THE CRUCIAL ROLE OF LANGUAGE IN HIGHER EDUCATION IN THE AEROSPACE INDUSTRY

O PAPEL CRUCIAL DA LINGUAGEM NO ENSINO SUPERIOR NA INDÚSTRIA AEROESPACIAL

EL PAPEL CRUCIAL DEL LENGUAJE EN LA EDUCACIÓN SUPERIOR EN LA INDUSTRIA AEROESPACIAL

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ABSTRACT: This article mainly attempts to analyze the crucial role of language in higher education in the aerospace industry, especially regarding aviation safety. In the context of global competition in high-tech industries, the quality and attractiveness of specialized higher education are becoming a crucial factor in the success of Russian enterprises on the global market. This article aims to identify the key gaps between the expectations of students of the University of the aerospace industry and the opportunities that the university provides. The research was conducted using the online language and sociological survey among full-time students of the Moscow Aviation Institute (N=631). As a result of the survey, the most critical gaps between the expectations and actual learning outcomes relate to developing foreign language and competencies necessary for international communication and the development and implementation of complex technical projects in real life.

KEYWORDS: Higher education. Aerospace industry. Quality of education. Language.

***RESUMO**: Este artigo tenta principalmente analisar o papel crucial da linguagem no ensino superior na indústria aeroespacial, especialmente no que diz respeito à segurança da aviação. No contexto da competição global nas indústrias de alta tecnologia, a qualidade e a atratividade do ensino superior especializado estão se tornando um fator crucial para o sucesso das empresas russas no mercado global. Este artigo tem como objetivo identificar as principais lacunas entre as expectativas dos alunos da Universidade da indústria aeroespacial e as oportunidades que a universidade oferece. A pesquisa foi conduzida usando a linguagem online e pesquisa sociológica entre estudantes em tempo integral do Instituto de Aviação de Moscou (N = 631). Como resultado da pesquisa, as lacunas mais críticas entre as expectativas e os resultados reais da aprendizagem estão relacionadas ao desenvolvimento da língua estrangeira e das competências necessárias para a comunicação internacional e ao desenvolvimento e implementação de projetos técnicos complexos na vida real.*

***PALAVRAS-CHAVE**: Ensino superior. Indústria aeroespacial. Qualidade da educação. Idioma.*

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***RESUMEN**: Este artículo intenta principalmente analizar el papel crucial del lenguaje en la educación superior en la industria aeroespacial, especialmente en lo que respecta a la seguridad de la aviación. En el contexto de la competencia mundial en las industrias de alta tecnología, la calidad y el atractivo de la educación superior especializada se están convirtiendo en un factor crucial para el éxito de las empresas rusas en el mercado mundial. Este artículo tiene como objetivo identificar las brechas clave entre las expectativas de los estudiantes de la Universidad de la industria aeroespacial y las oportunidades que brinda la universidad. La investigación se realizó utilizando la encuesta sociológica y lingüística en línea entre estudiantes de tiempo completo del Instituto de Aviación de Moscú (N = 631). Como resultado de la encuesta, las brechas más críticas entre las expectativas y los resultados reales del aprendizaje se relacionan con el desarrollo de la lengua extranjera y las competencias necesarias para la comunicación internacional y el desarrollo e implementación de proyectos técnicos complejos en la vida real.*

***PALABRAS CLAVE**: Educación superior. Industria aeroespacial. Calidad de la educación. Idioma.*

Introduction

The development of high-tech industries is impossible without an end-to-end system of vocational education that includes the attraction and development of talents at all stages of training: school, college, university, professional development in the workplace, etc. The key role in staffing is the higher education, it provides deep and systematic knowledge and skills for solving complex professional problems. At the same time, modern higher education is characterized by a growing level of competition: interorganizational, intersectoral, international (Baibarin, Mashkin & Shelengovskiy, 2016; Musselin, 2018; Papadimitriou, 2018; Tugun et al., 2020), educational organizations are actively fighting for resources and for students with diverse abilities.

The Russian aerospace industry remains one of the few high-tech industries that stay competitive on the world market, and maintaining these positions requires intensive efforts to develop the scientific and educational system. However, on the global educational market, even the leading Russian technological universities, including aerospace ones, occupy rather modest positions, reflecting the general problems of the development of the modern system of higher education (Endovitsky, Korotkikh & Voronova, 2020; Budzinskaya, 2018). For example, the leading industrial university, the Moscow Aviation Institute (MAI) in the Times Higher Education world ranking is only in the second thousand of the list (URL: https://www.timeshighereducation.com/world-university-rankings). In the last decade, a number of ambitious projects have been implemented in Russia; they were aimed at the development of the scientific and educational potential and strengthening the international

positions of Russian universities, especially the "5-100 project" – its effectiveness and efficiency have become the subject of active discussions (Kliucharev & Neverov, 2018; Rodnyansky & Abramov, 2020). Universities that are not covered by this program, however, also face the need to increase their competitiveness and ensure the influx of talented applicants and their training in accordance with the requirements of the market of modern high-tech industries.

The aerospace industry remains at the forefront of the technological development of modern society, and the success of the private cosmonautics open up fundamentally new opportunities for space exploration in the near future. Faced the need to solve extremely complex and unique scientific, technical, engineering and organizational tasks, the aerospace industry forms a request for the training of highly qualified specialists who are capable of developing and ensuring the operation of existing and innovative systems. This is the reason for the growing interest (of those who specialize in aerospace programs and specialties) in studying the features of training, the quality of training and its management (Zaludin, & Derasol, 2019; Xueai, 2020; Prosochkin, 2018; Bernelli-Zazzera, Bauer & Revel, 2017).

One of the important components of a high-quality educational process is the type of an applicant. He or she makes a choice based on the reputation parameters of the university, which are created, among other things, based on the opinion of graduates. This opinion is formed as the ratio of real preparation to expectations. However, in this day and age, relatively little is known about the requirements and expectations of future employees of the aerospace industry (applicants) to the university. This article allows us to partially fill this gap.

Research Methodology

The article presents the results of the empirical sociological research conducted among MAI students. The object of the research was the training of specialists at the aerospace university. The subject of the research is the study of possibilities of the learning system to realize the expectations of students regarding the quality of their training. The purpose of the research was to determine the gaps between the requirements of employers, the expectations of students of the University of the aerospace industry and the opportunities offered by the university.

To evaluate the training system, we considered two blocks of parameters. The first one included targets reflected in the graduate's competence model (employers' requirements). They were examined for compliance with the expectations of students and the degree of their

formation based on the results of training. In the second block, the principle of the organization of learning management was studied, which was based on the idea of introducing individual learning trajectories and the possibility of students' participation in the management of the educational program (planning and organization of training). The degree of implementation of this principle was assessed based on the desires and capabilities of students to manage such system parameters as: disciplines and their content, the sequence of study, the schedule of classes, the availability of disciplines for repeated study, training methods, methods of knowledge control, teachers.

The research toolkit also included a list of open questions related to the definition of a list of additional competencies, disciplines and topics that students wanted to include in the training system.

The research was conducted by the method of the online sociological survey among students of the Moscow Aviation Institute. The link to the electronic form was distributed among full-time students of all faculties (institutes) through university channels of electronic communications. Undergraduate, graduate and specialist students of all courses studying on a budget, paid and targeted basis were interviewed. Data collection was carried out in December 2020, the total sample size was 631 people. The sample is representative with a probability of 95%, the limit sampling error is 3.82%.

Results and Discussion

The results of the research made it possible to evaluate the training at the leading Russian aerospace university in terms of the structure of students' expectations and the compliance of training practices with these expectations. Respondents were asked to evaluate their learning experience by 19 different parameters. The assessments received from students of different fields of training, courses and forms of study did not significantly differ from each other that makes it possible to integrate them and provide a common average assessment throughout the university (Table 1). Competencies related to the management of activities were an exception.

Table 1. Expectations regarding university education, % of respondents

Expected learning outcomes	Response options				
	Did not expect and did not receive	Did not expect, but received	Expected and received	Expected, but did not receive	Total
Deep fundamental theoretical knowledge	7,3	12,0	54,7	26,0	100
Excellent professional basic knowledge in the specialty (skills for calculating typical professional tasks)	6,0	5,9	50,7	37,4	100
Design and inventive skills (creation and modeling of prototypes)	28,5	9,2	28,8	33,4	100
Skills and experience in solving real production tasks	20,1	6,5	29,3	44,1	100
Research and experimental skills (including analytics and modeling)	19,0	12,0	42,3	26,6	100
Skills of independent work with information (search, analysis, processing)	3,6	15,4	70,7	10,3	100
Skills of working with modern software or programming skills	13,8	8,9	39,0	38,4	100
Foreign language skills and ability to communicate with representatives of other countries	26,9	10,9	34,5	27,6	100
The ability to work in a professional group (team), the ability to organize its work	17,6	12,7	52,5	17,3	100
The ability to organize production (technological process) and to adapt new technological solutions to the conditions of the enterprise	41,2	7,4	23,1	28,2	100
Comprehensive understanding of the organizational and economic context of the functioning of the aerospace industry, the	43,1	8,4	25,0	23,5	100

Expected learning outcomes	Response options				
	Did not expect and did not receive	Did not expect, but received	Expected and received	Expected, but did not receive	Total
ability to sell the results of engineering work (business skills)					
Experience in the development and implementation of projects by the order of the industry or other organizations	42,5	7,0	18,7	31,9	100
The ability to participate in discussions on various issues, to present the results of one's own work, to state in simple language the algorithm of solving one's technical task	16,5	10,5	52,8	20,4	100
The ability to competently prepare applications for engineering projects, technical documentation, reports and scientific articles	33,4	11,7	29,2	25,7	100
Non-standard thinking skills	22,7	15,2	39,6	22,5	100
Combinatorial and analytical thinking skills	17,1	9,5	53,2	20,1	100
Multidisciplinary system vision	30,3	10,8	36,0	23,0	100
Interest in independent learning and development	10,9	14,1	50,7	24,2	100
The ability to allocate resources and time, self-organization skills	15,2	11,7	52,3	20,8	100
On average	21,9	10,5	40,7	26,4	100

Describing the expectations of students in general, it should be noted that they are high. With a single exception, the majority of students include all the proposed learning outcomes to their expectations. It means that students expect the university to form a wide range of competencies that will allow them to become world-class professionals in one of the most high-

tech sectors of the world economy. In this regard, the most interesting are those learning outcomes which turned out to be relatively less in demand. They include, first of all, skills related not to the ability to solve technical and professional tasks, but to the ability to build complex management systems necessary for the implementation of complex technical projects. It is significant that to the least extent (48.5%) students expect the university to develop managerial skills (including business ones), despite the fact that their shortage is regularly cited as one of the problems of Russian technological universities (Minin, Politsinskaya & Lizunkov, 2019; Chepurenko, 2017). The lack of corresponding expectations and expressed request from students should be considered as an additional factor reducing the competitiveness of Russian universities.

At the same time, a more detailed analysis showed that students differ significantly in their requests for the development of managerial competencies. In particular, the structure of the corresponding expectations is influenced by the basis of training, which turned out to be a statistically significant factor in the attitude to obtaining these skills (criterion $\chi 2= 29.3$, $p<0.01$).

Table 2. Expectations regarding managerial competencies, % of respondents

	The basis of training		
	On a budget basis	On a paid basis	On a targeted basis from enterprises
Expected the development of managerial competencies	54.23%	38.17%	60.32%
Did not expect the development of managerial competencies	45.77%	61.83%	39.68%
Total	100%	100%	100%
Received the development of managerial competencies	68.65%	51.91%	82.54%

Did not receive the development of managerial competencies	31.35%	48.09%	17.46%
Total	100%	100%	100%

More specifically, students of a targeted basis are more likely to have a request for the ability to organize a business in the aerospace industry than "state-funded" students, and "paid" students are much less interested in this competence than "state–funded" and "target" students. However, the "target" students received this training to a greater extent. Thus, the expectations of the "state-funded" students were not met.

Analyzing the degree of compliance of the actual learning outcomes with the expectations of students, we can conclude that in general it is moderate. The most satisfied expectations were, first of all, the development of skills of independent work with information (70%). The economy of the post-industrial society is primarily the work with information and knowledge, and in a highly saturated information environment, the ability to find, classify and process relevant information becomes a universal competence of a highly qualified specialist. In addition, the business situation all over the world is becoming turbulent, there is a need to quickly master new technologies to maintain the position of competitiveness of products, which requires the staff to develop this competence. As you can see, this task is being solved successfully at the specialized technological university. Other results that are relatively successfully solved at the university include basic educational competencies (mastering fundamental knowledge and professional skills - 54.6%), teamwork and independent work skills (52.4%), presentation and analytical skills (53.3%).

To identify problems and "bottlenecks" in the university's activities, it is of particular importance to identify students' expectations that have not been met. The highest gap in the expectations (the ratio of the number of those whose expectations were not met to the total number of ones with such expectations) turned out to be in the case of tasks related to the development of the ability to develop and implement complex production projects in real life. They include: experience in the development and implementation of projects by the order of industry (63.0%), skills in solving real production tasks (60.1% of ones with corresponding expectations did not meet them), the ability to organize production and to adapt new technological solutions to the conditions of a particular enterprise (55.0%). These figures are a direct indicator of the insufficient development of links between higher technological education

and high-tech industry, and an indicator of students' lack of confidence in their readiness to solve complex production tasks in real life. Other important gaps between expectations and reality include the development of design and inventive skills (53.7%), which are a prerequisite for innovative opportunities and the potential of high-tech enterprises. Finally, gaps in such areas as software competencies, business competencies, the ability to prepare technical documentation, applications and reports, non-standard thinking skills, as well as foreign language proficiency are significant.

Characterizing the structure of educational gaps, it should be noted that all of them reflect the real needs of the market, which determine the demand for qualified labor and the ability to perform unique professional tasks in high-tech industries. It is well known that innovation activity is not limited to solving typical technological problems or even developing new products and solutions. This is a complex activity that requires complex skills and competencies, among other things, in the field of project management, production organization, marketing and communications (Matthews & Brueggemann, 2015; Lang, Handley & Jablokow, 2018). It is important that the majority of students understand this, and even leading technological universities face serious problems in meeting these needs. We will pay particular attention to gaps in areas related to organizational, managerial and business competencies. The problem of insufficient formation of a request for them from students is only aggravated by the inability of the university to fully satisfy it. At the moment, the collaboration of the university and the enterprises of the aerospace industry has its limitations. Young specialists are often not allowed to new developments and interactions with customers. Therefore, organizations cannot provide conditions for the development of managerial and business competencies. One of the ways out of this situation is the use of the "entrepreneurial unity" concept (Minin, Politsinskaya & Lizunkov, 2019; Chepurenko, 2017), which involves the creation of separate departments (business units) working on orders of real customers. In MAI, such departments exist, and there is an opportunity to involve students more actively in their work.

The problems of mastering a number of competencies often lie in the organization of the educational process, for example, the terms and methods of training do not allow them to develop to the right extent (Kliucharev & Neverov, 2018). In the modern concept of education, the solution to this issue is seen in the formation of individual learning trajectories and students' participation in the management of the educational process.

As part of the survey, respondents were asked to assess the need to participate in the planning and organization of their training, as well as their compliance with actual capabilities. The distribution of responses is shown in Table 3.

Table 3. Students' assessment of the needs and opportunities for participation in the planning and organization of the educational process, % of respondents

Form of participation / opportunity	Response options			
	There is an opportunity, and it is needed	There is an opportunity, but it is	There is no opportunity, and it is	There is no possibility, but it is needed
Choose disciplines to study	23,0	4,6	9,5	62,9
Propose disciplines or topics that are not in the curriculum	14,9	7,8	23,5	53,9
Choose the sequence of studying disciplines by semesters	11,4	4,8	33,9	49,9
Change the teacher	27,6	14,9	14,6	42,9
Adjust your class schedule (duration and time) and the intensity of studying disciplines (number of classes per week)	23,0	4,1	20,8	52,1
Choose (change) learning methods	15,5	6,3	21,2	56,9
Independently set learning tasks and come up with ways to solve them	30,0	8,2	31,1	30,7
Choose ways to control knowledge	17,3	5,1	31,9	45,8
Repeatedly retake disciplines	56,3	9,5	12,2	22,0
Listen to the disciplines again	30,4	7,9	16,5	45,2
On average	24,9	7,3	21,5	46,2

As can be seen from the data obtained, there is an explicit request among students to increase their own role in the management of the educational process. The average demand for all types of participation is more than 71%. The highest demand exists for the ability to independently choose disciplines to study – it is the basis of higher education models operating in Western universities and that is still hardly implemented in Russian universities. The available data show that students are not satisfied with how this opportunity is implemented in practice: 73% of those who talk about such a need cannot realize it at the university. Other

major gaps between opportunities and needs include: the right to choose the sequence of studying disciplines (81.4%), the choice of learning methods (78.6%), the ability to independently propose topics and disciplines that are not in the curriculum (78.3%). The only relatively accessible form of participation in the management of one's educational process is the possibility of retaking disciplines.

The additional statistical analysis showed that the assessment of one's needs and opportunities provided by the university is not affected by the gender and level of the student's educational program. The course of study has some significance.

Table 4. The ratio of needs and opportunities for participation of students of different courses in the organization of the educational process, %

Form of participation / opportunity		Propose disciplines or topics that are not in the curriculum	Change the teacher	Choose (change) learning methods	Listen to the disciplines again
Junior courses	There is an opportunity, and it is needed	17,8	29,6	18,1	36,1
	There is an opportunity, but it is not needed	8,5	15,0	7,3	8,1
	There is no opportunity, and it is not needed	22,9	17,2	22,3	16,0
	There is no possibility, but it is needed	50,9	38,3	52,3	39,8
Senior courses	There is an opportunity,	9,9	26,6	12,0	19,3

	and it is needed				
	There is an opportunity, but it is not needed	6,5	13,6	4,1	6,7
	There is no opportunity, and it is not needed	22,5	9,2	19,7	19,5
	There is no possibility, but it is needed	61,1	50,5	64,2	54,5
Need an opportunity for junior courses		68.7	67.9	70.4	75.9
Need an opportunity for senior courses		71	77.1	76.2	73.8
There is an opportunity for junior courses		26.3	44.6	25.4	44.2
There is an opportunity for senior courses		16.4	40.2	16.1	26

Junior students have less pronounced requests for the possibility of changing teachers (67% vs. 77.1%), but have more opportunities to propose topics (26.3% vs. 16.4%), choose learning methods (25.4% vs. 16.1%) and listen to the disciplines again (44.2% vs. 26%). Among those who need to manage their educational process, junior students have fewer opportunities than senior students. 50.2% of junior students and 61.1% of senior students can change topics; 38.3% of junior and 50.5% of senior students can change teachers; 52.3% of junior students and 64.2% of senior students can choose methods; 39.8% of junior students and 54.5% of senior students can retake disciplines.

It can be assumed that after a period of initial adaptation, students begin to better understand their educational needs and limitations of their program. However, we emphasize

that, despite these differences, the general request to increase one's role in managing the learning process and especially in building an individual educational trajectory, is expressed as clearly as possible. The management of leading technological universities can hardly ignore this request if they want to maintain their competitiveness in the global educational space.

Specifying their requests concerning the content of educational programs, about a third of students (34.2%) indicated a lack of certain disciplines. At the same time, the answers to the open question formed a wide list of popular disciplines, both specialized and universal-technical (primarily in the field of IT) and socio-humanitarian. The presence of a high diversity of needs is an additional argument in favor of increasing the individualization of educational trajectories, among other things, by expanding the list of small modules (minors) offered to students to choose from. The need to increase their international competitiveness is clearly expressed: almost two-thirds of students (62.1%) declared the demand for teaching certain specialized disciplines in English. From the point of view of the educational process model, the surveyed students would prefer a mixture of classical and modular systems: the first variant turned out to be in demand for general scientific and fundamental disciplines (68.9%), and the second - for more specialized subjects (60.7%). For most types of study, the full-time format remains preferred (74.3%); the use of remote means is considered rather as an addition. However, with regard to lecture classes, a fairly large number of students (49%) expressed a preference for asynchronous online learning, while slightly more than a third (36%) of students are interested in maintaining the classical full-time lecture.

Summarizing the main results of the conducted research, it should be concluded that there are a lot of contradictions in the organization of the educational process. Higher education in one of the most competitive branches of the Russian industry, aerospace, does not fully meet the expectations and needs of students (MAI provides about 70% of the training of specialists in this field). At the same time, it should not be assumed that the expectations and requests of students are overstated, irrational or not meeting the requirements of the labor market. On the contrary, these expectations in some cases are rather underestimated – as in case of developing business skills and solving complex organizational and managerial tasks necessary in the high-tech industry. Improving the quality and competitiveness of specialized aerospace education is impossible without purposeful work to eliminate critical gaps between the needs of students and the opportunities that the university currently offers. However, there is an institutional problem when a university is forced to create a training system in accordance with the uniform requirements imposed by the ministry (regulatory requirements), and therefore its activities in the field of optimizing the educational process are limited.

Conclusion

From the point of view of human potential, the Russian high-tech industry is almost completely dependent on internal resources. This means that the system of specialized technical education is a critically important condition for the competitiveness of Russian enterprises in the field of high technologies. The results of the sociological research conducted in one of the leading universities of the aerospace industry allow us to draw several conclusions which are important for the development of its human potential and global competitiveness.

Firstly, there are a lot of serious gaps between the educational opportunities provided by the university and the structure of students' expectations and needs. The most important of them are competencies related to the development and implementation of complex innovative technological projects in real conditions. Since these are the competencies on which the innovative capabilities of high-tech enterprises directly depend, bridging this gap is in the interests of not only students, but also business. An equally important problem is the development of management and business skills, the value of which is understood mainly by students of targeted and budget programs, and which are not sufficiently formed at the university.

Secondly, the conditions of students' training do not allow them to realize their expectations, and the solution to this issue lies in the development of orientation work at the admission stage and the design of individual educational trajectories.

Thirdly, students demonstrate a pronounced request to participate in the management of the educational process. This should also be taken into account when developing educational programs and organizing the educational process.

The conducted research, of course, has a number of limitations, primarily related to the fact that it covers students of one and the same university. Further research is needed to understand how large the gaps between expectations and reality are in other technological universities, how successful the existing development programs, such as "5-100" or the discussed program "Priority 2030", contribute to overcoming these gaps, and what organizational and managerial decisions and practices contribute to this. Nevertheless, the present research demonstrates the continuing systemic problems in technological higher education, which negatively affect the global competitiveness of the aerospace and other high-tech sectors of the Russian economy.

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