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The Use of Special Computer Technologies in Teaching Students with Hearing Impairment

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Abstract

In the educational process, it is not the information technology itself that is important, but the extent to which its use serves to achieve the actual educational goals. The choice of means of communication should be determined by content, not technology. This means that the choice of technologies should be based on the study of the content of training courses, the degree of necessary activity of trainees, their involvement in the learning process, specific goals and expected learning outcomes. The result of training depends not on the type of communication and information technologies, but on the quality of the development and provision of courses.

Keywords: *Sign Language Teaching; Computer Technology; Interface; Special Techniques; Telecommunications*

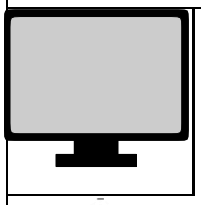
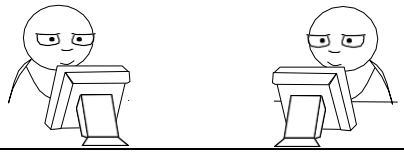
Introduction

When choosing technologies, it is necessary to take into account the greatest compliance of some technologies with the characteristic features of the trainees, the specific features of specific subject areas, the prevailing types of educational tasks and exercises.

The main role performed by telecommunication technologies in distance learning is the provision of educational dialogue. Learning without feedback, without a constant dialogue between the teacher and the student is impossible. Learning (as opposed to self-education) is a dialogical process by definition. In full-time education, the possibility of dialogue is determined by the very form of organization of the educational process, the presence of the teacher and the student in one place at one time. The educational dialogue should be organized with the help of telecommunication technologies.

The Main Part

Technologies can be divided into local and network, network - synchronous (online) and asynchronous (off-line) No. (Fig. 1).

Local	Network
 Multimedia courses	Offline E-mail Teleconferences OnlineTalk Chat Audio- and video conferences
 Audio and video cassettes	

When using synchronous (on-line) communication tools, the teacher and the student interact at the same time (real-time process). This form is closer to the traditional one, especially if the participants of the educational process are visualized (for example, using Skype). In this case, you can see the live reactions of the interlocutor, hear the intonation, etc., which contributes to a more complete understanding.

The advantage of synchronous DO over asynchronous DO is also that the social deprivation of the learner, which is the main disadvantage of any form of DO, is manifested to a lesser extent when using synchronous tools than when using asynchronous instruments.

However, the synchronous form assumes a high level of development of speech, thinking, attention, a high reaction rate of students, i.e. qualities that people with various developmental disabilities most often do not possess.

In addition, in the conditions of Russia, it is not always possible to use a synchronous form due to time differences in different time zones, since such a form does not require simultaneous inclusion in the work of all participants in the educational process.

Synchronous participation is provided in the following most common technologies:

chat - allows you to organize a discussion using text messages transmitted in real time, regardless of the location of the users;

Audio conference - allows several participants to communicate with the help of oral speech in real time. This form does not involve a visual analyzer and requires a good state of hearing and speech of users;

Videoconference - enables multiple users to interact in real time. This form is very close to the traditional form of education. In addition, there are software tools that translate oral speech into written (titles), which makes it possible for people with hearing impairments to get involved in this process5. It is also possible to transmit information in the sign language of the deaf. However, as in all other cases, it is necessary to take into account the peculiarities and specific needs of persons with hearing impairments (for example, if it is necessary to acquire lip-reading skills, develop auditory perception, auditory self-control, etc.) and carefully approach the choice of forms of education (traditional, distance, mixed).

Refer to educational materials repeatedly, at an individual pace; the speed of perception and processing of information does not matter; questions that arise can be asked by phone (orally) or by e-mail (in writing).

The main technical advantage of off-line technologies is that they are less demanding on computer resources and communication line bandwidth. They can be used even when connected to the Internet via dial-up lines (in the absence of a permanent connection).

An important advantage of off-line technologies is a large selection of software for working with e-mail and teleconferences. Modern mail programs allow you to send messages in hyper-text format (i.e. with hyperlinks, font and color selections of text fragments, insertion of graphic images, etc.) in addition, you can attach a file of any format to the letter, which makes it possible to forward, for example, documents in MS Word format. The effectiveness of off-line technologies is manifested in the organization of ongoing consultations, ongoing monitoring based on control and independent work, checked "manually" by the teacher.

These qualities make the asynchronous method more acceptable for most categories of people with developmental disabilities. However, it should be taken into account that, firstly, written speech is mainly used in this case, and secondly, the user does not have direct, direct contact with other participants in the learning process, which aggravates the already significant social isolation of the learner.

Technologies of this kind include e-mail, mailing lists, teleconference, etc. With the help of a list server, the distribution of educational information can be organized, personal communication is established via e-mail, and a teleconference allows you to organize a collective discussion of the most difficult or difficult issues of the course. All these technologies allow you to exchange messages between different computers connected to the Internet.

The educational process carried out on the basis of distance learning technologies includes both mandatory classroom classes and independent work of students. The teacher's participation in the educational process is determined not only by conducting classroom classes, but also by the need to provide constant support for the educational and cognitive activities of students by organizing current and intermediate control, conducting online classes and consultations.

When organizing joint educational programs, network technologies of distance learning are of particular importance, since they allow the principle of distribution of educational resources and human potential to be most fully realized.

Hearing loss negatively affects, first of all, the speech development of the child, which, in turn, complicates social communication and cognition of the surrounding world. Limited communication affects the formation of the psyche, negatively affecting the development of higher mental processes (thinking, perception, memory).

Modern microelectronics and computerization make it possible to create not only very advanced hearing aids, but also to supplement them with equipment that increases the capabilities of the hearing aid, for example, an additional microphone to obtain more complete sound information.

Today, computer selection of individual hearing aids is carried out on the basis of numerous individual characteristics of the patient's hearing and other data; his individual data is programmed in the hearing aid, which can be restored when the device is repaired or any of its blocks are replaced. Sensory activation and regulation of the hearing aid are being installed, and more advanced materials are being sought for the manufacture of hearing aid parts that are not subject to oxidation and other adverse environmental influences.

Currently, cochlear implantation is considered the most promising direction of social rehabilitation of people with hearing impairments. According to statistics, 1 to 3 children with total deafness and sensor neural hearing loss of the IV degree are born per 1,000 newborns.

A cochlear implant is a medical device, a prosthesis that allows compensating for hearing loss in some patients with severe or severe sensor neural hearing loss.

A cochlear implant is a medical electrical device that compensates for hearing loss in some patients with severe or severe sensor neural hearing loss.

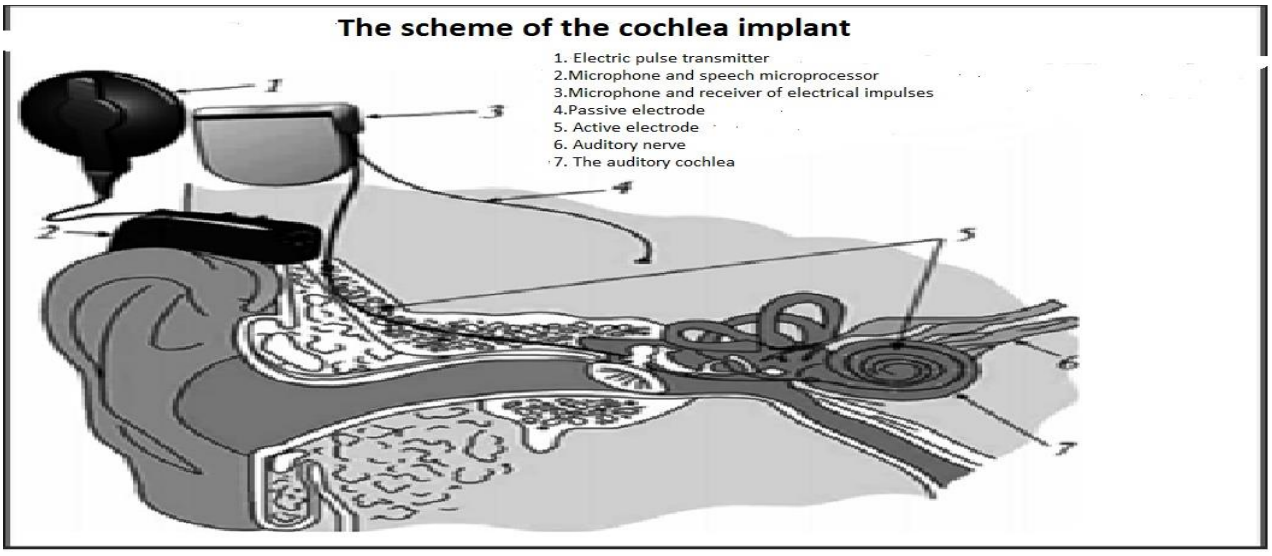
Cochlear implantation is a type of hearing aid, however, unlike a conventional hearing aid, which simply amplifies acoustic signals; a cochlear implant converts them into electrical impulses that stimulate the auditory nerve1.

The main purpose of using a cochlear implant is to teach children oral speech, for this the child needs everyday auditory and speech stimuli and auditory-speech conversational training.

Cochlear implantation is a type of hearing replacement, however, unlike a conventional hearing aid, which simply amplifies acoustic signals, a cochlear implant converts them into electrical impulses that stimulate the auditory nerve. The operation of the cochlear implant is as follows: the microphone receives acoustic signals, and then it transmits them to the speech processor.

A speech processor is a computer that translates acoustic signals into electrical signals.

In the future, it processes electrical signals, then they are carried to the transmitting antenna, and the receiving antenna processes the signals and conducts them to the electrodes that stimulate the auditory nerve, then the irritation is transmitted through the auditory nerve to the brain. The implant consists of two parts: external (removable) and internal (implantable). The implanted (internal) part contains a receiver (3) with an induction coil inserted into the temporal-occipital part of the skull, and a chain of electrodes (5) inserted into the cochlea (7) of the inner ear. This part of the cochlear implant is completely autonomous, as it does not have any external terminals, does not contain batteries and any other parts that require replacement. The outer (removable) part of the CI is attached to the auricle using a special hook and consists of a microphone (2) placed in the body of the ear hearing aid, a speech processor (2), which is actually a small-sized specialized computer, and a transmitter antenna (1) held by the magnetic field of the implanted receiver (3). The sound is perceived by the microphone, then encoded in the main and most complex component of the external part of the implant — in the speech processor - into a sequence of electrical pulses and transmitted through the skin via a radio channel to the receiver (3) of the implanted part.



Implantation scheme Fig. No. 2

The system of cochlear implantation measures is divided into three stages, each of which takes place using ICT.

In the preoperative stage, preliminary computer (CT) or magnetic resonance imaging (MRI) of the temporal bones and snails of the inner ear are performed to identify pathology that excludes the possibility of cochlear implantation: anomalies of the development of the cochlea of the inner ear, etc. Conducting cochlear implantation (the operational stage) requires a sufficiently high qualification of otorhingologists, the availability of modern optical and microsurgical equipment. The duration of the implant operation is about two hours and is performed under general anesthesia. Through the behind-the-ear incision, the site of the mastoid process is exposed, in which the bed for the receiver of electrical pulses is drilled with borons. Next, a standard mastoidotomy is performed to provide an approach to the medial wall of the tympanic cavity. Cochleostomy is performed, through which an active electrode with a length of 24-32 mm is inserted into the snail's drum ladder. The passive electrode fits under the temporal muscle. The operation is completed by testing the cochlear implant and checking its correct location on the X-ray of the temporal bone. The implant can stay in the head all your life.

At the stage of postoperative rehabilitation, a speech processor is connected. This does not happen immediately after the operation, but after the complete healing of the surgical incision on the skin (after 3-4 weeks). The first connection (first setup, programming) of the speech processor takes place in the cochlear implantation center.

The tasks of the audiologist (according to Korolyova I.V., 2009)1 when setting up the CI processor is:

1. Telemetry, switching on, programming of the CI processor.

Correction of the settings of the CI processor based on the reactions of the child during the tuning of the CI processor (involuntary, conditionally-motor), observations of the sign language teacher and parents for the reactions of the child.

Achieving the settings of the CI processor that allow the child to perceive speech sounds in the entire frequency range at a distance of up to 5-6 m.

2. Achieving optimal settings based on objective methods, observations and test results of the EARS/LitlEARS (MED-EL) sign language teacher, subjective assessment of the patient.

3. Teaching the patient/ parents to control the processor controllers and monitor his condition.

4. Registration of the stapedial reflex to electrical stimulation of the electrodes.

5. Clarification of the maximum comfort level according to the registration data of the threshold of the electric stapedial reflex.

6. Conducting tonal audiometry in a free field.

7. Reconfiguring the hearing aid.

The process of correctional education of children with hearing impairments is based on a polysensory basis. In this case, the main channel of perception is the visual analyzer.

Much attention is paid to the introduction of ICT in the pedagogical process in educational organizations that implement AOP for children with hearing impairment. Various hardware and software tools are used in diagnostics, training and education, in correctional and developmental work. Complexes of sound-amplifying equipment under the control of a computer program are used to develop the auditory perception of hearing-impaired children. Individual auditory work rooms are equipped with computer auditory-speech simulators with the possibility of using standard training software.

The use of technical means of education (TSO) in a special school plays an important role in compensating and correcting the shortcomings of the development of deaf children and provides a solution to a number of tasks:

1. Improving the quality of students' knowledge. The use of TSO makes it possible to acquaint deaf students with the surrounding world in all its diversity, development, to show individual phases of this development, to highlight certain elements in the complex, to reveal their dialectical connections and patterns. As a result, conditions are being created for teaching deaf students the ability to" analyze, compare and generalize the studied material, establish causal relationships, reason; opportunities for the formation of scientific concepts are expanding.

2. Increasing the density of lessons, rational use of educational time, increasing the productivity of teachers and students.

3. Ensuring the visibility of training. As a result of the application of TSO, conditions are created for a more complete account of the psychophysiological characteristics of deaf students, the possibilities of their cognitive activity. Characteristic didactic features of TSO used in school are expressiveness, richness, visual techniques, emotional saturation. This contributes to a better perception and assimilation of the material.

4. Stimulating independent creative activity and increasing the motivation of teaching deaf schoolchildren. When viewing on-screen manuals, a surdo- teacher can pose problematic questions and tasks to students (for example, to compare, search for missing information, generalization, systematization), thereby activating cognitive activity and interest in acquiring knowledge.

Currently, schools for the deaf use a variety of audio-visual educational materials, including on-screen (films, slides, filmstrips, transparencies or codepositives, epiobjects) and on-screen audio teaching aids (films, film fragments, educational TV programs, video recordings).

Audiovisual means are demonstrated using projectors, TV, computer, etc. Projection equipment gives the greatest effect with its complex use.

The presence of new modern equipment changes the traditional methods of conducting the lesson, the forms of presentation of educational material, the nature of the guidance of cognitive and practical activities of students with hearing impairments. All audiovisual means in their impact on students are interrelated, but not interchangeable.

A graph projector, an interactive whiteboard with the help of which you can project any material — not only ready-made images, but also those drawings that are performed immediately before the lesson or even during the lesson, is widely used in a school that implements AOP for children with hearing impairments. In this case, students see the process of solving the problem in dynamics. The drawing can be supplemented as the material is explained, which allows you to visually imagine the parts of the whole, the ratio of its parts, etc. When the frames are superimposed in the right order, it becomes possible to show deaf children the sequential transformation of an object or phenomenon.

Among the static visual aids in the school implementing AOP for children with hearing impairments, presentations representing a thematically combined series of slides are widely used. Cognitive tasks solved with the help of a presentation can be relatively easily combined with various forms of work, using the same word and text temporarily. It is advisable to use presentations when a detailed analysis of a limited number of consecutive, most significant phenomena and processes is necessary.

Educational films, more informative than static manuals, are also used in the educational process of the deaf school.

In the process of teaching children with hearing impairments, specialized programs are used.

The "Spectrum of Sound" module is aimed at working out the correct pronunciation of individual sounds by visualizing their spectra. It is advisable to combine working with this module with working in front of a mirror.

In addition to special programs, computer music editors, didactic computer games designed for normally developing children, speech therapy computer games are used.

At the same time, tasks or instructions are entered in the field of reference buttons, which are presented after auditory or auditory-visual perception of oral speech utterances, which ensures that the perception of the material is accessible to all students. Thus, the teacher gets the opportunity to organize speech communication, develop auditory perception of students.

Conclusion

When using ICT, a sign language teacher requires careful preparation, which involves knowledge of the content of the material to be demonstrated, a clear formulation of the educational tasks that the screen manual serves to solve; determination of the purpose of using the manual (to form an attitude, motive for educational activity or for cognitive purposes); clear lesson planning - determining in which part of the lesson and how the manual will be used, how it will be combined with other methods (with a layer, action); adaptation of titles, preparation of questions and tasks for students.

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