Educational communication and support technologies for deaf students

Anca LUŞTREA[*]

Abstract

Support technologies are a key concept that refers to the technical tools helpful in recovery, rehabilitation and education of people with disabilities. They play an important role in achieving effective communication with others and especially in schools, in educational communication. This study examine the main support technologies used with hearing impaired students in order to enable them to communicate effectively in school and successfully participate in educational programs. Also, in relation to the use of supportive technologies the teacher`s scientific beliefs about the best educational communication approach (gestural, oral or total) is examined. In order to assess the study variables two questionnaires was administrated to 20 teachers for deaf from CSEI C-tin Pufan Timisoara. Results revealed that the teachers adopt the total communication model, with accent on bilingualism, and except hearing aids, they do not use other communication support technologies.

Keywords: educational communication, support technologies, deaf students

1. Introduction

Educational communication facilitates the educational achievement, regardless of content, levels, forms and parameters involved. Compared to this, classroom communication appears as a particular form, binding, determined in the transmission of the curriculum and the specific act of learning. Communication, as a form of interaction and activation, involves gaining communicative competence. Its absence often explains the failure or the difficulties that highly trained teachers meet in their direct work with the

[*] PhD. Assistant Professor, Department of Educational Sciences, West University of Timisoara, anca.lustrea@e-uvt.ro

students. To make educational communication effective for hearing impaired teachers must know the characteristics of the communication and its specific in the context of deafness.

Communication is a process of transmitting information. The simplest scheme of communication between two people includes the following components: sender, code, communication channel, message, communication recipient and the feed-back. In the communication with the deaf student the sender is a hearing teacher and the communication recipient is a deaf student. The code is a system of signs that mean something, Typically, the code is the language, important are knowing and understanding the code by both sides. Therefore the teacher for the deaf must master a common code with his students.

Understanding deaf children language and communicational experiences in different life environments is a complex process (Allen, Anderson, 2010). There are three main approaches to language acquisition and also to the method used in educational communication: the oral, the bilingual/bicultural and the total communication approach (Luştrea, 2017).

The oral approach focus on verbalization, on acquisition of the oral (or phonetic) form of the language, the sign language is excluded from communication. In the classroom the teacher communicates with the students only in the oral form of language and demand from the students to communicate between themselves only orally. The code is in that case the Romanian language, the channel of communication is auditory and visual (in speechreading).

On the other side is the bilingual/bicultural approach. In this philosophy, the child is valued as deaf, and allowed to speak and learn in Romanian Sign Language (RSL). In the classroom the teacher communicate with the students and the students between themselves in sign language. The code is in that case is the RSL and the channel of communication is visual (in perceiving the signs).

Those two antagonistic approaches to language acquisition and communication do not exist in the Romanian special school system, only the third one, the total communication philosophy. In the total approach any mean of communication is accepted as valid, as long as it can improve human interaction. In the classroom the teacher communicate with the

students and the students between themselves both in Romanian and in RSL. The code is in that case is the Romanian language and in parallel the RSL and the channel of communication is both auditory and visual (in speechreading and perceiving of signs). All the Romanians special schools for deaf are total communication schools, but put more emphasis on oral or on bilingual methods.

In order to facilitate the understanding of the code and thus of communication, in the schools for deaf support technologies are used. Support technologies are used as compensatory tools for disabilities in question, providing greater independence in everyday life and technical support for specialists in the recovery and education of deaf students. The term support technologies means any item or piece of equipment acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities (Robitaille, 2010). There are three main types of support technologies: low-tech (the ones that don`t require electricity to function), mid-tech (use batteries or have electronic circuits) and high-tech tools (complex electronic devices) (Bugaj, Norton-Darr, 2011).

Support technologies have played an important role in the lives of the deaf for a long time, especially in terms of distance communication. The first system used for this purpose was the text phone, which communicate via text messages. The advancement of new informational technologies has facilitated distance communication for deaf, first via mobile (text messaging), and then through written or video communication via the Internet.

Support technologies used in education refers specifically to support communication technology equipment (hearing aids, cochlear implant) and to group technologies (FM systems) and the technologies used to support recovery of individual communication refers to hearing aids, cochlear implant voice amplifiers, audiometer and polidactilograf. Hearing aids are electronic devices that constitute as an aid in perceiving the sounds and the opportunity to learn verbal communication. In classroom situation, in addition to hearing aids/cochlear implant, the FM systems or infrared systems may also be used. FM systems are collective tools for amplification and transmission of sound to the group. The teacher and students are wearing a microphone that captures and amplifies the voice, transmitted by radio to a certain frequency to individual student`s aids. Infrared systems use light waves to transmit sound from a transmitter to a special receiver that can

be individual or for a group. "Specialized hearing technologies may reduce the impact of barriers that deaf students experience in schools, such as classroom noise, rapid rate of discussion, rapid change of topics, and large numbers of people engaged in conversation, all of which can prevent deaf students from participating in teacher–student and student–student communication." (Rekkedal, 2012, p.499)

It is also possible to use assisted note taking, computer-assisted note taking, hand writing recognition, digital pen, SMART tables, iCommunicator and Video Remote Interpreter. Assisted note taking and computer-assisted note taking requires the help of a support teacher to take notes in real time in pen paper or electronic format. Handwriting recognition systems and digital pen are systems that convert handwriting in to electronic documents. SMART interactive white boards are devices that via a USB connection are connected to the computer, with all its benefits. For deaf students they are particularly useful because they can provide visual support for understanding and learning new knowledge. iCommunicator is a digital tool that converts the spoken word into written electronic or video-sign language (Hersh, 2003). Video Remote Interpreter is a device that transmits video images of an sign language interpreter located in another place, which translates into sign language teacher`s message (Robitaille, 2010). Unfortunately, iCommunicator and Video Remote Interpreter is not available in our country.

In recent years support technologies for deaf relies mainly in advance electronics and virtual technology (Sullivan, Sahasrabudhe, 2017). New online applications and virtual communications tools (Abdallah, Fayyoumi, 2016; Martins et al., 2015) or sensory substitution aids (Sorgini, Calio, Carrozza, 2017) are developed customized to different needs, including the ones related to deafness. The rapid development of research on assistive technologies (Kbar, Bhatia, Abidi, Alsharawy, 2017) reflect the shift the accent from the product to a user-centered approach (Abbott, Brown, Evett, Standen, 2013).

Assistive technologies are a defining component of deaf culture (Eckert, 2010), but in recent years the new technology of cochlear implantation introduced a new element in the deaf culture. More and more deaf children are implanted in a young age, preferring to attend mainstream schools and missing the experience of creating a deaf identity in the special schools, the impact of this development being yet unknown (Marschark, Zettler, Dammeyer, 2017). However, deaf technologies and especially cochlear implants have an

impact on psychosocial functioning and quality of life but yet unknown in relation to deaf culture (Marschark et al., 2017).

Inthis researchwe want todetermine thetypes of support technologies used inschoolsfor the deafandthe link betweenthe type ofcommunication chosenby the teacherandsupporttechnologiesused.

2. Specific aims

Given the important role of support technologies in educational communication and language acquisition, we sought to assess the type of educational communication model adopted by the teachers for deaf and the support technologies chosen to facilitate the educational process. We address this specific aims:

- Assess the model of educational communication and the type of language acquisition approach adopted by the teachers for the deaf.
- Assess the types of support technologies used in the educational process.
- Determine the link between the chosen educational model and the support technologies used.

3. Research hypothesis

We presume that:

1. The teachers for deaf adopt mostly the medical model of disability and the oral approach to language acquisition.
2. Due to low financial resources teachers have little support technologies at their disposal.
3. The support technologies used in the educational and rehabilitation process are limited to hearing aids and cochlear implants.
4. There is no differentiation in the choice of support technologies in relation to the degree of deafness.
5. There is no differentiation in the choice of support technologies in relation to the educational communication model adopted.

4. Methods

4.1 Participants

In the research group are included 20 teachers from CSEI "Constantin Pufan" Timisoara, aged between 25 and 44 years old, with a mean age of 35.8. Lot gender distribution reveals 19 women and 1 man, with a mean of teaching experience in schools for deaf of 11.7 years. The participants are 10 psychologists (50%), 9 special education specialists (45%) and 1 (5%) mathematics professor. The positions occupied in school are 7 teachers for deaf (35%), 5 educational teachers (25%), 2 kindergarten teachers (10%),6 speech therapists (30%) and 1 mathematics teacher (5%).

4.2 Instruments

To assess the teacher`s attitudes about educational approach, the "BADE" questionnaire was administrated. The BADE questionnaire assess the attitudes and beliefs about deaf education and was elaborated by Science of Learning Centre on Visual Language and Visual Learning. The questionnaire was translated and adapted to the Romanian cultural specific. The questionnaire was auto - administrated online and consisted of 26 questions, grouped in 4 subscales: subscale 1: Medical Model/Oral Language, 10 items, subscale 2: Social Model/perceived positive impact on bilingualism 10 items, subscale 3: perceived negative impact on bilingualism, 4 items and subscale 4: learnability of RSL for hearing parents, 2 items. Low scores mean that people disagree with this subscale (scores between 1 and 2.5); Scores of 2.5 to 3.5 mean that respondents neither disagree or agree with this subscale; Scores of 3.6 or above mean that people agree with the subscale.To the BADE questionnaire 8 more items were added, they refer to the types of support technologies used in educational context.

5. Results

In order to test null hypothesis 1, that states that "the teachers of deaf do not adopt mostly the medical model of disability and the oral approach to language acquisition" we compared the differences of means between the medical and social approach scales of BADE questionnaire completed by teachers.

Table 1: One-Sample Test for BADE scales, teachers responses

	Test Value = 3.5					
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Medical model	3.791	19	.001	.51000	.2284	.7916
Social model	2.296	19	.033	.21000	.0186	.4014
Negative impact d/bibi	-9.293	19	.000	-1.25000	-1.5315	-.9685
Learnability RSL	-4.637	19	.000	-.95000	-1.3788	-.5212

In table 1 are presented the one-sample t test values for BADE scales, reported to 3.5 value, that is indicated in the questionnaire manual as the reference value for high scores per scale. The values higher than 3,5 indicated a positive approach towards that variable. So, in our case the teachers value both medical and social model (the t scores indicate that the difference of means is significant at $p< 0.05$). Also, they don`t think that learning RSL in early childhood determine a negative impact on language acquisition or that the parents are willing and capable of learning RSL.

Table 2: Paired sample t test for medical vs social approach to language acquisition, teacher„s responses

	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pair 1 Medical model – social model	.30000	.50990	.11402	2.631	19	.016

In table 2 is presented the paired sample t test for medical versus social approach to language acquisition, the result indicate that medical model is significantly more valued and adopted than the social model ($t=2.63$ at $p<0.05$). We can say that the null hypothesis was invalid, and the research hypothesis does confirm.

In order to test null hypothesis 2, that states that „due to low financial resources teachers have a lot of support technologies at their disposal" we calculated the following frequencies:

Table 3: Who much is the amount of financial support offered by school

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	6	30.0	30.0	30.0
	below 25%	14	70.0	70.0	100.0
	Total	20	100.0	100.0	

In table 3 are presented the teachers` opinions about the financial support offered by school for support technologies necessary in deaf education. The majority of teachers (70%) considers that the financial support is below 25% from necessity and 30% that the allocated funds are none. All the teachers perceived a very low financial support offered by school for support technologies.

Table 4:In teaching you use the following support technologies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	hearing aids/cochlear implant	15	75.0	75.0	75.0
	hearing aid, web cam, audiometer	5	25.0	25.0	100.0
	Total	20	100.0	100.0	

In table 4 are presented the types of support technologies used by teachers in the educational and rehabilitation process. The majority of teachers (75%) use only hearing aids or cochlear implants, only 25% of them use in addition web cam and the audiometer as support technologies. The null hypothesis 2 was invalid, and the research hypothesis does confirm.

In order to test null hypothesis 3, that states that „the support technologies used in the educational and rehabilitation process are not limited to hearing aids and cochlear implants." we calculated the following frequencies:

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Table 5: The support technologies used in educational communication are

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	hearing aids/cochlear implant	15	75.0	75.0	75.0
	web cam	5	25.0	25.0	100.0
	Total	20	100.0	100.0	

In table 5 are presented the types of support technologies used by teachers in the educational communication. The majority of teachers (75%) use only hearing aids or cochlear implants, only 25% of them use in addition the web cam as support technology. The null hypothesis 3 was invalid, and the research hypothesis 3 does confirm.

In order to test null hypothesis 4, that states that „there is differentiation in the choice of support technologies in relation to the degree of deafness, we compared the differencesin teachers beliefs about necessary support technologies for hearing impaired versus profoundly deaf students.

Table 6: Chi Square test

	Support technologies used for hearing impaired	Support technologies used for profoundly deaf
Chi-Square	9,100[a]	5,200[a]
df	2	2
Asymp. Sig.	,011	,074

0 cells (0,0%) have expected frequencies less than 5.
The minimum expected cell frequency is 6,7.

In table 6 is presented the Chi-Square test between the teacher`s choice of support technologies for hearing impaired versus profoundly deaf. The results indicate that there are no differences in teacher`s choices for support technologies in relation with different levels of deafness. The null hypothesis 4 was invalid, and the research hypothesis 4 does confirm.

In order to test null hypothesis 5, that states that „there is differentiation in the choice of support technologies in relation to the educational communication model adopted„ we compared the differences of means between the support technologies adopted by oral approach teachers versus bilingual/bicultural approach teachers.

In table 7 is presented the independent sample t test for support technologies adopted by oral approach teachers versus bilingual/bicultural approach teachers. The scores obtained indicate that (t=-7.01 at p<0.01) the teachers who adopt the bilingual/bicultural approach tend to use more support technologies for their profoundly deaf students. The null hypothesis 5 was valid, and the research hypothesis 3 does not confirm.

Table 7: Independent sample t test forsupport technologies adopted by oral approach teachers versus bilingual/bicultural approach teachers

Levene's Test for Equality of Variances		F	Sig.	T	df	Sig. (2-tailed)
For profound deafness necessary support technologies are	Equal variances assumed	13.927	.002	-5.678	18	.000
	Equal variances not assumed			-7.018	11.000	.000

6. Conclusions

This research focused on investigating the type of educational communication model adopted by the teachers for deaf and the support technologies chosen to facilitate the educational process.We aimed to determine the link between the chosen educational model and the support technologies used.

The results substantiate that the teachers value above average, both medical and social model. This dual attitude towards language acquisition demonstrates that they, in fact, adopt a total communication approach (in which both methods are accepted and valued). Also, teachers focus more on the medical model. In conclusion, teachers have a total communication approach to language acquisition, with more emphasis on the oral approach.

All the teachers perceived a very low financial support offered by school for support technologies. The majority of teachers (75%) use only hearing aids or cochlear implants, only 25% of them use in addition web cam and audiometer as support technologies. Because there are little support technologies at the teachers disposal, they cannot chose from a very large range of support technologies, the educational communication must take place without facilitating factors.

Also, because of the little support technologies at their disposal, there are no differences in teacher`s choices for support technologies in relation with different levels of deafness.The teachers who adopt the bilingual/bicultural approach tend to use more support technologies for their profoundly deaf students.

There are a number of limitations to this study. First of all the instruments used are not adapted for specialists. Secondly, the research groups are small and the effect of the findings cannot be generalized.

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