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Original article

Psychological and Pedagogical Components of the Readiness of Children with Hearing Impairments to Learn in the Context of Updated Content of Education

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Introduction. A new model of education introduced in general education schools of the Republic of Kazakhstan, is characterized by a criterion system for assessing the student's knowledge (involving the student, his self-esteem), stimulating the student's activity in obtaining knowledge and communication skills. These processes can be challenging for children with hearing impairment. The issue of the psychological and pedagogical readiness of students with hearing impairments to switch to new curricula is examined in this study using the example of the Republic of Kazakhstan.

Materials and Methods. Pursuant to the objectives of the study, the sample of children with hearing impairments, was formed without exclusion of children with concomitant impairments similar to the structure of this group present in overall population. In the general sample, which includes 138 children and adolescents 10–15 years old who were divided into four experimental and four control groups in accordance with their educational level, the emotional-volitional, intellectual and cognitive characteristics of deaf and hard-of-hearing children and their success in performing tasks in classic and updated programs were studied.

Results. In the children with hearing impairments, visual attention, hearing and speech memory, and conceptual thinking were reduced. The volitional regulation of complex actions and visual memory corresponded to the age norm. Children with hearing impairments performed the educational tasks less well, whereby they performed the tasks of the updated programs significantly more efficiently in comparison to classical tasks. Conclusions are drawn about the effectiveness of the updated educational programs for teaching this group of children.

Discussion and Conclusion. Our psychological and pedagogical study of this problem reveals that children with hearing impairments perform better at some tasks compiled in accordance with updated educational programs, indicating their effectiveness for this category of students. At the same time, a decrease in the number of cognitive processes of students in correctional schools with hearing impairments compared to their peers is also shown, namely in visual attention, auditory-speech memory, and thinking with the development of volitional processes corresponding to age. It is necessary to take into account the level of development of these processes in the formation and implementation of training programs.

Keywords: school, children, adolescent, hearing impairment, cognitive abilities, special education

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Оригинальная статья

Психолого-педагогические компоненты готовности детей с нарушениями слуха к обучению в условиях обновления содержания образования

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Введение. Новая модель обучения, внедренная в общеобразовательные школы Республики Казахстан, характеризуется системой критериев оценки знаний учащегося (вовлечение учащегося, самооценка), стимулирующей его активность в получении знаний и коммуникативных навыков. В данном исследовании рассматривается проблема психолого-педагогической готовности школьников с нарушениями слуха к переходу на новые учебные программы на примере Республики Казахстан. Цель статьи – представить результаты исследования готовности детей с нарушениями слуха к обучению в рамках внедрения новых учебных программ, педагогических технологий и способов взаимодействия всех участников образовательного процесса через сравнение результатов их психолого-педагогической диагностики с условно здоровыми сверстниками.
Материалы и методы. В соответствии с целями исследования были определены экспериментальная (обучающиеся специальной школы) и контрольная (школьники, не имеющие нарушений в развитии) группы. На общей выборке, включающей 138 детей и подростков 10–15 лет, составивших в соответствии с образовательной ступенью четыре основные и четыре контрольные группы, изучены эмоционально-волевые, интеллектуальные и познавательные особенности неслышащих и слабослышащих детей и успешность выполнения ими заданий классических и обновленных программ.
Результаты исследования. Проведенное психолого-педагогическое исследование изучаемой проблемы показывает, что дети с нарушениями слуха лучше справляются с некоторыми задачами, составленными в соответствии с обновленными образовательными программами, что свидетельствует об их эффективности для данной категории учащихся. При этом отмечается снижение количества когнитивных процессов у учащихся коррекционных школ с нарушением слуха по сравнению с их сверстниками, а именно зрительного внимания, слухоречевой памяти и мышления. Следовательно, необходимо учитывать уровень развития этих процессов при формировании и реализации программ обучения.
Обсуждение и заключение. Сделанные авторами выводы вносят вклад в развитие современного специального образования, позволяя, в рамках анализа эмоционально-волевых, мотивационных и когнитивных особенностей детей с нарушениями слуха в сочетании с оценкой успешности их обучения, определять потенциальную возможность корреляции внедряемых учебных программ обновленного содержания с их адаптированными аналогами.

Ключевые слова: школа, ребенок, подросток, нарушение слуха, познавательные способности, специальное образование

Авторы заявляют об отсутствии конфликта интересов.

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Introduction

The transition to an inclusive education system for children with disabilities makes it particularly relevant to study the effectiveness of special educational programs being developed and the conditions for their implementation. Also of great importance is the study of the psychological characteristics

and readiness for schooling of such children. One of the most common disorders is hearing pathology, which affects all processes of information perception, the formation of thinking, etc. [1; 2]. According to the Information and Analytical Center JSC, out of 3.1 million schoolchildren of the Republic of Kazakhstan, 2.3 thousand have hearing loss[1].

The problem of teaching children with hearing impairments has been considered by many authors (for example, a review [3]); however, in the context of a significant and continuous change in educational programs, it remains relevant. In particular, in the Republic of Kazakhstan over the past two decades, the amount of educational information to be mastered by deaf and hard-of-hearing children as part of updating the content of education has increased significantly and has become comparable with the curriculum of ordinary schools [4], a trend that is also characteristic of education worldwide [5]. Therefore, comparing the effectiveness of education for children with hearing impairments in the context of the peculiarities of the development of their mental processes and new and classical educational programs, using the example of the model proposed by the Republic of Kazakhstan, is essential.

The modern system of special education operating in most developed countries is characterized by the observance of the principles of accessibility, equal rights and opportunities to choose forms of education, giving preference to full or partial inclusion. L. S. Vygotsky stressed the importance of integrating a child with developmental disabilities into the general educational environment as an effective means of correction and adaptation [6]. He considered the primary goal of special education to be socialization, i.e. the education of the individual in continuous and bilateral contact with society. His ideas formed the basis of modern inclusive education systems, which have long been operating in the USA and Europe and are currently being reflected in CIS countries, including Kazakhstan [7; 8].

Nevertheless, inclusion is not always the optimal form of organizing special education. In addition, as noted by M. T. Doherty, even today there remain many unresolved problems: the lack of a unified pedagogical technology for integrating a child with developmental disabilities into the educational environment of a regular school, the difficulty in adapting curricula and ensuring individualization, the need for a flexible system of correctional care, and an insufficient level of social responsibility and social solidarity [9].

Considering the specific task of teaching children with hearing impairments, it is worth noting that, regardless of the type of educational environment (special school, inclusion in general education, individual classes or at home), any functioning correctional pedagogical system is very sensitive to change [10]. Undoubtedly, for children deprived of the opportunity to hear normally, mastering educational material is significantly more difficult than for their hearing peers and, according to E. A. Ormel, A. M. Bosman and others, they are more likely than conditionally healthy children to be vulnerable to imperfections in educational approaches [11]. Therefore, considering the issue of the modernization of special education (including for the deaf and hard of hearing), it is first necessary to determine the readiness of children for promising reforms.

Literature Review

Let us consider an example of the experimental transformation of the educational system for children with hearing impairments in the USA, which Kazakhstan pedagogy considers among the most acceptable models of special education [12]. In 1975, the USA passed a law on special education for people with disabilities, legally enshrining the integrated education of children with developmental disabilities and their healthy peers. It was assumed that this law would improve the quality of special education, making it part of the general system. As a result, the number of deaf and hard-of-hearing children

[1] [Statistics of the Education System of the Republic of Kazakhstan. The National Collection]. Astana: Information and Analytical Center; 2019. 319 p. Available at: http://iac.kz/sites/default/files/nacionalnyy_sbornik_2018-2019.pdf (accessed 14.01.2021). (In Russ.)

enrolled in special (correctional) boarding schools decreased from 70% to 20%, with the rest enrolled in regular schools using various inclusive models. This is a rather large number – out of 56.6 million schoolchildren, 76 thousand have hearing impairments according to the National Center for Educational Statistics[2]. However, the success of the integration of children with hearing impairments in society is assessed ambiguously: According to L. S. Spaulding and S. M. Pratt, the level of knowledge of these children is significantly behind that of hearing students, the development of oral speech (with a seemingly active speech environment) is difficult, and the conditions for expanding vocabulary and increasing general literacy do not meet their physiological and psychological needs [13]. Most hearing-impaired children experience significant discomfort: Understanding teachers is difficult for them and friendly relations are possible with only a few classmates. Also, communication with other participants in the educational process in general is carried out only through a deaf interpreter [14].

After analyzing the level of formation of key educational competencies in deaf and hard-of-hearing children, the Pedagogical Commission, organized in 1986 by the US Congress, recognized the inefficiency of full inclusion[3]. Hence, there is currently a partial return to traditional forms of education in the form of special classes and groups in secondary schools in which only children with hearing aids are educated. In addition, considerably more time is allocated to corrective exercises and work with audiologists, gesture, and dactylic speech, while collective sound reinforcing equipment is actively used. The US Department of Education acknowledged that inclusive education is far from a universal form of education for children with hearing impairments and cannot replace the traditional system of special schools[4]. Thus, by not appreciating the real readiness of deaf and hard-of-hearing schoolchildren to integrate, American pedagogy inflicted significant harm on its own model of special education [15], slowing its development for more than ten years. Therefore, it seems appropriate to verify any implemented programs carried out on local samples.

The study of the pedagogical and psychological issues of schoolchildren's readiness for the development of new curricula is reflected in the work of many scientists [16; 17]. Traditionally, the concept of readiness, in this case, includes a level of a student's cognitive development at which they can effectively master the proposed training material. The multi-component nature of this concept is expressed by the need to take several factors into account simultaneously, namely the child's cognitive abilities, their psychological and physiological states, and the intellectual and psychophysical characteristics of age development. Based on this, a set of criteria is derived that not only allows a determination of how ready the children are for the transition to new educational standards but also identifies their readiness for systematic schooling in general. These are intellectual, personal, motivational, emotional-volitional and social characteristics[5].

Most educators consider a child's intellectual development to be a priority component of their readiness for a particular stage of education. L. S. Vygotsky argued that this component is determined on the basis of the level of formation of a child's mental processes, generalization, comparison, and differentiation skills. Moreover, depending on the age category and educational level

[2] Glander M. Selected Statistics from the Public Elementary and Secondary Education Universe: School Year 2013–14 (NCES 2015-151). U.S. Department of Education. Washington, DC: National Center for Education Statistics; 2015. Available at: https://nces.ed.gov/pubs2015/2015151.pdf (accessed 14.01.2021). (In Eng.)

[3] Cawthon S., Garberoglio C.L. Research in Deaf Education: Contexts, Challenges, and Considerations. New York: Oxford University Press; 2017. Available at: https://books.google.kz/books?id=RDooDwAAQBAJ&hl=ru (accessed 14.01.2021). (In Eng.)

[4] Ibid.

[5] Rechitskaya E.G. [Psychological and Pedagogical Support for Persons with Hearing Impairment]. Moscow: Prometheus; 2012. (In Russ.); Rechitskaya E.G., Parkhalina E.V. [Readiness of Hard of Hearing Teenagers to Socialize with Society]. Moscow: VLADOS, 2009. (In Russ.)

of students, both perceptual and analytical abilities can play a decisive role [8].

Among cognitive processes, studies of attention and memory are important as the basis for any mental activity. For example, studies by H. Hamilton revealed some features of the memory of deaf people that were superior to those of hearing individuals. Thus, with the right approach, their educational potential can be significantly expanded [18].

The primary component of a child's personal readiness to master the school curriculum, according to L. S. Vygotsky, is the formation of a new level of self-awareness through the internal transformation of the psyche and individual qualities [19]. Considering the emotional-volitional side of this issue, many authors highlight the need to assess skills of concentration, switching attention and quickly changing activities while maintaining a level of involvement in the educational process. The motivational readiness of the child is very important [20]. At the same time, the socio-psychological component includes not only the desire to communicate and socialize but also the level of the formation of the skills corresponding to this.

Scholars (Mathis, Cotton, and Sechrest[6]) distinguish three key psychological and pedagogical components of a child's readiness to master new knowledge, namely content, sensitive and sociological components. The content component includes the child's intellectual abilities and the level of their ability to differentiate, analyze, and build logical connections. The sensitive component includes emotional self-control, stress resistance, and adequate response to external stimuli (corresponding to age-related characteristics). The sociological side of student readiness is described as the child's ability to interact in a particular social group and self-determination in the framework of school education.

This article aims to examine the readiness of children with hearing impairments for schooling as part of the introduction of new curricula, pedagogical technologies and ways of interaction for all participants in the educational process through a comparison with conditionally healthy peers. We assume that deaf and hard-of-hearing children have a deficiency of the emotional-volitional, motivational and cognitive spheres, associated with the ability to learn new programs. The identification of specific areas of deficiency in conjunction with an assessment of the success of training can make a significant contribution to the knowledge of the educational needs and capabilities of this category of students. In addition, an additional task is to determine the potential possibility of the correlation of training programs with their adapted counterparts, implemented using a comparative approach.

Materials and Methods

The study was conducted in two schools located in the Republic of Kazakhstan: A special (correctional) boarding school for children with hearing impairments and a nearby comprehensive school. The number of study participants was 138 people aged 10 to 15 years. Students in grades 5–8 of the special school were included in four experimental groups (in accordance with the educational level); students who did not have developmental disabilities made up the contingent of control groups.

The duration of the diagnostic studies was two weeks, after which the data were processed. The study included the following steps:

1. *Preliminary work.* Acquaintance with students, conversations about the ongoing research, study of school documentation (curricula, medical records), and conversations with school specialists (psychologists, sound teachers, deputy directors for educational work). Consent to participate was obtained for all students in grades 5–8 (correctional and secondary schools), a favorable psychological situation was identified, and the diagnoses of children included in the experimental groups were determined (mainly bilateral sensory hearing loss of the fourth or third degree).

[6] Mathis B.C., Cotton J.W., Sechrest L. Psychological Foundations of Education: Learning and Teaching. New York: Academic Press; 2013. 796 p. Available at: https://www.elsevier.com/books/psychological-foundations-of-education/mathis/978-0-12-480150-9 (accessed 14.01.2021). (In Eng.)

2. *Diagnosis of the concentration and volume of visual attention.* The "Proofreading test" (Bourdon test) methodology was used, which is widely used to assess the readiness of students for learning [8]. Letters were used as corrections, and the test task was the sequential crossing out of the indicated letters at speed. Forms consisting of 1 750 alphabetic characters located on 50 lines were used. Their order on each copy was unique.

3. *Diagnosis of attention and levels of development of complex volitional actions using modified Landolt tables.* In order to prevent overload, this phase was carried out the following day. The choice of tasks for this diagnostic phase was determined, firstly, by the simplicity of their implementation (without the need to have a special set of knowledge and skills), and secondly, by conscious uniformity and monotony, as a reliable indicator of will and not motive. The developed test material was presented to the participants as uninteresting, routine, and not containing a competitive element or the prospect of reward. The result of this was the simulation of a situation in which the inactivity of the participant due to a lack of urgent needs is interrupted by volitional effort due to the goal.

Diagnostics consisted of a sequential crossing out of a cross printed in the form of rings with a gap in the lower part, whereby the outlines of the rings were torn from the top to the right. The students had to go through four stages, each of which included processing six lines, as follows:

1. At a pace convenient for everyone;
2. At a fast pace;
3. At a slow speed;
4. At the fastest speed.

The alternation of these speeds implied a high dynamics in terms of volitional activity: In order to switch between uncomfortable modes of completing tasks, a sufficient level of formation of complex volitional actions is necessary. Indicators of volitional efforts in this case are, respectively, the ratios of the number of mistakes made to the pace of work imposed by the experimenter or chosen by the subject independently. Since the conditions for completing tasks at each stage were not initially communicated to students, the convenient pace chosen by them is a benchmark for the comparison with the indicators of the other three stages. To increase the objectivity of the results, the testing was repeated the next day.

4. *Determining the level of development of students' mental operations using the "Exclusion of excess" and "Logic of connections" methods.* These methods require students to possess basic school knowledge and are thus suitable for middle-level students. The children were offered tasks on operating with semantic concepts, understanding the meanings of words, and their classification according to essential features. Initially, all groups of students were offered 24 sets of concepts, closely related in meaning and containing six words, the first of which were the test ones. It was necessary to choose two words from each line that were close to the meaning of the first. Then, the second test was conducted: Using a cipher that included six different conceptual connections, the participants had to establish a correspondence between 20 pairs of words and the type of encrypted logical connection. Individually for each participant, form materials were developed containing a set of tasks and instructions for their implementation (the word sets in all the forms were different). The break between these tests and the previous stage was two days.

5. *Comparative diagnostics of the quality of the implementation of educational tasks compiled using various pedagogical approaches.* To do this, during the second week of the study, all the participants performed a small independent work that included eight tasks in two subjects – Russian and mathematics. Half the tasks were formulated taking into account traditional pedagogical methods; the rest were in accordance with the requirements of the curriculum for updated content, currently in force in the Republic of Kazakhstan[7]. The assignments

[7] Kulambayeva K.K., Dosanova S.S., Eli R.O., Surovitskaya Yu.Yu., Zhamankarin M.M., Sadykova A.K. [Formation of Innovative Competence of a Teacher in the Updated Educational Environment of the School]. *Innovatsionnye podkhody v reshenii problem sovremennogo obshchestva* = Innovative Approaches to Solving the Problems of Modern Society. 2018. p. 44-63. (In Russ.)

were compiled on topics completed by students at the beginning of the current school year. The lead time was 40 minutes.

6. *Diagnostics of auditory and visual memory*. We used the "Remembering 10 words" and "Triangles" techniques by D. Jacobs, S. A. Garibyan, N. V. Zvereva [21], adapting the text of their instructions for an unambiguous interpretation by deaf and hard-of-hearing children.

Group indicators were compared in pairs using the non-parametric Mann-Whitney test.

Results

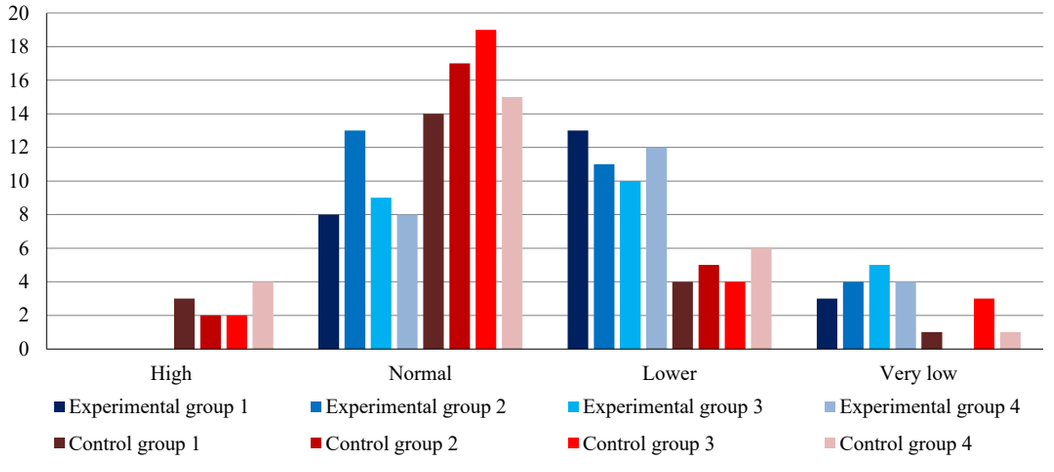
The study of visual attention and complex volitional actions. A comparison using the Mann-Whitney criterion of performance indicators of corrective tests by experimental and control groups showed significant differences in the number of errors in three comparisons for the four groups ($U_1 = 46.0$, $p < 0.001$; $U_3 = 59.0$, $p = 0.006$; $U_4 = 65.5$, $p = 0.004$). In all cases, attention indicators were higher in the control groups. Only for the second groups of differences were there no differences ($U_2 = 107.5$, $p < 0.137$). Next, we consider the distribution of students with different levels of attention, clearly shown in Figure 1.

We identified four main categories of subjects.

The first comprises children with a high level of attention and the development of strong-willed qualities. During the performance of tasks, they demonstrated composure, consciousness, and activity. They carefully studied the instructions, observed the described requirements, made a small number of errors, and coped with all the tasks. None of the children with hearing impairments showed this result, 'and among the control groups, only 11% achieved this result.

We assigned children to the second category if their level of attention fit the age norm: This referred to a fairly high rate of mental activity and ongoing mental processes and a good level of focus throughout the diagnosis, allowing these students to make the minimum number of errors in the proposed task. This result was shown by 38% of children with hearing impairments from the four experimental groups.

Participants who showed a moderately low level of attention were attributed to the third subgroup. During the diagnostic work, these participants started having problems at the briefing stage; the rules for completing the test tasks had to be explained several times. A large number of errors were recorded. For example, a common inaccuracy in filling out forms was the omission of several lines of corrections. The number of tested children with hearing impairments showing a moderately low level of attention and concentration amounted to 46% of their total number, while in the control groups this was only 19%.



F i g. 1. Distribution of students with different levels of voluntary attention ("proofreading" technique)

The fourth subgroup comprises students with an extremely low degree of attention and characterized by a frequent loss of concentration, distraction, and the need for constant assistance for the correct execution of tasks (they were unable to reproduce a fully consistent algorithm of necessary actions). Typical errors during the stage of psychological and pedagogical diagnostics were incorrect definition, omission of corrections and violation of their order. Such children, as practice shows, have almost no cognitive interest; any extraneous stimulus can easily distract them from productive activities. The arbitrariness of attention is practically absent in them, the development of speech activity regulation is represented very weakly, and signs of deviant behavior are noted. In the experimental groups, this category was 16%; in the control group, it was not more than 5%.

Note that the increased load on the visual analysis in deaf and hard-of-hearing students (the impossibility of perceiving speech is compensated for by reading and visual contact with the teacher) leads to them being more distracted when performing the educational tasks, which undoubtedly affected the overall results.

Table 1 presents a statistical comparison of the execution time of the Landolt tables and the number of errors at various stages of the experimental psychodiagnostic study.

Table 1. **Comparison of the execution time of the Landolt tables and the number of errors at various stages, Mann-Whitney test**

Examination	Stage	Indicator	Sum of ranks		U	p	Sum of ranks		U	p
			exp	contr			exp	contr		
1	2	3	4	5	6	7	8	9	10	11
			Experimental group 1 and control group 1				Experimental group 3 and control group 3			
I	1	Time	366.0	264.0	93.0	**0.050**	422.5	138.5	18.5	**0.000**
		Mistakes	366.5	263.5	92.5	**0.048**	425.0	136.0	16.0	**0.000**
	2	Time	368.5	261.5	90.5	**0.041**	266.5	294.5	95.5	0.159
		Mistakes	344.5	285.5	114.5	0.210	298.0	263.0	127.0	0.786
	3	Time	386.5	243.5	72.5	**0.008**	396.0	165.0	45.0	**0.001**
		Mistakes	425.0	205.0	34.0	**0.000**	368.5	192.5	72.5	**0.025**
	4	Time	361.5	268.5	97.5	0.069	304.0	257.0	133.0	0.957
		Mistakes	416.5	213.5	42.5	**0.000**	253.5	307.5	82.5	0.060
II	1	Time	352.5	277.5	106.5	0.129	351.0	210.0	90.0	0.108
		Mistakes	316.0	314.0	143.0	0.754	266.5	294.5	95.5	0.159
	2	Time	432.5	197.5	26.5	**0.000**	243.5	317.5	72.5	**0.025**
		Mistakes	454.5	175.5	4.5	**0.000**	298.5	262.5	127.5	0.800
	3	Time	430.5	199.5	28.5	**0.000**	173.5	387.5	2.5	**0.000**
		Mistakes	342.5	287.5	116.5	0.235	321.0	240.0	120.0	0.600
	4	Time	434.5	195.5	24.5	**0.000**	234.5	326.5	63.5	**0.010**
		Mistakes	437.5	192.5	21.5	**0.000**	226.0	335.0	55.0	**0.004**
			Experimental group 2 and control group 2				Experimental group 4 and control group 4			
I	1	Time	413.0	217.0	64.0	**0.003**	382.5	247.5	111.5	0.185
		Mistakes	472.0	158.0	5.0	**0.000**	348.5	281.5	145.5	0.843
	2	Time	339.5	290.5	137.5	0.621	357.5	272.5	136.5	0.619
		Mistakes	271.5	358.5	100.5	0.086	390.0	240.0	104.0	0.116
	3	Time	445.0	185.0	32.0	**0.000**	190.0	440.0	0.0	**0.000**
		Mistakes	315.0	315.0	144.0	0.779	472.5	157.5	21.5	**0.000**
	4	Time	231.0	399.0	60.0	**0.002**	321.0	309.0	131.0	0.497
		Mistakes	474.0	156.0	3.0	**0.000**	229.0	401.0	39.0	**0.000**

End of table 1

1	2	3	4	5	6	7	8	9	10	11
II	1	Time	227.5	402.5	56.5	**0.002**	333.0	297.0	143.0	0.778
		Mistakes	231.5	398.5	60.5	**0.002**	385.0	245.0	109.0	0.159
	2	Time	339.5	290.5	137.5	0.621	319.5	310.5	129.5	0.466
		Mistakes	291.5	338.5	120.5	0.291	354.0	276.0	140.0	0.703
	3	Times	229.0	401.0	58.0	**0.002**	236.0	394.0	46.0	**0.000**
		Mistakes	293.5	336.5	122.5	0.322	343.5	286.5	150.5	0.974
	4	Time	212.5	417.5	41.5	**0.000**	371.5	258.5	122.5	0.337
		Mistakes	381.0	249.0	96.0	0.062	270.5	359.5	80.5	**0.019**

Note. I – Initial examination, II – Re-examination. The stages of a psychodiagnostic examination differ in the rate of completion: 1 – convenient, 2 – fast, 3 – slow, 4 – maximum.

Significant differences are highlighted in bold.

Table 2 presents the descriptive statistics, including the average time for completing tasks using the modified Landolt method at different speeds and the average number of errors made for each group of subjects.

Table 2 shows a number of significant differences. In a number of samples, the conditionally healthy students make fewer mistakes and completed the task faster than the students with hearing impairments. At the same time, there are no pronounced dynamics of these indicators depending on the need to work at a different pace. Apparently, they are associated with a general decrease in the characteristics of attention in hearing-impaired children. We can assume that the level of formation of the volitional actions of children is similar between the experimental and control groups.

T a b l e 2. **Average values of the execution time of the Landolt tables and the number of errors at various stages (with different rates of work)**

Groups		Stage 1		Stage 2		Stage 3		Stage 4	
		Time (s)	Mistakes	Time (s)	Mistakes	Time (s)	Mistakes	Time (s)	Mistakes
Initial examination									
Experimental	1	81.6	2.5	63.5	8.6	163.7	2.6	49.3	13.8
	2	74.5	3.6	61.4	4.2	135.3	1.3	44.5	16.5
	3	83.2	2.9	58.2	6.5	142.3	1.5	41.7	11.2
	4	76.9	1.3	55.9	7.1	120.9	1.9	42.9	7.4
Control	1	75.2	1.7	59.4	7.6	155.2	0.9	45.3	10.6
	2	68.7	0.7	60.7	5.2	121.5	1.5	50.1	8.5
	3	71.4	0.9	61.2	6.7	132.6	0.7	41.7	13.4
	4	72.7	1.2	54.7	5.9	181.3	0.2	44.3	12.6
Re-examination									
Experimental	1	79.3	1.9	66.2	9.3	132.2	1.1	51.5	15.3
	2	75.1	0.7	62.3	6.2	165.7	0.3	43.2	14.7
	3	77.2	1.1	57.5	4.2	141.6	0.5	44.4	9.0
	4	72.3	0.8	56.2	3.6	135.7	0.2	47.1	11.3
Control	1	76.2	2.0	55.3	4.2	120.1	0.7	42.1	9.6
	2	81.4	1.8	61.2	6.9	174.9	0.6	49.3	12.5
	3	73.9	1.6	62.8	4.4	168.3	0.3	50.1	11.9
	4	72.7	0.4	58.4	3.4	144.8	0.3	45.6	13.6

Note. Stages of psychodiagnostic examination; see Table 1.

Assessment of the intellectual component of the readiness of students with hearing impairments to switch to new curricula. The first stage aimed to study the level of development of their mental operations in comparison with their hearing peers.

The results of the statistical comparison of the experimental groups according to the "Exclusion of excess" method revealed significantly higher rates in the children of the control groups for three pairs of groups of four (U_1 = 11.0, $p < 0.001$; U_2 = 29.5, $p < 0.001$; U_3 = 41.0, p = 0.001). For the pair of fourth groups, similar differences were identified at the level of the trend (U_4 = 97.5, p = 0.074). The "Logic of connections" methodology was significantly higher for all four groups (respectively, $U = 54.5, p = 0.001$; $U = 45.5, p < 0.001$; $U = 42.5, p = 0.001$; $U = 83.5, p = 0.024$).

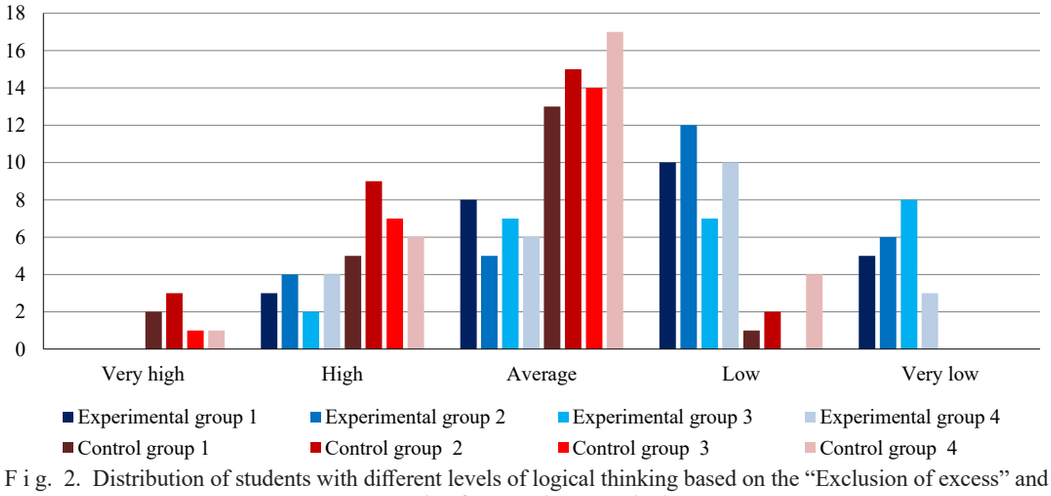
The total descriptive diagnostic results for the "Exclusion of excess" and "Logic of connections" methods are presented in Figure 2.

Analysis of the data revealed five distinct levels of the development of mental operations. Students with a very high level of development of mental abilities were assigned to the first subgroup. Such indicators were recorded only for a small number of participants in the control groups, namely 7%.

The second subgroup included subjects who showed high results: 13% of the entire experimental sample and 27% of the control. These children scored a large number of points for both tests, correctly established the conceptual connections between the proposed groups of words, and correctly identified the semantic dependencies. Note that most of the deaf students needed the help of an experimenter to clarify the meanings of some of the concepts presented in the test forms, while hearing-impaired students coped with the tasks relatively independently. This indicates gaps in the vocabulary of students with complete hearing loss.

The average level of the development of mental operations (the third subgroup) was found in 26% of children from the experimental groups and 59% of the control groups. Many hearing children could score more points if they carefully studied the instructions and did not make structural mistakes. The participants in this subgroup, based on the results of previous tests, are characterized by a low level of concentration and attention volume. The most common mistakes made by the children of this subgroup were incorrect classification of concepts according to non-essential features, violation of the number of defined connections, and erroneous use of a test cipher.

The fourth subgroup of subjects is characterized by a low level of development of the components of mental activity and the children made numerous mistakes when completing tasks. Essentially, students with hearing impairments belonged to this category, comprising 39%, while only 7% of hearing students were placed here.



F i g. 2. Distribution of students with different levels of logical thinking based on the "Exclusion of excess" and "Logic of connections" methods

These children showed a clear lack of interest in the test items, constantly asking for help from the experimenter in explaining the rules for filling out forms, the meaning of verbal concepts, and the meanings of many linguistic pairs. Thus, in addition to insufficient vocabulary, these children experienced significant difficulties in abstracting and explaining the meaning of known words.

An extremely low level of the formation of mental operations was demonstrated by only 22% of deaf and hard-of-hearing children from the experimental groups. They could not correctly understand the instructions for completing tasks, combine words by semantic attributes, and exclude superfluous ones from the proposed concepts.

The second stage of the study of the readiness for learning of children with hearing impairments examined their abilities to complete educational tasks, compiled with the new methodological recommendations. In addition, their objective performance was compared with that of hearing children.

A statistical comparison of the task results for the Russian language and mathematics, compiled in the traditional form and according to the methodology of the updated content, is presented in table 3.

Table 3. **Comparison of the success of tasks completed in the traditional form and according to the updated content methodology, Mann-Whitney test**

Task	Sum of ranks		U	p	Sum of ranks		U	p
	exp	contr			Exp	contr		
	Experimental group 1 And control group 1				Experimental group 3 And control group 3			
No. 1 in Russian language (traditional method)	175.5	454.5	22.5	**0.000**	211.5	349.5	40.5	**0.001**
No. 2 in Russian language (traditional method)	364.5	265.5	94.5	0.056	176.5	384.5	5.5	**0.000**
No. 1 in Russian language (updated content)	199.0	431.0	46.0	**0.000**	284.0	277.0	113.0	0.437
No. 2 in Russian language (updated content)	247.0	383.0	94.0	0.054	289.5	271.5	118.5	0.563
No. 1 in Mathematics (traditional method)	158.0	472.0	5.0	**0.000**	196.0	365.0	25.0	**0.000**
No. 2 in Mathematics (traditional method)	153.0	477.0	0.0	**0.000**	178.0	383.0	7.0	**0.000**
No. 1 in Mathematics (updated content)	222.5	407.5	69.5	**0.006**	192.0	369.0	21.0	**0.000**
No. 2 in Mathematics (updated content)	358.5	271.5	100.5	0.086	315.0	246.0	126.0	0.759
	Experimental group 2 And control group 2				Experimental group 4 And control group 4			
No. 1 in Russian language (traditional method)	363.5	266.5	113.5	0.198	201.0	429.0	11.0	0.000
No. 2 in Russian language (traditional method)	190.0	440.0	19.0	**0.000**	259.5	370.5	69.5	**0.007**
No. 1 in Russian language (updated content)	380.5	249.5	96.5	0.065	311.5	318.5	121.5	0.321
No. 2 in Russian language (updated content)	267.0	363.0	96.0	0.062	267.0	363.0	77.0	**0.014**
No. 1 in Mathematics (traditional method)	206.5	423.5	35.5	**0.000**	190.0	440.0	0.0	**0.000**
No. 2 in Mathematics (traditional method)	171.0	459.0	0.0	**0.000**	198.5	431.5	8.5	**0.000**
No. 1 in Mathematics (updated content)	279.0	351.0	108.0	0.142	284.0	346.0	94.0	0.057
No. 2 in Mathematics (updated content)	268.0	362.0	97.0	0.067	261.0	369.0	71.0	**0.008**

The average success of completing tasks (% of the maximum successful completion) in the Russian language and mathematics, compiled in the traditional form and according to the methodology of the updated content, is presented in table 4.

From tables 3 and 4 it can be seen that the results for more than half the tasks, both in the traditional paradigm and in the updated content, for most pairs of groups are significantly better in hearing children. For some tasks, in contrast, the performance at the trend level is higher for children with hearing impairments. In general, we note a decrease in cognitive abilities in deaf and hard-of-hearing children, most likely related to the decrease in attention and memory described above; however, this decrease is unevenly manifested in different groups and does not apply to all the proposed tasks.

It is noteworthy that for deaf and hard-of-hearing children, the success in completing tasks compiled with the new educational methods was higher than the success in completing traditional tasks (U = 439.5, $p < 0.001$, the sum of the scores for tasks for the combined four groups). A similar pattern is absent in children from the control groups ($U = 2103.0$, $p = 0.735$). Probably, such a result was influenced by the form of setting tasks offered by the curriculum of updated content: each task assigned to students is accompanied by descriptors – a description of the stages of its solution, on the basis of which the teacher assesses the student (criteria-based assessment model). This serves as a form of hint and guide for children, and we use them to determine the correct sequence of stages of the assignment.

For example, one of the tasks, solving a quadratic equation, contained the following descriptors:

– the learner brings the equation to normal;

– defines the variable and coefficients of the equation;

– finds the discriminant;

– determines the number of roots in the equation;

– finds the roots of the equation, if any;

– performs verification;

– records the response.

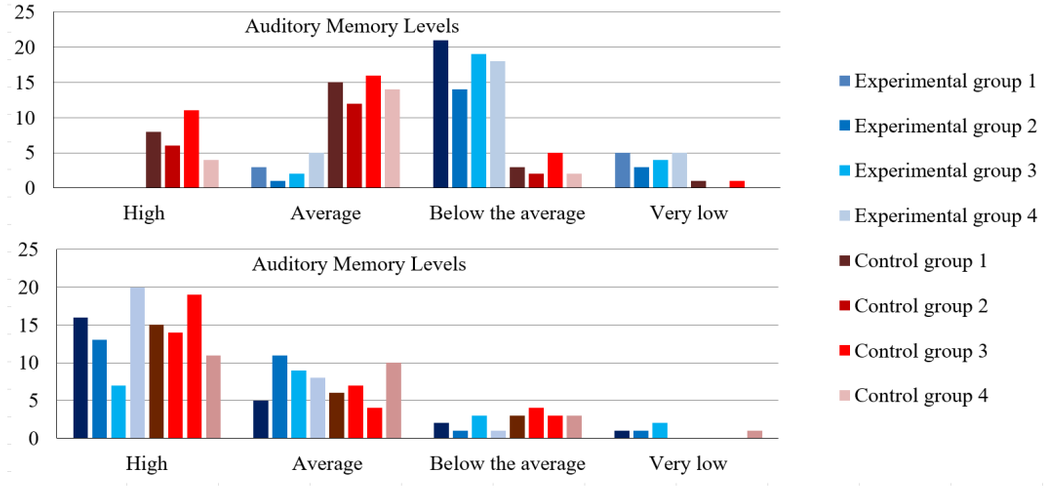
Accordingly, the availability of such information could have a positive effect on the overall results.

Diagnostics of the auditory and visual memory of students (physiological component). The quantitative results of this study, obtained using the "Remembering ten words" method, are presented in the diagram (Figure 3).

Highly significant differences in the indicators of the auditory-speech memory of children with and without hearing impairments were revealed in all four groups ($U_1 = 23.0$, $U_2 = 23.0$, $U_3 = 23.5$, $U_4 = 34.5$).

Table 4. **Success in completing tasks compiled in the traditional form and according to the updated content methodology**

Tasks		Success in completing tasks, %							
		Experimental groups				Control groups			
No.	Description	1	2	3	4	1	2	3	4
1	No. 1 in Russian language (traditional method)	67	79	72	81	84	75	82	94
2	No. 2 in Russian language (traditional method)	79	74	61	73	72	90	86	81
3	No. 1 in Russian language (updated content)	69	83	74	80	82	78	76	83
4	No. 2 in Russian language (updated content)	75	79	81	86	80	84	83	92
5	No. 1 in Mathematics (traditional method)	45	59	54	42	68	71	73	75
6	No. 2 in Mathematics (traditional method)	39	56	59	61	72	84	79	81
7	No. 1 in Mathematics (updated content)	67	74	69	76	77	79	85	83
8	No. 2 in Mathematics (updated content)	71	76	74	68	65	82	74	78



F i g. 3. Distribution of students with different levels of development of auditory-speech and visual memory

An analysis of the data showed that the sample under study can also be divided into four categories. The first comprises students with a high level of formation of auditory-speech memory. Based on the principles of this methodology of psychological research, the greatest number of points is given to children who can reproduce at least 9 words at the end of the first stage and at least 8 words after 60 minutes (second stage). This level was shown only by children of the control groups (29%).

The second category is the middle level (reproduction of 6–8 words in the first stage and 5–7 words in the second). Some participants of the experimental groups were able to show such a level (11% of the total number). According to psychologists and defectologists, this is a very good indicator for children with hearing impairments since due to physiological characteristics, such tasks present them with special difficulty. At the same time, the majority of students in the control groups entered this category (57%).

Children with a less than average auditory speech memory comprised the third subgroup. These were mainly deaf and hard-of-hearing subjects (72%) and were able to reproduce 3–5 words in the first stage and 3–4 words after 60 minutes. For control groups, this indicator was 12%.

Children with a very low level of auditory-speech memory were assigned to the fourth subgroup: memorizing no more than 2 words. This was 17% of the experimental groups and 2% of the control groups. For persons with hearing impairment, one of the reasons for not including such tasks is speech impairment caused by damage to the auditory analyzer and the subsequent complexity of defect correction.

Furthermore, as the analysis of the results of the "Triangles" technique (Figure 3) showed, interaction with visual material is much easier for deaf and hard-of-hearing children. If we divide the experimental sample into four categories (by level), the following results emerge:

– high level – error-free reproduction of all figures (experimental groups – 56%, control – 59%);

– average level – a small number of errors in the reproduction of figures (experimental groups – 33%, control – 27%);

– below-average level – a sufficient number of errors, inaccurate determination of figures, violation of their order (experimental groups – 7%, control – 13%);

– very low level – a large number of errors, incorrect image of figures, the addition of extra elements (experimental groups – 4%, control – 1%).

Visual memory showed highly significant differences only between the third experimental and third control groups (U_3 = 37.5, $p < 0.001$); other differences were insignificant.

Summarizing the results of the diagnosis of auditory-speech and visual memory, we can conclude that based on a certain approach, difficulties in the perception of sound information by deaf and hard-of-hearing children can be compensated by visualization, while maintaining the level of development of the cognitive sphere of such children on a par with hearing. In addition, training based on visual material reduces the need for additional corrective work due to the visual perception skill, which is sufficiently developed in students with hearing impairments.

Discussion and Conclusion

Based on the analysis of the results of the study, we can conclude that children with hearing impairments are characterized by a decreased concentration and volume of visual attention. This result is of significant interest. The literature presents mixed information about the development of visual attention in such children; for example, the compensatory role of visual attention and the gradual increase in its development, from younger to adolescent, in comparison with hearing peers have been described [22]. However, it is obvious that many factors can influence the development of different components of attention [23]. These are concomitant diseases, which are widely present in deaf and hard-of-hearing children [24], difficulties in understanding instructions, and especially motivation [25]. Studying these factors and identifying the causes of the differences in the conclusions of researchers working with different samples is an important task.

Disruptions in the attention of schoolchildren indicate that during organizing educational and cognitive activities, conditions should be created that minimize the likelihood for the students to be distracted or engaged in extraneous activity. Not all methods recommended by the Kazakhstani curricula for updated content meet these requirements; for example, in comparison with the results of studies by E. S. Glukhova and S. A. Litvina [26], active forms of assessment and introspection can, if used improperly, adversely affect the final results of training.

The development of the analytical and synthetic components of the mental abilities of students with hearing impairments as a whole lags behind the age norm for hearing children. According to F. E. Kyle and C. Cane, this is affected by the lack of an active vocabulary, the difficulty in perceiving abstract concepts, and the perception of textual information [27]. The development of auditory-speech memory with the preservation of visual memory is also reduced, which generally corresponds to the findings of other researchers [28] and, through a number of mechanisms, is associated with the nature of the primary defect [3]. At the same time, the normative but not increased development of visual memory is consistent with modern ideas about the limited compensatory ability of the visual analyzer in deaf and hard-of-hearing children [29].

The complex impairment of memory, attention, and thinking identified in this study among hard-of-hearing and deaf schoolchildren reveals a single pattern of disturbance in mental processes that manifests in various fields, which is consistent with the current research [2]. The indicators of the formation of complex volitional actions (for example, the solution of educational problems) in children with hearing impairments generally correspond to the age norm of those who hear. This means that the effectiveness of the pedagogical impact on children with impaired auditory function does not depend on the specifically enhanced motivating component of education, but, first of all, relies on taking into account the characteristics of cognitive processes. Moreover, it can be assumed that the success of schooling, based on the general level of the development of cognitive processes, can have a significant impact on the motivational sphere, leading to attitudes toward success or failure.

Based on the lack of cognitive processes, students in special schools may not be ready for an increased volume of educational material while maintaining the total duration of the training, which is assumed in educational programs with updated content for deaf and hard-of-hearing children. The independent searching, analysis and processing of most of the educational information in these programs also cannot be fully realized by such children without appropriate pedagogical support.

Criteria methods for assessing and compiling control tasks currently adopted in the Kazakhstani educational model of updated content can potentially offer greater pedagogical effectiveness compared to traditional ones [30], but only if the conditions of accessibility and corrective compliance are observed. Having shown comparable results during standard school assignments in the study, children with hearing impairments demonstrated their current readiness for a changed format for organizing educational activities. However, to evaluate the effectiveness in the long term, additional research is needed.

The compensatory mechanisms of the human body, which include intensifying the work of the visual analyzer in deaf and hard-of-hearing children [29] can, in some cases, smooth out differences in their cognitive abilities compared to hearing children. Thus, we revealed similar levels of visual memory (but not its increase) in children with hearing impairments compared to their hearing peers, which is consistent with the current research in other contexts [27].

It is established that an inability to perceive certain types of information imposes serious restrictions on a person's social capabilities. Children with hearing impairments are one of the examples requiring the modern state to provide conditions for their full development, communication, and education. The Republic of Kazakhstan, which seeks to strengthen its position on the world stage, is actively increasing its human capital by building a training system that can give society modern, active, competitive personalities, regardless of its physiological characteristics. To date, the priority direction of development in this area is updating the content of Kazakhstani education.

One of the pressing issues associated with this process is the readiness of children with hearing impairments regarding whether they can successfully fulfill their educational needs in the new conditions of a growing volume of information and the necessary pace of its assimilation, analysis, and application. Our psychological and pedagogical study of this problem reveals that children with hearing impairments perform better at tasks compiled in accordance with updated educational programs, indicating their effectiveness for this category of students. At the same time, a decrease in the number of cognitive processes of students in correctional schools with hearing impairments compared to their peers is also shown, namely in visual attention, auditory-speech memory, and thinking with the development of volitional processes corresponding to age. This indicates the need, firstly, to continue research aimed at identifying a system of mechanisms that determine an interconnected "chain" of violations. Secondly, it is necessary to take into account the level of development of these processes in the formation and implementation of training programs.

REFERENCES

1. Ishembitova K.R., Uvarova L.N. Features of the Development of Children with Hearing Impairment. *Colloquium-Journal*. *Pedagogical Sciences*. 2019; (7):24-26. Available at: http://www.colloquium-journal.org/wp-content/uploads/2019/04/Colloquium-journal-731-chast-3.pdf (accessed 14.01.2021). (In Russ., abstract in Eng.)

2. Marschark M., Wauters L. Cognitive Functioning in Deaf Adults and Children. In: Ed. by M. Marschark, P. E. Spencer. The Oxford Handbook of Deaf Studies, Language, and Education. Vol. 1. Second ed. 2012. (In Eng.) DOI: https://doi.org/10.1093/oxfordhb/9780199750986.013.0034

3. Caio S., Deller F., Cassio R. Technologies For Educating Deaf Children – A Systematic Literature Review. *Conference: XXX Simpósio Brasileiro de Informática na Educação (Brazilian Symposium on Computers in Education)*. 2019. p. 1161-1170. (In Eng.) DOI: https://doi.org/10.5753/cbie.sbie.2019.1161

4. Makoelle T.M., Burmistrova V. Teacher Education and Inclusive Education in Kazakhstan. *International Journal of Inclusive Education*. 2021. p. 1-17. (In Eng.) DOI: https://doi.org/10.1080/13603116.2021.1889048 (ahead-of-print)

5. Cawthon S.W., Garberoglio C.L. Evidence-Based Practices in Deaf Education: A Call to Center Research and Evaluation on the Experiences of Deaf People. *Review of Research in Education*. 2021; 45(1):346-371. (In Eng.) DOI: https://doi.org/10.3102/0091732X20985070

6. Alekhina S.V. Inclusive Education: From Policy to Practice. *Psikhologicheskaya nauka i obrazovaniye* = Psychological Science and Education. 2016; 21(1):136-145. (In Russ., abstract in Eng.) DOI: https://doi.org/10.17759/pse.2016210112

7. Zhetpisbayeva B.A., Zhetpisbayeva M.A. Peculiarities of Inclusive Education in the Republic of Kazakhstan. *Bulletin of the Karaganda University. Series "Pedagogy"*. 2017; (1):22-27. Available at: https://articlekz.com/article/17922 (accessed 14.01.2021). (In Russ., abstract in Eng.)

8. Zajceva G.L. Dialogue with L.S. Vygotsky on the Problems of Modern Surdopedagogy. *Kulturno-istoricheskaya psikhologiya* = Cultural-Historical Psychology. 2006; 2(3):21-27. Available at: https://psyjournals.ru/kip/2006/n3/Zaitseva_full.shtml (accessed 14.01.2021). (In Russ., abstract in Eng.)

9. Doherty M.T. Inclusion and Deaf Education: The Perceptions and Experiences of Young Deaf People in Northern Ireland and Sweden. *International Journal of Inclusive Education*. 2012; 16(8):791-807. (In Eng.) DOI: https://doi.org/10.1080/13603116.2010.523905

10. Alduais A., Deng M. The Effect of the National Plan (2010–2020) on the Development of Special Education in China: Evidence from Before–After Design at a 7-Year Interval. *Education Sciences*. 2019; 9(2):95. (In Eng.) DOI: https://www.doi.org/10.3390/educsci9020095

11. Ormel E.A., Gijsel M.A., Hermans D., Bosman A.M., Knoors H., Verhoeven L. Semantic Categorization: A Comparison between Deaf and Hearing Children. *Journal of Communication Disorders*. 2010; 43(5):347-360. (In Eng.) DOI: https://doi.org/10.1016/j.jcomdis.2010.03.001

12. Sivinskiy A.M., Kulambayeva K.K., Kosherbayeva A.N. History and Modern Condition of the System of Teaching Children with Hearing Disorders in the Republic of Kazakhstan. *Chelovecheskiy capital* = Human Capital. 2019; (3):38-45. (In Russ., abstract in Eng.) DOI: https://doi.org/10.25629/HC.2019.03.04

13. Spaulding L.S., Pratt S.M. A Review and Analysis of the History of Special Education and Disability Advocacy in the United States. *American Educational History Journal*. 2015; 42(1):91-109. Available at: https://eric.ed.gov/?id=EJ1143593 (accessed 14.01.2021). (In Eng.)

14. Fernandes P.R.d.S., Jardim J., Lopes M.C.d.S. The Soft Skills of Special Education Teachers: Evidence from the Literature. *Education Sciences*. 2021; 11(3):125. (In Eng.) DOI: https://doi.org/10.3390/educsci11030125

15. Kauffman J.M., Ahrbeck B., Anastasiou D., Badar J., Felder M., Hallenbeck B.A. Special Education Policy Prospects: Lessons From Social Policies Past. *Exceptionality*. 2021; 29(1):16-28. (In Eng.) DOI: https://doi.org/10.1080/09362835.2020.1727326

16. Salisbury F., Karasmanis S. Are They Ready? Exploring Student Information Literacy Skills in the Transition from Secondary to Tertiary Education. *Australian Academic & Research Libraries*. 2011; 42(1):43-58. (In Eng.) DOI: https://doi.org/10.1080/00048623.2011.10722203

17. Shulga T.I. Emotional and Volitional Component of School Readiness. *Bulletin of Moscow State Regional University. Series: Psychological Sciences.* 2012; (1):60-66. Available at: https://vestnik-mgou.ru/Articles/Doc/2805 (accessed 14.01.2021). (In Russ., abstract in Eng.)

18. Hamilton H. Memory Skills of Deaf Learners: Implications and Applications. *American Annals of the Deaf*. 2011; 156(4):402-423. (In Eng.) DOI: https://doi.org/10.1353/aad.2011.0034

19. Smolucha L., Smolucha F. Vygotsky's Theory In-Play: Early Childhood Education. *Early Child Development and Care*. 2021; 191(7-8):1041-1055. (In Eng.) DOI: https://doi.org/10.1080/03004430.2020.1843451

20. Newman S., Latifi A. Vygotsky, Education, and Teacher Education. *Journal of Education for Teaching*. 2021; 47(1):4-17. (In Eng.) DOI: https://doi.org/10.1080/02607476.2020.1831375

21. Zvereva N.V., Balakireva E.E. Arbitrary Modality-Specific Memory of Children with Different Types of Dysontogenesis: Assessment of Memory Efficiency. *Sovremennaya terapiya v psihiatrii i nevrologii* = Modern Therapy in Psychiatry and Neurology. 2017; (2):23-28. Available at: https://cyberleninka.ru/article/n/proizvolnaya-modalno-spetsificheskaya-pamyat-u-detey-i-podrostkov-pri-raznyh-tipah-dizontogeneza-otsenka-effektivnosti-zapominaniya (accessed 14.01.2021). (In Russ., abstract in Eng.)

22. Dye M.W.G., Hauser P., Bavelier D. Visual Attention in Deaf Children and Adults: Implications for Learning Environments. In: M. Marschark, P. Hauser (Eds.). Deaf Cognition. New York: Oxford University Press; 2008. p. 250-263. (In Eng.) DOI: https://doi.org/10.1093/acprof:oso/9780195368673.003.0009

23. Van der Straaten T.F.K., Briaire J.J., Dirks E., Soede W., Rieffe C., Frijns J.H.M. The School Career of Children with Hearing Loss in Different Primary Educational Settings – A Large Longitudinal Nationwide Study. *The Journal of Deaf Studies and Deaf Education*. 2021; 26(3):405-416. (In Eng.) DOI: https://doi.org/10.1093/deafed/enab008

24. Clark T. Assessment and Development of Deaf Children with Multiple Challenges. In: Evidence-Based Practices in Deaf Education. Oxford: Oxford University Press; 2018. p. 33-58. (In Eng.) DOI: https://doi.org/10.1093/oso/9780190880545.003.0002

25. Todorov M., Galvin K., Klieve S., Rickards F. Engagement of Children Who are Deaf or Hard-of-Hearing Attending Mainstream Schools. *The Journal of Deaf Studies and Deaf Education*. 2021; 26(3):395-404. (In Eng.) DOI: https://doi.org/10.1093/deafed/enab003

26. Glukhova E.S., Litvina S.A. Problems of Psychological Readiness of Participants of an Educational Process to Implementation of Inclusive Education. *Psikhologiya obucheniya* = Training Psychology. 2013; (1):28-39. Available at: https://edit.muh.ru/mag/jour3.php?link=po012013 (accessed 14.01.2021). (In Russ., abstract in Eng.)

27. Kyle F.E., Cain K. A Comparison of Deaf and Hearing Children's Reading Comprehension Profiles. *Topics in Language Disorders*. 2015; 35(2):144-156. (In Eng.) DOI: https://doi.org/10.1097/TLD.0000000000000053

28. AuBuchon A.M., Pisoni D.B., Kronenberger W.G. Elementary Cognitive Processes Underlying Verbal Working Memory in Pre-Lingually Deaf Children with Cochlear Implants. In: N. Young, K. Iler Kirk (eds.) Pediatric Cochlear Implantation. New York: Springer, NY; 2016. p. 257-273. (In Eng.) DOI: https://doi.org/10.1007/978-1-4939-2788-3_17

29. Sivinskiy A.M., Kulambayeva K.K. Learning Effectiveness and Evaluation Technology in School for Hearing-Impaired Children. *Obrazovaniye i samorazvitiye* = Education and Self Development. 2019; 14(2):92-104. (In Russ., abstract in Eng.) DOI: https://doi.org/10.26907/esd14.2.08

30. Iskakova R.K., Azhigenova S.K., Zengin Z. A Modern Assessment of Students in Schools in the Education System of Kazakhstan. *Vestnik Karagandinskogo universiteta. Seriya: Pedagogika* = Bulletin of the Karaganda University. Pedagogy Series. 2018; (2):155-161. Available at: https://rep.ksu.kz/bitstream/handle/data/3674/Iskakova_A%20modern_2018-90-2.pdf?sequence=1&isAllowed=y (accessed 14.01.2021). (In Eng.)

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СПИСОК
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1. Ишембитова, К. Р. Особенности развития детей с нарушениями слуха / К. Р. Ишембитова, Л. Н. Уварова // Colloquium-Journal. – 2019. – № 7. – С. 24–26. – URL: http://www.colloquium-journal.org/wp-content/uploads/2019/04/Colloquium-journal-731-chast-3.pdf (дата обращения: 14.01.2021). – Рез. англ.

2. Marschark, M. Cognitive Functioning in Deaf Adults and Children / M. Marschark, L. Wauters. – DOI 10.1093/oxfordhb/9780199750986.013.0034. – Текст : электронный // The Oxford Handbook of Deaf Studies, Language, and Education; ed. by. M. Marschark, P. E. Spencer. – 2012. – Vol. 1.

3. Caio, S. Technologies For Educating Deaf Children – A Systematic Literature Review / S. Caio, F. Deller, R. Cassio. – DOI 10.5753/cbie.sbie.2019.1161 // Conference: XXX Simpósio Brasileiro de Informática na Educação (Brazilian Symposium on Computers in Education). – Brasilia: SBC, 2019. – Pp. 1161–1170.

4. Makoelle, T. M. Teacher Education and Inclusive Education in Kazakhstan / T. M. Makoelle, V. Burmistrova. – DOI 10.1080/13603116.2021.1889048 // International Journal of Inclusive Education. – 2021. – Pp. 1–17. (ahead-of-print)

5. Cawthon, S. W. Evidence-Based Practices in Deaf Education: A Call to Center Research and Evaluation on the Experiences of Deaf People / S. W. Cawthon, C. L. Garberoglio. – DOI 10.3102/0091732X20985070 // Review of Research in Education. – 2021. – Vol. 45, issue 1. – Pp. 346–371.

6. Алехина, С. В. Инклюзивное образование: от политики к практике / С. В. Алехина. – DOI 10.17759/pse.2016210112 // Психологическая наука и образование. – 2016. – Т. 21, № 1. – С. 136–145. – Рез. англ.

7. Жетписбаева, Б. А. Особенности инклюзивного образования в Республике Казахстан / Б. А. Жетписбаева, М. А. Жетписбаева // Вестник Карагандинского университета. Серия: Педагогика. – 2017. – № 1. – С. 22–27. – URL: https://articlekz.com/article/17922 (дата обращения: 14.01.2021). – Рез. англ.

8. Зайцева, Г. Л. Диалог с Л. С. Выготским о проблемах современной сурдопедагогики / Г. Л. Зайцева // Культурно-историческая психология. – 2006. – Т. 2, № 3. – С. 21–27. – URL: https://psyjournals.ru/kip/2006/n3/Zaitseva_full.shtml (дата обращения: 14.01.2021). – Рез. англ.

9. Doherty, M. T. Inclusion and Deaf Education: The Perceptions and Experiences of Young Deaf People in Northern Ireland and Sweden / M. T. Doherty. – DOI 10.1080/13603116.2010.523905 // International Journal of Inclusive Education. – 2012. – Vol. 16, issue 8. – Pp. 791–807.

10. Alduais, A. The Effect of the National Plan (2010–2020) on the Development of Special Education in China: Evidence from Before–After Design at a 7-Year Interval / A. Alduais, M. Deng. – DOI 10.3390/educsci9020095 // Education Sciences. – 2019. – Vol. 9, no. 2. – Pp. 95.

11. Semantic Categorization: A Comparison between Deaf and Hearing Children / E. A. Ormel, M. A. Gijsel, D. Hermans [и др.]. – DOI 10.1016/j.jcomdis.2010.03.001 // Journal of Communication Disorders. – 2010. – Vol. 43, issue 5. – Pp. 347–360.

12. Сивинский, А. М. История и современное состояние системы обучения детей с нарушениями слуха в Республике Казахстан / А. М. Сивинский, К. К. Куламбаева, А. Н. Кошербаева. – DOI 10.25629/HC.2019.03.04 // Человеческий капитал. – 2019. – № 3. – С. 38–45. – Рез. англ.

13. Spaulding, L. S. A Review and Analysis of the History of Special Education and Disability Advocacy in the United States / L. S. Spaulding, S. M. Pratt // American Educational History Journal. – 2015. – Vol. 42, no. 1. – Pp. 91–109. – URL: https://eric.ed.gov/?id=EJ1143593 (дата обращения: 14.01.2021).

14. Fernandes, P. R. d. S. The Soft Skills of Special Education Teachers: Evidence from the Literature / P. R. d. S. Fernandes, J. Jardim, M. C. d. S. Lopes. – DOI 10.3390/educsci11030125 // Education Sciences. – 2021. – Vol. 11, no. 3. – Pp. 125.

15. Special Education Policy Prospects: Lessons From Social Policies Past / J. M. Kauffman, B. Ahrbeck, D. Anastasiou [и др.]. – DOI 10.1080/09362835.2020.1727326 // Exceptionality. – 2021. – Vol. 29, issue 1. – Pp. 16–28.

16. Salisbury, F. Are They Ready? Exploring Student Information Literacy Skills in the Transition from Secondary to Tertiary Education / F. Salisbury, S. Karasmanis. – DOI 10.1080/00048623.2011.10722203 // Australian Academic & Research Libraries. – 2011. – Vol. 42, issue 1. – Pp. 43–58.

17. Шульга, Т. И. Эмоционально-волевой компонент психологической готовности к обучению школьников / Т. И. Шульга // Вестник Московского государственного областного университета. Серия: Психологические науки. – 2012. – № 1. – С. 60–66. – URL: https://vestnik-mgou.ru/Articles/Doc/2805 (дата обращения: 14.01.2021). – Рез. англ.

18. Hamilton, H. Memory Skills of Deaf Learners: Implications and Applications / H. Hamilton. – DOI 10.1353/aad.2011.0034 // American Annals of the Deaf. – 2011. – Vol. 156, no. 4. – Pp. 402–423.

19. Smolucha, L. Vygotsky's Theory In-play: Early Childhood Education / L. Smolucha, F. Smolucha. – DOI 10.1080/03004430.2020.1843451 // Early Child Development and Care. – 2021. – Vol. 191, issue 7-8. – Pp. 1041–1055.

20. Newman, S. Vygotsky, Education, and Teacher Education / S. Newman, A. Latifi. – DOI 10.1080/02607476.2020.1831375 // Journal of Education for Teaching. – 2021. – Vol. 47, issue 1. – Pp. 4–17.

21. Зверева, Н. В. Произвольная модально-специфическая память у детей и подростков при разных типах дизонтогенеза: оценка эффективности запоминания / Н. В. Зверева, Е. Е. Балакирева // Современная терапия в психиатрии и неврологии. – 2017. – № 2. – С. 23–28. – URL: https://cyberleninka.ru/article/n/proizvolnaya-modalno-spetsificheskaya-pamyat-u-detey-i-podrostkov-pri-raznyh-tipah-dizontogeneza-otsenka-effektivnosti-zapominaniya (дата обращения: 14.01.2021). – Рез. англ.

22. Dye, M. W. G. Visual Attention in Deaf Children and Adults: Implications for Learning Environment / M. W. G. Dye, P. Hauser, D. Bavelier. – DOI 10.1093/acprof:oso/9780195368673.003.0009 // Deaf Cognition ; M. Marschark, P. Hauser (Eds.). – New York: Oxford University Press, 2008. – Pp. 250–263.

23. The School Career of Children with Hearing Loss in Different Primary Educational Settings – A Large Longitudinal Nationwide Study / T. F. K. Van der Straaten, J. J. Briaire, E. Dirks [и др.]. – DOI 10.1093/deafed/enab008 // The Journal of Deaf Studies and Deaf Education. – 2021. – Vol. 26, issue 3. – Pp. 405–416.

24. Clark, T. Assessment and Development of Deaf Children with Multiple Challenges / T. Clark. – DOI 10.1093/oso/9780190880545.003.0002 // Evidence-Based Practices in Deaf Education. – Oxford: Oxford University Press, 2018. – Pp. 33–58.

25. Engagement of Children who are Deaf or Hard-of-Hearing Attending Mainstream Schools / M. Todorov, K. Galvin, S. Klieve, F. Rickards. – DOI 10.1093/deafed/enab003 // The Journal of Deaf Studies and Deaf Education. – 2021. – Vol. 26, issue 3. – Pp. 395–404.

26. Глухова, Е. С. Проблемы психологической готовности участников образовательного процесса к введению инклюзивного образования / Е. С. Глухова, С. А. Литвина // Психология обучения. – 2013. – № 1. – С. 28–39. – URL: https://edit.muh.ru/mag/jour3.php?link=po012013 (дата обращения: 14.01.2021). – Рез. англ.

27. Kyle, F. E. A Comparison of Deaf and Hearing Children's Reading Comprehension Profiles / F. E. Kyle, K. Cain. – DOI 10.1097/TLD.0000000000000053 // Topics in Language Disorders. – 2015. – Vol. 35, issue 2. – Pp. 144–156.

28. AuBuchon, A. M. Elementary Cognitive Processes Underlying Verbal Working Memory in Pre-Lingually Deaf Children with Cochlear Implants / A. M. AuBuchon, D. B. Pisoni, W. G. Kronenberger. – DOI 10.1007/978-1-4939-2788-3_17 // Pediatric Cochlear Implantation ; N. Young, K. Iler Kirk (eds). – New York: Springer, NY, 2016. – Pp. 257–273.

29. Сивинский, А. М. Эффективность учебного процесса в школе для детей с нарушениями слуха и технология ее оценки / А. М. Сивинский, К. К. Куламбаева. – DOI 10.26907/esd14.2.08 // Образование и саморазвитие. – 2019. – Т. 14, № 2. – С. 92–104. – Рез. англ.

30. Iskakova, R. K. A Modern Assessment of Students in Schools in the Education System of Kazakhstan / R. K. Iskakova, S. K. Azhigenova, Z. Zengin // Вестник Карагандинского университета. Серия: Педагогика. – 2018. – No. 2. – Pp. 155–161. – URL: https://rep.ksu.kz/bitstream/handle/data/3674/Iskakova_A%20modern_2018-90-2.pdf?sequence=1&isAllowed=y (дата обращения: 14.01.2021).

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