

About The Content of the Master's Degree Programs of Teacher Training in Educational Robotics

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ABSTRACT

Technological processes of modern production require training of high-level specialists, including in the field of robotics. Modern education requires a systematic approach to the training of future specialists in the field of engineering and IT. This can be achieved if students in General secondary and vocational education develop research, engineering and creativity. The master's program in the profile "Educational robotics" in a network form will prepare teachers who are able to effectively organize the training of students in the direction of engineering specialties.

Keywords: master's degree program, teacher training, educational robotics.

INTRODUCTION

The modern world is on the verge of transition to Industry 4.0, which involves the introduction of cybernetic systems in all spheres of human activity. In this regard, the issue of training of a new generation of specialists possessing engineering knowledge, including in the field of creation and management of robotic systems, is becoming increasingly urgent [1]. Therefore, it is necessary to train teachers who will be able to effectively orient children, starting from preschool age, and young people to choose professions related to robotics and IT.

Educational and developing potential of robotics was noted by scientists and teachers from different countries. So Michael J. Freeman, inventor, educator and entrepreneur from the USA in 1974 he invented a robot teacher Leachim, who was programmed and tested in a class at school in New York. Existing since 1982 company Intelitek organizes STEM, robotics, programming and technology training in secondary education institutions, colleges, and universities. Since 1998, the Robotics Certification Standards Alliance (RCSA) has been actively implementing robotics curricula in education, conducting online testing and certification. In the early 90-ies of the twentieth century, the possibilities of educational robotics

were devoted to the work of teachers and scientists of the CIS countries (Alekseeva A. P., Bogatyreva A. N., Ershov M. G., Nikitina D. A., Serenko V. A.) [2]. Teaching robotics in higher education institutions of CIS countries up to 2005 was carried out mainly on extracurricular activities and thesis preparation on engineering, and then at the faculties of technical profile appeared the specialty and discipline called "Robotics".

Today, scientists, engineers and teachers of educational institutions of China, India, Turkey, as well as the EAEU member States, including Russia and Belarus, make a great contribution to the development of educational robotics along with the leaders of this field (Japan, USA, leading EU countries) [3]. With the rapid development of microelectronics started to develop intensively the possibilities of educational robotics for the production of programmable LEGO blocks, ENGINO ROBOTICS, MAKEBLOCK, FISCHER TECHNIK, ARDUINO, MOSS etc. In the teaching of robotics in Russia is actively used by designers TEHNOLAB, ROBOTREK, etc. Belarusian software developers MROBOT presented on the educational market the first Belarusian educational robotic toyRoboCat going designed to teach children programming, Scratch and Arduino.

RESULTS AND DISCUSSION

Today, the introduction of educational programmable designers into schools and training centers has become popular and is actively promoted at scientific fairs, including in the EAEU countries [4]. In Russia, the study of robotics is included in the program of the school subject "Technology" since 2015. In Belarus, robotics classes are held as part of elective courses. At the same time, the issue of training qualified teachers in the field of educational robotics. Training of teachers in this area began in Russia in 2012 as part of training. Improving the system of teacher training in the field of robotics has continued with the opening of the Institute of mathematics, Informatics and Sciences (at present Institute of digital education) Moscow city pedagogical University (MGPU) undergraduate educational programs on "Informatics and technology" (duration of studies – 5 years) and master 44.04.01 in the direction of "Pedagogical education", profile "mechatronics, robotics and electronics in education" (training period – 2 years) [5], practical classes which are held in the pedagogical STEM-Park of MSPU and implemented by the teaching staff of the Department of Informatics and applied mathematics of the University.

In Belarus, training in robotics began in private educational centers in 2014, which themselves prepared the teaching staff, most often of engineers and students, little or no familiar with the teaching methods, pedagogy and child psychology. For this reason, in November of 2017, the educational institution "Belarusian state pedagogical University named after Maxim Tank" (BSPU) was opened by the Republican resource center of educational robotics. The center is the base for the students of physical and mathematical faculty of the elective course "Foundations of mechatronics and robotics," and "Fundamentals of visual programming and educational robotics" for students of primary and preschool education developed by the Department of information technology in education. The center also actively implements educational programs to improve the skills of teachers, training courses for children and youth, provides methodological assistance to teachers of additional education, taking into account their needs in theoretical and scientific-practical knowledge, seminars and workshops on educational robotics. In March 2018, the International Internet conference "Educational

information technologies and robotics" actively discussed the methods of teaching this direction.

Institutions of General secondary education in Belarus began to actively acquire programmable designers to organize creative and research activity of students. Currently in the Republic organized more than 300 workshops in the institutions of additional education of children and young people, national centers of innovation and technical creation, private educational centres in which pupils prepare for national and international competitions (World Skills Hi-Tech (Junior Skills), world robot Olympiad, Belarus-China youth robotics tournament, the international championship "Robo Cup", "Robot Challenge", etc.).

However, the analysis of the state of the problem of introduction of educational robotics in the learning process revealed contradictions between the need for human resources of modern robotics and the level of training of specialists in this area, between the need to integrate subject areas of physics and technology for the formation of knowledge on educational robotics and features of education of different levels and profiles, between the need to introduce methods of application of educational robotics in the education of schoolchildren and the lack of pedagogical research in Belarus in the development of effective methods of its use in interdisciplinary education.

These facts determine the need for specialists who have the ability to apply scientific, technical and interdisciplinary knowledge to solve problems in the subject area, able to apply modern methods of development of information, algorithmic support of the educational process, modern tools of software and hardware for solving professional problems, able to understand the problems of their subject area, choose methods and means of solving them, adapt to changing conditions, re-evaluate their experience, analyze opportunities, to be able to work in a team and use in practice the skills and abilities of the organization of scientific and pedagogical research, to develop educational materials for students.

In our opinion, training of specialists possessing these competencies is possible within the framework of the implementation of international educational programs of the second stage of higher education. With this joint initiative by Institute of digital education Moscow state pedagogical University (Moscow, Russia), physics and mathematics faculty of

Belarusian state pedagogical University (Minsk, Belarus) within the framework of training of masters in experimental educational program of a magistracy in 1-08 80 02 "Theory and methodology of training and education (on areas and educational levels), the specialization: Educational robotics, focused on preparing the graduates for independent solution of tasks of professional activity (research, expert-methodical) in the field of training on the basis of new technologies and effective tools for training modern teaching staff, taking into account the peculiarities of national and international education systems.

For the implementation of this program were developed curricula full-time (period of study 1 and 2 years) and correspondence forms (1.5 and 2 years) of education. Two-year study plan was developed on the basis of the educational program of magistracy on the direction 44.04.01 "Pedagogical education", profile "mechatronics, robotics and electronics in education". The total volume of the educational programs is 120 credits (ZE), of which 54 ZE – training (1944 hours, of which 716 hours of classroom lessons), practice – 58 8 ZE and ZE allotted for the preparation of a thesis. To be able to implement a network form of educational interaction, which involves the academic mobility of students and teachers, the values of credits for disciplines and practices have been preserved, the periods of passage have been agreed. This will allow to send students to partner universities to pass the discipline on the educational material base of the University to obtain a certificate of training, as well as to invite scientific and pedagogical staff of the partner University to carry out educational activities, including the use of remote technologies and the implementation of online courses. The structural plan consists of the state component (38%), represented by the module "foundations of scientific-research work pedagogical direction", and a component institution of higher education (72%) consisting of modules "Basics of electronics, mechatronics and robotics", "Methods of teaching robotics" module of optional subjects. The form of certification and the number of academic hours for educational modules and disciplines of their components correspond to the plans of partner universities. This educational program is designed to train teachers for lyceums, colleges and specialized classes aimed at orientation of students in the choice of professions in the field of engineering, robotics and it.

One-year curriculum was developed on the basis of approved educational standard of the specialty 1-08 80 02 "Theory and methodology of training and education (on areas and educational levels) and has a capacity of 60 credits (ZE), of which 42 ZE – training sessions (1370 hours, including 504 hours of classroom lessons), practice 6 and 12 ZE ZE allotted for the preparation of a thesis. The structural plan consists of the state component (34%), representation of the module "Philosophical and methodological problems of education" and "innovation Management in education", and a component institution of higher education (66%), consisting of modules "Basics of electronics, mechatronics and robotics", "Programming in robotics" and "Methods of teaching robotics" module of optional subjects etc. For the possibility of joint implementation of this plan, the developers have retained the names and values of academic hours for individual disciplines, which will allow academic mobility of students and teachers. With respect to the 2-year plan, 57% of the disciplines of the professional cycle are preserved. The program involves the training of teachers for the third stage of General secondary education, lyceums, as well as the system of additional education of children and youth, where the research, engineering and creative abilities of students will be developed.

Presents the forms of interaction between universities-partners will promote the globalization of higher education; the training of highly qualified specialists in research; development of distance learning; creating conditions for development of creative activity of teachers in the field of innovative technologies.

This project is aimed at ensuring the innovative nature of the development of the sphere of training of teachers in the field of educational robotics, taking into account the peculiarities of national and international education systems based on partner universities.

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About The Content of the Master's Degree Programs of Teacher Training in Educational Robotics

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