PROJECT-BASED LEARNING AND TEACHING (MOSCOW POLYTECH EXPERIENCE)

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Abstract. This article describes the experience of implementing project activities in the study at the Moscow Polytechnic University. Project activity was built into the schedule of the 1st semester without any preliminary preparation and included the statement of the problem, development and final presentation of the project. The development of professional skills was in parallel with the work on the project. This type of work led to the most desired result - an independent solution of the task, the main activity that higher education is called to teach. The character of teaching and excellent results gave us the basis to see the correlation with suggestopaedia principles.

Keywords: project activity; suggestopaedia principles; student-oriented learning; practical problem solving; positive teaching

Treating people in a most appropriate way for them, we can get everything we want. And what does a high school teacher want? The best results in learning and developing of the students' skill to make various decisions independently. In this case positive basis and absence of imposition are the key traits in reaching kind and at least relations in the educational environment. The above is not the author's idea but in our opinion one of the outstanding teacher and psychologist, who discovered the best possible and effective method of psychotherapeutic approach to learning – Georgy Lozanov. A few words about how we got acquainted to his study. It was not either a traditional mastering of pedagogical methods, or happy acquire of something we had been looking for. An unexperienced teacher due to his young age and psychophysical characteristics conducted her lessons in a positive way not without a bit of humor when in some time it revealed, that all her students in spite of different purposes of learning managed and reached their aims anyway. Suprisingly, there was no negative or "no result" teaching experience at much extent. And only after that that teacher came across the Losanov's method. It happened by chance.Many specialists know that the psychotherapeutic method of doctor Lozanov "still optimizes the learning process, creating the most natural atmosphere

in which knowledge is obtained beyond any special efforts and highly effectively. Absence of psychological pressure on students in the "teacher – student" format releases additional reserves of memory. With this approach, the method also gives good results for students with disabilities. The experience of the situation of success is required by any student and secured by a convincing job: the unconscious movement in learning from the success of the simple to the psychologically easier the development of the complex" (Lozanov, 1971). In a short time there was written an article on this topic (Kurbakova, 2016), which says how the method can be applied nowdays and what unexpected perfect results it can lead to.

We just see all these results in project activity as well. This is due to a certain component of the above Georgy Lozanov's study. It can be followed at all stages of project activity at our university and how it was arranged. For the proper explanation what we mean we will describe the way of project activity realization at our University in general, pointing out the very aspects we can see the suggestopaedia approach.

Implementation of project activities as modernizing of the educational system. The process of implementing project activities: goals, ideas and design

Implementation of project activities in Moscow Polytech was realizing as a part of wide-scale reform of the university as a whole. In order to modernize engineering education and bring it into line with the needs of the modern economy, a set of measures was implemented at the Moscow Polytechnic, including both organizational and substantive changes. Project activities was developed and appeared in the curriculum by the Directorate of Educational Programs in 2014 as one of the compulsory disciplines.

Implementing of project training was carried out in stages. If initially the educational programs of only engineering areas of training were updated and the first-year students were accepted, then a year later the educational programs of the social and humanitarian areas of training were updated. Thus, by 2015, admission to the first year of study was already carried out throughout the university programs that included project activities. As a result, today, 4 years later, almost all undergraduate and specialty students of the Moscow Polytechnic are involved in project training – more than 40 areas of training are included in project activities, in which more than 4,000 students are studying. The transformation of the educational process took place against the background of a serious reorganization of the university: structural and optimization of the staff.

If to speak about structural content, a design model includes lectures from company experts, study tours, workshops, internships and practical training, setting the design objectives, preparing documentation and final presentation of the project, prototyping, testing, developing a team solution to the design task.

Even at first glance it is obvious that the approach does not show the traditional

features of teaching with the obligatory component of imposition of "what it's customary to do at high school", strict subordination of a student but primarily encouraging an interest to the process. As a result students do not show the strengths opposing imposition or trying to suppress it. That is inevitable to some extent in traditional education. But in positive teaching environment all the efforts are directed on revealing of abilities and realization of "the theory of reserve capabilities of a human" (Lozanov, 1973), that unconsciously bears natural acknowledgement and satisfaction of the educational process.

New model of University-business interaction

The second important point: the main idea of introducing project-based learning into the educational process was embodied in the framework of comprehensive transformations aimed at bringing the university closer to the branches of the economy and their needs, with real professional practice. In fact, this meant the search for a new model of interaction in a rapidly changing professional environment. It should be noted that long before the start of this reform, the Polytechnic University had developed several practices that were consistent with the principles of project training. So, in 2008, the Formula Student team was founded, which was the prototype of the group engineering student projects that are still being implemented. And it is another important principle of suggestopaedia: a snapshot, without any preparation deepening in the environment, in which "I can, I may, I become better and better, I do, I manage". Lozanov said one day: "Indeed, starting from the very childhood, capabilities of an individual are restricted by some average level of average human abilities which is defined by the authority of competent officials", but it is not just like that in real life (Lozanov, 1973).

The chronology of the establishment of project training at the Moscow Polytechnic is as follows:

– In 2008, the Formula Student team was founded

– In November 2013, the Polytechnic University introduced the concept of project education development in an engineering university at the 3rd annual Forum Engineering in Russia – 2013"

– On September 01, 2014, training sessions on new educational programs began, in the curriculum of which the discipline "Project Activities" first appeared

– October 12, 2014 Polytech hosted the first tournament "Engineering Start"

– In November 2014 work on projects began (650 students)

– September 1, 2015, the Center for Project Activities was opened as a part of the Directorate of Educational Programs

– In the 2015/2016 academic year the number of students increased to 2000

– In December 2015 a special laboratory was opened

– 2016/2017 acad.years – 3200 students• 2017/2018 acad.years – 4000 students

The definition of project training: key criteria and principles

In general project training at the Moscow Polytechnic University is defined as an educational approach, in which students develop a practical solution to the vital problems of various sectors of the economy and society, use the a full project life cycle approach and an interdisciplinary approach, collaborate with each other and external participants, and are supported by the curators' project activities, achieve real results in the end.

The **key principle** of project training is to focus on practical problem solving. At the same time, the problem the project is aimed at should be practically genuine, concerning the real world. This principle connects the university with external stakeholders and is also designed to generate and maintain student motivation. The academic community seems to be the first to say: you are awesome, we need your opinion and energy are important to us. In real life we also make sure that people like not only trustable people but even any kind of compliments are more pleasant than indifference and coldness. Many wise people do not reject flattery as well: they desire and like it. That is why it is not difficult to agree with Cervantes's words: "In terms of courtesy, it is better to overdo". "Right" attention for an individual is one of the best value, and he is able to appreciate it and give away. Due to this Losanov's system of positive learning is so effective, the system in which everybody is significant and respected. "Suggestopaedia applies to the whole complex of a human capabilities, – he says, – regains faith in yourself and gives a feeling of internal freedom, uses not only active but passive attention, not only conscious but also unconscious peripheral perception" (Lozanov, 1973).

The next important feature of project training is interdisciplinarity. Interdisciplinary nature of the problems is the basic of project activity and requires the formation of diverse project teams, as well as the interdisciplinary nature of the skills is necessary for the implementation of the project. This refers to competencies related, for example, to understanding the social context of engineering, critical and systemic thinking. This pursues, in particular, the goal of developing students' adaptability to the changing social conditions of their professional activities, as well as the ability to solve problems that challenges disciplinary boundaries.

Students' activities include, inter alia, complex interactions between team members and are critically dependent on communication, planning and ability to work effectively in a team. If teamwork refers primarily to interaction within the team, then cooperation includes partners external to the university - various organizations and enterprises.

Project activity is a kind of student-centered learning, in which the role of the teacher shifts from the exclusive possession and dissemination of knowledge to personal support and assistance in choosing tools and methods. It should be recognized that for full-time university professors this role is unusual and requires additional training and methodological support. In response to this need, twice

a year, refresher courses are organized for all curators of project activities, and ongoing counseling is provided. In project training at the Moscow Polytechnic University, considerable emphasis is placed on the results of project activities, which are divided into the so-called "grocery" and "educational". If the educational result can be obtained during the entire period of the project, the product result, passing the stages of its development, is embodied in the final result presented to the customer.

The issue of the product result is closely related to the full life cycle approach implemented in project activities, within which the project goes through certain stages from initiation to the implementation of measures to complete it.

Project life cycle at the university:

PRE-PROJECT STAGE includes: an ideas cloud, a map of projects, project passports, project approval and student registration.

PROJECT WORK: work with students, movement on the road map, participation in events, ongoing certification and grading.

The RESPONSE STAGE consists of a final conference, an exhibition of projects, a report and reflection.

At the Moscow Polytech, the organization of project training received institutional design in the form of the Center for Project Activities (CPA), which carries out planning, launch, monitoring and control of students' project activities.

To organize the management of students' project activities within the framework of mastering the relevant discipline at the Center for Project Activities, all projects are grouped on nine spheres, including transport, additive technologies, and technologies for artistic processing of materials, ChemBioTech, energy, initiative projects and contests, information technologies, social humanitarian technologies. The relevant coordinators from among the teaching staff of the Center for Project Activities were appointed according to these fields. Every sphere is focused on a particular type of product that is being worked on under the project. Thus, it can be said that the subject of student projects is orthogonal to faculties - specialists in different areas (designers, technologists, electronics engineers) can participate in various projects and in different topics where they have corresponding tasks. All the above said underlies that the basic principles of suggestingopedia can be applied not only in the field of studying foreign languages, but also in any educational environment.

A portfolio of projects for the academic year or semester is formed by announcing a collection of project initiatives. At the Moscow Polytechnic, a project can be initiated by an external customer — a partner of the university, the university itself, represented by a structural unit, and the curator of project activities — a university staff member or an industry representative, as well as students themselves. Currently, projects from external partners predominate, followed by projects from

the university, and projects proposed by students close the rating. At the beginning of the semester, students are usually given the opportunity to choose a project topic from a number of alternatives. The decision to launch this or that project is made based on the results of the examination of the project initiative by the expert group of the Center for Project Activities.

Currently, CPA employs over 120 people on an ongoing basis and under conditions of internal and external combination. The external customers of the projects are more than 50 organizations, among which the main partners of the university are BMW, KAMAZ, AvtoVAZ, Santekhprom, Beko, Gamma, NPO Engineering, Technopark "Glory" and others.

Close interaction with partners makes it possible to put in the basis of project activity the solution of real and urgent problems of various sectors of the economy. Acting as a customer, a partner organization provides expert support for students' work, and also participates in protecting project results.

Introduction to project activities: Engineering and Project launches

Students are immersed in project activities from the first day of study at the university. During the first semester, all engineering students participate in the Engineering Start competition. Each team (training group) must design and create five finished working products and then demonstrate their work at the full-time final at the end of the semester. The main document of the competition is the regulation, which sets out the technical requirements for tasks, restrictions on the use of certain components, as well as the organizational framework and parameters of the tests.

Thus, "Engineering Start" models for freshmen the real practice of engineering activity when it is necessary to present a finished result in a specific time frame and with specified technical characteristics. For students of non-engineering fields (Higher School of Management and Law), a similar project start tournament has been held since 2017, in which students are united in teams, distribute roles and prepare projects in the nominations "The development of a PR-campaign for an educational program" and "The development of an entrepreneurial initiatives". Each nomination like the engineering tasks mentioned earlier, has its own requirements for the result and quality assessment criteria. Thus, during the first semester, students acquire the necessary minimum skills for project activities. Psychologically – when a student is given a possibility to make decisions at once, taking into consideration his intelligence, this is a trigger to be grateful for trust – "finally I am given such a chance to act by myself". It is easy to move forward quickly developing skills and improving in this positive paradigma. Some time ago doctor Lozanov suggested in any practice to do easy tasks first. He knew exactly they would do it perfectly as they had managed them before well and being in "the situation of success", it was not difficult to get down to learn something new and difficult. That is why project

activity shows high results as well – both in creation and motivation, in reflecting knowledge obtained, in the final result – students are positioned as capable to do everything by themselves fulfilling a challenge and reaching all the goals.

Practice Brief: Idea and Goals

Taking part in projects, during the training, students gain experience in project work in their future profession, understand better the relationship of the disciplines with practice and the importance of teamwork, and also develop the ability to complete the job to the end and on time. In addition to the diploma, each graduate by the time he graduates from the university can form his personal portfolio of completed projects with various companies, which can help him find a more attractive job.

Thus, the "breakthrough" logic of project training is built in the Moscow Polytechnic, according to which students are immersed in real activities and can already be deliberately employed in companies with which they have already developed good relationships while working on projects or going out with their personal initiative developments and organize your own business individually or with their fellow students.

Plans for the future. Results

Thinking over this way, it was planned to describe and standardize a number of processes that were built within the project activity in accordance with its logic. Among the immediate plans are the expansion of project formats, the introduction of a digital organization of project activities and the development of online courses for curators of project activities, the inclusion of project activities in the master's programs. All this is possible not only because a single type of academic activity has shown such high learning outcomes: 84% of all freshmen involved in projects have found the results of their activity and creativity, which are estimated at the maximum grade; about 10% – are rated as "good", and only the remaining small percentage worked satisfactorily (mostly they did not get the required scores due to absence on various reasons, not lack of interest).

Summary. The main idea of introducing project-based learning into the educational process was embodied in the framework of comprehensive transformations aimed at **bringing the university closer to economic sectors** and their needs, with real professional practice. This transformation revealed a great deal of educational benefits for students.

Project activity was essentially a search for a new model of interaction in a rapidly changing professional environment. In short, project training at the Moscow Polytechnic University is interpreted as an educational approach, in which students develop a practical solution to the pressing problems of various sectors of the economy and society, use the full project life cycle approach and an interdisciplinary

approach, collaborate with each other and external participants, enjoy the support of the curator of project activities, achieve real final results.

The key principle of project training was to focus on **practical problem solving.** At the same time, the problem on which the project is presented should always be practical, genuine, concerning the real world. This principle connects the university with external stakeholders, and is also designed to generate and maintain students' motivation, based on the major suggestopaedia principles.

Interdisciplinarity is the next advantage of project activity. This means the interdisciplinary nature of the problems underlying the project activity and requiring the formation of diverse project teams, as well as the interdisciplinary nature of the skills necessary for the implementation of the project in a foreign language. This refers to competencies associated with understanding the social context of engineering, critical and systemic thinking, and good command of the language.

Students' activities include complex interactions between **team** members and are critically dependent on communication, planning, and ability to work effectively in a team.

Project activity is a kind of **student-centered learning**, in which the role of the teacher shifts from the exclusive possession and dissemination of knowledge to personal support and assistance in choosing tools and methods – making such academic cooperation more positive and effective.

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