

Inclusion of sign language users via information and communication technology

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Abstract—The paper addresses the situation of sign language users (mostly deaf people) in the context of inclusion as a political goal. For several reasons, there is often still some confusion with the terms of deaf and hearing impaired. In order to overcome this confusion, a survey is given over the needs of people who have a sign language as their preferred language as well as the needs of people who decide on preferring spoken language (mostly hard-of-hearing people). One should also doubt that the whole target group of people with disabilities in the hearing area consists of two separate groups only. Starting from the right of self-determination, the better solution seems to be the individual right of a person to choose any offers which are useful for her/him. As for other groups of people with special needs, ICT is seen as a big chance for improving their situation in terms of life and job chances. Several projects and experiences are reported.

Keywords—*integration, inclusion, deaf, hearing-impaired, communication society.*

1. Introduction

There are a lot of programmatic declarations and initiatives concerning “integration” or “inclusion” of people with special needs and there is also much “good will”. In case of the “hearing impaired” taken as the comprehensive group of people with any hearing disability we have to deal with a lot of misunderstandings and even ideological positions which make the situation more different than with other groups of people with special needs. Therefore, in order to reach optimal results for the inclusion of deaf people, besides providing adequate technical solutions two main conditions have to be fulfilled. First, the situation and needs of the sign language users have to be clearly acknowledged (especially in comparison to other hearing-impaired people). Second, the intellectual, scientific, organizational, and political barriers for the necessary developments have to be brought to the attention of all decision-makers so that they can be removed.

The objectives of the paper are to clarify the specialty of the target group addressed – in contrast to the majority of the hearing-impaired – and to draw the necessary scientific, educational and organizational consequences from the given situation.

2. An unclear target group?

2.1. Acoustic perception and spoken language

Compared to salient acoustic phenomena like a strong pulse or a loud noise, the perception of a spoken language needs fine differentiation with respect to acoustic data. The differences in intensity between accented and non-accented syllables or words are big; the same is valid for intensity and frequency bands of different sounds. Therefore persons with a restricted hearing ability are in danger to miss some less salient sounds within words or some less salient parts of words, words themselves or even phrases. The perception is additionally influenced by environmental noise and the communication situation. There are a lot of hearing-impaired persons who can perceive spoken language in a relatively silent environment and concentrating on one communication partner, but fail to understand communication in a noisy environment or in groups of people speaking to each other.

If the perceivable linguistic information does not reach a certain threshold, the acquisition of spoken language may be negatively influenced. During their ontogenesis of language, the respective persons then acquire “gaps” which lead to a less than complete mastering of their mother tongue compared to subjects with normal hearing.

Many forms of a hearing restriction have no severe consequences and lead only to slight deficits concerning spoken language or communicative competence. The situation begins to change with increasing hearing loss and becomes completely different if the hearing capability of a person is not sufficient to acquire spoken language via the acoustic channel in the manner that hearing subjects do (this is the practical definition of deafness).

While many of the hard-of-hearing only demand adequate hearing aids in order to amplify acoustic phenomena, the acoustic channel is barred to the deaf so strongly that more or less all acoustic data have to be presented in a visual form in order to be accessible. This is also true for spoken language. As there are often problems with or restrictions on the use of written language (for the reasons, see below), practically all the deaf choose a sign language as their preferred language.

In the case of deaf-blindness, both channels, the acoustic and the visual one, are barred and language has to be learned via the tactile channel (sometimes in combination

with residual abilities in the other two channels). Here a system of tactile perception of a sign language is recommended, accompanied by written language in tactile form.

2.2. Spoken and written language

2.2.1. The learning of language

Human beings learn language as a special behavior in the framework of everyday interaction. They acquire competence by “anchoring” the signs of language on the results of general cognitive processes. They learn languages in realizations which can be quickly and spontaneously produced and perceived. For hearing people the acoustic mode is the best one for this enterprise, for deaf people it is the visual mode.

Though it seems sometimes that written language represents language much better than the spoken one, we learn it the other way round, naturally. We have a good competence in spoken language already when we begin to learn the written variant of our mother tongue. Although we should not say that it is impossible for a young child to learn a language first by its written variant, we all know that this would be a very unnatural way (how would we connect writing activities to spontaneous interaction?).

2.2.2. Principal differences in spoken and written language

There is another important fact concerning language use and learning. Our everyday spoken language is not identical with the standardized written language. These two language forms have often different communicative settings and functions. Due to its production mode and our normal communicative behavior, spoken language shows some features we normally do not find in written language (we do not always “speak as we write”), e.g., different registers and styles, breaks and new beginnings, or additional “paralinguistic” information.

Written language is of great importance for all people in our culture (as the so-called information or knowledge society strongly relies on written information). Deaf people can only be included in the hearing society if they have all written information at their disposal.

There is also the need to offer written English as a third language – in a form specially adapted for deaf people – in order to make deaf people able to follow the international communication.

2.2.3. Inadequate education

Due to shortcomings in deaf education yet existent in several countries, deaf people often lack a sufficient competence in writing and reading. For hearing subjects, spoken language is the main basis for learning the written language; this pedagogical principle cannot apply to deaf people, however. As a consequence, those deaf brought up following this inadequate principle are not only cut off from

acoustically offered information but often also from written information because they had no real chance to acquire a sufficient competence. This is the reason why many sign language users need help with written language in spite of the fact that it is already in the visual mode. A consequence of this situation is that some deaf do not dare to use “normal” means of traditional or electronic written communication like letters, fax or e-mail with persons they do not know.

2.2.4. The social situation of deaf people today

Large parts of the groups of deaf people still show typical properties of underprivileged societal groups. Their job chances are worse, their jobs are less qualified than in the average of the whole society; a vocational career onto higher levels of organization and management is more or less closed (they often use the metaphor of the “glass ceiling” for this situation). In rich countries they are often cases for the social welfare system instead of having the chance of showing their abilities; in poor countries the situation is still worse. No wonder that the suicide rate of deaf people is higher than average. It has to be stressed therefore, that this partially enormous reduction of life chances is not due to the deaf’s attitudes or behavior or to their special disability, but it is due to an inadequate furtherance and education and the discrimination which follows from these.

Although there have been massive improvements in some countries or sectors, there is still a grave lack of access to information and communication from the perspective of the deaf as a specific user group within the information and knowledge society. Video telephony, interpreters and fax are currently very important for work, but are not offered everywhere or wherever necessary. The same is valid for relay services.

2.2.5. Adequate education

The goal of offering written language competence to the deaf comparable to hearing subjects can only be reached if their respective instruction is considerably improved. As deaf people cannot hear spoken languages well enough to learn them this way, they need a special form of bilingual education, where a sign language provides the linguistic and cognitive base and the/a national written/spoken language is “anchored” to the first system (as a parallel but second language).

The sign language they chose as their preferred language has to be systematically used as the language of their instruction and – where they want to have it – also as one language of communication. Their competence in a written national language as well as in English have to be brought so far that they meet the normal educational standards for hearing people. More hearing persons should be motivated to learn a sign language as a foreign language in order to help inclusion from this side.

The ICT will play an important role in this task. There is the need for special research and optimization of this sort of language learning.

2.2.6. Still dangerous: a false analogy

The situation of deaf people with written language just described above explains why an appealing analogy falls down. Our experience shows that blind persons can easily read if they are offered a tactile version of written language (Braille). The reason for this is: they had no severe problem to learn the spoken language and can therefore acquire written language from this base like other hearing subjects. In this case the so-called compensation hypothesis applies: if an individual cannot perceive data from a certain sensory channel, these data have to be offered in another, accessible channel.

For deaf people the analogy would be: as they are unable to access the spoken language in the acoustic channel, we simply have to offer them spoken language via written language and all problems should be solved. Because this solution does not respect the natural learning sequence (spoken to written language) and because we cannot produce and perceive written language as simply and quickly as spoken language, the analogy does not work. Written language is by far not the best choice to replace spoken language for deaf people. Therefore we have to acknowledge sign languages as the languages chosen by deaf people for everyday use and instruction.

2.3. *Two frequent misunderstanding concerning "sign language"*

2.3.1. Sign languages and fingerspelling

Fingerspelling means that we use some different hand-shapes (they may be one- or two-handed) in order to represent letters from the alphabet of our written languages. Though fingerspelling plays some role within sign languages, especially when unknown names or new words coming from written language are introduced in sign language communication, it is not identical with sign language.

2.3.2. Sign languages versus signed oral languages

"Signed (oral) languages" are systems which (in a strict sense) provide a morpheme-to-morpheme transposition of an oral language into the visual channel. By this process all structures of the respective oral language are preserved. From this point of view, "signed" English, French, or German, etc., can be used in two important "bridging" functions. They can be used for hearing parents of deaf children to make the beginning of a visual communication system less difficult. And they can be used to show the structures of the specific oral language to deaf children in bilingual education. It has been found that a "signed oral language" is an operative means for initializing visual communication.

But it shows no features of an adequate use of the visual channel (including factors of linguistic economy) so that it remains relatively slow and complicated. Therefore, if an individual should develop a visual language of his/her own, it should be a sign language as soon as possible.

2.4. *The target group reconsidered*

2.4.1. Self-determinacy

A principle to be stated here first is that of self-determinacy. Everyone has the right to define the form of his/her life. Parents of a child with hearing difficulties have to decide for their young child, the child itself has to get more and more control over his/her language choices as it matures. Self-responsible adults have the right to get language and communicative contexts as they want them.

2.4.2. Sign language users as a minority within the hearing impaired

To describe the minority state of deaf people within the large group of the hearing-impaired, let us look at the numbers. The standard estimation of the number of deaf people (= primary sign language users) in any society is 0.1–0.2 per cent. The percentage of hearing-impaired people as a whole varies from country to country and depending on the criteria applied, but with about 6–15 per cent it is sixty to hundred times the number of deaf people. From this fact it is understandable that the use of the generic term "hearing-impaired" in political or scientific discussion often leads to the consequence that only the needs of the overwhelming majority within this group, the hard-of-hearing, are considered. This fact is the reason that many scientific publications simply ignore the fact that there is an important division within this group concerning self-identification and language needs.

2.4.3. Sign language users as a linguistic/cultural minority

Due to the use of a special type of (visual) language, deaf people most often identify themselves as a linguistic/cultural minority. Therefore we have the – perhaps surprising – situation that a group of people which is societally identified as having special needs, declares to be a minority with special language rights. To be "deaf" in this sense is therefore not a matter of any medical diagnosis but of self-identification.

In analogy to the ethical rules of working with "exotic" oral languages and cultures, deaf as native speakers of their sign language must get their full "language rights", including recognition of the national sign languages similar to oral minority languages – if they demand that. The consequences are, e.g., deaf people are primary candidates to give courses in "their" language (that follows from the "native speakers first"-principle). Interpreters have to be trained

like those for oral languages. The deaf communities must have the possibility to (co)determine plans and work on the scientific analysis of sign languages, deaf education, and the development of their facilities.

2.4.4. An open and changing sign language user community

In earlier times, this community could be easily described as consisting of the deaf people themselves, those relatives and friends of them who used a sign language in order to communicate with them, and the interpreters. Like some other minorities, some deaf groups even looked closed for people coming from outside.

The traditional understanding of “disabled”, realized, e.g., in special schools for the deaf, made segregation and discrimination possible. The special schools not fulfilling the demands of standard education for a life of inclusion in society hindered many parents to let their child attend such a school.

There are several factors which since at least one or two decades lead to an immense change within the sign language user community:

- The deaf communities open to the hearing society.
- Research into sign languages and deaf culture have positive results, e.g., for the acknowledgement of sign languages and the improvement of deaf education.
- More hearing people find a sign language attractive enough to study it as a foreign language.
- There is more understanding in societies concerning the needs and rights of people with special needs.
- The stigmatizing of sign languages as primitive communicative systems (i.e., non-languages) and of deaf people as “dumb” decreases.
- The rigid delimitation between “deaf” and “hard-of-hearing” begins to become weaker; more hard-of-hearing people see a sign language as an additional medium of communication and no more as something to be avoided.

All the points listed above have the increase of the sign language community and its prestige as their consequence. But there is also a strong factor which directs the development to the opposite: with the invention of the cochlear implant (CI), a big change began to take place. First late-deafened adults, then deaf-born children were implanted in order to overcome deafness. The portion of implants in the rich countries or in rich parts of a society reaches about 80–90 of these people.

While the implants help almost all late-deafened adults, the implantation of deaf-born children is not so successful. Most important is that a cochlear implant does not

mean that the respective person will identify always and only with the hearing society. This identification depends on the quality of understanding spoken language they reach with the implant. As a consequence, the number of deaf people in the traditional sense may diminish, but the need for sign languages will remain. Some hard of hearing people with a severe impairment may use a sign language, at least partially or for certain purposes. We estimate the number of hard of hearing who would eventually rely on a sign language with about 0.1–0.2 per cent of the population.

2.4.5. The global perspective

It should be added, however, that this development is only valid for the rich countries. Starting from a number of about 6 000 millions of human beings, there are at least 6 millions of deaf people worldwide for whom adequate measures of inclusion could bring about a higher quality of life. But the great digital divide existing between rich and less developed countries requires adapted (and many non-ICT-) measures.

3. Technical aids for the perception of spoken language

Before turning to the needs of sign language users, we give a short overview concerning the aids for people who decide to use spoken language as their preferred language (mostly: the hard-of-hearing). They need all equipment which helps to strengthen the acoustic data in order to be sufficiently perceived for, e.g., understanding language. As an alternative or additional help, the acoustic data can be transformed into visual ones (i.e., the spoken language can be written down). Within limits, the systems transforming spoken language into a written form make the former accessible also to deaf people.

3.1. Systems amplifying acoustic stimuli

These are, in general, all amplifying systems, hearing aids and induction loops. As there is much information and discussion already established, we do not go into details here.

3.2. Systems transforming acoustic stimuli

Here we find two basically different solutions.

3.2.1. Systems of manual or automatic transformation of spoken language into a written representation

While the manual services (i.e., subtitling, note-taking or captioning) are rather traditional, the automatic transformation from the spoken to the written mode is rather

new, because it needs speech recognition. The European Union (EU)-project VOICE [1] is an example for such a system. The automatic recognition has currently still a major limitation. It forces the speaker to use a special sort of speech behavior (e.g., separating all words from each other by small articulatory pauses). All the systems – manual and automatic – have another limitation: they are useful only for persons who know a spoken/written language well enough to decode the meaning. As shown in Section 2, this is not the case for a considerable number of deaf people.

3.2.2. Systems for the transformation of the acoustic stimuli into electrical ones for the inner ear

These systems, the so-called cochlear implants are now recommended especially for deaf people whose inner ear nerves are in order. They are generally working very well for people who had some experience of spoken language before becoming deaf; the rate of success in cases of deafness from birth being lower and the subject of some controversies [2].

4. Technical aids for sign language users

The access of deaf people to communication and information has the following aspects.

4.1. Aids for telecommunication between sign language users

Here the transfer of visual information is necessary. In principle, modern ICT makes such a transfer possible. But still the quality needed for understanding sign language poses some restrictions on the types of telecommunication means used. While a double ISDN line provides a sufficient data rate, slow telephone connections do not. As a consequence, video telephony or videoconferencing via Internet are impossible for sign language users with a standard telephone connection. Mobile video telephony is sufficient within areas of UMTS service only. In all cases, the costs of a sufficient line capacity are a major problem.

4.2. Aids for the communication between sign language users and hearing subjects

In this case, the most economic solution would of course be an automatic translation in both directions. But there is no complete automatic translation system for any spoken/written language to any other (even for written variants); the situation being even worse for minority spoken languages as well as sign languages. Therefore human interpreters are necessary, the costs of which strongly limit their use. A good solution is represented by the so-called

relay centers [3], especially those who offer written (= text) as well as signed (= video) access to their services.

4.3. Aids for making spoken information accessible to sign language users

Two solutions are possible. The optimal one is real-time or delayed interpretation from spoken into signed language (for problems, cf. Subsection 4.2). This solution offers the information in the language preferred by the addressees. The second solution is the transfer of a spoken language from the acoustic into the visual mode, i.e., into written language (as described above in Section 3).

4.4. Aids for making written information accessible to sign language users

Human interpreters are also needed if we want to have the information translated into a sign language. Concerning automatic transfer from written language to a sign language, the EU-project eSign (a further development of ViSiCAST) [4] shows the state of the art. It converts frequent (written) phrases into fixed forms of a sign language produced by an avatar. This is no translation, but an important step towards more accessibility. This project aims to provide sign language on websites, using avatar technology and is currently working on local government websites in Germany, the Netherlands and the United Kingdom. They claim that, although the technology is still in development, virtual signing can be even better than using videos of real signers: changing small sections of the signing can be done quicker and easier (e.g., for updates), and the videos can be downloaded faster and do not take up much space on Internet servers.

Naturally, the improvement of the competences of sign language users in written languages could unburden the deaf from some necessity to use interpreters too often. To reach this goal, intensive educational measures have to be set, however.

5. Regulations and standards

There are some EU directives as well as international and national laws against discrimination, on human rights, on equal opportunities, or on inclusion of people with special needs.

The laws for equal opportunities, e.g., formulate the right of deaf persons to use sign language in many contexts. This includes the right to get interpreting financed. But – as they concentrate on equal rights at the workplace – they ignore the fact that the right of using one's preferred language is not very valuable if one cannot learn this language following the standards of language acquisition (this includes the systematic use of the language in education and the respective education of teachers).

Concerning standards (cf. the web accessibility initiative (WAI) [5] or the European Telecommunications Standards Institute ETSI [6]), the needs of sign language users are not always sufficiently taken into consideration. Though some standards give adequate recommendations, namely to use a written language, simple written language or a sign language in order to transfer acoustic information into a visual one, these are presented as if they were equally applicable and useful. Sometimes sign language is even mentioned as a “non-text equivalent of text”. The focus is then on “clear and simple” (written) language, which should benefit deaf persons. While this is at least partially true, most deaf people would prefer a sign language. Neither the connections between deaf education and different competence in written language are made clear, nor the language rights of deaf people are mentioned. Additionally, there is no clear differentiation between sign language users and other people with a hearing impairment. Practically all recommendations focus on assistive technology, without telling us explicitly that some forms of this technology – especially those important for languages, including translations – are still not available. Adaptive technology is an important instrument for the inclusion of deaf people. But it has to be developed to a state where it works reliably (which is not the case for sign language synthesis and recognition yet) and it must not replace personal social interaction between deaf or deaf and hearing persons. Additionally, the potential users must be offered the competence to handle hard- and software.

From our perspective, this situation is mostly due to the following facts:

- The people with special needs under discussion are not always invited to participate in technical standards development.
- It is not understood that the inclusion of deaf people has to be provided not only by assistive technology but often needs direct human interactions.
- The technology orientation of scientific programs: sometimes it seems that many technicians are not interested in a real inclusion of groups of people with special needs if mainly already established technology is used. They are more interested in developing new technologies. In other words: there are conflicts between economic interests and the interests of people with special needs. Practical examples of necessary tasks, using established technology, are the extensive installation of relay centers or the installation of video connections between deaf organizations nationwide and worldwide.
- The costs per individual signer: as sign language users need their visual languages, they cause costs like any other acknowledged language minority or even more, because they often need interpreters in order to communicate with the hearing society. As they are few in numbers and spread all over the countries, the costs per capita are quite high. This fact often prevents them from getting the adequate service.

- Lacking information about the needs of the deaf: hearing people without direct contact to the deaf community are often convinced that deaf people can easily compensate by reading written texts.

6. The contribution of new media to inclusion

The new media (NM) or information and communication technology (ICT) give us for the first time the chance to realize education material and measures adequately, sustainably and economically. Sign languages as visual languages can be presented in digital films, software tools allow different designs and a flexible exchange of materials, as well as the cooperation of various authors. We can save, transfer or exchange these materials if they are in a format which allows that. Templates, i.e., parts of software which allow the use of a concept (e.g., of a course or an exercise) within different contexts, will play a major role here.

Because the target group is so small, it is necessary not to realize one and the same material, e.g., in every EU country at high costs, but to use templates or distribute parts of the work and then exchange them. Such a practice means that only the detailed decisions concerning the material and the video production have to be done individually, but the software costs and some design costs only have to be financed once.

Furthermore, ICT allows expensive courses – often held only a few times – to be stored, modified and called up easily. A comprehensive offer of online courses also helps to realize the concept of a free and accessible basic education and training.

The ICT allows for more self-determined work of the students, e.g., by improving temporal and local accessibility, either in combination with a presence course or via online courses alone. The same is valid for joining formal or informal groups of learners. At least some of the material can be used for other target groups (immigrants, alphabetization, people with learning or speech disabilities) also or some can be taken from already developed products for these groups.

Useful solutions in the new media should show the following properties:

- a flexible structure, e.g., modules instead of fixed lessons which allow the users free navigation;
- a software with tool character which allows any author to design more modules or exercises without having programming competences;
- a cognitive orientation which motivates the learners to start from their own experiences, e.g., with language and strategies of behavior and information processing (e.g., analyzing, contrasting, systematizing, deducing).

7. Recommendations for ICT in the area of deaf and hard-of-hearing users

7.1. *Self-determination and multiple choices*

To recall the principle, every deaf or hearing-impaired person should be able to decide for themselves, whether s/he wants to identify with a signing or a speaking community (this includes free choice concerning their preferred language) or even wants to live in both communities.

Therefore ICT for hearing-impaired persons must allow many individual strategies of approaching information and language. Ideally, the users have to be offered a general ICT-menu within which they can decide what (combination of) media they use for their access to information and communication.

7.2. *Recommendations*

We can classify the hearing-impaired persons roughly in two groups (without postulating that every respective person will fall in one of the two following groups).

7.2.1. *Spoken language users*

This is the group of hearing-impaired people (mostly with a lighter impairment) who decide on spoken language as their preferred language. They can be helped by optimizing the auditive perception via hearing aids and by improving the visual channel as an additional source of information (e.g., lipreading for the perception of spoken language, presentation of important information both in the acoustic and visual channel) in the sense of multimodal access.

7.2.2. *Sign language users*

The other group are those people who decide on a sign language as their preferred language and therefore need a special bilingual way of education and training. Members of this group get their access to information and language(s) by using a sign language or other visual communication systems like "signed English".

In order to support the improvement of education especially of the second group (with some impact also on the first one), a lot of work is urgently required to provide sign language items and sign communication as well as to provide the interconnection of sign language with written and spoken language.

We have to develop more programs for computers which allow:

- parents to learn visual communication systems including sign language;
- parents to look for the adequate combinations of visual and acoustic means of communication for/with their child;

- parents and children to take adequate exercises for the development of visual and oral communication systems.

Naturally, ICT cannot substitute for everyday communication but it can provide inestimable tools for strengthening and broadening language competence and information processing. The point has to be stressed that communication skills are learnt by communicating with human beings, however.

To mention only a few features which an adequate ICT should display (for a detailed discussion cf. [7]):

- The computer system and its Internet connection must be able to run digitized videos in a sufficient size and good quality (e.g., 16–20 frames/s). The possibility of videoconferencing should be available.
- Learning programs have to include acoustic and visual versions, e.g., sign language, signed oral language, as well as written and spoken language for every item. That means: all information which is now available in the acoustic mode has to be transposed into the visual mode step by step. Programs and materials have to be offered for the early years, for preschool and school education, as well as adult education.
- Where automatic facilities do not work, there must be personal services present, like interpreter or relay services as well as educational interaction, counseling and tutoring in the classroom or via Internet.

8. Policy recommendations

The following policy recommendations should be taken into account:

- Sign language users must become a group specifically addressed by the authorities in all questions of accessibility, education and vocational training. Without always questioning the necessity or the costs, this group has to be provided with equal opportunities in education from the early years on and at the workplace.
- The authorities should install comprehensive interdisciplinary applied research and the use of modern ICT, e.g., building a "deaf research area" and a coordination network concerning deaf education (in connection with the representatives of the deaf people) in order to avoid doubling or repeating the same projects.
- Some money from scientific or social funds has to be given directly to the deaf in order to enable them to release calls for projects on their own (the same is valid for all other groups of people with special needs).

- The deaf users should take part in the development of new technologies, both in design and development.
- Access to information and communication services should not be regarded only as a hardware problem but as a multi-factor problem influenced by the following issues: the language used, costs, technical standards, contents and whether human services are necessary.
- As for the costs for the use of information, access to the basic services of the information society should be free, not only for the deaf.
- The communication needs of the deaf cannot be satisfied with functional equipment alone. They also need services and multiple options so that the deaf can choose the most fitting one, no limitation to a single solution.
- As for telecommunications, we suggest the development of a respective “deaf workplace”. Such workplaces should exist at home, on the job and in some public institutions.

9. Examples from projects

Some concrete examples from our work can serve to illustrate what can be done in the area of deaf education.

9.1. The e-learning for the deaf

9.1.1. Internet as a potential source of new employment possibilities for the deaf

In this project of the Leonardo da Vinci programme, several courses for the deaf were developed and held as presence courses in the partner countries (Czech Republic, Austria, Flemish part of Belgium and United Kingdom), concerning computer skills (basic skills, Internet, web page design), the respective written national languages, (computer) typography and Internet-related job-seeking skills. The materials for this course include textbooks, partially accompanied by CD-ROMs.

An added bonus was the collection of standardized signs for grammar and computer terminology. The signs were discussed during meetings of deaf people from all over the country; the signs they agreed on were then filmed and stored in the form of video clips on CD-ROM. These signs provide a basis for the next courses so that there is no confusion because signs from different regions are used interchangeably. Interpreters can now draw on a unified terminology.

9.1.2. Courses in written German

In Austria, courses in written German for deaf people are especially important. Within a project aimed at introducing a new, officially recognized training for (deaf) teachers of sign language, the Center for Sign Language and

Deaf Communication (ZGH) developed a (written) German course for future teachers. The online modules of this course will allow the students to look up information about German grammar and to practice it by doing exercises on their own. We believe that it is best to use the target language, i.e., written German, as a basis, supplemented with sign language videos as a ubiquitous help, if the users have problems understanding the text. The deaf can first try to read the text on their own, without additional help. If any of the words are too difficult or if the meaning is not clear, a help function explains everything in sign language. The students can do the exercises in whatever order they like; there is no fixed course structure. The user simply chooses a subject which is of interest to them, i.e., the present tense, and can then read the respective grammar explanations (or watch the accompanying videos in Austrian sign language = ÖGS) and do the various exercises. Those are taken from an exercise pool, using a random generator, so that the students will get new exercises each time they access the course. There are three levels of complexity: beginners, intermediate and advanced. Normally, the program will show all three levels one after the other for each exercise type, but the students may skip any of them if they do not want to do them or do not feel competent enough.

For the easier levels, feedback is sometimes inherent; for example, with drag-and-drop exercises, wrong choices will not stay in place. There is also a special button which allows the students to call up the correct solution; with another click on this button, they can repeat the exercise. In the cases where the feedback is explicit, this takes the form of red (wrong) and green (correct) boxes around the respective word, phrase, etc., or of a green hook and a red “X”. In this way, mistakes are made visible unobtrusively; but there are no grades, so that the deaf students are not feeling as if they were back at school again (this was an express wish of the deaf participants).

9.1.3. Sign On

The EU-project *Sign On – English for Deaf Sign Language Users on the Internet* [8] is a cooperation of Austria, Finland, Iceland, the Netherlands, Norway, Spain, and the United Kingdom (October 2004 – September 2007). It is aimed at deaf people who use a sign language as their first or preferred language and are not complete beginners, i.e., they are e-mail and Internet literate and have a basic competence of English.

The goals of the project are to teach deaf people some skills, strategies and the confidence they need to exchange e-mails in written English and to read information on English language websites (one of the target groups are deaf researchers attending international conferences and wanting to stay in contact with people from other countries afterwards); sign bilingual learning materials (ten lessons in written English, national sign languages and international sign) will be produced, both for individual study and classroom situations.

9.2. Learning a sign language

For the deaf, it is important that as many people as possible learn sign language. This concerns not only deaf children of deaf or hearing people and their hearing relatives and friends, but also other hearing people. At the University of Klagenfurt, we have noticed a growing interest for learning Austrian sign language among the students. Some believe that this may help them with their future career (e.g., students of pedagogy), while others have deaf friends or relatives. However, there are lots of students, who are learning it out of pure interest only. We believe that immersion is the best method for learning a language, so Austrian sign language is the language of instruction; only during the first lesson is an interpreter present if there are any questions.

Naturally, sign language competence can best be acquired by interacting with native signers. If this is not possible or for repeating what you have learned at home, the second-best way is using sign language videos. Pictures (line-drawings or real photos), even with little arrows to mark the direction of the movement, cannot capture the reality of the sign; although they may serve as a memory-aid, if one has already learned the respective sign.

At the ZGH, e-learning materials for courses have been produced over the last few years, replacing the original books and VHS videos, which were not really comfortable for the students (imagine, for instance, searching for a certain sign by forwarding and rewinding the tape).

9.2.1. Austrian sign language course “ÖGS 1” on CD-ROM

Although the students in our sign language courses are very motivated, they had some difficulty remembering the signs and the grammar over a longer period of time and they kept asking us for some study tool. To fulfill this request, we developed a course on CD-ROM together with a local software firm.

The first six lessons of the original course used at the university were adapted for a multimedia course (the next six lessons are to follow in a new project). The exercises remained mostly the same, while the PC took on the part of the teacher. True to our philosophy, only native signers appear in the videos. Mostly, sign language is used (e.g., for the feedback); only the instructions and grammar explanations are in written German, but this will also change with the second part of the CD-ROM.

The six lessons all have the same structure: dialogues illustrating the main topic of the lesson, e.g., describing people, are followed by exercises and games. The main grammar points are explained together with videos of sample sentences. Notes on deaf culture are intended to prevent hearing people from making common faux-pas, e.g., politely walking around two deaf people instead of crossing between them. Individual signs can be looked up at the end of each lesson or in an overall alphabetical list. Details of the contents are presented in [9].

The exercises and games often take the form of drag-and-drop or matching videos and pictures/translations. Most of the exercises use a random generator: the pictures, etc., are either completely different or at least will appear in a different order, so that the students cannot simply memorize the correct solution. Feedback is sometimes automatic (with drag-and-drop, wrong choices revert to their original place) and sometimes signed (the videos are chosen by a random generator to avoid boredom).

There is no rigid structure to the course: although complete beginners had best do the lessons in the correct order, they can also choose to pick out the parts that interest them most.

The course is not intended as a stand-alone product, although it can be used as such. We recommend to attend a presence course as well or to have at least some personal contact with deaf people.

The reaction to the CD-ROM was very positive, and it even won a prize, the *Europäisches Sprachensiegel 2004* (European Language Quality Seal). As it was programmed without static parameters, its framework could be used for other sign languages (or even spoken languages) by exchanging the videos and some of the data.

9.2.2. Sign-IT

This was a two-year project funded by the Austrian Federal Ministry for Education, Science and Culture; it was carried out by the ZGH in cooperation with the University of Graz (sign language interpreter training) and the higher education institution “Joanneum”, also located in Graz [10].

Because sign language is taught in Austria only at two universities (Graz and Klagenfurt), not all the people who would be interested in learning it can attend the presence courses. The aim of the project was to develop e-learning for students of Austrian sign language so that they could also learn or repeat it individually. Moreover, by making ÖGS available to any interested person, the project would also serve to raise awareness of sign language as a minority language.

The e-learning part is still a pilot and consists of an online e-learning platform, containing courses on deaf history and deaf culture and allowing communication between teachers and students, a CD-ROM for individual study (mainly aimed at interpreters; containing structured lessons with exercises and vocabulary) and an online database.

9.3. Tools for developing courses

9.3.1. The lesson manager

Originally, this tool was used for the production of the CD-ROM “ÖGS 1”, but it can be used independently. It allows the linking of sign language videos, glosses and written text.

Imagine, for instance, that you want to link a signed dialog with its translation. After loading a video file into

the program, it can be split manually into smaller parts, e.g., phrases or sentences. Normal control elements are used. The user can work either at normal speed or choose to view the file frame by frame. Each of the pieces can then be linked to the name of the signer, the respective gloss(es) and the translation.

A preview function allows the user to check that the linking is correct; if not, changes are possible (the latest version of the lesson manager allows not only the exchange of glosses and text, but also the reassigning of beginning and end points of the video).

The program is in German and English; but it can easily be adapted for other languages with a built-in function which requires only the translation of the German/English terms into the new language.

9.3.2. The course editor

For the multimedia course in German, we teamed up with the Austrian Research Center Seibersdorf to develop an electronic tool called "Course Editor". With this tool, exercises for courses can be created and the finished course then administrated. The design of the so-called masks (templates for the exercises) can be individually changed, according to the designer's wishes. From the pool of finished exercises, any one (also those designed by another person) may be copied and used as basis for new ones; those can then be added to the pool in turn. Possible exercise types include common ones like multiple choice, cloze tests, complementing or merging sentences, matching text and pictures. All in all, there are currently 15 masks.

For sign language courses and language courses that want to show the contrast between spoken/written languages and sign language, new exercises using videos (e.g., matching signed sentences with their translations) will have to be defined in a new project.

Although the course editor was originally intended for a German course, it is not limited to a single language. As the course editor can be filled with whatever exercises and videos the designer chooses, it can easily be adapted for different languages, by simply swapping the contents. The exercises can also be tailored by the instructor according to the needs of the respective group of students.

9.3.3. The Klagenfurt database for sign language lexicons

The first version of the database was developed for a project aimed at implementing a special server for deaf people in 1997/98, funded by the Austrian Federal Ministry of Science and Transport. This original database has since been revised and extended several times; currently, we are working on a completely web-based version.

The database can be used for signs from different sign languages. For Austria, signs from all the provinces are entered¹. Not only formational properties like phonetic-

¹The database can be found in [10] under the heading "ÖGS-Lexikon".

phonological and sublexical ones can be described, but also morphosyntactic and semantic ones. Users can search for single entries, properties of signs or via semantic fields. The main characteristics are the iconic arrangement of sign components and the open sets of categories/parameters and category values (new categories and values can be added at any time, if necessary). Details are presented in [11].

9.4. Barrier-free access to information for deaf people

For discussions of the situation of deaf and hearing-impaired people with respect to the Internet cf. [12, 13].

Barrier-free access to the Internet. One of the requirements of our modern communication society is access to information on the Internet. A lot has already been done for barrier-free access, but sign language is usually seen as only a desirable addition, not a top priority (see Section 5).

However, there are some initiatives by European governments to amend matters: in 2004, the German Federal Ministry of Health and Social Security supplied some of its web pages with additional sign language videos [14]. Not only did they receive enthusiastic feedback, but an accompanying survey indicated that the users would like more such videos. From all the people interviewed, only 10% understood the contents in written form only, more than 89% needed sign language in order to really understand the texts [15].

A similar venture has been started in Austria in spring 2005. There is a special website managed by the Austrian authorities which deals with e-government [16]. Citizens can get information from the various ministries, print out forms, etc. The project led to some information texts in ÖGS, but most of the written texts still have to be translated after the end of the project.

There are some websites – mostly maintained by deaf associations or institutions/organizations which work with the deaf – which show best practice. An excellent example of a bilingual website is "Sign Community" of the British Deaf Association [17], where users are free to choose between British sign language and a text version.

As for news and information, a European example of good practice is the Swiss "Focus-5 TV" [18], which is run by deaf people and covers many subjects, ranging from the deaflympics to films for children. This excellent website can really be compared to "TV for deaf people". In Austria, the "Österreichischer Gehörlosenbund" (Austrian Deaf Association) offers news in the form of video clips in Austrian sign language and text on their website [19]; since January 2005, they also cooperate with BIZEPS (an association which offers advice to people with special needs and their relatives), which publishes chosen bilingual news on their website "BIZEPS-INFO" [20].

Unfortunately, such websites are few and far between. Although video technology has come a long way, producing sign language videos is still a time-consuming and therefore expensive process. Until there are new technological

developments, sign language will probably remain limited to those websites which take a special interest in the deaf community and maybe a few official websites.

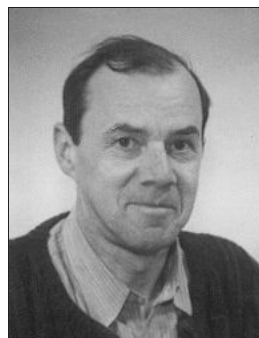
10. Final thoughts

There are big changes going on in so different areas as economy, technology, education, inclusion. It is very probable that there are many relations between these changes; but not all developments point to the same direction: the development of technology offers many new perspectives on inclusion and participation on the one hand. On the other hand a so-called economical compulsion serves as an argument to restrict or give up, e.g., inclusive developments in social affairs, because some ideologies tell us that we do not have the money for them. For the sake of persons with special needs we have to intensively point out their right for a full participation in society, though. This participation cannot undergo evaluation from a simplistic thinking of effectiveness in profit terms. From a more elaborate economic thinking which includes social costs and an ethics of welfare for all, inclusion is cost-effective. We researchers in this area have to stress the obligation of our societies to offer equal life chances. Progress of sciences and technology will allow the realization of that goal in any case. Concerning the field of hearing impaired persons with its strong internal differentiation technology in combination with the ethics of inclusion could allow for the offer of all useful solutions of inclusion and participation as well as for the free choice of the individual person from these offers.

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