PROJECT-BASED LEARNING IN TRAINING OF A NEW GENERATION OF SPECIALISTS: A CORPORATIVE ANALYSIS

Assoc. Prof. Dr. Jan Betta[1]
Assoc. Prof. Dr. Liudmila Boronina[2]
Assoc. Prof. Dr. Zinaida Senuk[2]
Assist. Aleksandr Baliasov[2]
[1]Wroclaw University of Science and Technology, Poland
[2]Ural Federal University, Russian Federation

ABSTRACT

One of the most important component of innovative economy is forming of effectively functioning the work market. This is particularly true for countries with developing economy, that requires the formation of new pedagogical paradigms. The universities face a global challenge - to rebuild the educational process, taking into account the challenges and requirements of modern production. A successful preparing of future specialists, who are able to independent, creative, solving problems and strive toward their goals achieving is a practice-oriented project management education. It should consist in the work on educational project of different level of sophistication, using adapted educational attempts. Studying in this ideology, students acquire the experience of team work required in professional activity, such as team work, practice of presentation and defending of their ideas and responsibility of solutions adapted. Such an approach is actively applied in many leading universities in the world.

The main task of the authors is to carry out a comparative analysis of educational design practices in different areas of training (engineering, management, public administration, organization of work with youth) in two leading universities in Poland and Russia – Wroclaw University of Science and Technology and Ural Federal University. Used research methods are general and particular document's analysis, data integration, benchmarking, constructive congruency and case study.

It is established that project competences are universals and recommended in national learning standards at all levels and streams of education. Regardless of corporative specificity, project management affects education matters, resources of educational process and pedagogical technologies. Project education of students has a systemic, infiltrating, successional and interdisciplinary character. Specificities of project learning, its social and corporative heterogeneity, are addicted many factors. Among them, the most important are project learning content, specificity of national project background, level of adaptivity in regional practices and different methodological approaches to project management–from the classical to agile one.

INTRODUCTION

The rapid dynamics of technological and economic changes necessitate a new type of human resources with the knowledge and skills, advance competences for future use. According to the forecasts of the California Institute of the Future (IFTF) researchers, the future specialist must have 10 key work skills for the future, corresponding to macro-trends in the global and national labour markets: sense-making, social intelligence, novel and adaptive thinking, crosscultural competency, computational thinking, new media literacy, transdisciplinarity, design mindset, cognitive load management, virtual collaboration [1]. Are there prerequisites in the modern educational space for the formation of perspective competencies?

BACKGROUND

The introduction of the ideology of the competence approach in the content and technology of modern education has caused a pedagogical paradigms shift. Traditional (classical) paradigm, focused on the acquiring and reproduction of knowledge, gave way to an activity, practical-oriented approach of education. The purpose of the introduction of practice-oriented approach is the formation of professionals with a set of competencies that enable them to use most effectively in the future professional activity. The basic postulate of the practice-oriented paradigm is the principle of the primacy of the educational product, which has an advanced, project character. The effectiveness of educational activities is measured through a set of competencies used by students when an educational project is creating. The properties of "projectivity" in the new educational paradigm are appeared not only in educational products. The content of education, means of educational process [2], [3], [4], including project-based learning are subject to design.

The synthetic nature of project thinking, which is based on the iterative change of convergent and divergent approaches, becomes attractive and significant for the introduction of its project content into the educational environment of the 21st century. A comparative analysis of project management and project training shows that project learning is derived from project activities and project management and preserves all their hereditary characteristics (table 1).

Table 1. Comparative analysis of project management and project learning

Criteria	Project management	Project learning
Mindset	convergent and divergent	linear (algorithmization) and non-standard / creative
Activities	research, planning, modelling, programming, design	depend on the type of educational project and the subject area of designing
Interdisciplinary links	strategic management, functional management (personnel, financial, time management, risk management), marketing, logistics, sociology, social psychology, culturology, law, etc.	depend on the type of educational project and the subject area of designing
Competences	ability to systemic, cognitive, organizational, creative, adaptive, transdisciplinary, contextual thinking; teamwork skills; cross-cultural and media competence; the ability to virtual collaboration.	hard skills, soft skills (sense-making, novel and adaptive thinking, cross cultural competency, computational thinking, new media literacy, transdisciplinarity, design mindset, cognitive load management, virtual collaboration).

The goal of project learning is the mastering of the design algorithm for solving a specific professional task. This means that the methodological basis of project training is the methodology of designing, in its classical and modern versions. The composition of the formed competencies is determined by the skills that are associated with the professional subject areas (hard skills), and "soft" project competencies (softs kills) - the ability to work in a team, communication skills (social intelligence), including in a cross-cultural and virtual environment (crosscultural competency, virtual collaboration) [1], the ability to innovate and adaptive thinking (novel and adaptive thinking), the ability to work with a large amount of information (computational thinking, cognitive load), the ability to understand the meaning and consequences of their own decisions (sense-making).

How is the practice of project teaching in modern universities in the dialectic of "possible, proper and real"?

1. PROJECT LEARNING AS A MECHANISM OF TRAINING SPECIALISTS IN URAL FEDERAL UNIVERSITY

Ural Federal University (UrFU) - one of the largest universities in Russia, there are more than 40,000 students. The university consists of 12 structural subdivisions, called Institutes, which carry out training in the most diverse areas: technical, natural-science, humanitarian, socio-economic, management.

1.1 Elite engineer training

The University is the center of responsibility for the training of elite engineering cadres in the region. The formation of the engineering elite necessitates the generation and sustainable reproduction of interdisciplinary project teams, oriented to international engineering standards and possessing world-class competencies. The need to form such teams necessitates new educational technologies. The basis for the introduction of project management technologies was the international project "Initiative CDIO" ("conceive – design – implement – operate"[5]). In 2013, project learning was introduced into the educational process within the framework of one of the modules of educational programs. According to CDIO, the project-implementation activity is a practical one in which students design, produce (build, create), test and apply real objects, processes and systems or their models.

An example of the introduction of project training in a technical master program may be the educational program "System Engineering". System engineers are most in demand today in the spheres of military-space technologies, energetics, information and cognitive technologies, biotechnologies, nanotechnologies. The key competence of the system engineer is the ability to integrate complex systems within the framework of a purposeful, multifaceted work process. Project learning is the main educational technology in the program. Project learning is carried out with the use of active methods (active learning), Socratic dialogues, workshops, case studies, laboratory experiments, brainstorming, etc. The exchange of views and ideas (peer learning), joint research and project activities is mandatory in the training. The designing uses the tools of gamification-game methods and elements of computer games, virtual simulators, expert systems and situation centers. Priority of active teaching methods and inclusion in the program of interdisciplinary projects ensures the formation of graduates, along with professional competences, a conscious ability to work in a team and the necessary leadership qualities.

1.2 Training of public administration managers

The introduction of project learning in the training of future officials took place in the early 2000s. The author's teaching methods were originally developed on the basis of the international standard PMBOK. In 2014, in connection with the transition to tertiary education and the inclusion in the educational program of the undergraduate individual educational trajectories,

one of which is "Project Technologies in the Sphere of State and Municipal Management", two models of project training, general and specialized, have been formed.

The general model. In the second year all students complete an introductory project course "Fundamentals of project activities", in the fourth year (after mastering a significant part of principal disciplines) - the module "Project management in state and municipal management". Lecture material involves the mastery of technologies and tools of classical project management. Practice are held in the form of workshop. At the heart of the training for bachelors is the development of an educational project based on the fairy tale plot "Little Red Riding Hood". The work is conducted in small groups with the use of brainstorming technologies and expert evaluation. Experts are not only lecturers, but also students themselves. Iterative change of the two roles of the "developer" and "expert" allows students to identify and fix typical errors in the designing, to find the best solution for the task set by the lecturers at each stage of training. This is the first, trial and rather difficult design experience for bachelors of public administration. The rigid format of training suppresses traditional and mass attempts of students to write a new fairy tale or psychoanalytic thriller. The main task of the teaching staff is to form the project thinking of the beginning designers. Students moving positionally, sequentially mastering the algorithm of project activity, should develop a preventive social project "Ensuring the safety of Grandma and the Little Red Riding Hood". Special difficulties for students are caused by the establishment of cause-effect relationships in the structure of pre-project analysis and the development of the target decomposition. Consecutive complication of the project activity in the bachelor's program is accompanied by the increasing complexity of the final design products. In the second year of the bachelor as a final work is proposed to develop group mini-projects (project work). As a result of the study of the module in the 4th year, students must develop and protect an individual course project, executed on the basis of a specific state or municipal authority.

Specialized model. The students of the project trajectory should master three additional project modules. The first module is aimed at reinforcing the skills of pre-project research - using methods of analysis of socio-economic, socio-political, socio-cultural processes. Within the second module project technologies of time, team, cost, risk management are concretized and enriched. The project training is completed with the module "Project Workshop", when the teaching staff attracts practitioners - leading specialists from ministries and departments of the regional government. Features of project learning in this module - application of flexible iterative-incremental methods of "Agile" along with the technologies of classical project management. The final report on the module are group projects in the field of public administration - organizational, sectoral, territorial ones, projects for the promotion of state and municipal services. A high level of the formed bachelor's project competence confirms external public evaluation of their project achievements. Project works of students have repeatedly won prizes at national and international competitions.

One of the principles of project learning in public administration is continuity. There is an applied educational program "Technologies of state and municipal management" at the level of master's training. Project training is mandatory for all program trajectories. The enhancement of project competencies in the trajectory "Project technologies in development management of territorial socio-economic systems" allows developing projects of different levels and scaling in executive authorities, state and municipal organizations. The main difficulty of project learning for students is related to the socio-demographic and professional characteristics of the master's community. 70 % of students are active officials over 30 years of age whose professional activity is primarily related to the implementation of the program-targeted approach in management. In this regard, the main efforts of the project teaching team are aimed at overcoming stereotypical attitudes of master's students and patterned practices adopted in public administration. The task is achieved by applying benchmarking technologies, demonstrating the best regional and municipal project practices.

1.3 Training of specialists of work with youth

The educational program "Organization of work with youth", opened in 2011, was based on project learning. The specifics of working with young people from 14 to 30 years make special demands on the professional project competencies of bachelors and masters in this area of training. In particular, in all areas of youth policy, organizational and event-projects, which are of a massive nature, prevail. The project competences of bachelors and masters is different: bachelors can take an active part in the development and implementation of projects, master's students must be able to independently design and implement their own projects and assess their social risks.

The methodology for teaching bachelors of design basics is largely similar to the methodology for learning students of public administration. The basis of the methodology is the international standard PMBOK. Bachelors listen to lectures on the technology of project activities, then work out educational projects on a given topic in practical classes during the project workshop. The training is completed by the development of an independent group or individual project on the module. This project is an integrative development that requires students to demonstrate all the acquired competences not only in managerial disciplines, but in all previously studied modules, in particular, in the field of legal regulation, content and economic grounds of youth policy.

The acquisition of project competencies by master's studentы logically continues the skills and abilities formed in the bachelor's degree. Since students are already able to develop their own project, the training is built exclusively in the form of practical classes. Active forms of organization of practical classes provide increments design competencies. In assessing of effectiveness of youth projects, students are encouraged to use the original author's methodology for assessing the effectiveness of projects of non-profit public organizations, which was developed by order of the Ministry of Social

Policy of the Sverdlovsk region. The main difficulty is working with students who don't have basic profile training. This problem is overcome by more intense individual work with such undergraduates. But, unfortunately, in this case there is a violation of the principles of consistency and continuity, which complicates the formation of actual competencies among graduates.

The experience of project training in the field of training "Organization of work with youth" shows that this approach is highly productive. In particular, this is evidenced by the constant victories of our students in the competitions of the federal agency for youth affairs (Rosmolodezh) and various youth forums.

Summarizing the practice of project training in UrFU, it should be noted that the project training of students is systematic, cross-cutting, consistent and interdisciplinary; is based on the regular performance by students of technical and management projects of increasing complexity.

2. TEACHING PROJECT MANAGEMENT AS A TOOL OF THE HUMAN RESOURCES EDUCATIONAL PROCESS IN WROCLAW UNIVERSITY OF SCIENCE AND TECHNOLOGY

Wroclaw University of Science and Technology is one of leading universities in Poland, doing research and educating future polish human resources at 16 faculties, mostly technical. The author of this section is a searcher and lecturer at Informatics and Management Faculty, involved from 25 years in project management (PM). He is teaching different matters of PM (bases, methods and tools of PM, advanced PM, agile PM, preparing for IPMA Student Certification, changes management) for future managers, at bachelor's, master's and doctoral degrees. The teaching at it very early stage, in time of starting polish economic transformation, was realised without any standards nor national neither professional. This situation changed in 2002, with national standards emergence [6]. These standards are flexible enough, leaving for the teacher a choice of methodology (PMBOK, IPMA, PRINCE2, SCRUM or others), as well as concrete forms and instruments.

Evolution of the teaching of project management (PM), focused on innovative forms, is divided into two parallel processes – main and auxiliary. Main process of PM education. From 1998 to 2008, for subjects basic PM, advanced PM and change management, the only didactical forms were lectures, classes, workshops, laboratory (MS Project). Used methodology – mix (PMBOK, IPMA, own).From time to time, also lectures given by invited practitioners – first PMBOK or IPMA certified project managers – from Poland and Germany. Several times lectures were given in enterprises (Bosch, Fagor, Wroclaw Park of Technology). In 2015 the Faculty of Informatics and Management cooperated with IPMA Poland that leaded to an agreement between two subjects, consisting in creation of the new product – IPMA Student Certification, being a student "light" version of IPMA Certification level D. The matter has been launched "Preparation for IPMA Student Certification", composed with lectures and workshops. As the examples of using non-standard works done by students, let us give "Building the tower

with matches boxes", which illustrates the project realisation in case of a non-complete information – the students have their eyes bint. The second one – identifying students soft attributes (predispositions) to be a project manager. Twenty fife attributes according to AFITEP (French Association of PM) are checked. Both events have the competition characters; winners, prices and so on included. The most innovative experiment is going just now. The workshop of agile PM is organized really according to Scrum Methodology [7]. The students work as self-organizing and multifunctional Development Team, working cyclically on a real Canadian project, using events and artefacts of Scrum. The teacher is in the role of Scrum Master; he cannot give orders. This experiment allows to build a real partnership between all stakeholders, is highly motivating, stimulates students creativity and leads to the satisfying PM results.

Auxiliary process of PM education. From the beginning of PM education at the Faculty, other events and activities were conducted, in order to improve and reinforce the educational effect. In 2005 the PM Group was creating; the students organise themselves interesting events. The most important are annual national PM Days, the conference with the participation of about 300 students and PM practitioners from the whole Poland. It creates platform for discussing the real PM problems, find solutions and cooperate. From 2006 students take often part in Regional Group of IPMA Poland meetings. The results are similar as above. Simultaneously with academic work, several PM academic teachers of the Faculty are active trainers and consultants in PM area. Promoting project thinking, implementing PM in enterprises, and managing real, complex projects, appears helpful to improve the educational process. The enterprises experience of academic teachers affects several educational dimensions, particularly during the workshops. Working on real cases, with continuous feedback, the students are more motivated, understand better the real PM problems what allows them to take be better management decisions, get experience, can appreciate the team work quality and get the responsibility. In 2017 Alex Clarman, director of Goldratt Institute in Tel Aviv, conducted 2-day workshop on the Critical Chain PM. The students' opinions were like above.

Another source of students new practical skills are documentation and personal participation of PM teachers in "IPMA Project Excellence Award" – annual competition for the best managed project in the World. Sharing experience contributes to the teaching quality increasing. Some colleagues are involved as volunteersin PM of non-profit organisation. This experience is important, like this with Scrum described before, for understanding by teachers as well as students, the added value of partnership in the project team and the human added value of PM.

All teachers from PM team are open to innovative educational methods. Among students and teachers there exist a need of mutual trust and partnership, facilitating educational process. The students' opinion is "non-

traditional forms of teaching, based on empiricism, are more interesting and efficient".

CONCLUSION

It is revealed that project learning is derived from project activities and project management and preserves all their hereditary characteristics. The methodological basis of project learning is the design methodology. Corporate analysis showed that the logic of project learning development, its orientation is common, regardless of the different temporal dynamics (completeness and speed of phase passage). The development trend is linear, from classical project management to modern technologies of Agile, Scrum. The basis of project learning is international standards (PMBOK, IPMA, PRINCE2, etc.), allowing to use different methods (fig. 1).
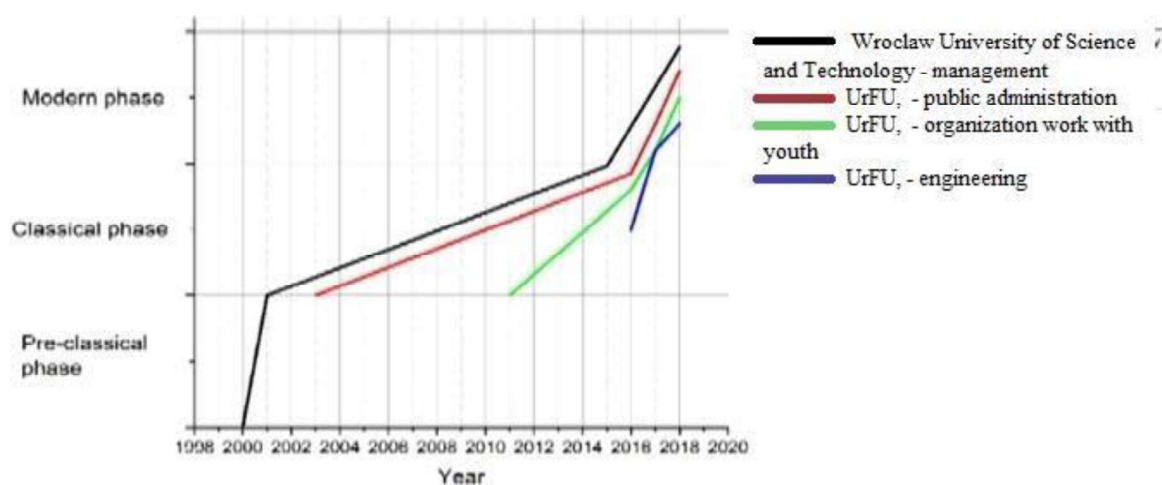

Figure 1. Dynamics of development of project learning

The practice of project learning at universities in different areas of training is universal and advanced. In the conditions of transition to an innovative economy, project learning is the basic prerequisite for the formation of prospective competencies for a new generation of specialists.

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