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COMPLEX ANALYSIS OF THE DIDACTIC CONCEPT EFFICIENCY IN THE CONTINUOUS EDUCATION SYSTEM

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Abstract

At present the demand for a well-educated specialist with wide and diverse skills and competence requires reconsidering the concept of professional training of graduates at all levels. In the contemporary world, which is changing dramatically and with high speed, the notion of life-long (continuous) education has gained unprecedented value. Although for most people it is primarily connected with postgraduate education, but it is obvious that successful academic and professional careers significantly rely on two conditions: the right choice of the future profession and solid basic knowledge and skills obtained at the level of secondary education. The paper presents the system of life-long education developed at Moscow Polytechnic University based on project activity. Introduced in secondary and higher education, project activity is aimed at developing both professional skills and competence and individual qualities important for studies and work for every person. Despite the fact that the experiment is still in its progress, the preliminary results have shown that students who at school attended professionally oriented courses are more motivated and interested in learning process and do better at the first year of studies at the University compared to those who were not engaged in this kind of extra-curriculum activity at the pre-university level of studying.

Keywords: Life-long education, project activity, efficiency

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1. Introduction

Russia has rich experience and tradition in quality education at all levels - from primary and secondary school to bachelor, master and postgraduate programmes. However, the advances in national and global science, technology and economics require changes in the education at all levels from school to higher education.

Higher education is always characterized by constant search of significant changes, their part in modern economy and social life of the society. Defining an "ideal type" of higher education requires scrutiny and creative process. Such type of a higher education is intended at personal interests, a present-day employer, business and society and high professional skills of graduates (Luksha, Cubista, Laszlo, Popovich, & Ninenko, 2017).

Initially, this process can be implemented by continuous growth of new pedagogical, IT and multi-media technologies, by increased versatility and integration of all participants of the educational process into global education (Klimenko, Lubimova, Presnukhina, Tamrazova, 2017), (The Future of the Higher Education, 2008), (Zhuang, Fang, Zhang, Lu, & Huang, 2017). As a result, it is critical to take action and reflect changes in education, its organization and transition from one educational level to another.

2. Problem Statement

Therefore, the accumulation of qualitative changes in higher education leads not only to changes in its framework but also in its mission. It is important to keep traditional education while training a new generation of experts with high level of skills and efficiency, adaptable to professional activity and social life.

The understanding of the necessity to change the existing paradigm of the education of Soviet times has led to the elaboration of the following documents:

- The Concept of Long-Term Development of Russian Federation (RF) until 2020
- Innovation in Russia - 2020
- Federal Law "On Education in RF"

All of them highlight one important idea that one of the priorities in education is the improvement of the instruction quality in life-long education regardless of its direction and level.

For most people and professionals the term "life-long education" is mainly connected with the notion of postgraduate self-education in one's professional environment in order to keep up-to-date with the latest innovations and developments in his or her field (Vampa, 2014).

3. Research Questions

On the other hand, it is obvious that the quality of a higher education graduate significantly depends on the level of training in the secondary school, which makes it a cornerstone in the new educational paradigm (Volgina, 2005). In the present always changing technical and professional environment the main objective of the secondary education is no longer just to teach basic reading, writing and mathematical skills or to provide a student with the general picture of every existing science. Nowadays all levels of pre-university education (primary, secondary and high school) should aim at

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helping a student to make the right choice of the future profession as this is the most important condition of his or her success or failure in the further academic and professional career.

4. Purpose of the Study

Thus, the purpose of the study is to evaluate the state of the art existing at the levels of secondary and higher education in the context of life-long education and the importance of developing an educational model providing smooth and successful transition of students from one level to another.

5. Research Methods

Nowadays we need to have a new perception of the essence, contents and social importance of the secondary education as a stage where a teenager makes the most vital decision in his life. That's why the analysis of the efficiency of the didactic concept of pre-university training in the system of life-long education has a true practical engagement and requires serious scientific research.

The modernization of the present state of the Russian education needs such innovative and effective activities and teaching methods which will both lead to the significant improvements in all levels of education and help teenagers choose the career path corresponding to their talents, skills and psychological type. In this respect it is essential to have resources to improve the quality of psycho-pedagogical activities in the system of professional orientation in secondary and higher education.

At present, the professional orientation of secondary school pupils should be based on personal expertise, duality and temporality and should become a structured, open and most importantly deliberate process.

Based on the experience, new models of school specialization (internal school specialization, network organization of complete, partial and professional elementary, secondary and high school education) offer a flexible development of continuity of educational system: school - university - manufacturing. Additionally, there is another significant objective of the secondary education: to find out gifted and talented children and prepare them to function efficiently in their future professional work in highly intellectual and technological industries.

The development and introduction of a new didactic concept of the secondary education, aimed at providing effective occupational guidance to adolescents, should be based on the following blocks:

1. motivational block which implies understanding of the core of a chosen profession, its social mission and responsibility, direction and encouragement of matriculants to obtain sensory culture of the chosen vocation;

2. procedural and informative block which includes proper educational documentation concerning secondary school education and vocational training of schoolchildren, communication of all members of the process through webinars, the Internet or face-to-face;

3. result-oriented block which pays attention to the level of independence in the choice of future profession, complacency of education in early years, results of education and job security of students;

4. integral criterion which estimates the readiness of graduates to perform well their job-related duties and to move on to the next level of education.

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6. Findings

In this respect the next question to ask is as follows: which institute is to elaborate such a system of truly life-long education when a student is purposefully and systematically trained according to a single educational path? Obviously, it cannot be a secondary school itself as it has no connections with an employer and is not aware of the exact requirements to the final product, i.e. a university graduate. It should not be the ministry of education as it often lacks flexibility and does not really participate in the educational process, but only monitors and regulates it. University, being in the middle position between the secondary school and the consumer of a final product, the employers, seems to be the best choice. University has a clear understanding both of the requirements to the future specialists, because it trains students for their future professional life, and of the level of knowledge and skills a person must possess to do well while doing a university degree (Grishina, 2017; Perezhovskaya, 2015).

Closely interacting with schools and other organizations, Moscow Polytechnic University has made an attempt to develop a consistent educational trajectory from school to employment aimed at developing the person's abilities to create and self-improve. This has required a shift from the reproductive-informative methods in teaching to productive training techniques which would allow to realize student's potential (Allan, 2014). One of the most prospective ways to achieve this goal is to organize project activities for students. Project activity regarded as a prototype of a real life professional or social task possesses true practical value as it prepares young generation to cope with problems and to be able to find or invent a proper solution after carefully considering the existing options (Rienties & Toetenel, 2016).

Project activity displays a number of important benefits for students:

1) it teaches students to obtain necessary information from different sources themselves without teacher's help based on the project's aim which they determine themselves;

2) it teaches students that realization of any project requires a thorough plan of actions which should take into account participants' skills and possibilities and the knowledge gained during the lessons;

3) it teaches to work in groups and to cooperate with the colleagues, develops student's communicative skills;

4) it develops person's research skills, such as defining the problem, collecting information, monitoring, carrying out an experiment, analyzing the data received and summarizing results.

Of course, at the first stage project activity must be guarded and controlled by a tutor or a lecturer, but gradually his or her involvement should be reduced to its minimum.

Project activity being the cornerstone in its educational system, Moscow Polytechnic University has introduced two departments into its structure: Engineering school and Project activity centre. The former deals with schools and schoolchildren, while the latter presents consistent development of project activities within the University studies as every student at Moscow Polytechnic University is to be engaged in a project connected with his or her future profession.

Engineering school pursues two main objectives. The first goal is to attract talented and gifted pupils in science and technology to work under the guidance of tutors and lecturers from the University. The second goal is the professional orientation of schoolchildren in the engineering area. As a result,

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Engineering school functions in the several directions. First of all, it interacts with schools and different educational establishments to create specialized engineering classes that will be able to train skilled specialists for modern branches of industry. Some years ago, Moscow Polytechnic started to work with pupils at the age of 13 (pupils of 8 – 11 classes). At the moment such engineering classes are organized in 26 schools-partners, involving approximately 1500 students in 25 educational projects. Pupils are taught to carry out a project activity as the basis of educational program for solving different tasks. For example, the students are asked to work out an electromotor bike. To fulfill this task the pupils have to use the knowledge gained at the lectures, workshops and practical lessons. In future the ideas, devices or prototypes created within such project activity can be further developed and enhanced during the University studies and realized as a real-life product later. Since 2017 according to the initiative of the Education Department of Moscow the students of engineering classes are to pass pre-professional examination.

The next important direction of Engineering school activity is organization of different competitions for schoolchildren, such as Engineering Olympiad or Moscow Project Competition.

Engineering school also provides schoolchildren with the opportunity to do courses in basic or specialized engineering areas, for instance: Science Art, Additive technologies, Robotics, Computer design, etc. Every year this department of Engineering school attracts more than 700 students between 10 and 18 years old.

The close collaboration with schools fulfills two essential tasks: helps schoolchildren to make the right career choice and prepares them for the studies at a university which differs a lot from a school.

In 2016 to evaluate the effectiveness of Engineering school the University started a lengthy survey comparing two groups of students:

1.schoolchildren who went through a standard university preparation (Faculty and University Open Days, meetings with famous scientists, entrepreneurs, experts);

2.schoolchildren who went through a purposeful competency-focused (experimental) system of secondary education.

Three groups of students with their major in mechanical engineering were taken for this experiment, each of them containing both categories of participants. Thus, we formed two comparable sets of the equal number of individuals. The first group, which includes the students with motivation to high-quality education, is made up of the students from engineering classes and the second group are the students from ordinary secondary schools.

The assumption which lies at the basis of this study is as follows: the first group cannot compete with the second group as their knowledge is deeper than of those who finished an ordinary secondary school (Behrendt, Dammann, Ştefănică, Markert, & Nickolaus, 2015), (Happ, Zlatkin-Troitschanskaia, & Förster, 2018).

The first stage involves accumulating information concerning the results of the United State Exam (USE) test which can be high, mediocre or low. Numerous research and experience from colleges prove the fact that USE is a “poor” criteria to demonstrate a student’s intelligence or readiness for the university. That’s why once students are enrolled into university, both groups undergo “entrance scrutiny”

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in the beginning of the first term. That includes results from tests that define students' motivation to high-quality education and the knowledge of the fundamentals of their future profession.

During their studies at the University, students are being checked for their grades, IQ tests, testing and results of practical experiments. After graduation, the results are based on final exams, a thesis, a job market and an opinion of an employer.

The next follow-up takes place after one, two and three years after students enter the job market and is based on the following criteria: an opinion of an employer, a degree-related position, career growth, salary, whether a graduate has changed jobs and how many times and job satisfaction of the graduate.

To conduct a complex analysis of the efficiency of the new approach to pre-university education there has been developed a series of studies intended to gauge the effectiveness of the introduction of project activity into schools. The information obtained through continuous monitoring of two groups of students is either factual (such as results of tests and exams, a number of special pre-university courses taken, length of studies, a number of jobs changed, etc), or subjective (such as inner motivation, knowledge base, job competence and expertise, ability to put knowledge and skills into practice, etc.). The first kind of data is gathered automatically without students' participation. But to collect the data of the second type a set of surveys has been developed. These questionnaires are intended to collect information concerning four categories of factors which can affect the project activities efficiency in secondary and higher education.

The factors of the first group are permanent and determine goals and tasks of the training program adopted in secondary school education. They are well known in advance as in some way they are imposed by state standards and guidelines. They include a number of academic disciplines and hours allotted for each of them, types of control, length of studies, and the development of certain basic competences. The evaluation of competence acquisition is based on its structure which comprises four levels (Ermakov, 2009), (Tatur, 2004):

1.understanding of significant scientific foundations in the main field of activity;

2.comprehension of the practical algorithm;

3.social experience and relevance on the job market;

4.creativity and self-development abilities (trendy fields, analysis of potential areas of implementation, development of theoretical foundations).

The components of the second group are variable and can vary at the stage of creation of secondary education and influence its quality. They comprise such factors, as educational technologies, the use of computer-based technologies, professional level of educators, the quality of educational programs, etc.

The factors of the third group deal with talents and psycho-physiological capabilities of a student.

The last group of factors studies the influence of unknown initial and internal conditions, such as the initial level of readiness; common social and age background of participants, relations between all students in the group (competition, leadership, assistance, etc); new IT trends, new methods in education, that is the state of educational milieu (Thomas & Chavan, 2015).

Engineering school is a recent department at Moscow Polytechnic University. It started its work on pre-university training in secondary schools only in 2015. That's why the experiment being carried out now is only in its initial stage. So far we have collected and compared the results of students' UGE and their examination sessions only for the last two years. The obtained information showed a great progress of the students from the engineering classes: the number of these students who passed their exams successfully equals 91%, while the number of students from ordinary secondary schools who have good exam results equals 79%. Yet it should be noted that the experiment is still in progress, and it is difficult to make any final conclusions at this point. In future these figures might be changed, and the students from ordinary secondary schools may have remarkable achievements.

7. Conclusion

The experiment being conducted at Moscow Polytechnic University reflects the situation in the Russian educational system as a whole. Rapid and dramatic changes in society require reconsidering the concept of professional education of graduates at all levels starting from its goals, tasks, final product, mission, approaches, methodology, teaching techniques, etc. Everyone agrees that our society needs well-educated specialists with wide and diverse skills and competence. But which skills and competence are of the most priority in the modern professional environment is still an issue to argue. The only obvious thing today is that it is necessary to continue creating and implementing in educational milieu new approaches and new teaching methods and technologies and to monitor the efficiency parameters dynamics of the developed didactic concepts in order to formulate a comprehensive and consistent system of life-long education able to adapt to the altering conditions.

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