

# Training of the Individuals with Disabilities Using Adaptive Education Programs

Valentina Burenina

Bauman Moscow Technical University (BMSTU)  
2-ya Baumanskaya st., 5  
Moscow, Russia  
E-mail: bvi@bmstu.ru

Liubov Arsenkina

Bauman Moscow Technical University (BMSTU)  
2-ya Baumanskaya st., 5  
Moscow, Russia  
E-mail: larsenur@bmstu.ru

Olga Scherbakova

Bauman Moscow Technical University (BMSTU)  
2-ya Baumanskaya st., 5  
Moscow, Russia  
E-mail: sherbakova@bmstu.ru

Olga Otrokova

Bauman Moscow Technical University (BMSTU)  
2-ya Baumanskaya st., 5  
Moscow, Russia  
E-mail: otrokova@bmstu.ru

**Abstract**—The use of training equipment for individuals with disabilities by adaptive education programs using the “Russian method of teaching engineers” is described in this paper. The points of view of scientists and specialists in the field of pedagogy and psychology are analyzed in the paper, and also the practice of using training equipment at universities is considered. In particular, the object of the research is programs of adaptive training in higher education, which are focused on training individuals with disabilities. The processes of using training equipment are analyzed, the concept of this equipment is formulated, and the necessity of usage is justified in the paper. The necessity of a creative approach in teaching activities for the introduction of training equipment to the educational process is shown in the paper. The analysis of the necessity of training equipment usage in the classes was carried out, and was revealed that the usage of training equipment increases the level of student learning in the educational program.

**Keywords**—higher education; individuals with disabilities; training equipment; visualization of educational environment

## I. INTRODUCTION

The issues of training individuals with disabilities by adaptive education programs are actively discussed in the academic community now. In higher education institutions in Russian Federation, individuals with disabilities are enrolled in all programs, including Bachelor's programme, specialty, Master's programme and postgraduate studies.

In Russian Federation, much attention is paid to the quality of the higher education system and education in general. In order to prepare high-level specialists, professional teachers strive in their own profession to improve educational processes, and higher educational institutions monitor learning activity. It also paid great attention to the training of highly qualified specialists in BMSTU.

“Russian method of training engineers” was born in a vocational school which in turn gave a start of the history of modern BMSTU. A. V. Yaminsky notes that “BMSTU went through the hard historical journey which is imprinted in abbreviations - EIH- IMTS - BMHTS - BMMEI - BMHTS - BMSTU. BMSTU is the heirson and successor of the XIX century school and its historical method”[1]. The Russian method of teaching received worldwide recognition in 1876 at an exhibition in Philadelphia, and till present is reflected in the educational processes of the current National Research University.

Russian scientists, as like as their foreign colleagues, are actively discussing issues related to engineering in scientific literature. The issues are the following: the specifics of the historical approach to engineering activity (OV Kozlovskaya; V.I. Martinkus and others); philosophical understanding of engineering work (G.Y. Bush, V.F. Gorbachevsky, B.I. Kudrin); development of higher engineering education (A.G. Bondarenko, Yu.A. Dmitriev, I.P. Kaloshina, P.F. Kravchuk, A.B. Kurlov, A.I. Pozdnyakova, V.P. Starzhinsky, S.I. Shabalin, VF Shepetko) [2]. Many papers of modern scientists including BMSTU scientists are devoted to the problems and innovations in the field of education [3]. Papers of V.I. Burenina, N.Yu. Terekhova, T.Yu. Tsibizova. and others are addressed to the consideration of innovative forms of education and improvement of educational processes.

Currently, various science and technology achievements which make life in modern society comfortable for people are widely spread. In particular, nowadays there is training equipment that makes possible to simplify the training of individuals with disabilities. In this regard, the issue of usage of various training equipment in the educational process is particularly relevant [4]. It is not a secret that working with individuals with disabilities requires a much greater energy efforts from a teacher, and also requires additional efforts

that are directly related with the realization of his creative potential. It should be noted that the usage of training equipment and the realization of the creative potential of the teacher is an essential part of the modern educational process, not only within the framework of adaptive learning, but also in the educational system in general [5]. The existing best practices in this case can suggest that a single model which can be used to train engineers, in particular, by adaptive educational programs, did not exist and does not exist.

The focus of this paper is issues of adaptive education of students with disabilities on the example of BMSTU, successfully implementing the "Russian method" of training engineers during the XIX-XXI centuries, as well as issues of training equipment usage in educational organization.

The novelty of the work is to consider the processes of using training equipment in the educational process for adaptive education in order to increase the level of perception of educational material and the quality of training for individuals with disabilities. The necessity training equipment application in the educational process is justified

by the increased demand for educational services of higher education for individuals with disabilities, which is confirmed by statistic data.

**II. REALIZATION OF ADAPTIVE TRAINING PROGRAMMES IN RUSSIAN FEDERATION**

The Ministry of Education and Science of the Russian Federation monitored issues related to the education of individuals with disabilities. In particular, the "Certificate about the availability of conditions for education of individuals with disabilities in higher education institutions" indicated that in most higher education institutions (51.5%) that provide education for individuals with disabilities are taught 10 to 49 individuals with disabilities [6]. In one third of higher education institutions (31.5%) less than 10 students in this category are taught. Only in 37 higher education institutions (7.9% of the total number of higher education institutions that teach individuals with disabilities) more than 100 people are taught ("Table I").

**TABLE I. THE RATIO OF THE TOTAL NUMBER OF STUDENTS AND THE NUMBER OF STUDENTS WITH DISABILITIES IN RUSSIAN UNIVERSITIES**

Higher education institution	Total amount of students	Amount of individuals with disabilities	The percentage of individuals with disabilities in the total amount of students
Moscow State University of Humanities and Economics	812	487	60,1
Russian State Social University	37272	410	1,1
Southern Federal University	28201	282	1,0
Ingush State University	7393	207	2,8
Bauman Moscow State Technical University	20502	205	1,0
Moscow State University of Psychology and Education	4390	187	4,3
Kazan Federal University	44750	179	0,4
Plekhanov Russian University of Economics	28167	169	0,6
Siberian Federal University	33203	166	0,5
Vladimir State University named after Alexander and Nikolay Stoletovs	23001	161	0,7
North-Caucasus Federal University	23006	161	0,7
Herzen State Pedagogical University	16004	160	1,9
Ural Federal University	26504	159	0,5

In accordance with the indicated source, among the individuals with disabilities, enrolled in educational programs of higher education, the largest number of students have somatic diseases (29%). 17.9% of students have muscle-skeleton disorders. Nearly 7% of students with disabilities have hearing disabilities, 8.5% have visual disabilities, and 1.6% of students have neurodevelopmental disorder. 223 students with disabilities enrolled in educational programs of higher education use a wheelchair (1.5%) [6].

Individuals with disabilities are taught both in common groups and in selected groups. Individuals with disabilities are taught in common groups in most educational organizations (94.6%). 2.8% of higher education institutions provide training for individuals with disabilities in selected groups. Also "mixed" form of education can be separated. The mixed form of education provides for the training of individuals with disabilities both in common groups and in

selected ones, and is implemented in 10.6% of higher education institutions. 31% of higher education institutions carry out the training of the individuals with disabilities by an individual education plan.

According to Rosstat during the admission campaign of the 2015/2016 academic year 5966 students with disabilities were admitted to educate on higher education programs, 6087 people for the 2016/2017 academic year, 6881 students for 2017/2018 and 7487 people for 2018/2019[7].

The main professional curricula which are implemented for training individuals with disabilities should include training equipment for collective and individual use, for example, special acoustic systems for deaf and hearing-impaired individuals, special software for translating the teacher's speech into text for deaf and hearing impaired students and so on [8].

### III. JUSTIFICATION OF THE NECESSITY OF TRAINING EQUIPMENT USAGE WITHIN THE FRAMEWORK OF TRAINING INDIVIDUALS WITH DISABILITIES

Working with individuals with disabilities, the teacher should choose the ways and methods of the most accessible presentation of information. It means that in the case, for example, of work with students with hearing impairment, it is required to maximally visualize the information provided.

The easiest way to visualize information is by using training equipment. In the paper "The use of training equipment in the modern educational process", the authors emphasize that "improving the student's perception of the material being taught and the quality of education in general is the goal of using training equipment" [9]. In Federal Law "On Education in Russian Federation" is established that "teaching and education means include devices, equipment, illustrated study guide, computers, audiovisual media, printed and electronic educational and information resources, and other material objects necessary for the organization of educational processes". Kodjaspirova G.M. means that training equipment is "a set of technical devices with didactic software used in the educational process in order to optimize it for the presentation and processing the information" [10]. Thus, training equipment should be understood as devices and equipment that are used in the framework of the educational process due course of law in order to improve the quality of the educational process. The use of such kind of equipment in Russian Federation is regulated by a number of regulatory legal acts: the specified Federal Law "On Education in the Russian Federation", as well as federal state educational standards. These documents require the educational organization to make extensive use of training equipment. Since it is talked about the organization of the educational process, the statutory documents of universities, regulations on structural divisions also fix such contributions.

Usage of training equipment first of all means implying the presentation equipment in lectures and seminars. The presentation equipment includes smart boards, stationary and portable projectors, specialized webs, etc. In the recent past, filmstrip playing equipment was widely used. The use of training equipment is advisable not only in the framework of adaptive education, but also in the framework of the educational process as a whole.

The issues of perception were studied in detail in the paper "Improving the process of perception of information in the framework of educational processes on the example of BMSTU". According to this work, science identifies various channels of perception depending on the five sense organs for a human being, such as: visual, olfactory, auditory, tactile, taste senses [11]. Four types of sensory systems in dependence to information analysis system which prevails in human are distinguished: visual, auditory, kinaesthetic, and digital [12]. In this regard, different people perceive the same information in different ways.

According to the British psychologist Tony Buzan, the left and right cerebral hemispheres are responsible for different cortical abilities - the brain's abilities to perceive information. When both cerebral hemispheres are involved

simultaneously, the perception of information improves exponentially. In his theory, Buzan relies on the work of Roger Sperry, who studied the cerebral cortex. Roger Sperry in his research indicates that the two cerebral hemispheres split the most important intellectual functions [13]. According to this theory, the right hemisphere is responsible for imagination, dreaming, perception of colors and sizes, and the left hemisphere is responsible for speech, logical thinking, operations with numbers, etc. Taking this into account, it's possible to talk about improving the efficiency of information assimilation processes using both hemispheres simultaneously. During the lecture or the seminar, the student perceives the speech of the teacher by activating the left cerebral hemisphere. When the teacher uses schematics, the right hemisphere is involved. However, it is obvious that, in response to imagination, perception of colors and shapes, the right hemisphere functions at the minimum acceptable level. Within the framework of the theory of Sperry, continued by Buzan, the work of the right hemisphere can be activated by adding colors, objects of various forms to the learning process. It can be done by using training equipment.

Therefore, in the framework of the educational process, it is necessary to use various forms of information presentation by training equipment that would be oriented to different types of perception and involve both cerebral hemispheres [14]. Thus, in order to increase the level of perception in the framework of the educational process, it is appropriate for the teacher not only to speak out the material of the lecture aloud, but also to discuss certain issues with the students in addition, to speak with emphasis on certain issues, accompany the speech with diagrams, drawings, show presentations and, if it is possible to show objects for the purpose of their kinaesthetic perception. In other words, the teacher during the class must focus on different systems of perception. For this purpose, it is advisable to use the training equipment that was mentioned above. It is necessary to use training equipment in the process of implementing adaptive education programs.

### IV. TRAINING EQUIPMENT FOR REALIZATION OF TEACHER'S CREATIVITY WITHIN THE FRAMEWORKS OF ADAPTIVE EDUCATION

Of course, it should be noted that mostly young teachers use training equipment. The "old school" teachers, mostly, adhere to traditional teaching methods, and the blackboard and chalk are exclusive visualization tools in their practice. Therefore, a "dialogue" between young teachers and experienced teachers is dramatically important [15].

According to the information of the Ministry of Education and Science of the Russian Federation, higher-education teaching personnel of higher educational institutions in the context of the subjects of the Russian Federation to total amount of higher-education teaching personnel has 28.9% of teachers aged less than 25 to 40 years old, 32.1%, from 40 to 55 years, 38.9% of 55 years and more. Thus, the ratio of teachers of various age groups is almost equal.

Unfortunately not every teacher is interested in the qualitative performance of their duties. If a teacher is conscientious, he sincerely strives to share the knowledge with students, get a visual result of the activities, and also to self-realize.

Modern education has great potential for its development and the ability to create its own flexible system that meets the requirements of a post-industrial society and the individual needs of the individual [16]. A modern teacher strives to make the educational process qualitative and effective. Teacher needs to realize his creativity in the educational process within the framework of the approach to the organization of classes. A creative approach is an indispensable condition for the pedagogical process, and therefore there is a necessity to train teachers for creative pedagogical activity [17] [18]. A great attention is also paid to the creative development of personality in the framework of the educational process. The teacher, who, in turn, acts as a link between the educational system and the individual has a great influence on the creative development of personality. Thus, the implementation of the teacher's creativity contributes to the formation of the students' creative potential.

Each teacher can realize his creativity in different ways. In addition to the tools that currently belong to the training equipment, the teacher in his work can use other achievements of science and technology [19]. For example, if necessary and if the appropriate equipment is available, the teacher can give a lecture using video communication facilities from another city or country. The teacher can distribute the presentation to the students so that they run it on their personal devices in case there is no relevant equipment in the classroom to show the presentation. This way of demonstrating the presentation takes place in technical universities because students of various specialties, especially specialties which are related to computer technology, prefer to bring laptops or tablets to the class and keep notes in electronic form. In other universities, the use of this method would be appropriate or inappropriate depending on how many students use laptops in lectures and seminars. The distribution of presentations in order to reproduce them via smartphones is left to the discretion of teachers.

## V. CONCLUSION

Thus, it is impossible to minimize the importance of training equipment, even if it is talked about the most common training equipment, such as a computer and presentation equipment. The perception of information by the human brain occurs with the use of various sense organs and cerebral hemispheres. The material that is perceived at once by both cerebral hemispheres is absorbed much better and faster. Thus, the teacher can make both students' cerebral hemispheres work by submitting lecture material using high-quality and colorful presentations as part of the educational process. To ensure the activation of several sense organs it is necessary to use specialized equipment — training equipment.

In addition, the value of training equipment in the framework of adaptive education increases significantly. The use of training equipment becomes a necessity for work with students with disabilities. Finally, the teacher must demonstrate a high level of professionalism and be patient during working with such students.

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