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Dear Reader,

In this second issue of the Bulletin of the Jagiellonian University Disability Support Service we wish to showcase some assistive technologies supporting the educational process of persons with sight and hearing disabilities as well as share our experiences in work with students who are partially sighted, blind, hard of hearing and deaf/Deaf. The reader will find here a wealth of methodological guidelines which may prove useful in adapting classes and lectures to their specific needs as much as possible. Many of those tips entail no extra expenses and their implementation may considerably improve the accessibility of your classes and lectures. Training courses for academic teachers that our Service offers on a regular basis now show how much such knowledge is needed and how fruitful co-operation between students with disabilities, their teachers and the Service providing educational support may be.

Here is the usual scenario. A student visits us to talk about his/her needs related to the adaptation of academic classes/lectures. On the basis of such an interview, a consultant of our Service prepares 'educational strategies' which – with the student's knowledge and approval – are sent to the academic teachers working at the University institute the student has chosen for himself/herself. The teachers are often consulted about the guidelines contained in the strategies as they should take into consideration the existing reality while ensuring that classes are adapted to the student's needs as much as possible. The strategies are partly

a responsibility of the academic teachers and party of the Service which has got suitable technological facilities to provide specific specialist services. In theory, the model of collaboration works perfectly yet in practice the following complications may appear:

- the student voices his/her needs which cannot be satisfied since they are, for example, financially unreasonable or technically unrealistic or would grant the student excessive privileges, that is such that violate the rule of equal obligations had by students with disabilities;
- the needs voiced by the student are reasonable yet the academic teacher does not agree to have them satisfied which may be explained by or a result of his/her low disability awareness;
- the academic teacher suggests adaptations and facilitations which grant excessive privileges to the student who agrees to have them yet the Service disapproves, or
- the Service consultant and academic teacher suggest adaptations to the student, who rejects them.

Many more examples of such complications could be given, yet all I wanted to show here is that inclusive education is the fruit of a mature compromise between three players: the student, the teacher and the Service consultant. This requires responsibility, goodwill and awareness of limitations stemming from disability from all the parties. The Jagiellonian University increasingly often succeeds in striking such mature compromises, which entitles us to conclude that we indeed provide inclusive education and are a socially responsible university. It must be mentioned, however, that there are still some situations where entirely unnecessary complications occur. It seems to us that is due to low disability awareness and systematic efforts are needed to improve it so that the risk of misunderstandings can be minimised. In this regard,

training courses developed by the DARE project are of great help and we also write about these courses for each type of disability. We are happy to see so many doctoral students showing a keen interest to participate in them, which gives us even more reasons to be optimistic about the future of inclusive education at our University. Our experience so far shows that those who have attended our training courses find it much easier to later follow the triangle model of academic support presented above. That is why we kindly invite all those willing to take part in our comprehensive training courses raising disability awareness or individual training modules focusing on specific types of disability.

Concluding, I wish to share a personal reflection with you. As I began my studies at Jagiellonian University back in 1993 no fellow student in my year had a computer. In the second year, I managed to lay my hands on one of the first computers with a speech synthesiser available in Poland, also the first PC in my student group. Two years later in the fourth year some of my peers already had their own computers. As for educational materials, I had to scan them myself and because of many mistakes in scanned texts I found it difficult to learn from them effectively. Occasionally I would be successful in getting electronic-format books from lecturers which were of vital help for me. I remember that it was Professor Andrzej Mania who offered me most of such books. I mentioned this here because as a student I was given direct educational support from the sitting Vice-rector for Education although at that time in the area in question there were no regulations in place, no educational strategies and no training courses.

At present, a blind student in the first year who visits our Service receives: a PC with a speech synthesiser along with a license to use it while taking examinations, a monthly allowance of 500 scanned pages

of educational materials per month, training on moving about the University, a chance to participate in adapted English classes and that is not all. This shows the scale of changes made as regards availability of new assistive technologies and development of specialist services the contemporary University may offer its students although a mere 17 years has passed since I started my university education. I keep returning to my conclusion that technologies and wide access to them will not mean much if there is lack of understanding and acceptance for the idea of inclusive education from the broadly understood academic community.

This publication offers a multidimensional approach to this subject. We are glad that in this way the Jagiellonian University may inspire all those who would like to open up to the needs of persons with disabilities. They would be well advised to start with some action which does not cost much at all but depends on the good will of lecturers/teachers. In this publication you will find more than descriptions of modern educational aids, namely ways of using them effectively, examples of educational strategies for both disability types, good practice and specific methodologies, and so of involvement of all the interested parties responsible for inclusive education, a feature of the modern European University, the socially responsible University.

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Jagiellonian University Disability Support Service

Part One
Educational Support for Blind and Partially Sighted Students

Assistive Technologies for Educational Purposes: State of Play

Paweł Miąsik

This article aims to familiarise the reader with ways of ensuring broad access to mainstream education for persons with sight disabilities. It is estimated that as much as 95 per cent of information reaches modern man through sight. As a consequence, it is obvious that a massive information gap takes place because of complete or partial loss of vision. This obstacle may be considerably overcome using specific methods facilitating more extensive use of the other senses as information channels. That is why it is important to become familiar with such methods and the possibilities they create as well as be aware that information should be organised in such a way as to make it as accessible and useful as possible also for those members of information society.

The senses for which key information-access methods have been developed, alternative to visual ones, are hearing and touch. Using the sense of hearing for that purpose is obvious since it ensures interpersonal

verbal language communication, and so its value as a source of information is, first and foremost, related to the language potential. Touch, in turn, is a sense of contact facilitating capture of relations between the perceived elements so wherever such a relation may carry information the use of touch is useful. The history of applying touch in education of blind persons is closely linked to the invention of Braille's alphabet. A great role in the development of methods targeting those two senses has been played by the contemporary IT revolution and technological progress which, while generally leading to the transformation of society into knowledge-based society, have facilitated the development of tools ensuring access to information for blind persons on a larger scale, faster and more easily than ever before.

Sightless computer use

One of the key tools allowing modern man to enjoy full access to information – including educational information – is a standard PC, so in simplified terms a central information processing unit connected to input/output devices which facilitate interaction with the user, equipped with application software, in particular an operational system. The very same set may be used by blind persons, yet they must additionally use screen readers (programs) which help them to have information in a non-visual manner. Such information may be conveyed, for example, as sound by a speech synthesiser supporting a screen reader. The work of a synthesiser consists in converting the signal generated by a screen reader which contains text information to speech. The synthesiser function may be performed by a special piece of hardware or a separate program (in this case communication with the user takes place by means of a standard sound card and loudspeakers or headphones connected to

it). Speech synthesisers have been developed for many languages, so it is also possible to have satisfactory access to foreign-language texts.

Such solutions (screen readers and speech synthesisers) currently available on the market let the blind user perform most of the work that can be done by sighted users (with the exception of those purely consisting in the creation or processing of graphics). As regards educational applications, it should be emphasised that on his own a student can create and read a document in a text editor and a calculation sheet, efficiently use an Internet browser as well as a variety of other tools allowing him/her to use the potential of the Internet, read pdf-format documents, manage audio materials, perform basic operations on files as well as manage many specific applications.

One very important and useful application offered by modern IT technology is the conversion of paper-based printed documents to electronic format. The method consists in feeding the image of the pages into the computer (typically using an optical document scanner) and using an OCR (Optical Character Recognition) program transforming it to the electronic format of that program. Such a text can be then exported to one of the popular document formats (e.g. txt, rtf, doc, html, pdf) and read as well as edited. An experienced user can go through the whole conversion process on his/her own, even in the case of large documents like entire books. Interestingly, if right parameters (like good print quality, correct placement of the document on the scanner or adequate configuration of the program itself) are retained, the quality of the recognition results is very high at over 99% compatibility with the original; apart from the very text, document formatting is also faithfully retained.

Comments and tips

1. Most existing screen readers are compatible with MS Windows because of the system's immense popularity and blind computer users are no exception here. These are usually commercial products with considerable functionality, but also high prices, mainly due to the fact the target group is relatively small.

However, there are also analogous solutions for other operational systems, in particular an open-source solution for Linux, a screen reader for Mac OS (an integral part of that environment provided in the standard installation package) as well as commercial sound-making programs for operational systems of mobile devices like Symbian and Windows Mobile, thanks to which blind users can make full use of mobile telephones and palmtops, too. Moreover, at least one non-commercial programme of such type for Windows has been created which indeed has less functionality than its commercial equivalents, but is being developed quickly and allows the user to perform many typical actions like writing, browsing through WWW pages etc.

2. It must be clearly stated that a blind computer user is not able to work effectively with such pointing devices like a mouse or a touchpad and must resort to a keyboard. That is why he/she should have a good command of keyboard shortcuts activating most frequently used functions and so considerably improving work efficiency.

3. As regards administrative issues related to, for example, the way an academic course is conducted, it is recommended that the possibilities of electronic communication offered by university IT systems should be widely used. In particular, it would be good if each teacher had his/her own website featuring updated messages, office hours, materials accompanying his/her classes/lectures etc. Such solutions are

undoubtedly useful for all the students while for those with disabilities they are of special assistance and guarantee them full and equal access to information.

4. While a website is being designed WWW sites accessibility guidelines developed by the World Wide Web Consortium should be consulted so that the new site can be fully accessible for all Internet users. The guidelines can be found at http://www.w3c.org/wai.

Using Braille tactile writing

Dot writing was invented and developed by Louis Braille (1809–1852), his surname being synonymous with the system (in modern Polish the French form of his name and invention is hardly ever used). The notion of Braille writing boils down to representing letters of the alphabet and other symbols through ascribing them a specific configuration of convex elements on a flat surface, easy to identify with touch while moving the fingertips along. Such elements have a form of elevated dots of a specific height and using special appliances may be embossed on paper, for instance.

A typical Braille character is based on the six-dot (formative) cell comprising two vertical columns with three dots in either. The upper dot of the left column is conventionally seen as first, the middle one as second and the lower one as third. Likewise, the dots in the right column are seen as fourth (the upper one), the middle dot as fifth and the lower one is the sixth dot. The system for entering characters is based on the creation of various combinations of how one to six points are positioned. In this way, it is possible to get 63 various sets, which in practice ensures correct spelling in any natural language as well as a representation of basic mathematical computations. Additionally, various notation rules can be

created, like combining two or more characters and assigning a given symbol to such a set or preceding a character or a series of cells with an appropriate modifying character thus changing its/their meaning (in this way digits created from the letters *a–j* preceded with an appropriate character called a digit cell, for example, are written in Braille). Thanks to the flexibility of the system, advance mathematical, physical, chemical, musical and other Braille notations have been developed.

Because on paper Braille writing takes relatively much space as compared with regular print, and with the comfort of Braille users in mind, Braille shortcuts have been developed which allow for notation shorter than the integral character-by-character notation. The abbreviation system is based on creating statistics for the frequency of specific words and letter combinations in a given language, and then assigning a Braille character or several cells to those with highest prevalence (in English abbreviations, for instance, the word *like* is replaced by the Braille cell for the letter *l*, *the* by a cell made of dots 2, 3, 5, 6, which in Polish Braille is used for the *ź* diacritical mark – obviously non-existent in English, while the *-tion* ending by the Braille character for the letter *n* preceded by a cell made of dots 5, 6, not used in the Polish alphabet at all – and analogous solutions are adopted for other frequently used words and letter combinations). Although Braille abbreviations have also been developed for Polish, the system is not commonly used in Braille publications or education. In English-language Braille publications, in turn, the shortened notation is used almost exclusively and so the knowledge of its rules can be very useful.

Braille writing was the most useful method for accessing knowledge and most widely used by blind persons until IT tools based on transmission by hearing were created and disseminated in the 1990s. Still,

Braille remains highly useful particularly in educational applications. The utility of Braille is still high because of the advantages of the very system like precision in notation presentation on the one hand and, on the other hand, due to the development of modern technical Braille devices.

Because Braille is a kind of writing it precisely reflects the details of the text it represents like word spelling, placement of punctuation marks and partially formatting. Due to such features Braille is highly useful in foreign language learning as well as wherever formal notation exists, e.g. in reading texts with mathematical expressions or in analysing the notation of computer program source codes. Key types of technical devices able to generate convex Braille writing are Braille printers, typewriters and Braille displays (Image 4).

Braille embossers and typewriters

The operational principle of the Braille embosser is based on a software-controlled electromechanical system featuring uniquely shaped hammers which by hitting paper emboss convex points on its surface. Producers of such devices offer quite a wide range starting from large industrial machines pressing Braille publications, through printers used for the creation of handy materials for schoolchildren and university students, to small portable printing devices. Modern printers can create Braille printouts on both sides of a paper sheet at a speed of up to 300 characters per second. They can be fitted with a sound interface which allows the blind user to control device settings and easy-to-handle software for creating printouts by users unfamiliar with Braille. A very important feature of modern Braille printers is their ability to print Braille graphics. They can emboss dots anywhere on paper, so there is no limitation due to dividing the sheet into rectangles sized like the Braille six-dot cell.

Image 1. Braille embosser (Index Everet)

Thanks to that dots can be embossed in any relation to each other thus making it possible to create a convex drawing whose lines are made up by densely packed dots. The creation of a decent convex drawing legible to a blind person is a complex notion in itself and not to be discussed here and now, yet after correct graphic processing it is possible to produce charts, diagrams, graphs and even simplified models of three-dimensional objects legible to touch. There are also printers able to provide various heights of the embossed Braille dots, which means that information can be conveyed through changes in the drawing texture. Thanks to that it is possible to map e.g. lines differing in colour onto lines differing in the height of the convex points making them.

Heaters/Fusers (Image 2) are another interesting solution for tactile graphics. Making a convex drawing using such a heater requires special microcapsule paper also known as swell paper. Using a regular printer a printout of a drawing to be touch-read is made on a sheet of such paper. The sheet is then placed in a heater. The device emits energy,

Image 2. Heater for tactile graphics

mostly absorbed in places covered in black, less so in places in shades of grey while white spots absorb least energy. The energy makes the microcapsules expand as much as much energy they receive. The process is one-directional and as a result a convex drawing is created ideally matching the input drawing.

Braille typewriters are mechanical or electromechanical appliances (Image 3) and as for their functionality analogous to classic printing presses. The differences relate of course to the structural elements responsible for the creation of Braille writing, most visible being a different keyboard comprising just seven basic keys. Six of them are responsible for making relevant points in the six-dot Braille cell, the seventh is a space key. After pressing a desired key or key combination, relevant points are embossed on paper by a system of needles connected with the keyboard, and once the keys are released the machine mechanism moves the sheet by a unit equal to the width of the six-dot.

Image 3. Electric Braille typewriter

Just like conventional typewriters, Braille typewriters are being driven out by similar devices based on digital technologies yet because of their considerably lower price they may be a good alternative for private users intending to make relatively little notation. Additionally, typewriters equipped with electronic systems feature many extra functions facilitating work and enhancing capabilities like recording texts in the memory so that later they can be automatically reproduced in any number of copies, the possibility to connect to a regular computer keyboard thanks to which notation may be executed by a user unfamiliar with Braille, the possibility to connect it to a PC and use as a simple Braille printer, etc.

Braille displays

Braille displays are another group of very useful modern tools using the Braille notation system. Using them a blind person may obtain tactile access to many kinds of information generated by computer

Image 4. Braille display (Super Vario)

programs. The notation is presented on the display thanks to a unique electromechanical system, the rule of its operation being based on the reverse piezoelectric effect. On the user's side, the effect of such a system operating is the appearance of Braille characters on the Braille display, e.g. making a text which at the same time is displayed in the cursor line on an ordinary screen. Braille dots are created from the ends of special pins slid out from relevant hollows to such a height that they look similar to dots embossed on paper and their distance from each other is just like in Braille characters. And so as a given character is being presented in a particular display cell (e.g. the character for the letter *x* made up by dots 1, 3, 4 and 6), the ends are slid out of the pins matching the location of those dots, while the pins that do not participate in cell creation (and so in this case matching the location of dots 2 and 5) are slid back below the display surface so that a smooth space appears as a result. A similar situation takes place in subsequent cells, where relevant pins are slid out or back, depending on what character falls to a given cell (in particular,

if that is the six-dot cell all the pins will be slid out and in the case of the space character they will be all slid back, giving an empty cell, and so a space between characters). As a result, a line of clear Braille notation appears. As the cursor is moving to the next text line, within a fraction of a second an automatic change takes place of the configuration of pin placement in all the cells and a new text is displayed.

Because commonly used displays show one notation line at a time it is possible to present text information only. A message for the display is relayed by means a screen reader, just like for a speech synthesiser. Thanks to the rules implemented in this software effecting the replacement of graphic information with text information the display facilitates access to some graphic elements controlling the operational system and programs like buttons, selection fields etc. In this way the blind user may work using the computer with touch only. Moreover, as many display models are equipped with extra keys activating most frequently used keyboard functions like moving the cursor or pressing the enter key, the user may freely work with the computer with his/her hands steadily on the device. Many people use both solutions at the same time i.e. a speech synthesiser and a Braille display, thus obtaining fuller general information or use both methods alternating depending on what kind of tasks they are performing and individual preferences. All this goes on to show that the use of the Braille system in modern education of blind persons as well as their full participation in knowledge society continues to bring considerable benefits and may not be treated as either a second-rate solution (e.g. because it is necessary to master notation rules) or as competitive when compared with sound-making solutions but should rather be treated as a complementary information acquisition method, of particular use in some specific situation.

Comments and tips

1. Attention is due to the fact that Braille is quite often wrongly called a language. As already mentioned, the Braille system is a different type of recording texts, yet compatible with the characters and rules used in a given language (hence differences in the meaning of the same Braille symbols in various languages). One can indeed talk of the Braille alphabet as it is a set of uniquely written characters (by the same token the Morse system can be called an alphabet), yet it is not an alphabet of a separate language.
2. The cell of most Braille displays is adapted to create not just a six-dot but an eight-dot. Using two additional dots in comparison with the traditional system aims at making the presentation of elements typical for work using the computer (like a cursor pointer or a mouse) easier. These dots are also used to present text attributes. Also many Braille printers support making printouts based on the eight-dot cell.
3. Modern screen readers have translation rules implemented which provide for automatic conversion of a text straight away into a system of Braille abbreviations and presenting them in that form on a Braille display (the facility always available for English; availability of abbreviation management for other languages may depend on the particular program, its version, distributor in a given country, popularity of abbreviation use in a given language etc).

Appliances used for recording classes and lectures

Below is a brief description of most popular types of devices blind students use to record what is said during lectures and classes. These may be various portable notebook computers equipped with a screen reader

and possibly some extra hardware and software. Many users nevertheless prefer to use Braille notetakers (Image 5). These are specially designed portable devices based on popular PDA (Personal Digital Assistant) solutions, controlled by an operational system for mobile devices with an installed version of a screen reader dedicated to this kind of system. They are usually fitted with a Braille keyboard, thanks to which the appliance is small and quick text entry is a comfortable experience. The notetaker communicates with the user by means of an internal speech synthesiser. Many models of notetakers have additionally built-in Braille displays, allowing for precise text control. Such devices are fitted with many applications used in standard palmtops such as a calendar, calculator, Internet browser, e-mail client, audio player etc. yet so designed as to be fully and comfortably used without sight and by means of commands introduced on a Braille keyboard.

Image 5. Braille notetaker (Braille Sense)

They have many typical communication interfaces like Bluetooth, USB or Wi-Fi, but may have no screen at all or are fitted with small displays or/and connectors for link-ups with external screens so that sighted users enjoy easy access to texts. They are particularly useful for blind students who can easily take their own notes during classes/lectures, record the sound of lectures, present the written text by displaying it on the notetaker screen or send it to the teacher's computer, for example during a test, as well as store and read large volumes of texts, thanks to which students may always have the books or notes etc. they need handy.

An important and already mentioned method of 'saving' classes and lectures is recording them. Obviously, good-quality recording provides a faithful representation of what was said. The method was successfully used by blind students since relatively small devices recording sound on magnetic tape had become popular. Tape recording had some downsides, too: it was impossible to easily find specific fragments of the recording (in particular of long recordings of academic lectures or books), the sound quality deteriorated after multiple play etc. As the digital sound recording technology developed and memory carriers became ampler as well as thanks to the creation of mark-up languages describing the structure of information in documents, it became possible to make many long recordings with good sound quality using such miniscule devices as digital dictaphones. Many modern dictaphones offer advanced multi-layer bookmarking in recordings, marking specific fragments of recordings or adding one's own comments. Using such functions the student can now easily mark some specific points in a lecture, where for instance a new subject is raised, or 'emphasise' particularly important information so that it can be easily found later on. Files with saved recordings may be

also moved onto a computer and subjected to operations in sound editing programs, a few of which are well compatible with screen readers.

Currently digital dictaphones with sound are available on the market so they can be fully used without using the eyes. Moreover, many models of the aforementioned Braille notetakers have an in-built dictaphone function; blind persons can also use some basic functions of dictaphones without sound. There is another distinct group of specialist devices that can also work as advanced digital dictaphones: DAISY standard players.

The DAISY (Digital Accessible Information System) standard is an international system of recording spoken digital books for blind persons. A spoken digital book is a digital audio recording of a book read out by a reader or speech synthesiser. The DAISY system is based on the use of files with a book recording saved in a format used for sound files (mostly mp3) described by HTML mark-ups, for creating its digital audio form retaining the logical easy-to-navigate structure of the book. In practice, the reader equipped with a suitable program or hardware may press correct keys and move between various book sections like parts, chapters, subchapters, paragraphs and pages. It is also possible to automatically move from the table of contents item to the section referred to by the item, inserting bookmarks and notes, manage footnote reading, jump to a specific passage on the basis of a sequence of entered characters (in books where the text layer is integrated with the audio layer) and use other options.

Apart from their basic feature that is support of the standard, hardware players of DAISY books may additionally have many useful functions like: reading texts using synthetic speech, playing many typical sound file formats, giving current time and date, the already mentioned

dictaphone with recording organisation by means of bookmarks and many more.

Comments and tips

1. If during classes/lectures it is necessary to write something one the board, it makes sense to also read the text being written out loud. In this way persons with sight issues will have better orientation in the material covered in the class/lecture.
2. If a class/lecture is being recorded the recording device should be placed to the teacher, for example on his/her desk. Then the recording is usually of much higher quality.

Useful links

Below are websites of some large producers of specialist appliances and programs discussed in this article and their distributors in Poland (featuring detailed descriptions of equipment, user manuals, software demo versions etc):
http://www.baum.de
http://www.freedomscientific.com
http://www.gwmicro.com
http://humanware.com
http://www.indexbraille.com
http://www.viewplus.com
http://www.altix.pl
http://www.ece.com.pl
http://www.medison.info.pl.
Websites with free screen readers:

http://www.nvda-project.org
http://www.nvda.pl
http://www.screenreader.net
http://www.live.gnome.org/orca.

Websites with a wealth of information on Braille writing, its history, applications and methods of creation:
http://www.braille.org
http://www.brailleplus.net
http://www.brajl.pl
http://www.brajl.pzn.org.pl
http://www.rysunki.pzn.org.pl.

Websites concerning the DAISY standard and digital audio books for blind persons:
http://www.daisy.org
http://www.bcpzn.pl
http://www.daisy.pl.

Examples of Strategies for Teaching Students with Sight Disabilities

This material comes from the training manual for academic teachers published by the DARE project

The application of the following principles during classes/lectures, appropriately matching a given person's individual needs, will improve the quality of education provided for blind and partially sighted students, and so provide them with equal opportunities in access to the University's educational offer.

Recommendations:

- Encourage the students to sit close to the teacher in lecture rooms. In this way partially sighted students will better hear his/her voice and receive visual stimuli.
- Inform the students in advance of any changes regarding the location where classes/lectures are held so that those unfamiliar with the new location can get there on time unhindered.
- Agree to have classes/lectures recorded on a dictaphone after the student has declared the recording is going to serve learning purposes only. Some students will find it indispensable educational support.

- Ensure good lighting conditions in the rooms and places where partially sighted students are and work, depending on their individual preferences. Some people may need more light provided by an extra table lamp. It is also important to provide good lighting of the area where the lecturer stands or sits as partially sighted students may feel uncomfortable unable to use the information coming from the teacher through a non-verbal channel.
- As much as possible, ensure best acoustic conditions in the lecture hall or classroom.
- Make sure the room/hall does not feature obstacles that may be potentially dangerous for blind persons like cables or screens hanging too low.
- Allow use of extra optical aids (magnifying glasses) or electronic equipment like laptop computers, Braille notetakers and enlargers.
- Provide the students with the content of lectures/classes in an electronic format, text or html, which can be easily read using sound software. The best solution is to provide such electronic materials well ahead of the class/lecture using, for instance, a closed mailing list or an Internet platform. Given the opportunity to become familiar with the material beforehand, the students will enjoy a fuller participation in the classes/lectures. If they know the structure of a lecture they can, in memory or taking supplementary notes in Braille, organise new knowledge on the basis of the already known conceptual framework. Importantly, this is an innovative solution in the teaching process beneficial for all the students and often practised for entire student groups bringing good results.

- During lectures and presentations describe the items being referred to by the speaker at any given moment; always read out the text shown on the slides.
- Provide a precise verbal description of the visual reality (information from diagrams, charts, slides, tables etc) using specific words so that a blind student may imagine it (e.g. a straight line linking points a and b rather than a straight line linking two points). Turn to the Disability Support Service for tips on how to describe such content as this skill can be mastered.
- As you are writing information on the board dictate it at a pace facilitating note-taking after hearing the message.
- Provide partially sighted students with legible materials and multimedia presentations. This mainly means selection of an adequate font size as agreed with the student, using contrast or the same colours of variable intensity.
- Preparing materials with enlarged print ensure they are legible.
- Provide the students well in advance with a list of obligatory reading matter and topics relevant for examinations and obtaining credits. Persons with sight disabilities may take longer to read as a printed text must be first adapted to an accessible format. The reading process involving electronic or optical devices itself also takes longer. At the same time, this is another activity which, if commonly practised, could contribute to the general improvement of teaching results.
- During examinations and tests allow for taking them in adapted forms. They should be established before the test and could involve the following solutions: replacement of written examinations with oral ones, use of examination sheets with larger print size (most commonly 16–18) or in Braille, use of PCs with speech synthesis

or text enlargement software, Braille displays, assistants or extra examination time.

Behaviour in the presence of persons with sight disabilities

Below are several useful principles governing behaviour in the presence of people with sight disabilities. Following them will help avoid embarrassing situations on both sides.

Recommendations:

- Behave casually and naturally towards the other person; ask questions any time it is unclear when and what kind of support matches his/her individual needs.
- Look at the face of your interlocutor with sight disability, always address him/her directly, not the guide who may accompany him/her.
- Use forms unambiguously indicating that a given person is addressed (like his/her first name), in particular when there are more people in the room.
- Do not fear to offer support in, for instance, crossing the street or finding a building or a bus. Ask directly whether assistance is needed, without pressing and not feeling offended if the answer is no.
- Be aware that most people with sight disability are partially sighted (some of them do not stand out in any way whatsoever) and their abilities and support needs vary greatly.
- Take into account difficulties stemming from lack of access by blind or partially sighted person to many messages issued though the visual channel and playing an important regulatory function in communication. Such messages include facial expressions and the

direction of looking as well as specific eye movements, gestures, sometimes proxemics (use of the physical space during interaction between people). Subtle messages through the visual channel often carry information concerning the interlocutor's emotions, his/her involvement or boredom during the conversation, wish to speak, friendliness, disapproval, readiness to accept the content fed by the other interlocutor etc. People unable to see such signals may feel uncomfortable if no sound equivalents appear in the interaction. Wishing to express one's approval, recognition or interest in what the blind student is saying one may directly use relevant words, sounds commonly used for that purpose, as well as voice timbre, tone and dynamics. It is worthwhile to reflect on how our utterances may be received if not accompanied by visual messaging like a voice tone without a facial expression or body posture. Remember, however, that blind persons usually aptly use the other senses as a rich source of information about the context of events or contact with other people.

- Do not comment and do not pay excessive attention to his/her disability, yet do not avoid the subject of non-seeing too hard. Do not stop using common phrases like 'have a look', 'we haven't seen each other for quite a bit' or 'see you' as their meaning is broader than purely sight-related and blind persons themselves use such expressions on a daily basis.

Introducing Tactile Graphics

Joanna Skrzyńska

There are many definitions of typhlographics (tactile graphics). The very word stems from the Greek *typhlós* meaning blind[1]. In most general terms, we can assume that typhlographics or tactile graphics for blind and partially sighted persons are useful and prepared in a simple and unambiguous way, thanks to which they convey possibly all the relevant information about the adapted images or illustrated objects or phenomena. Graphics have been known to man since prehistoric times, as evidenced, for instance, by wall paintings in caves. Creating drawings is very important in the process of development of sighted children and adults. In the blind community, a similar role is played by convex graphics as they stir one's imagination, help express one's emotions and convey information. However, convex graphics require from blind persons prior preparation and acquiring skills needed for reading and creating them. Once such skills are in place, tactile graphics are as important and pleasant for blind persons as traditional graphics are for sighted people, although their reception is somewhat different.

[1] See Jakubowski M. (2009) 'Tyflografika – historia i współczesność, metody i technologie' [Tactile graphics: past and presence, methods and technologies], in *Tyfloświat* issue 1, Kraków: FIRR.

Blind persons read tactile graphics moving their fingertips along their surfaces. Even if the fingers of both hands are involved, the field of perception is limited to the area that is being touched at a given moment and has already been recognised. People with sight disabilities read graphics sequentially, remembering all the elements and gradually reproducing them in their minds making them into a whole[2]. This manner of familiarisation with images takes much longer than is the case with sighted people and requires a lot of patience, willingness and involvement. And so it is very important that tactile graphics are made in a clear way, without any unnecessary details, yet contain all the relevant information.

Partially sighted persons should receive graphics not just convex but also in contrasting colours so that they are able to distinguish between individual areas of the image. It must be borne in mind that partially sighted users, depending on individual preferences, will need a description in print or Braille, unlike blind persons (for whom additional descriptions are made in Braille only). While making a tactile graphic, it is not enough to give a convex form to an ordinary drawing. It may be legible for a sighted person and convex too but not necessarily understandable and useful for blind users. To ensure its utility, specific rules must be observed while making tactile graphics. They are as follows:

- Using touch we are able to distinguish dots if they are at least 2.5 mm away from each other.
- If a line is to have a specific meaning and to be read separately (like a line of tram tracks), it should lie at least 5 mm away from the other elements.

[2] See Lamant A. (2003) [Use of tactile techniques in education] in *Europejska Konferencja Owińska 25–26.04.2003*, Poznań.

- If descriptions are provided in Braille, the text should be at least 3 mm away from the main lines.
- Making a convex graphic for a blind user, replace colours with a tactile texture and the areas covered with various textures should have their edges delineated with lines. The same distance is used to separate characters or areas with markedly different content.
- Making a convex graphic for a partially sighted user use distinct contrasting colours.
- The height of individual lines and characters should be around 1 mm.
- The drawing will be much more legible if various lines are used with different meanings, for instance the auxiliary line thin and dotted, the tram line thick and dotted and the border area line continuous.
- For better legibility arrowheads should be shown as full triangles.
- If several graphic images are put on a single drawing they should be logically positioned against each other, at a suitable distance from each other and if necessary descriptions should be added.
- Making graphics on similar subjects use the same signs in the legend, so that the blind user does not need to learn new symbols anew.
- Making a tactile graphic of a building it is recommended that a full picture be shown by several plans, so that the blind user is clear about the structure of the building.
- Tactile graphics should be executed on durable materials and will not be easily damaged or broken if used correctly[3].
- Making a drawing of an object or animal (e.g. a swan) focus on its contours and draw it in such a position that all its vital elements are clearly outlined, for example body part like the head, beak, legs

[3] For the abovementioned recommendations see Więckowska E. (2009) 'Zasady redagowania tyflografiki' [Rules for tactile graphic editing], in *Tyfloświat* issue 3, Kraków: FIRR.

and trunk. If an item has a colour in reality it must be filled with a texture, contours are not enough. Skip unnecessary details which may hamper the reading of the graphic.

- A text description is often very important for full understanding of tactile graphics. It helps in complete comprehension of their content and recognition of all their elements without assistance. Very often, even well prepared convex graphic without a textual description will not be fully legible to blind people.

The rules governing graphic preparation for blind and partially sighted users may vary slightly depending on the technique applied to make a graphic.

Tactile graphic techniques

There are many techniques for making tactile graphics by blind, partially sighted and sighted persons. Below is a description of two of them, both effectively used by the Jagiellonian University Disability Support Service.

One technique of making tactile graphics requires swell paper and a heater. Available in the A3 format, the paper is on one side coated with a special substance containing alcohol[4]. On the surface covered with that substance, a printout from a laser printer is placed. It may be only in black and shades of grey for blind users or contrasting colours for partially sighted persons. What is of key importance is that most elevated will be elements with suitably selected black parameters while areas with less black content like grey will be lower. Printed this way, the paper is

[4] See Jakubowski M. (2005) 'Tyflografika. Historia i współczesność. Metody i technologie' [Tactile graphics: past and presence, methods and technologies], a synopsis of a multimedia presentation at a conference of the Polish Association of the Blind, Warsaw.

put through a special heater. The high temperature activates a reaction on paper areas printed with appropriate black parameters which 'swell' within seconds and become convex. One advantage of the technique is high precision in tactile graphic manufacture and the possibility of creating various textures. This technique is very often used for making maps, charts, diagrams and other types of drawings. It was also used at the Jagiellonian University Disability Support Service to make a map of the UN member states to be used by a student. The person for whom it was created is partially sighted so the background for individual countries is made in contrasting colours. State and continent borders have been separated by a convex line easy to touch-read. In the countries which are big enough their capitals were marked as convex points. As requested by the student, the names of the countries and capitals, in regular print,

Image 6. Map for partially sighted students

were put directly on the map (if space allowed) or in the legend. One disadvantage of the technique is the relatively high cost of swell paper.

Another technique of making tactile graphics is a dot printout from a Braille printer. Depending on the printer, such printout may be more or less precise. Everest printers are able to print such graphics yet they will be relatively imprecise and lack colours.

Emprint SotDot printers, in turn, offer a simple printout of a graphic with colours. Depending on colour intensity the printed dots will assume various elevation levels and so the texture of the colour surfaces will be more or less convex. After calibration a colour is first printed and then the printer puts dots of various heights onto the printed area. It also uses inexpensive Braille paper, graphic manufacture costs are lower then.

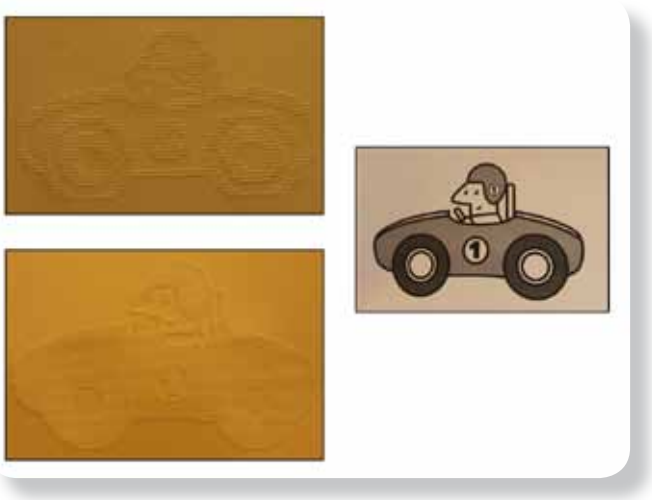

Image 7. Identical drawing made with two different printers

As already mentioned, convex graphics are very important for blind and partially sighted persons. It must be borne in mind, however, that not each blind person will read well even best made graphics. Many people cannot, and so do not want to, read tactile graphics, which is why those interested should be encouraged to read. Additionally, convex graphics should be 'interesting' to touch if they are to invoke a true interest among beginner readers and be a pleasant experience.

Image 8. Braille printer (Emprint SotDot)

Fair of Specialist IT Equipment for Blind and Partially Sighted Users

Magdalena Sławińska

The International SightCity Fair held annually in Frankfurt for eight years now is one of major events in the world of assistive technologies for blind and partially sighted persons. In 2010 the fair saw over a hundred exhibitors from across the globe showcasing their products.

More than four thousand visitors could get familiar with technological novelties and products shown by exhibitors from twenty-one countries like Freedom Scientific, BAUM Retec, GW Micro, Human-Ware, Handy Tech GmbH, Metec AG and Tieman. Notably, a Polish company Harpo also presented its offer. Over and above already tested and known technological solutions, the 2010 edition of the Fair also featured some improvements of the existing products as well as new interesting ones.

Staff members of the IT section at the Jagiellonian University Disability Support Service have been visiting the Fair for the last three years looking for exciting technological solutions. Below is a summary of a few which they have found to be of particular interest: the Step-Hear navigation system as well as the ClearReader+ and Top-Braille devices.

Step-Hear system

The Step-Hear navigation system has proved to be one of the most interesting technological solutions on view. It comprises a base and an activator, the former equipped with high-quality loudspeakers placed in key locations and playing a pre-recorded message. The activator is a small device carried on the wrist by a blind person. When he/she approaches the base at a distance of 8–10 meters the activator starts to vibrate, letting the base know that the Step-Hear system is near. After the activator button is pressed, a diode flashes up and a message from the base is played. The length of recorded information can be up to a minute and concern, for example, the location of a given person. The activator features an in-built battery ensuring its continuous operation for two-three days. The base is available in two versions: standard one for indoor use and resistant to weather conditions for mounting outside buildings. The 2010 Fair saw a presentation of new improved base units with an option of powering them with solar energy. The producer claims that in the absence of sunlight the base will work continuously for two days when its batteries are fully charged. Such a solution could considerably facilitate its assembly in locations where power cords cannot be provided.

Such a navigation system could be successfully used in bringing sound to both university and public buildings. The system could be mounted at main entrances, lifts, junctions of main corridors or important yet not easily accessible rooms and halls. This would be of particular help for blind persons with weak spatial orientation.

ClearReader+

Optelec has presented an OCR device with simple structure and easy to use: ClearReader+. Its shape is similar to that of a small suitcase and it has been designed in such a way as to ensure easy movement. It is easy to use, too – an arm with a camera slides out of the casing and a paper sheet with a text should be arranged in such a way as to make sure that the side of its edge touches the appliances along its length. Notably, many languages on offer include also a Polish reader's voice. Once fully charged, the battery ensures work for up to five hours.

Top-Braille

This device facilitates fast text recognition in traditionally printed media and its conversion to Braille in real time, up to 20 letters per second. Another option that may be activated is letters spoken by a synthetic voice. In size, Top-Braille resembles a computer mouse and features a one-cell Braille display with two additional Braille dots (above and below the six-dot) informing the user of his/her deviating from the text line and the need for correcting his/her movement up or down. The appliance is also equipped with a colour recognition facility. Top-Braille has a USB port making it possible to send texts directly to a PC, it is handy, light and easy to use.

The SightCity Fair is a great opportunity for updating one's knowledge and getting familiar with new IT offers for blind and partially sighted users. The knowledge acquired by our specialists is gradually used to expand the educational support offer available at the Jagiellonian University Disability Support Service.

Part Two
Educational Support for Hard of Hearing and Deaf Students

Methods of Effective Communication

This material comes from the training manual for academic teachers published by the DARE project

The contemporary understanding of hearing disability requires redefinition of the popular perception of persons who are hard of hearing, deaf/Deaf[1] only as clients of medical staff and hearing/speech specialists. They are becoming full members of society ceasing to be those balancing between a given illness assigned to them and efforts focusing on bringing them closer to the standard (ability to hear). Under the social model, their disability stems from their relations entertained with society, linked to the general lack of knowledge concerning ways of communicating with persons who are hard of hearing and deaf/Deaf.

There are three following key ways of communicating with deaf and hard of hearing persons:

- sign language

[1] The term 'Deaf' refers to people who identify themselves with Deaf culture, i.e. those for whom sign language is first or preferred in communication.

- oral speech
- bilingualism

Sign language:

- A language which incorporates visual and spatial coordination
- It has its own rules (like visual grammar)
- In grammatical terms, it differs from spoken language (e.g. does not have articles or passive forms of verbs and has different syntax)
- It does not have a written form (but there are attempts to note it down, like 'sign writing')
- It uses the finger alphabet (dactylography) to specify proper names and new ideas and words
- It is not a universal language.

Just like phonic languages, it is used in the territory of a given country utilising a variety of signs. Examples include ASL (American Sign Language), BSL (British Sign Language) and LSF (La Langue des Signes Française, French Sign Language) but the existence of a given sign language does not always overlap with state borders (for instance, ASL is used in both the United States and Canada; LSF in France and Switzerland).

Oral speech

This way of communicating comprises two categories:

- Understanding: information conveyed by means of oral speech is available through a hearing aid or cochlear implant; it is also integrated with the visual messages received by lip-reading.
- Creation: many people prefer using oral speech.

This strategy promotes auditive-verbal ways of communicating with hard of hearing and deaf persons. In Polish education of children and adolescents with hearing disabilities this communication method is heavily predominant.

Bilingualism

It means using two languages on a daily basis: sign language (Polish Sign Language, PJM) and speech. The philosophy behind bilingualism acknowledges sign language as the 'first' language in education of deaf/Deaf children. It is the basis for the introduction of a second language, the written version of a national language. Scandinavian countries can be seen as pioneers of including this strategy in the educational policies. In Poland, attempts are only being made now to incorporate bilingual education into the teaching process for Deaf children.

Examples of teaching strategies for students with hearing disabilities

Recommendations:

- Make teaching materials available to the student well before the lecture/classes (for instance paper-based or electronic-format notes, a synopsis, a list of new specialist terms, references), and so facilitate the student's more active participation.
- Hold classes/lectures in rooms which are well lit and have good acoustic features. To that end, try to reduce noise (for instance by closing the windows).

- Let the student use available technological solutions like audio-recording lectures/classes, and hearing-assisting systems: FM or the inductophonic loop.
- During seminars and group exercises arrange the desks in such a way as to make the faces of all the students visible to the deaf and/or hard of hearing persons as much as possible (use the U-shape for instance) and so make it easier for the lip-reading students to participate in the debate.
- Avoid standing with your back to the window or another source of light as the face of the speaker is then in the shadow, making lip-reading more difficult.
- Draw the student's attention before formulating a message. Make sure you have established eye contact so that the student knows that he/she is an addressee of a given message. Check whether the student is able to follow changes of speakers during a lecture, practical classes or a seminar. A pre-arranged visual system could be set up to that end ensuring fast signalling who has been given or has taken the floor (for instance by raising the hand or relaying a prompt).
- Before a specific exercise begins explain in detail the sequence of activities to be performed. It is a good recommendation to provide written instructions concerning each exercise and verify whether the student has understood them by asking specific questions related to the text.
- While communicating face the student; do not cover the mouth, speak clearly but without exaggerated articulation, at a level pace. Speaking too slowly may distort the natural speaking rhythm and make it difficult to lip-read for those who find lip-reading a useful communication tool.

- Formulate your messages using unambiguous and clear expressions, emphasising key ideas and words. Explain the meaning of complex language structures, particular of specialist jargon. If the student lip-reads, repeat what you have said reformulating the message by using other terms as articulation systems of many words are similar and around 60% of words being read out is based on guessing so changing words to express the same message increases the probability of its successful reception.
- New, unknown words (particularly specialist) and key terms should be put down in a visible place like a board or distributed as student printouts.
- Deaf students should be given extra time and support in editing written works, as they may experience difficulties formulating sentences that comply with stylistic, grammatical, phraseological and lexical rules of Polish because the rules governing sign language are different.
- During classes/lectures use teaching aids facilitating information reception through the visual channel (for instance multimedia presentations, transparencies, graphs, charts, animations, maps, mock-ups, illustrations and photographs). Audio or video materials should be accompanied by the relevant text transcript.
- Make short resting breaks during classes/lectures as lip-reading means a considerable load for attention and memory faculties.
- Remember that students who lip-read or use support of sign/signed language interpreters cannot read or take notes while participating in a debate. The teacher should give them extra time for reading materials or make them available beforehand.

- Adapt the form of examinations to the student's individual needs. For deaf persons, it is usually recommended to replace oral tests with written ones.

If students use support of sign/signed language interpreters, follow these recommendations:

- Make materials available to the interpreter before classes/lectures so that he/she is able to prepare the translation well.
- During classes/lectures remember that the quality of simultaneous interpretation depends on the interpreter's ability to precisely hear what the speaker is saying. This may be hampered by fast speaking pace, which is why it is important that you speak freely but naturally, at a suitable pace. Experienced interpreters will not ask for reducing the speaking pace or simplifying what you are saying unless a specific problem occurs, for instance distracting background noise. For less experienced interpreters, you may need to adjust your speaking manner. This should be discussed with the interpreter before he/she begins the work.
- In conversations, always address the deaf person directly, not the interpreter. Do not use intermediary expressions between the deaf student and the interpreter like 'tell him/her' or 'ask him/her'.
- Provide the interpreter with a suitable place for his/her translation work so that he/she can stand or sit close to the speaker (the interpreter and student usually work at a distance). It may also be useful to provide the interpreter with a list of the other students in the group or the course schedule.
- Remember that the interpreter may need a break to rest after around 30 minutes. If the course is very demanding or lasts very long,

translation may be done by two or more alternating interpreters. In the circumstances, it is recommended that suitable support be provided. The duration and frequency of the pauses should be agreed with the student and interpreter(s).

- Ensure the observance of high speaking culture during debates as at any given moment it is possible to translate only what a single speaker is saying.
- Give the deaf student extra time to express him-/herself as the interpretation of the teacher's questions and the student's contributions takes longer.
- Acknowledge the fact that the student focusing on the interpreter is not able to divide his/her attention while doing some other things like note-taking.

Educational Cyberspace, or Modern Technologies in Education for deaf/Deaf and Hard of Hearing Persons

Dagmara Nowak-Adamczyk

Given the predictions made by Thomas Landauer that the world of 2020 would be addicted to technology, it is worthwhile to reflect on the challenges that advanced technological solutions present for 21st-century education.

The ever-growing importance of the Internet, the miniaturisation or digitalisation of analogue materials in recent years have undoubtedly contributed to the development of communication technologies for deaf and hard of hearing persons across the world[1]. They also became an inspiration for opening the international scientific debate on effective education of deaf and hard of hearing persons which for a few years now has been ongoing at the National Technical Institute of the Deaf in Rochester (USA) during a seminar entitled 'Technology and Deaf Education'. In 2010, its participants very clearly emphasised the need to create a modern educational space including such aspects as e-competences of the lecturers or redefined strategies for managing

[1] See Nickerson R.S. and Zodhiates P.P. (1988) *Technology in Education: Looking toward 2020*, New Jersey: Lawrence Erlbaum Associates.

Image 9. Captioning used during a presentation delivered at the 'Education Technology and Deaf' seminar in Rochester (USA) in June 2010. It was also interpreted simultaneously into American Sign Language (ASL)

the processes of learning and teaching. They are indispensable for the education of a new generation of deaf and hard of hearing students using both assistive technologies and other technological solutions improving their educational potential, which will be related to the use of tools matching the individual communication needs of deaf and hard of hearing persons, stemming from their various ways of communicating, for instance in sign language, oral speech and following the bilingualism strategy (using both sign language and national language in writing). Thus, the technologies ensuring their equal access to knowledge making up for the consequences of disability will be based on visual and/or hearing-supporting communication.

Image 10. Presentation about tools used in 21st-century education

Selected examples of technological solutions in education of deaf and hard of hearing persons:

a) using the visual modality: video communication, text messages, captioning, subtitles for deaf persons, automatic speech recognition, interactive boards, 'virtual' sign-language interpreter, chat, flashing signals, visualisers.

Captioning

A solution facilitating, by means of a stenographer, the creation of a text version of spoken language unavailable in the audio version. (It also allows for the transfer of information unrelated to speaking like specifying the speaker's identity). The tool is also very helpful for foreigners who want to understand a language they do not know.

'Virtual' sign-language interpreter

Although there are some examples of notation of sign languages (sign writing), the transfer of the content in sign languages is usually video recorded featuring a person communicating in that language. (Sign languages are visual languages with positional-spatial grammar, where apart from signs non-manual elements like facial expressions or the direction of looking are very important). Such a transmission method is also successfully used in e-learning, on various educational platforms or while developing teaching multimedia materials like sign-language dictionaries.

b) using the hearing modality: the FM system, the inductophonic loop, cochlear implants.

FM System

It is a wireless communication system focusing on maximum hearing benefits as well as a better quality of speech understanding by the user in various acoustic conditions. The system comprises two parts: a transmitter directly accompanying the lecturer/teacher (e.g. as a microphone pinned to his/her clothes or a digital remote control) and a receiver directly linked to the student's hearing aid. The proximity of the speaker and transmitter considerably reduces the distance covered by the sound travelling to reach the student thanks to which he/she does not need to sit in the first row to draw benefits from attending classes; he/she can also hear those in his/her direct vicinity.

Inductophonic (Induction) loop

This device is most frequently used in public buildings like lecture halls, auditoria or theatres. Its structure covers a set of wires laid out around the room linked up by means of an electroacoustic amplifier to which other electronic external appliances like a microphone or a DVD player may be hooked up. The induction loop brings benefits to users of hearing aids with an in-built inductophonic coil present in the field of its operation.

Over several days of seminar discussions teachers, instructors as well as scientists have identified four areas of challenges faced by contemporary education of deaf/Deaf and hard of hearing people not just in the United States but also across Europe. They are as follows:

- access to modern solutions i.e.: ensuring support for students in mobile teaching by providing stenographers for them; use of 3D technology; use of videoconference systems, portable communication technologies; effective note-taking, text translations into sign language etc;
- online education (e.g. a bilingual system of Web conferences in sign language and the written version of a national language, sign-language courses, use of visual communication in e-learning, tests available online);
- use of technology to support the educational process (for instance the creation of cyberinfrastructure facilitating knowledge acquisition, social networks, online video forums, blogs focusing on learning how to write academic papers, a multimedia communication platform, interactive sign-language dictionaries);

- assessment of the impact technology has on learning and teaching processes (e.g. impact of online courses and subtitles on content understanding, the students' cognitive skills and motivation).

The abovementioned solutions are considered of special importance not just as regards obtaining information by the student in an attractive interactive form but also improving the level of understanding of the content conveyed. It is after all hard to assess the abilities or knowledge of a given person without using specific communication strategies which to a significant degree may be based on the use of technological solutions adapted to a given person's individual communication-related needs and preferences.

The progress of the civilisation, enhanced availability of various technologies and reduced costs of their production undoubtedly have an impact on further technological progress in education setting various challenges for the users as well as modifying their needs and expectations. There are two fundamental questions which must be asked: what conditions for implementing educational innovations are created by the contemporary educational system for deaf and hard of hearing persons; how ready are academic teachers to accommodate new solutions and include them in the methodologies of the courses they run so as to meet the challenge of the 21st century?

Language Courses for Students with Disabilities

Urszula Szczocarz

Following the idea of inclusive education, Jagiellonian University students with disabilities attend most classes together with their non-disabled fellow students. Adaptations like using sound-recording devices, the presence of a sign-language interpreter and the availability of materials in the electronic format frequently eliminates the differences between persons with and without disabilities as regards benefiting from lectures and classes. However, things are much more complicated in the case of foreign-language classes. Let us have a look at such classes conducted in the conventional way, where at least more than a dozen students work on the basis of textbooks, colourful and graphically complex, and recordings. Let us imagine the position of a blind or deaf person there: it is virtually impossible to keep up with the rest of the group when one can hardly see (or cannot see at all) the text in the book or cannot hear the recordings played to the group. Once the student has fallen behind, problems accumulate resulting in not just lack of educational results but often also an acquired reluctance to learn foreign languages. In 2004 the DSS reacted to such problems voiced by students with disabilities and teachers alike by setting up specialist groups for foreign-language learning. The solutions the Service has worked out supported by several years of practical experience have been in place

also today while the number of persons using that form of teaching is growing steadily.

When the DSS organises foreign-language classes it first and foremost makes sure the basic principles are respected as regards the provision of good conditions conducive to learning languages. Some key success factors are a low number of students per group, which facilitates the individualised approach to the participants, high qualifications of the teachers as well as suitable teaching space. The teachers are competent in handling disability and using adapted teaching methodologies. As the students' sensory channel of sight or hearing is turned off, the fact must be recognised during classes and compensated for in some other way. Indeed, the task of the teachers running foreign-language courses is to find such ways and putting them into practice. Dominika Stopa, a foreign-language teacher for deaf and hard of hearing student groups offers a handy summary: 'all the information must be conveyed also visually. During classes each new word is written on the board, also transcribed phonetically for those who find it useful. If a piece of information can be presented graphically, I use various drawings and illustrations.'

A serious problem is presented by patchy foreign-language learning/teaching at the secondary-school level. This is a consequence of foreign-language school classes not being adapted to the needs of persons with disabilities. The DSS manages such difficulties by organising 'bridging' classes in the year preceding the obligatory foreign-language classes to facilitate making up for at least some of the knowledge gaps individual students have. It must be underlined, however, that in the case of deaf persons it is not infrequently very difficult or just impossible to reach the level attained by other students, to some degree because of their previous educational experiences.

Below is a briefing on how the language courses are run for students with sight and hearing disabilities. The main barrier to teaching blind and partially sighted students is present-day textbooks. 'Partially sighted persons find it very difficult to understand colourful drawings, paragraphs written using fancy fonts or the column-based layout of texts which sighted people find attractive. Also, it is virtually impossible to adapt such textbooks to an electronic version accessible for blind users,' says Katarzyna Błaszczak who collaborates with the DSS in developing adaptations. In the groups for blind and partially sighted persons the teachers use materials in alternative formats, custom-adapted using the technological facilities available at the DSS. Depending on the individual needs, students receive teaching materials in enlarged print or Braille. Some graphic materials useful for language learning are prepared in the convex format or taking into account the abilities partially sighted students have. The students may also use electronic-format texts received by email.

The language teaching room is equipped with convex wall maps of Europe and central Kraków as well as models of the city's historical monuments described in Braille. Such aids are there not only for language learning purposes but also to stimulate imagination and convey some information about the immediate environment. The language room also features a high-quality lighting system which (depending on the preferences) may be set in a variety of ways improving the working comfort of partially sighted students. Another useful aid is a headphone system facilitating conversations in pairs or small groups, as intended by the teacher. Thanks to work with headphones on, background noise and sonic disturbances are eliminated which fosters good concentration during the exercises. 'What is most pleasant in this job is the students'

enthusiasm,' says Halina Kozdęba-Murray, a teacher for a group of partially sighted students. 'When I see involved and motivated participants I know that the effort put into adaptations makes sense.'

Another type of classes caters to the needs of deaf and hard of hearing students. Placing students with hearing disabilities in suitable groups the assessors take into consideration both the level of proficiency in English and communication preferences of individual students. Then appropriate teaching methods are selected to suit their individual needs. Their value is confirmed by what one student has said in the evaluation questionnaire: 'we make effective use of the time available during the classes, we read, talk and write. We do not listen to recorded texts, which we would hardly hear anyway.'

On the technical side, the working comfort of students with hearing disabilities is enhanced by the specialist equipment found in the multimedia room designed with them in mind. An interactive board and a projector make it possible to convey most information visually. The students also receive relevant printouts of the information written down by the teacher during the classes. In this way, the participants do not need to take any notes, thanks to which they pay undivided attention to lip-reading what the teacher is saying or receiving sign-language messages. Some students also use the inductophonic loop installed in the room. The desks are arranged in a U-shape and lighting is good so that optimal conditions are created for effective communication. A handy tool used by the teachers is a light-controlled student prompting system. Flashing lights at the students' working stations tell them, for instance, that the time allotted for a written exercise is almost up. 'The classes I run differ from conventional classes mainly by the frequency of using modern technologies. This possibility considerably enriches the teaching toolbox

in educating students with hearing disabilities,' says Dominika Stopa. If need be, some classes or consultations are conducted on a one-to-one basis.

Persons with sight or hearing disabilities make largest recipient groups at the classes organised by the DSS, yet we are also open in this in regard to support students with other difficulties preventing them from working effectively in conventional foreign-language classes. One example is a class format custom-made for a person with a serious mobility disability. As the student is able to learn only using the PC, the teaching materials are so adapted as to enable him moving around the text independently and completing the exercises using the mouse only.

DSS consultants monitor the quality and level of foreign-language classes on a regular basis and at the end of each academic year all the participants have the opportunity to voice their opinions in anonymous evaluation questionnaires. For a few years now this assessment has been consistently good. The evaluation exercise for the 2009/2010 academic year showed that the foreign-language classes met the students' expectations (80% said definitely yes, 20% said rather yes), while the subjects discussed were useful and interesting (80% said definitely yes, 20% said rather yes). All the participants' assessment was unanimously positive of the teachers being well prepared for the classes (90% gave them a 6 and 10% a 5, on a 1–6 scale), the way the material was explained, understanding and accommodating the needs of persons with disabilities as well as the atmosphere (70% assigned it a 6 and 30% a 5, on a 1–6 scale). Later on, the students willingly continue their foreign-language education at classes run by the DSS. Year on year, the number of those keen to participate is also growing. In the 2010/2011 academic year we

have launched eight groups of various levels of advancement, attended by students from various faculties.

In summary, it should be reiterated that the ultimate goal of language learning is not only passing the examination at the level required for the completion of a given year of the studies. Knowledge of foreign languages facilitates easy use of specialist sources and references needed for academic papers as well as going abroad on student exchange programmes; it also improves their chances of finding employment on the open labour market. The skill of using English is one of the University graduates' key competences.

Water and Oil, or Reflections on Teaching Foreign Languages to Deaf Students at Charles University in Prague

Interview with Marie Dolezalova

Marie Dolezalova

She is deputy head of the Language Centre of the Humanities Faculty at Charles University in Prague, the Czech Republic, where since 2007 she has been teaching English to deaf and hard of hearing students. In 2008, she completed a three-week-long summer course at Gallaudet University in Washington, D.C., in the USA. In 2009, she attained level one of British sign language and is now at level three of Czech sign language. Marie Dolezalova has also completed a Web-based training programme for counsellors working with persons with disabilities. Moreover, she is a coordinator of the Dsigns project, developed as part of Leonardo da Vinci, aimed at creating an Internet course of Czech sign language for healthcare personnel.

Does Charles University in Prague have a unit equivalent to the Jagiellonian University Disability Support Service?

Marie Dolezalova: Yes, it is called the Information and Advisory Centre and its activities are similar to what the DSS does. I myself am a teacher

of English and teach deaf and hard of hearing students, but we also have other students with disabilities. At our University it is a rule that each student, regardless of his/her status must pass an English test. Some, for various reasons, are unable to pass a language test at the generally required level and so an individual approach is needed, these are our students at the Languages Centre. This group includes people who cannot hear or see or move using a wheelchair, as well as persons with other disabilities. We have a specially equipped working room with computers, an interactive board, appliances and software for blind persons as well as teachers well trained for the purpose.

What is most difficult in foreign-language learning for deaf students and teaching for their teachers?

M. D.: Many start to learn a foreign language from the very beginning, so we must considerably speed up the learning process, as we have just four hours a week, the course taking three years. After this time, the students are expected to take a test. In the circumstances, the pace and volume of the material may be a problem. For me as a teacher, however, the biggest challenge is discovering the way of thinking of my students, which is entirely different from that carried out in a language of hearing people. I must confront both ways and adopt my own, and consequently attune the teaching method to their needs. In practical terms that means that I always look for new materials and try out new measures.

Is this difference in thinking due to the specific language used in daily communication between deaf students, that is sign language?

M. D.: Yes, in the case of deaf persons; hard of hearing people are a different story. Students who have not heard since birth have never

acquired the ability to speak in a foreign language. One must remember that Czech is as foreign to them as English. Accustomed to the structure of sign language, they must confront it with the structure of a new language, an entirely different structure let me add. As a teacher who wants to be effective, I must use my knowledge of sign language, examine the differences and find a right way of communication. In other words, I must analyse, how a given phrase operates in sign language and how it will work in English. Once we have gone through this stage of linguistic analysis together with the students, we can move on.

Is this a tip for other teachers of foreign languages to deaf persons: learn your national sign language?

M. D.: Certainly, that is helpful, yet in the Czech Republic it is not obligatory for language teachers working with deaf persons to know sign language. I think, nonetheless, that one should know it since this facilitates understanding of other ways of thinking. If you cannot sign, you need an interpreter, so there is a serious risk of something getting lost on the way, a new piece of information in English or a tip on language learning. Besides, one must bear in mind that when an interpreter is necessary we suddenly have as many as three languages, not two, and so misunderstanding may abound. The result may resemble playing Chinese whispers.

What about sign language in the Czech Republic, its status? Is it used in schools, can one learn it?

M.D.: The situation is changing for the better. In Prague, there are four schools for deaf and hard of hearing children, one of which is oriented towards the bilingual method, as is the case in Brno. Sign language is used

as a tool for explanations and this may pose some difficulties. Until now education of deaf pupils has focused on spoken language (lip-reading), but I cannot imagine how one can sit for several hours concentrating on this kind of understanding.

Can the bilingual method be considered promising, more effective than its predecessor?

M. D.: I just do not know, hard to say, it is very costly for sure, because it requires two teachers. My experience tells me, and I have tried out both methods explaining things in both Czech and sign language, that the result is better in the latter case. But please remember that I teach university students who are adults, not children. Obviously, what is needed is a tried and thought over teaching method, but certainly, when I am using sign language my students tend to understand better and more.

Are there any differences between teaching deaf and hard of hearing students, for instance as regards educational approaches in the context of language learning?

M. D.: Yes, hard of hearing students make other mistakes. Also, there are many differences, but one may assume that hard of hearing students want to speak, while that option is unavailable for deaf students. Examinations are carried out using the computer in the Internet-chat format. It is, just like a conversation, a direct spontaneous exchange of opinions on a given subject, usually some reading matter. There are many advantages of this format: it is interactive and quite fast, and on the other hand it does not require any articulation of sound. It is also easy to record, correct and evaluate. As is the case with all the students, mine also tend to digress and go off at a tangent, but after such a session their

knowledge of a language can be verified. Afterwards I often go back to the mistakes the students make and we clarify things together.

Deaf persons make up closed communities. Is it easy for teachers to reach them?

M. D.: I am not trying to become part of this community, I can hear and will never get to know the world through their eyes; I can learn a lot, I can observe and this is what I do, but I know I will not cross a certain threshold. It is like water and oil, two worlds which will not mix and that is why at their interface misunderstandings are frequent. It is easy to offend deaf students, but sometimes they, following their own rules, may also hurt others. I have assumed the principle of openness following which I tell my students: if I do something you are not comfortable with, tell me and I will tell you when there is something in your behaviour that I do not like. Here is a practical example: students used to be late for my classes, which supposedly in their community is not rude. I asked them not to do it as it bothered me and the problem got solved. The other way around, there are also many examples of misunderstandings and explanations. Deaf people do not like at all to be shown pity. I remember once writing to the head of one of their organisations in good faith I replaced the word 'secretary' with 'assistant' and it turned out that the very word I considered a more polite option in the situation was associated with dependence and was interpreted as suggesting pity in a way. That was unacceptable. In that community there are some binding standards, and it is good to know them in order not to offend anyone. Yet being among hearing people on a daily basis one may be totally unaware of them, obviously. To move around in both communities without sparking conflicts one then needs openness and caution.

Here and there in Poland one can still see some consequences of the unfair and untrue view that deaf people are less intelligent. How do you cope with stereotypes concerning them in the academic environment?

M. D.: Such stereotypes are also present in our society. Because communication is impeded, many people think that deaf persons require constant help (assistance), which, in turn, they do not tolerate. It is also true, that deaf people used to have limited Internet access, so unable to read and engage in interactive communication with the world they did not develop this ability and could be regarded as undereducated. They also often treated themselves as less intelligent because of the mistakes they made in written language. At university such opinions are not heard, as that would be politically incorrect. But the truth is that most deaf students choose an academic field called 'communication with deaf persons'. Lecturers/Teachers are unwilling to see deaf students in other academic areas, they do not know how to go about them, how to teach them, they fear this challenge. Likewise, they do not agree to have a sign-language interpreter present during their lectures/classes, saying they expect the pace of work to slow down or the other students' attention to be diverted. Here is the real problem.

Is there any good idea concerning remedying the situation so that such public attitudes, such stereotypes could be eliminated?

M. D.: As a matter of fact we do not have a teacher training programme comparable to that offered at the Jagiellonian University. Each of our university faculties has a counsellor who provides support for students with disabilities. He/she receives training in various fields, becomes familiar with issues related to various disabilities, as well as psychology

and sociology. Yet there is no programme which would improve the disability awareness of academic staff. If a lecturer thinks that over 15 years of teaching he/she has acquired good practice which does not require any corrections because it works, nothing will make him/her change his/her mind. In Czech society it is relatively new to openly talk about disability.

Thank you.

Interviewed by Agata Stawska in July 2010 during a meeting of the DARE 2 project's quality management group held in Kraków.

Editorial note

The Congress of Deaf Educators held in Milan in 1880 officially banned use of sign languages in education of deaf persons treating them as hampering the acquisition of 'pure speech'. At present, various countries suggest various solutions aimed at widest possible use of national sign languages.

The Polish education system for deaf persons is still dominated by teaching using auditive-verbal methods inspired by those for sound speech acquisition and hearing support. This philosophy, known as oralist, fails to produce satisfactory results in teaching deaf people, as evidenced for instance by a low number of such persons in university education in Poland. Polish Sign Language (PJM) is not officially included in the system designed for teaching deaf persons at any level of education; it is also charged with many discrediting stereotypes. PJM the natural language of the Deaf community, is confused with the Language and Sign System (SJM) showcased by a 'sign-language interpreter' seen

for example on television and identified as a 'sign language'. SJM is actually a visual representation of Polish (use of manual signs following the grammatical rules of Polish). It has nothing to do with either PJM or the notion of bilingual education, in the case of deaf persons referring to Polish Sign Language and the written national (Polish) language.

Since 1999, the Faculty of Polish Studies at Warsaw University has been involved in linguistic research on PJM. The UN Convention on the Rights of Persons with Disabilities signed by Poland in December 2006 refers to education embracing Polish Sign Language. In 2008, the foundations were laid for a Sign Language Act.

At the Jagiellonian University deaf students can count on various methods of educational support, including the provision of sign-language (PJM) and signed-language (SJM) interpreters. The University is Poland's only school of higher education to offer training courses for academic teachers focusing on disability awareness, including a module focusing on hearing disabilities (www.DareProject.eu).

The American Perspective: Students' Linguistic and Cultural Diversity at Gallaudet University in Washington

Dagmara Nowak-Adamczyk

Those keenly interested in issues faced by deaf/Deaf persons dream of a visit to Gallaudet University. The school is recognised across the globe as a prestigious university offering high-quality educational programmes for deaf/Deaf and hard of hearing students and one which promotes the idea of diversity among its students, as well as that of inclusive deaf university. It was here back in 1960 that the results of William Stokoe's linguistic research provided insights into the structure of American Sign Language (ASL) and initiated further study of ASL, which was to become the basis for similar activities in various European countries. Today, the 1988 student protests known as the Deaf President Now movement are a global symbol of courage and determination shown by the students defending their own rights as members of a linguistic and cultural minority.

Called Gallaudet University since 1986, the school offers its students a wide range of courses, including classes on American Sign Language (ASL) and Deaf studies promoting the interdisciplinary approach to the Deaf community and sign language. The courses focusing on ASL give

the students knowledge of the language and cultural awareness, a key aspect of their cultural identity (as members of Deaf culture). All the classes and lectures implement a visual communication strategy, that is using both ASL and the written version of English, also aided by various technological solutions. As the students may have diverse educational and linguistic experiences (speaking persons, ASL users, those who write in English) the school offers them additional support in the form of various ASL and English courses.

The teachers, instructors and academics still cherish the discourse on the quality and effective methodology of bilingual education. In June last year at a conference entitled *Educating Diverse Students: Language, Culture & Learning* one of the most contentious subjects was effective language education bringing good results as regards the reading and writing skills

Image 11. Gallaudet University in Washington

of deaf students. A wide spectrum was presented of technological solutions which could improve the quality of language teaching (both in English and ASL). It was explicitly stressed that effective systems must be in place for evaluating the results and achievements of the students taking account of their linguistic diversity (proficiency in ASL and written English). It is worth noting that Professors Tonya Stremlau and Gene Mirus have pragmatically analysed word games in English and ASL teaching for university student and schoolchildren of various ages. The results of their inquiries let them report a very simple relation: the easier and more proficient one's use of a language is, the better one's understanding of its structure. Also, the abstract tier of a language necessitates becoming familiar with its structure, which at the right moment would support learning of another language. Creating an effective and attractive language game the researchers tried to breathe a new life into classic English-grammar classes which are not very appealing to the average deaf student.

At this historic university and that important conference experiences of the Jagiellonian University Disability Support Service were presented as regards educational support for deaf/Deaf and hard of hearing students, including English-language classes: *Technology & English in the context of diversity: learning and teaching deaf/Deaf and hard of hearing students*. During the conference the idea behind the DARE project was also presented as well as selected multimedia training materials from the project's section for deaf/Deaf users. The conference participants showed a very keen interest in the DSS offer. Both the disability support services and DARE project materials were rated very well. At the same time, the participants were surprised to learn about the status of Polish Sign Language, still not introduced into the Polish educational system for deaf children

and adolescents as a bilingual education strategy. (The unused potential of deaf persons as regards manual language learning results in more difficulties as regards learning, understanding and use of Polish). They found it hard to accept the fact that in Poland the unfavourable policy of oralism has been dominant for as many as 130 years.

As a result of good co-operation between Gallaudet University and the Jagiellonian University Professor Tonya Stremlau accepted the invitation to the DARE project closing conference: *Disability Awareness and New Challenges for Education*, held in October 2009. During the event, in the Main Auditorium of the Collegium Novum building, she presented in American Sign Language the idea of bilingual and bicultural education of Deaf students. The contribution was interpreted simultaneously also into Polish Sign Language.

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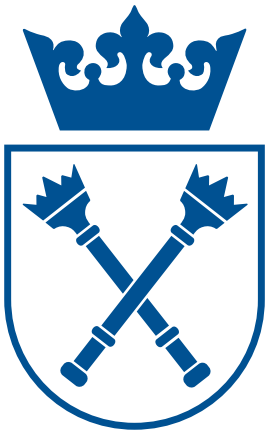

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The Jagiellonian University
Disability Support Service

invites **academic teachers** whose students include persons with disabilities to

a disability awareness enhancement workshop.

The objective of the workshop is to equip the participants with knowledge concerning disability: its types, consequences for the educational process and disability compensation methods as well as techniques for preparing classes so that they are adapted to the needs of students with disabilities.

The workshop is conducted as a group training session. The materials to be used are heavily interactive and the exercises prepared for the participants are based on activating methods.

At present, the following three modules are available:

Who are people with disabilities?

The workshop focuses on the following themes: the role of the oppressive language used while speaking about disability, the stereotypical perception of persons with disabilities as a threat to their participation in society on equal terms and the role of the environment of persons with disabilities in determining his/her opportunities and limitations.

Each module lasts three hours. At the end of the workshop the participants receive certificates and supplementary materials.

The workshops are offered on a regular basis in the afternoon at the office of the Jagiellonian University Disability Support Service in Kraków at ul. Retoryka 1/210.

www.DareProject.eu

More than Braille

The workshop focuses on educational support for students with sight disabilities. The participants become familiar with methods for conducting classes and preparing materials in a format adapted to the needs of students with this type of disability. Appliances are showcased which facilitate the elimination of restrictions in access to written word through electronic and Braille versions of texts.

I cannot hear, I am a university student, I talk

The workshop covers educational support for students with hearing disabilities. The participants become familiar with alternative communication techniques used by persons with hearing disabilities and requirements related to principles of conducting classes for student groups including deaf and/or hard of hearing persons. One of the workshop's assets is a discussion on the meaning of Deaf Culture offered as part of the training.

If you would like to participate in a workshop please contact trainer **Małgorzata Perdeus** at **malgorzata.perdeus-bialek@uj.edu.pl.**

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