

Discovery expedition as an educational approach to improve the effectiveness of Master's training for modern RF industry

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Abstract. The questions of improving educational technologies of highly qualified personnel training in Russia that takes into account all stakeholders are considered. The effective educational method of training at HSSE MIPT – Discovery expedition – is presented. Advantages of DE and its influence on science-intensive competences formation and increase of master's training effectiveness are analyzed.

1 Challenges in Russian Education

Today the burning problem in Russia is insufficient number of qualified engineers, who are capable of running large projects from the development process to the implementation. Changes in the market conditions and the improvement of production technology show that Russian industrial companies will be able to compete with foreign producers provided that approaches to run development projects are improved. Today, best in class companies integrate engineering, market and technology risk management and project management technics in development processes. In order to properly animate such a sophisticated process, companies need experienced engineers capable to plan development from its launch under conditions of uncertain environment, linking cooperation between different suppliers, formulating requirements and taking responsibility for the decisions.

The prerequisite for success in this modern approach is to have enough new level specialists, familiar with systems engineering and best world's experience in high-tech intensive technologies, capable to coordinate team work, integrate technologies between branches at the global level and systemize knowledge from different areas. Such experts should also have skills of controlling all stages of the product life cycle: from the idea, to project launch, until the end of product exploitation. That's why the particular urgency raises the question of improving educational technologies, methods, teaching tools, tactics, and also organizational and pedagogical environment of educational process focused not only on educational standards and Master-degree program customers demands but also on best world's leading practices.

The important part of preparing highly qualified professionals at "Higher School of Systems Engineering MIPT" (HSSE MIPT) is made up of these factors:

- The best world approaches to learning.

- Direct communication of the students with outstanding leaders in relevant areas.
- Development of the change agents.
- Personal effectiveness improvement.

2 Discovery expedition HSSE MIPT

Discovery Expedition (DE) is an educational method for preparing engineers, integrated into HSSE MIPT learning process at the end of the first academic year. It demonstrates an amazing fusion of academic courses at the world's leading universities and visits to the world's leading enterprises and manufacturers, and engineering companies specializing in research and development, production and implementation.

DE HSSE MIPT makes itself different from classical learning methods by carefully integrating academic courses on "Introduction into Operations" and "Industrialization", customized for the particularities of Russian high-tech industry, with an expert assessment of high-tech specialists and the illustrations of high-tech intensive production during company visits.

The academic component of DE is education in the world's best universities and communication with professionals, who create the future, demonstrate high culture of international higher education, and different approaches to highly qualified specialists training.

The engineering part of DE is shown in full specter of companies with various forms of organization and interaction at designing a complex product or system, with different concepts of creating value, gives an idea of the largest conglomerates philosophy, secrets of their rapid growth and advancement. Criteria for choosing the companies to visit during DE are as follows: they are high-tech enterprises, successfully competing at the world market, producing complex new products with advanced value chain and effective organization. So we have at least 3 types of companies to visit. Type 1: customer-oriented companies and market leaders. Type 2: companies that create genius ideas, design and create

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prototypes. Type 3: companies leaders in support the whole product life cycle, focusing on minimizing production costs, yet maintaining the necessary quality standard. Table 1 illustrates the advantages of the educational method DE, and its effect on raising the effectiveness of Master's degree training.

Table 1. Components of DE and their effect on the competences formation

№	Elements	Formed Competences	Components of DE
1	2	3	4
1	The best world approaches to learning	Being able to lead a group of people in one's professional life, adequately accept social life, ethnic, religious and cultural differences (DIC-3)	Teamwork, gaining experience of working with different cultures.
		Being prepared to technology reengineering and business processes based on modern science and technology achievements (PK – 8)	A possibility to see high – tech manufacturing process and equipment, discover new manufacturing technologies, best innovations, results of new technological research, new ways of creating and promoting a product; gaining experience of the world's leading countries.
		Being prepared to formulate aims and tasks of applied studies, choose a method of investigation, obtain necessary resources, organize work and tasks, bring the applied research/study to the final result (PK-1)	Group projects defence to the international experts commission as a result of the academic courses.
		Being prepared for oral and written communication in Russian and foreign languages for problem solving of professional activities (OPK-1)	Perfecting language skills for implementation of professional activities in the events of foreign language communication

1	2	3	4
2	Direct communication of the students with outstanding leaders in relevant areas	Understanding natural sciences and social economic nature of studied occurrences and processes, Being prepared for abstracting oneself and highlighting the essential features of occurrences and processes with the aim of analysis and building of an adequate quantitative and quality model (PK-2)	Communication with technical experts of the companies producing the development of complex, new products and successfully compete on the world market, possibility to ask questions and discuss current problems of one's company.
3	Development of the change agents	Being prepared to assign new tasks, discover new connections in subjects for discussion, integrate personal knowledge into study and developments, justify the expediency of their implementation (OPK-5) Being prepared for passing the gained knowledge, sharing skills, attracting the company employees to changes, teaching new methods and equipment, motivate and develop the employees	A personal acquaintance with the world experience increases the motivation level to set up new tasks and approaches, that are not implemented in RF.
4	Personal effectiveness improvement	Being prepared for self-development and using creative potential (OK-3)	Getting to know traditions and cultures of world leading countries, expanding personal scopes, opening personal possibilities and resources, additional training mental capabilities.

3 De influence on the competences formation

DE gives new knowledge, instruments and systematic approaches, which allows the engineer to have completely different views on high-tech designing and manufacturing, ability to ask the correct questions, realize that high technology and innovations are daily work of talented and dedicated professionals. This

educating method, made possible at HSSE MIPT, allows in practice synchronizing the requirements of the professional educational program, whereas meeting the priorities of high-tech manufacturers. Implementation of the described approach to professional development will eventually lead to higher competitiveness of Russian manufacturing industries.

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