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### Professional Culture of the Specialist of the Future

#### FORMING OF PROFESSIONAL CULTURE OF FOREIGN STUDENTS OF PRE-MASTER TRAINING PROGRAM

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#### *Abstract*

Article deals with pre-master training of foreign citizens in aspect of forming professional culture of engineering field researchers. Paradigm basis of pre-master training is polytechnic approach. This one focuses on solving innovative problems, breakthrough technologies, and interdisciplinary study. The educational process of foreigners' pre-master training bases on theory of non-native language teaching synthesizing didactic and ethno-psychological components. Need for individualization follows from age characteristics of students at higher degree of social maturity, and dictates introduction of adults' education approaches in andragogy manner. Therefore, pre-masters training programs teacher performs the role of mentor, possibly coach. Due to interdisciplinary approach teacher should be a kind of wide range of scientific and technological problems expert. Selection of educational program disciplines and their content is important. We give curriculum of two-semester program. Implementing discipline "Pre-exam training" teacher advises students on exam questions, and leads preparation and demonstration of presentations of main results of undergraduate studies prepared in foreign universities. Presentations are leading tool for professional culture formation and readiness for research work in Russian-speaking scientific community. Important component of graduate's professional culture is professional Russian language. Language training aims on formation of skills and abilities necessary for graduation qualification work. We introduce individual component into learning process, and draw up professionally oriented text libraries.

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**Keywords:** Foreign students, pre-master training, individualization of training, mentoring, professionally oriented Russian language.



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## **1. Introduction**

There is an annual trend towards an increase in the number of students enrolled in graduate programs in the world. The data for Russia given in the study of the Higher School of Economics, record the growth in the number of undergraduates from 330.7 thousand people in the 2015-16 academic year to 446.9 thousand people in the 2016-17 academic year (Gohberg et al., 2018, p. 44). There are several reasons for this phenomenon.

### **1.1. Reason 1: globalization of higher education**

Firstly, the ongoing globalization of higher education has directed its development along the path of English & American model, in which the magistracy is the second stage of higher education. Therefore, the countries that traditionally gave large share of the global student contingent, when dividing the steps began to demonstrate large number of undergraduates. These countries include, above all, Russia, China, Germany, France, and Italy.

### **1.2. Reason 2: massification of higher education**

Secondly, in connection with the massification of higher education (Nikolaeva & Shchelkunov, 2015), education in the magistracy became an element of a certain prestige, just as, for example, until the 1970s the status of a higher education itself was a phenomenon.

## **2. Problem Statement**

A certain degree of massification of the magistracy posed a number of problems for universities. We consider only some of them related to the subject of this study. First of all, the separation of higher education levels has led to an increase in its variability. Having received a bachelor's degree, the graduates have the opportunity to have wide enough choice of both the directions of masters training and universities to continue their studies. As a result, even with the formal correspondence of the magistracy profile to the previous undergraduate training, its level and its content may vary depending on the university where the prior education was received. Therefore, the actual problem is the search for mechanisms that aim to put graduate students in relatively equal conditions. As a solution, they propose, for example, to strengthen career guidance work among students studying for undergraduate studies (Berestneva, 2015), or to include special adaptation courses (Guslyakova, 2010) in the first year of graduate programs. However, analysis of the Web space shows that many universities organize preparatory courses or even implement preparatory programs for the magistracy. To the greatest extent, this is true for leading universities with a competitive nature of admission to the magistracy.

The difficulties described above, which must be overcome by a university graduate who chooses to study at the magistracy at another university, are only multiplied if the country of study is new to the graduate student. The number of graduate students abroad has increased significantly in recent decades due to the development of the internationalization of higher education (Kuzminykh, Krasilnikova, & Powell, 2015). For Russian universities, a major problem is also the language of instruction, since the overwhelming number of master's programs in our country are still implemented in Russian. This means

that the problem of the formation of a professional culture of foreign graduate of magistracy cannot be solved in 2 standard years of study. The fundamentals of the formation of professional culture should be laid in the course of pre-master training. Thus, the pre-magistracy training of foreign citizens is a complex problem that can be considered as a challenge to Russian universities.

### **3. Research Questions**

Basing on the above consideration we can call two main questions of present research.

#### **3.1. Question 1: common context**

How to form the professional culture under the condition of sufficient inequality of graduates' entrance levels and fields?

#### **3.2. Question 2: Russian context**

How to form the professional culture under the condition of non-native language surrounding?

### **4. Purpose of the Study**

The aim of the research is to construct the model for training foreign engineering pre-master students, taking into account the need to develop a graduate's professional culture. The model consists of:

- Variable pre-master training program for groups of training fields.
- Methods for implementing this program taking into account the characteristics of the contingent.
- Conditions for implementing the program in cooperation with educational units implementing the master study.

### **5. Research Methods**

To solve this problem, we analyze the experience of domestic universities in the field of pre-master training of foreigners. Smolskii (2008) was the first who expressed the idea of need for pre-master training, but later he did not address this issue. We can divide works on this subject into three categories. The first type includes articles of general nature, affecting organizational and methodological issues of designing and implementing pre-master programs. First of all, it should be noted the work of Tomsk Polytechnic University (TPU), performed with the participation or under the guidance of Guzarova. She introduced for the first time the term "pre-master training of foreign citizens", although the concept, of course, existed before. You can find relatively complete list of works involving Guzarova on pre-master topics in article (Guzarova, Kashkan, & Vladimirova, 2017). The work of this group of authors has shown the need to separate pre-master programs from general pre-university training programs for foreign students. In addition, she called the main characteristic of the organization of the educational process of

pre-master training “an individual student-centered approach to each student” (Guzarova, Kashkan, & Shahova, 2013).

In the works carried out based on Peter the Great St. Petersburg Polytechnic University (SPbPU) experience, they developed the idea of individualizing pre-master training (Krasnoshchekov, Rud', & Davydov, 2018). As a substantive basis for individual work, we proposed the subjects of undergraduate studies of pre-masters, as well as the presentation method. We presented the results of this work at the scientific and methodological conferences of SPbPU with the involvement of pre-master students as speakers. We emphasized the importance of pre-master programs as training of representatives of potential national elites (Krasnoshchekov, Novikova, & Surygin, 2018).

The second group of works related to pre-masters training concern the problems of studying Russian as a foreign language. These articles distinguish the pre-bachelor and pre-master training with the designation of the particular didactic complexity of the latter. In the process of working with foreign students undergoing training in the pre-university training program and planning to enter the magistracy, Vasilyeva (2016) developed special course "Introduction to the master's program", and created the textbook of the same name. A number of authors contributed to the analysis of the problems of preparing pre-masters in Russian language. For example, Aseeva (2019) pointed out the problem of texts selection, and the important role of independent work in language teaching of adults. Gorbenko and Chuvaeva (2018) presented preliminary generalizations on the language training of pre-masters.

The third group of works on pre-master training for foreigners are articles, the subject of which is the content and technology of teaching non-philological disciplines. We can consider as a pioneer article of authors of SPbPU dated 2004, when foreign pre-masters began to appear in Russian universities. In these few works emphasizes the need to use teaching methods aimed at students who have reached a higher social maturity compared to pre-bachelors. One of the most active authors working in this direction is Ermakov. We give link to one of his latest works (Ermakov, 2016), in which he cited earlier articles.

Websites of universities show an interest in the subject of pre-master training of foreigners. General analysis of the sources shows that, in addition to TPU and SPbPU, they develop various aspects of programs for foreign pre-masters at Moscow State University named after M.V. Lomonosov, Kazan Federal University, Peoples' Friendship University of Russia, Volgograd State Technical University, Higher School of Economics, Voronezh State University and other universities, where there is a large contingent of foreign students. In addition, we note that TPU prepared a significant number of textbooks for pre-masters (Guzarova et al., 2017).

Summarizing, we note that it is necessary to separate the programs of pre-master training for foreign citizens from the preparation programs for training at bachelor's level., firstly, there are different content of the studied disciplines, and secondly, there is an individualized teaching methodology, focused, in particular, on the training of elder students (Palis & Quiros, 2014).

## **6. Findings**

When building a model of pre-master programs for engineering areas, two circumstances should be taken into account.

### 6.1. Polytechnic approach

First, according to modern view on the quality of education in the field of engineering and technology the graduate must be able to combine research, design and business activities in an integrated manner. The difficulty of preparing foreign pre-master student at technical university connects with the need to combine the deep mastering of fundamental knowledge with the mastery of engineering creativity. Formation of professional culture of the graduate carries out based on proficiency in Russian at level not lower than B2 (Gorbenko & Chuvaeva, 2018). SPbPU is developing its own polytechnic approach to educational process. The fundamental scientific basis of this approach is multidisciplinary research. It means that the studies aim at solving large-scale scientific and technical problems, which implies the use of inter-sectoral and supra-sectoral technologies, as well as the effective interaction of specialists from various fields of knowledge. This leads to interbranch transfer of "invariant" technologies that are currently in demand (Rudskoi, Borovkov, & Romanov, 2018). Thus, the methodological basis for implementation of pre-master program for foreign citizens is a polytechnic approach or, in short, innovative multidisciplinary research.

### 6.2. Teaching in non-native language

Secondly, the pre-master programs implemented both at TPU and at SPbPU base on the approaches for teaching of foreign citizens, which means they base on the theory of teaching in a non-native language of Surygin (2000). The main provisions of this theory are the need to take into account adaptation processes in the design and implementation of educational technologies, as well as the principle of interdisciplinary coordination. The latter principle links the teaching of non-philological disciplines with levels of mastering foreign students in Russian. In addition, the implementation of the principle involves close cooperation with institutes providing training in the basic professional educational programs of the magistracy.

### 6.3. Integrated approach

Thus, when designing a pre-master program for engineering directions, an integrated approach was used combining the "polytechnic" paradigm with the theory of teaching in a non-native language.

Taking into account the integrated methodological approach, a unified technical program of pre-master training was developed. Corrected after a number of improvements during the three-year approbation of the basic distribution of the classroom load is given in Table. 01.

**Table 01.** Study plan of pre-master program for engineers

1 semester		2 semester	
Disciplines	Contact hours	Disciplines	Contact hours
Russian language	324	Russian language	462
		Common language	168
		Scientific style of speech / Language of specialty	210
		I will be a master!	84

Mathematics (introductory course)	48	Mathematics	84
		Mathematics (bachelor level)	42
		Advanced mathematics	42
Physics (introductory course)	36	Physics (bachelor level)	42
Informatics (introductory course)	18	Electives: Informatics / Machine building / Chemistry & Biology / Philosophy	42
Chemistry (introductory course)	18	Pre-exam training	42
Semester total	<b>444</b>	Semester total	<b>672</b>
Total		<b>1116</b> contact hours	

“Requirements for development of additional education programs that provide training for foreign citizens and stateless persons to master professional educational programs in Russian,” approved by Order No. 1304 of the Russian Ministry of Education and Science of October 3, 2014, determine the amount of contact workload per 1008 hours. For pre-masters arriving on the base of state budget, we achieve this value through withdrawal of electives ("Informatics / Machine building / Chemistry & Biology / Philosophy"), and Pre-exam training, and including 24 hours of Russian language in electives.

#### 6.4. Model's conditions

The implementation of the proposed model requires the fulfillment of a number of conditions. The pedagogical conditions will be discussed below when analyzing the characteristics of the model. The main organizational condition is training of a significant number of pre-masters, sufficient for the formation of full-fledged academic groups. An additional condition that ensures the relative profitability of the program is homogeneity of contingent of pre-graduate students in the areas of training. Obviously, with increasing contingent homogeneity, the quality of training increase. If the first condition is feasible for large universities, then the second remains unattainable, and we only consider it when building idealized models of reference pre-master training.

We described both content of disciplines and technology of teaching mathematics, physics, and chemistry in special work (Krasnoshchekov, Rud', & Davydov, 2018). Fundamental in the preparation of pre-masters is the discipline of choice (electives). The choice and content of the discipline are consistent with the institutions in which students will master the graduate program. Students coming in the direction of "Biotechnology", as well as the profiles "Biophysics", "Medical Physics", "Medical Nuclear Physics", "Medical Biotechnology", "Physics of Medical Technologies", "Bio Nano Technology" learn "Chemistry & Biology". Elective "Machine Building" does not need comments. Pre-master course "Informatics" is interdisciplinary in the wide field of areas related to computer science. The main goal of the elective disciplines is to help pre-masters to learn the terminological and conceptual apparatus in professional field. As a rule, we involve in providing electives professors of institutes, where future graduates will master the main programs.

Using Total Quality Management approach (Sohel-Uz-Zaman, & Anjalini, 2016), we are changing the list and the content of the courses annually. We do it basing on the student's feedbacks in co-operation with the institutes providing master training programs.

## 6.5. Pre-exam training

Future graduates need to take an interdisciplinary exam for admission to magistracy. Exam questions reflect the control of possession of universal, general professional and professional competencies. They post all questions for the interdisciplinary exam on the website of the relevant training units. Classes in the discipline designated as “Pre-exam training” begin with clarification of the future student magistracy profiles. Persons those responsible for foreign students in institutes, or professors specially allocated by institutes conduct pre-exam preparation consultations. We consider this part of training as relatively obvious mechanism for the formation of professional culture. Inadequate students’ proficiency in Russian language at the beginning of the second semester is the only difficulty. This problem exacerbates in the case of late arrival of students. The easiest way to reduce communication difficulties is to communicate in English, especially since English is likely to be the language of their professional communication (Norhafezah, Amrita, & Joyce, 2019).

Also, in preparation for graduate studies, you can consider inviting pre-master students to participate in scientific seminars and conferences on the subject of their future educational institution. Moreover, scientific communication is an important component of the researcher's professional culture (Iyengar, & Massey, 2019). Experience shows very low level of understanding of the speakers by students. It is positively possible to assess that the fact of shock takes place only in the pre-master's program, and not in the master's program, and students can realistically assess their potential in the field of Russian language scientific communication. Thus, participation in conferences is motivational for pre-masters and it contributes to professionalization in many respects.

The second part of the course is much more difficult. We implement this one using the presentation method. Presentation skills are of paramount importance both for training in a magistracy and in further professional activity - when covering the results of research work in classes, seminars and conferences. Each future graduate should prepare a small presentation in Russian, for example, in the PowerPoint system. The topic of the presentation relates to bachelor level graduate work of the students those they did at the university abroad. The most successful students in research work make presentations on current research topics. The professors analyze topics of the presentations carefully and consistent. Very often, when preparing a presentation, you have to use English as an intermediary language. Work on the presentation is time consuming process. Our professors use video recording of the improvement process. Other students and all the professors involved in the implementation of the pre-master program discuss videos jointly. The students demonstrate final version of presentation for the leadership and teachers of the pre-master program, as well as representatives of training institutes. The most effective form of presentation is the student conference. The best pre-master students show their presentations at breakout sessions of scientific and methodological conferences. Since 2015 we announce the sections “Pre-master training” and “Problems of pre-master training” in the programs of annual scientific conferences “Science Week of Polytechnic University” and “Actual issues of teaching foreign students”. Speeches in these sections and answers to participants' questions help pre-master students to adapt to scientific component of graduate education. We conduct video recording of presentations, and we analyze achievements and shortcomings of presentations at the lessons. Thus, we model the components of the future professional scientific activity of students.

A separate problem is the staffing of the pre-master program. First of all, highly qualified personnel only should carry out the teaching of graduates. Further, we attach great importance to the choice of the main professor, who prepare students for the exam in the magistracy. This professor, first, must be an expert on a wide range of scientific and technical problems. Otherwise, they find actual mistakes and even curiosity in the presentations of undergraduate works presented by pre-masters. Secondly, as mentioned above, the teacher needs to be fluent in English for everyday and scientific communication. Thirdly, this teacher should play the role of a mentor (Aguilar, 2017) perhaps even a coach of pre-masters (van Nieuwerburgh, 2012). Such functions of the teacher correlates with the andragogic approach to learning (Loeng, 2018). The age and degree of social maturity of students determine introducing of andragogic technology elements (Knowles, Holton III, & Swanson, 2015).

### **6.6. Russian language for professional communication training**

Study Russian as a foreign language is important part of engineering pre-master training programs model. Foreign pre-masters have graduated from universities in other countries do not speak Russian. We form their communicative competence at the stage of pre-university education via the experimental discipline "Language training of foreign citizens (pre-master's stage). Technical training profile". This discipline consists of 3 modules: 1 "Common Language"; 2 "Scientific style of speech / Specialty language"; 3. "I will be a master!".

The purpose of module 1 "Common Language" is the formation of communicative competence in all communication spheres. The purpose of module 2 "Scientific style of speech / Specialty language" is the formation of communicative competence in the educational and scientific field. The purpose of module 3 "I will be a master!" is to build the skills and abilities necessary for writing and defending graduation qualifying work.

The goals and objectives of teaching pre-masters determine the structure and content of each module. The content of module 1 largely coincides with the content of such a module for pre-bachelor groups, and therefore the description of the content of modules 2 and 3 deserves special attention. At the initial stage we carryout teaching of scientific style of speech in the framework of an elementary course. At the basic level we implement basic course, containing 2 components - general one and individual one.

The common component is a system of tasks aims at the formation of communicative competence in the educational and scientific sphere of communication and develops on the basis of general scientific texts on general educational disciplines (physics, mathematics, computer science, chemistry). The main tool for teaching at this stage is textbook aimed at studying the prepositional case system of the Russian language.

Principle of variation and principle of high degree of specialized orientation of training explain the introduction of individual component. We obviously need to increase the degree of correlation of the pre-master study materials studied with master study materials. After studying the main communicative speech blocks ("Concept of an object. Definition of the concept", "Designation. Measurement. Calculation", "Properties of the object, substance", "Changes, transformations", "Relationship and dependence of phenomena and objects", "Composition. Structure. Structure. Device ", " Classification of objects, objects, phenomena ", " Receipt ", " Application. Use. Purpose ") included in the content of



common component, students perform uniform system of tasks, specially designed for each communicative speech block with the text material directly connected with the chosen master's specialty.

Due to the numerous composition of pre-master groups and wide range of special areas, the introduction of the individual component expects in the mode of independent work, as well as in the form of individual consultations. Teacher monitors the results of this work during the classroom in the form of individual consultation with each student. Work in an autonomous mode does not cause difficulties for pre-masters. Experience shows, that due to their cognitive-psychological features and high motivational factor, the effectiveness of the independent work of pre-masters is not inferior to the effectiveness of classroom work under the guidance of a teacher. Clear algorithm of work proposed by the teacher allows to build educational route of each pre-master student in convenient format. The organization of the educational process in the form of independent work allows, firstly, to make the content of the program more variable, and secondly, it allows to significantly increase the degree of the profile orientation of training.

Working in pre-master groups, teachers must construct the learning process in contrary with pre-bachelor training, taking into account the low level of language and speech competence, and at the same time the high level of subject competence, as well as the need to increase the degree of correlation of study materials studied with the chosen direction of training.

One of the important issues in teaching language of specialty of foreign pre-masters is the issue of compiling "authentic text libraries, selected on the basis of communicative professionally-oriented minima" (Klobukova, 2012). An obligatory principle of text library, is the principle of taking into account interdisciplinary communication. One of the main conditions is close interaction of the Russian language teachers and the teacher of other disciplines, and the correlation of the regulatory documents on teaching Russian as foreign language and the teaching at the magistracy and, as a result, the correlation of the content. The range of topics of communicative professionally oriented minima at the pre-master preparation connects with the program of the entrance interdisciplinary exam for magistracy.

For example, for the specialty 08.04.01 "Construction" text library includes such text topics as "The concept of a map and a plan", "The property of fluidity. Solid and fluid substances ", " Resistance of materials depending on state of surface and on their size ", etc. We select the topics within the framework of binary coordinate system, namely: taking into account the belonging to the disciplines included in the program of the entrance interdisciplinary exam, as well as the functioning of certain communicative speech blocks in them, like "Definition of the Concept", "Properties of the Substance", "Dependence", etc. Despite the low level of language proficiency of pre-masters, we create teaching aids on the basis of authentic engineering texts, which requires Russian language teachers to develop special teaching methods.

Within the framework of module 3, pre-masters get acquainted with the master's thesis genre, study the structure, composition, and language features of the texts of final qualifying works. The content of this module also includes teaching communication in various situations relevant to the master's context of situations, like conversation with the supervisor, conversation with dean's office worker, conversation with bibliographer in library, conversation with reviewer / opponent.

## 7. Conclusion

Approbation of the model built at Peter the Great St. Petersburg Polytechnic University for 4 years shows its viability in the aspect of the formation of professional culture.

### 7.1. Students successes increase

All graduates of the program successfully passed the entrance exams to the magistracy, although some of them had to adjust the training profile. Not more than 3% of former pre-masters gone or had to repeat preparatory course already at the training in the magistracy. Prior to the implementation of the program presented, this share reached 15-20%. This confirms in particular the lack of professional competencies.

### 7.2. Quality management terms

At the same time, we annually modify the list and content of academic disciplines during the course of the program. Therefore, we use the process approach to improving the quality of educational programs via continuous improvement conception.

### 7.3. Recommendations

We can recommend the model of pre-master training for implementing in universities of Russia. It will not only raise the level of professional culture of graduates, but it will improve the international image of Russian universities.

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