Certainly not all effects of the application of technology will be positive, and an unreflected use of telematics can cause several damage to the individuals in the school and to the institution. Therefore we presently find a broad discussion world-wide about these effects.

In the my presentation I will attempt to show the expected or already observed changes and evaluate them along the criteria of human communication needs and explain them along methodological categories and report some experiences I have made myself or observed in German schools in the context of the project PLUTO European Educational Network (Project to Link Universities and Training Organisations) [Gorny 1993].

It will not be possible to give a complete picture of all effects of telematics on all forms of teaching and learning. In spite of the rather broad hypothesis given above, I will refrain from developing long term prognoses and visions of the future, but will concentrate on those possibilities, that are already or will be shortly available for schools and universities. So I will not talk about video conferencing via broad band channels or full scale multimedia or hypermedia interactive networking on high speed lines, but will stay to dominantly textual (written) information and character-coded pictorial or audio "documents", which can be transferred on normal telephone lines.

In this report I will not regard private and commercial educational institutions, but stress the public sector, though it is obvious today, that private enterprises with their training needs and efforts are a source of strong influences on the school development - though under completely different economical conditions.

2.   Some considerations about human communication and methodological aspects

2.1   The present situation in Germany

While it is still not very common for German teachers today to have a private computer, we find surveys that every other pupil in Germany in the 7th grade (approx. 13 years old) can use a PC at home and that 70 % of all pupils have some kind of computer access [Rohe-Krebeck 1993]. According to some estimations every secondary school in Germany has at least one computer cabinet with an average of 12 PCs, mostly linked in a local area network. Only a few hundred

schools have direct or indirect access to wide area networks.

It is realistic to assume, that within only a few years teachers and pupils, lecturers and students in secondary schools and universities will have broad access to telematics systems, and that many teachers and learners will have their private computers connected to networks. The development in other West European countries is not differing very much from the German situation.

The communication technology, which would be necessary for schools, is already available today and has penetrated the market: there are thousands of non-profit or commercial "bulletin board systems" and "mail boxes" in Germany, and it is estimated that more than 10.000 computers (of 3 million world-wide) are directly or indirectly connected to the quasi public InterNet. Additionally we find the US-based AT&T Learning Network and the British Campus2000 in the domain of education, but these systems are "closed shops", i.e. their subscribers (teachers or pupils) cannot exchange mail with InterNet participants.

For schools the necessary subscription fees and the transmission costs (charged by the national TeleCom Systems) are normally as prohibitive as the many variations of hardware and software requirements for networking, but the development of international standards by the ISO (International Standards Organisation) or by CEN (Commission Européen de Normation) will increase the interoperability of the systems. The "gateways" between the different systems have been improved and new techniques are used to create local access to the networks for schools.

Finally I have to refrain from presenting the technical details of installation and application of today's systems, since there is a broad flow of publications available -- at least in West European countries (see for example [Kehoe 1992]).

2.2   Human communication and telematics usage

Basically the networks support a broad range of human communication forms. This report will stress those forms, which will be accessible by schools in the nearer future - technically and economically. I will restrict myself to asynchronous communication with a textual representation of the information. This means we will talk about sending a message to recipients arriving there with a considerable time delay (i.e, seconds, minutes or hours later), analogous to telegrams and letters. This textual communication is based on a character code system such as ASCII. Thus it does not allow to transfer sound or pictures directly: but after the picture or sound file has been coded into an (illegible) ASCII-string it can be handled as a normal text file.

As examples for the technical background I have chosen the InterNet services "mail" (person-to-person) including group mail (person-to-group; also called lists) and "newsgroups" (also called bulletin boards). Besides I will present some uses of "ftp" (file transfer protocol) and WWW (WorldWideWeb) for information dissemination and retrieval.

On this technical basis I will investigate more deeply the possibilities of asynchronous communication for teaching scenarios. Chapter 3 gives a selection of scenarios and their human communication properties, but with only few hints to the technical realization, since there are often several software and hardware systems to enhance (or to disturb) the teaching and learning in a given scenario. The

easiest forms to organize are the closed learner groups on a homogenious techni-cal platform (for example, a homogeneous local area network of PCs), but when the geographical distribution and the number of participants increases, it becomes rather improbable that such a homogenity can be enforced. In these cases an interoperability as in InterNet is necessary, that can be categorized as an inhomo-genious network of distributed single- and multi-media servers. In our scenarios the "mail servers" are the most important part of the software, followed by the "list servers" and the "newsgroup servers". The "file server" function allows the transfer of files to and from a remote computer and can be accessed either by the "ftp" (file transfer protocol) or by "WorldWideWeb" (WWW), which automates the coding/decoding of files for the transfer and the ftp commands.

If one of communication partners is working in another network than InterNet, such as the commercial systems CompuServe and America Online or the private networks FidoNet or ComLink, then some of the functions may not be available and the partners will have to substitute them with another technical form, nor-mally reducing the ease of use.

As an example for a substitution process we can take group discussions. Such communication within closed or open groups can most easily be organized on the basis of newsgroups, which offer the functions of bulletin boards: if a person wants to contribute a text to a group discussion, then he has to select the bulletin board with the most appropriate topic label and post his message there. Anybody interested in that topic has to "walk to the board" (access the newsgroup) in order to read all (new) postings. The initiative for retrieving information stays with the user, who, by the way, can thus control the transmission costs.

A bulletin board can be restricted to a closed group, it can be controlled ("moder-ated") by a moderator or open to everybody. The moderator can filter, comment or abbreviate the messages. At present the InterNet supports almost 10.000 news-groups, many of them only with regional distribution. The newsgroups relevant for schools and teaching are in the domains `k12.*` (for example `k12.lang.fran-cais`), `school.*` and `schule.*` (see Table 1). These groups are not restricted.

Sometimes a group has members who have no access to InterNet directly, but can only communicate via a commercial network, e.g., CompuServe. Then they have no access to the newsgroups. In this case the group cannot use this service, but has to communicate via group mail. This service is using the metaphore of mail-ing lists. In only one of the computers the "list moderator" maintains a list of the email addresses of all participants. If someone wants to contribute to the group discussion, then he sends his message to the list address and the "list server" com-puter will spread it to the full group. Here the initiative to disseminate the infor-mation is in the hand of the sender; the recipients are completely passive (and in the worst case have to bear the transmission costs for a lot of unwanted messages -- "junk mail").

If the group´s systems are fairly homogeneous, then special "groupware" may be used. Normally this can be handled within well organized institutions such as pri-vate enterprises, though some groupware systems can be installed on several computer platforms. At present efforts are undertaken to define common stan-dards for the functionality of such software [ISO93], so one might hope for more interoperability. For schools such special software is not yet available.

schule.*   (In German)

schule.allgemein
schule.geistwis
schule.info
schule.jufo
schule.mathe
schule.natwis
schule.org
schule.polhist
schule.sprachen
schule.umwelt.aquadata
schule.zeitung

comlink.bildung.aktionen
comlink.bildung.allgemein
comlink.bildung.beruf
comlink.bildung.diskussion
comlink.bildung.schule
comlink.bildung.uni
comlink.europa.*
comlink.fluechtlinge.*
comlink.geschichte.*
comlink.kultur.*
comlink.oekologie.*
comlink.utopien.*

school.*   (Europe - in English)
school.general
school.project.esp
school.project.pluto
school.pupils
school.subjects.humanities
school.subjects.languages
school.subjects.science
school.teachers

alt.*   (USA; approx. 1500 groups)
alt.architecture
alt.atheism
alt.culture.*
alt.cyberpunk
alt.desert-storm
alt.education.disabled
alt.education.distance
alt.fan.tolkien
alt.music.*
alt.philosophy.*
alt.politics.*
alt.religion.*
alt.rodney-king
alt.sci.*

k12.*   (dominantly USA;
        K-12 = Kindergarten till 12th grade)
k12.chat.   (general chat group)
k12.chat.elementary
k12.chat.junior   (Lower Secondary)
k12.chat.senior   (Upper Secondary)
k12.chat.teacher
k12.ed.art
k12.ed.business   (Ed = Education)
k12.ed.comp.literacy   (ITG)
k12.ed.health-pe   (PE = Physical Education)
k12.ed.life-skills
k12.ed.math
k12.ed.music
k12.ed.science
k12.ed.soc-studies
k12.ed.special   (special schools)
k12.ed.tag   (TAG = talented and gifted)
k12.ed.tech
k12.comp.literacy
k12.lang.art
k12.lang.deutsch-eng
k12.lang.esp-eng
k12.lang.francais
k12.lang.russian
comlink.*   (Germany; small selection)

rec.*   (USA; Recreation,
rec.antiques   approx. 600 groups)
rec.bicycles.
rec.climbing
rec.kites
rec.music.beatles
rec.music.classical
rec.music.reggae
rec.outdoors.fishing
rec.skiing
rec.woodworking

comp.*   (International; computer sc.)
                    (approx. 200 groups)

sci.*   (International; Science)
(approx. 150 groups)

Tab. 1:   Some selected Newsgroups from the InterNet

3. Scenarios for telematics-supported teaching and learning

In this chapter I will present a few selected scenarios and report some experiences from schools, where telematics were integrated in teaching units. As you will see, the categories are not very sharp: some examples show that one teaching unit may fit into several of the scenarios. (When no source is given, see [Gorny/Sarnow 1993])

3.1 Scenario 1: The virtual classroom

Communication attributes: Partners: one teacher, many learners;
Initiative: teacher;
Main objective: knowledge transfer;
Typical application: distant teaching.

The normal teaching in school is organized in a classroom, where a group of pupils works together with one teacher on a certain subject. This situation is replicated in the "virtual classroom", except that it is not necessary any more to collect the participants at one place at the same time. This implies a change of the teacher's role:

- the transfer of knowledge from the teacher to the learners is still possible, but rather slow, so other telematics features could be used to enhance the knowledge transfer;

- the teacher's role as advisor, mentor and tutor is strengthened by the tool: the pupils can easily ask him directly without interfering with the group discussion, he can choose to submit such a question to the whole group or answer only to the pupil.

Within our project PLUTO European Educational Network we did not use this scenario, since pure distant learning was not within our scope. It may even be questionable, if the scenario is advisable for normal schools: it stresses cognitive aspects even more than in the normal classroom and it implies the reduction of social learning. Since asynchronous textual communication is absolutely dominating, the participants experience a loss of non-verbal means of expression and try to compensate it by including quasi non-verbal messages into their texts and by diverting the stream of discussion to non-curriculum topics (see chapter 4).

3.2 Scenario 2: Several groups or classes work together

Communication attributes: Partners: several teachers, several learner groups;
Initiative: teachers;
Main objective: social contact; development of attitudes
towards foreign cultures;
Typical application: class partnerships.

By extending the first scenario beyond the limits of one class it reaches a new dimension: guided by their teachers the pupils from geographically separated schools work on a specific topic. Knowledge transfer is more dominant again, since it can be expected that the preknowledge of the pupils and the teachers' didactical approaches for the teaching differ widely. Examples for this approach can be found for the subjects Geographie, Civics, Ecology, Mathematics and Bio-

logy. Very often also language teaching is included, when the schools are situated in different cultural areas.

Some years ago there was such a cooperation between Belgic, Danish and English classes in lower secondary   level. The task was from local geography: to describe the own home town to the other classes and subsequently to discuss the differences. Since it had been decided beforehand, that the common language was English the children in England had the task to correct the texts from the other schools. This lead also to some misunderstandings -- because humor is extremely difficult to transmit:

Belgic girl:
```
We are 14 girls in our class and Torsten is the
one and lonely boy...
```

English boy:
```
You wrote:
> We are 14 girls in our class and Torsten is the
> one and lonely boy...
You made a mistake:      ...the one and only boy...
```
<div align="right">[Libotton 1993]</div>

It may be remarked, that teachers normally get headache, when they try to organize language teaching via the network. Take the case, that a German and a Portugese school work together: Which is the correspondance language (German, English or French -- Portugese is not taught in German schools)? How about the spelling in the different national character sets of ASCII (Umlaute, tilde, accents etc.). While teachers are disgusted to read, let's say, French without accents, our observations indicate, that the pupils quickly develop their own way of writing and even stay aware of the deviation from the correct forms, and they frequently switch the languages within one message. For the teachers this is a didactical challenge! Here are two messages from an inter-school partnership between a school in the Netherlands and a school in Denmark, which had resulted in class excursions to the respective other country. The correspondance language was German for both schools.

```
Amsterdam 12. Juni                           (Pupil in the Netherlands)
Liebe Ann Soffie,  wie geht es? Mir get es gut. Es hat mir toll gefallen in
Danemark, und du? Es war da warm und toll. Ich fand Tivoli am tollsten, es war
da gemutlich. Was ich eigenlich das Tollste finde, ist die Ruechreise,unser
Bus ging kaputt!!!!!!!!!
Wir waren in Holand um 8 Uhr morgens.Ich fand Dienstagabend nicht toll, ich
weisse nicht warum, [...] Ich danke deine Schwester fur die Zeichnung, deine
Eltern fuer alles ,besonders fuer euere Freundlichkeit und naturlich danke ich
du auch fuer alles.  Vielen danke ,Gruesse  Negar 2BB
```

```
Amsterdam 12.06.1992                          (Pupil in the Netherlands)
Lieber Kasper, wie geht es?Mir geht es gut [....] Die Reise war lang und
toll.Wir haben uns viel belustigt vor allem im Tivoli und in der Stadt. [...]
Mal im Ekspirimentarium und den Orientierungslauf habe ich mich nicht zu
viel amusiert. [...] Das Schloss Kronborg und das Museum Louisiana fand
ich langweilg, weil ich moderne Museen mehr mag mit Popstars und Filmstars
und Madame Tussaud. [...]  Viele Gruesse Radjeh
```

3.3 Scenario 3: Project groups

Communication attributes: Partners: one or several moderators, many participants;
                             Initiative: all;
                             Main objective: cooperative solution of an assignment,
                                 development of cooperation skills;
                             Typical application: teaching/learning projects.

You can imagine, that the step from the two first scenarios to project-organized learning is only very small. Telematics-based project groups can be organized on the basis of newsgroups or group mail technology. The frontal teaching of the traditional classroom has already been broken up in various threads of communication between the teacher and all pupils, the teacher and a single pupil and the pupils among each other. The teacher's role changes completely to a moderator and advisor.

Given a task and the possibility for self organization pupils can work on large projects. This form is mostly practiced in upper secondary level classes. For example, there was a hot debate about xenophobia in Germany in the beginning of 1993 between a group of PLUTO schools. Here are a few selected messages between pupils, but also teachers giving their opinion [Gorny 1993]:

```
From: kid@caeci.o.ni.schule.de                          (Pupils in Germany)
Organization: Caecilienschule Oldenburg (Pluto Projekt, Uni Oldenburg)
[...]
Deutschland ist das reichste Land in Europa mit dem hoechsten Lebensstandard
der Welt und mit der besten Sozialpolitik fuer alle Bewohner der BRD. Nach dem
2. Weltkrieg haben die Gastarbeiter (von uns geholt) erheblich zum deutschen
Wirtschaftswunder beigetragen. [...]  Anders verhaelt sich die situation bei
Asylanten (pol.Fluechtlinge). Diese kommen aus allen Laendern der Welt,soweit
sie die Moeglichkeit haben,die BRD zu erreichen.
Grundsaetzlich sind wir der Meinung, dass das Asylgesetz nicht geaendert
werden sollte und halten den Entschluss des Bundestages in der Asyldebatte
fuer nicht gerechtfertigt. (Nachweis von pol. Verfolgung). Vielleicht sollte
das Sozialgesetz geaendert werden und zwar statt Geld-Hilfsmitteln Nahrung,
Kleidung u.s.w., um eine Ausnutzung des Asylgesetzes zu vermeiden.
        Janette und Kathrin (11 d)
```

```
From: wwhobrey@norfolk.vak12ed.edu                          (Teacher in USA)
[...] Ich kann Dir  sagen, dass ich und meine Klasse von 15-Jaehrigen sehr
daran  interessierrt sind, mit Euch und anderen einen  Meinungsaustausch ueber
dieses hoechst zeitgemaesses Thema zu  unternehmen. Wir sprechen schon seit
einiger Zeit ueber die  aktuellen Ereignisse in Deutschland und koennten auch
einiges  ueber die Verhaeltnisse in den USA sagen.[...]    Ihr werdet [im Ja-
nuar] von uns hoeren und wir freuen  uns schon darauf, mit Euch darueber zu
sprechen. Bis dann,
William Whobrey (Norfolk VA, USA)
```

```
From: reinfel@caeci.ol.ni.schule.de                      (Teacher in Germany)
Organization: Caecilienschule Oldenburg (Pluto Projekt, Uni Oldenburg)
[...]
Gestern verursachte in unserer Pausenhalle eine Plakatwand  erhebliches
Aufsehen. Unter der provozierenden Ueberschrift  "Auslaender raus?" hatte
unser Englisch-Leistungskurs (13.  Jahrgang) ca. 40 grosse Portraitfotos von
Schuelern unserer  Schule ausgestellt. [...] Unter den Fotos stand dann der
Vorname und der Zusatz "Deutscher"  bzw. bei etwa der Haelfte der Schueler
stand "Chinesin", "Tuerke",  "Kanadierin", "Halb-Araberin" usw. Ich glaube,
die meisten von  uns haben die auslaendischen Mitschueler bisher nicht als
Fremde  wahrgenommen und wollen sie auch unbedingt einfach als Menschen  be-
trachten, die zu uns gehoeren. [...]
Wolfgang
```

```
From:  Jette Glargaard <INRGKF@vm2.uni-c.dk>          (Teacher in Denmark)
[...]  Ich finde das Projekt mit  Auslaenderfeindlichkeit sehr spannend und
relevant - auch im Verhaeltnis zu meinem jetzigen  Unterricht, wo ich im
Moment Wallraffs Buch Ganz Unten behandele. [...]
Viele Gruesse von Jette
```

```
From: kid@caeci.ol.ni.schule.de                        (Pupil in Germany)
Organization: Caecilienschule Oldenburg (Pluto Projekt, Uni Oldenburg)
Alexandra writes:
> Wie und wo leben Asylbewerber bei uns?
Ich persoenlich weiss nicht viel ueber diesen Punkt. Allgemein
bekannt ist, dass Asylbewerber in Asylantenheimen untergebracht
werden. Sind diese nicht vorhanden, werden andere Moeglichkeiten,
wie zum Beispiel, Wohncontainer, leerstehende Hotels und
Turnhallen, gesucht.
[...] Mich wuerde es interessieren, [...] was fuer Rechte Asylanten in
Deutschland haben. (Werden straffaellige Asylanten anders behandelt als
Deutsche? Wer zahlt bei Unfaellen, Krankheit... ) Solche Einzelheiten erfaehrt
man eigentlich selten durch die Medien.
                                        getippt von Maren Oesten
```

Another example is from a French school where the teachers initiated an international project with many schools on the topic of the Olympic Winter Games in Albertville in 1992 with this message:

```
                                                       (French professor)
NOUS VOUS ANNONCONS QUE NOUS AVONS UNE PREMIERE ECOLE PRIMAIRE QUI
SOUHAITE CORRESPONDRE AVEC DES CAMARADES EUROPEENS. IL S'AGIT
D'ENFANTS DE 9 A 12 ANS, EN QUATRIEME ET CINQUIEME ANNEE PRIMAIRE. [...]
VOICI LES COORDONNEES DE L'ECOLE: ECOLE ALLEZARD, 94000 CRETEIL.
INSTITUTRICE: MADEMOISELLE CATHERINE SEGUENOT,
DIRECTEUR: MONSIEURGERARD DELARUE
CES ENFANTS ONT COMMENCE L'APPRENTISSAGE DE L'ALLEMAND ET PARTI-
CIPENT A UN PROJET EUROPE AVEC LES AUTRES ECOLES DE LA VILLE.
CETTE CLASSE A UN PREOJET DE JOURNAL PAPIER SUR LES JEUX OLYMPIQUES
D'HIVER D'ALBERTVILLE, QUI POURRAIT ETRE DIFFUSE EN TELEMATIQUE.
Y AURAT-IL DES ECOLES INTERESSEES DANS VOTRE PAYS ?
RACHEL  COHEN
```

A similar project was accompagnying the Whitbread Sailing Race Around the World in 1993. Pupils discussed the events during this race and exchanged self produced maps and pictures. The school scopes were Geography, English language learning and multi-cultural understanding.

3.4 Scenario 4: Gathering material via network questionnaires

Communication attributes: Partners: one teacher, many learners;
                            Initiative: teacher;
                            Main objective: opinion polls, knowledge acquisition
                                from experts;
                            Typical application: Modern History and Social
                                Science teaching.

This rather popular and easily implemented scenario can be used in almost all school subjects. Pupils design a questionnaire on a specific topic and mail it to a known individuals or lists or post it in newsgroups. The incoming responses are collected and evaluated, and serve as a basis for further investigations of the topic. On the day of the formal German unification (1990) there were several classes who sent out such questionnaires in order to hear opinions about the new

"other" fellow citizens in the East and about the individual experiences from visits in the former GDR. Some questionnaires were also directed to pupils in other countries.

3.5   Scenario 5: Projects with collecting and evaluating data

Communication attributes: Partners: two or more teachers, two or more classes;
Initiative: teachers;
Main objective: information collection and retrieval,
  statistical evaluation;
Typical application:Science, Mathematics, Civics teaching.

An example from a class cooperation between a German and a Spanish school in Mathematics (in English) was centering on statistics. The material was gathered by the pupils from both classes: they jointly designed a questionnaire directed to the other class respectively with questions about the family profiles of the pupils (pupil's age, sex, brothers and sisters, weight and height, TV habits, parents' weight and height, parents' brothers and sisters etc.)

The success was surprising. Practically all families responded to the questionnaire, except that Spanish mothers often rejected to mention their weight....

The data collection phase was followed by an statistical evaluation including spread sheet programming. Some more experienced children produced computer generated graphs of the results. These documents were also sent to the other school.

The largest activity in this categorie is the project AQUADATA. It has been initiiated in the context of a European School Project (ESP) and lasts several years. Many hundred participating classes from many countries collected hydrological data from a river in their vicinity and exchanged them. The data were also stored in a joint database, from where schools can now extract them in order to compare the water quality in the rivers. The didactical objectives were linked to the domains of Chemistry (measuring techniques), Biology/Ecology (consequences of polluted water), Mathematics (statistics), Information Technology (database handling) and Language Learning. [Sarnow 1993]

3.6   Scenario 6: Information search and retrieval from data bases

Communication attributes: Partners: one or several learners;
Initiative: learner;
Main objective: retrieval of information stored previously
  by experts;
Typical application: individual assignments with strong
  stress on reference literature.

This scenario centers on individual activities of the pupils while they are collecting information about a specific topic and during the structuring and evaluation of the gathered material. The learners are encourage to search on academic or journalistic information servers. The results may again be structured and stored in a local data base, so others can access them. The necessary technology is either InterNet-based, or special software to access the information servers is needed. Mostly the pupils have to use "mail ftp" by sending search commands via email to the server. After they have received the response to their command, they can send a transfer command for a certain file.

For schools with direct on-line access to the InterNet there are two more comfortable possibilities: on-line ftp for direct file transfer and the WorldWideWeb (WWW).

WWW is a fascinating technology, since it allows the "authors" to link documents of various types together by setting interactive pointers (references) to other documents. This technology is called "hypertext". It is equivalent to references in traditional text documents pointing to other print material, but the computer based referencing allows directly to open and read the referenced document. When the documents are of differing types (for text, sound, picture and video), then we speak of "HyperMedia". WWW takes up this technology, but adds the feature, that the documents may be stored on random WWW-servers around the world, as long as the servers are linked directly to the InterNet.

WWW may also be seen as a simple technology for electronic publishing. But here is not the place to deepen this thread.

In practice WWW means, that a pupil can ask, for instance, for a document which has been developed by an academic institution in the USA, click in a picture or text document on an interactive button, which represents a reference to other documents and receive more detailed information. Here I want to show only one example, which has been developed in an American school and at least partly by the pupils of a 6th class. Fig. 1 is the "homepage" of their school, fig. 2 is part of the screen, which comes up, when the reader has clicked on the interactive button 3 "Dinosaurs" in fig 1. This text has been written by three pupils. They reference to other documents by making them "hotspots" (underlined words). When you investigate fig. 3 more closely, you will see, that the 12 years old pupils have not
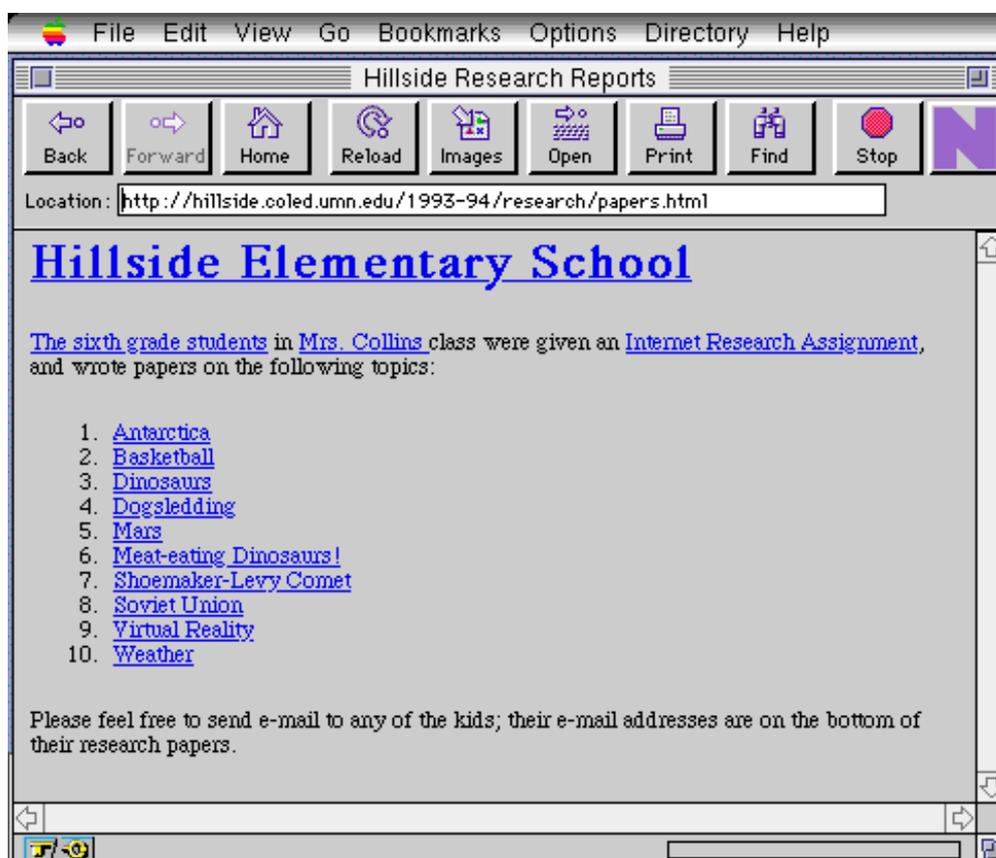
Fig 1: WWW-Homepage of Hillside Elementary School

compiled this page by themselves, but have "only" referenced to the WWW-pages of the Natural Science Museum of the University of California Berkeley. The didactical objectives of this assignement were to develop information retrie-
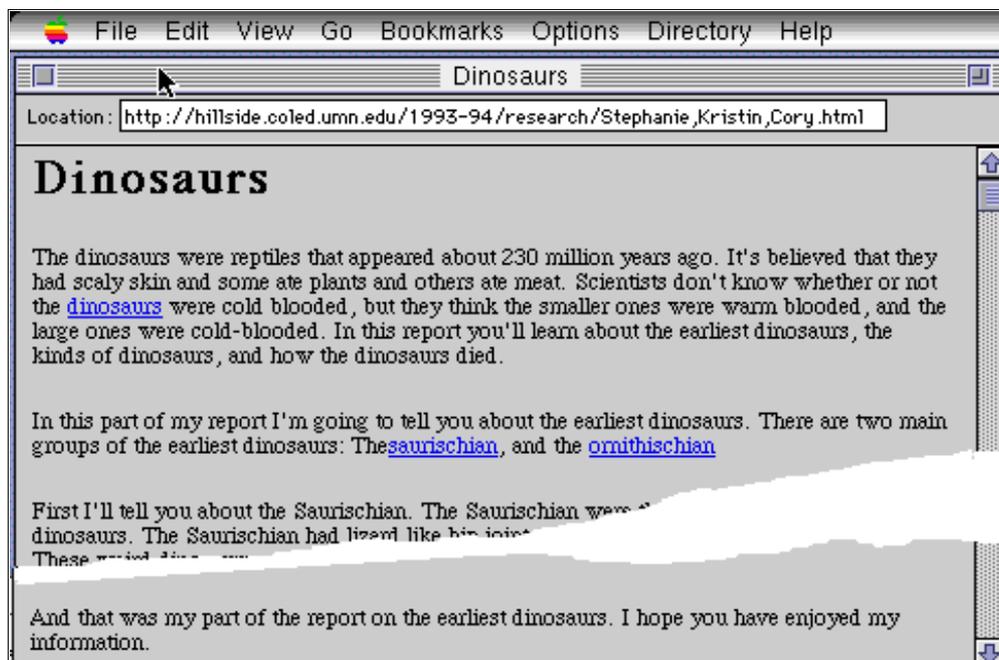

Fig. 2: WWW-page produced by three 12 years old pupils (see header line "Location")
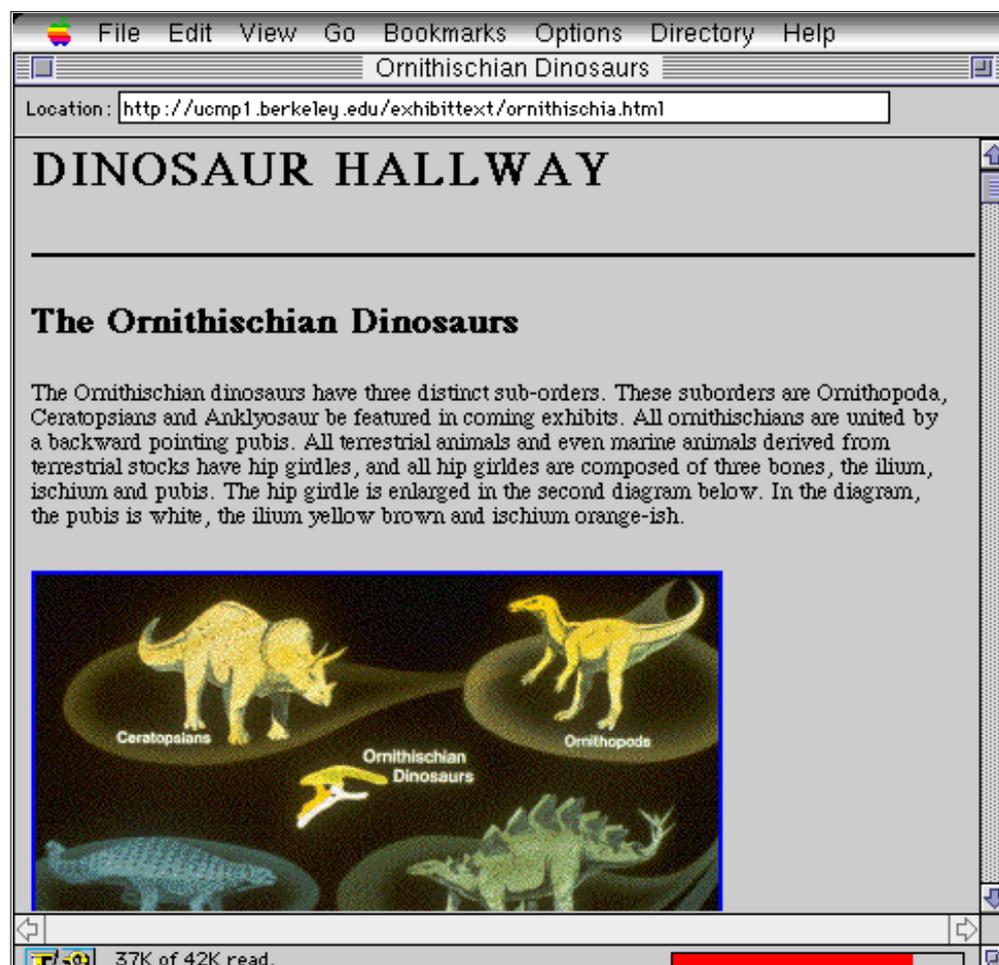By clicking on the hotspot "ornithischian" fig.3 will come up.

Fig. 3: WWW page generated by the University of California Berkeley Museum.

val techniques, to evaluate and select relevant material from a vast choice of documents and to train computer handling by learning to program interactive documents with the WWW-language HTML (Hypertext Markup Language).

4.　Changing language usage and social processes

One of the most astonishing phenomena which can be observed in the telematics-based commuication processes of pupils and children is the change of language usage. Apparently children are highly motivated when exchanging messages with peers and forget many of the restrictions which are imposed on them by the school in order to teach them correct language usage. From several investigation of pupil texts it can be concluded:

- The written language is less formal than in other texts and closer to daily life jargon.

- Conventional forms for correspondance are ignored (common structures of letters etc., in languages with special formal address modes for persons, the informal address form dominates -- in German: "du" instead of "Sie", etc.)

- The missing possibilities for non-verbal communication (body language, facial expressions) are substituted by comics language and "smileys".

  Examples:　*** WOW***,　 ***GROAN***

  Smileys can be interpreted, when you lean your head to the left side. One three examples of hundreds of variatants:

  > :-)　　　　　　　8-(　　　　　　　;-)
  > (Happiness)　　(Disappointment)　　(Blinking -- Attention: it's a joke!)

- Social status and formal authority (professor - student, teacher - pupil, boss - staff) have considerably less influence on the communication than "face-to-face". Other personal attributes (sex, ethnic background, religion) will not be taken into account. Disabled persons (sensorically or physically impaired persons) can, as long as they are able to type and read messages, participate without any disadvantage in the communication. Persons, who have language problems or are inhibited in face-to-face debates, become ardent discussants, because they can analyze the received texts, prepare an answer without stress and then send it.

- Participants tend to write more aggressive than in normal texts. This phenomenon received the label "net flaming". The reason for this behavior seems to be the informal language, which is not reflected so thoroughly when typed, so that the receiver often interprets the texts in another way than meant, causing a spontaneous and harsh reaction on his side.

- The participants show a strong tendency to "side discussions", so that unmoderated groups very soon communicate about many other topics, but not about their original issues. An interfering moderator can very often experience a brutal flaming ("dictator", "censorship" etc.).

These empirical observations have found the interests of academic researchers and some af them have confirmed the observations statistically. (More details are published in [Gorny/Sarnow 1993], especially with the appropriate bibliography.)

6.   Conclusions

Telematics in the schools is already reality in some regions, and the resulting changes are here to stay. The use of information technology not only for technical or organizational purposes, but also for communication will change not only the educational system, but our daily life at work and at leasure. The application of telecommunication-based communication and information retrieval offers the didactical chance to find new forms for communication processes in the class-room, to develop new concepts for the organisation of teaching and learning. Thus we can make use of its advantages without forgetting, that in the first place communication is a social process, that needs personal contacts and the non-cognitive parts of this process receive their due share.

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