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PECULIARITIES OF TEACHING NATURAL-SCIENCE DISCIPLINES TO FOREIGN STUDENTS

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Abstract: This work considers methodological principles of computer science, mathematics and physics in the process of teaching foreign students in Russian as a non-native language at the pre-University level of the International Education Faculty of Tambov State Technical University. The work also focuses on peculiarities of students' ability to use educational materials and their expertise to hold an inter-University academic competition (Olympiad) in natural-science discipline organized by the "General-Theoretical Disciplines" Department.

Foreign citizens arrive in Russia to study in higher education institutions to get a degree, defend a thesis or re-train within the chosen professional field. Apparently, foreign students have different levels of training in natural-science disciplines. In addition, their attitude to learning is also different. Lecturers of the "General-Theoretical Disciplines" Department of the International Education Faculty of Tambov State Technical University constantly carry out individual work with foreign students teaching and motivating them as well as increasing their interest in studies, for more successful integration of foreign students into the Russian education system.

Foreign students study the Russian language and a number of other subjects for their chosen profession. The subjects include mathematics, chemistry, physics, biology, economics, computer science and others. The major part of a one-year preparation program is the course of the Russian language. Other subjects are studied depending on specificity and level of training as well as in accordance with the chosen disciplines for further education. Special attention is given to studying a scientific style of the Russian language as the basis of a discipline's language.

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One of the top priorities for the “General-Theoretical Disciplines” Department is to teach foreign students the Russian language through natural-science disciplines, to prepare them for their verbal communication within educational, professional and socio-cultural spheres of their university life. The Department’s lecturers have accumulated a significant amount of teaching methods and techniques to offer future students and postgraduates.

In accordance with educational goals, the Department teaching staff have created learning aids and materials in all above mentioned disciplines including computer science. The Computer Science Manual contains scientific style texts. It includes descriptions, narrations, discourse and proving. They help students satisfy their communicative needs [1].

The first place in the process of learning the language belongs to a text definition as part of a text description as every scientific concept requires definition. A detailed description of various notions is carried out by characteristic texts, etc. Therefore, the authors of the Computer Science Manual aim to teach students to understand and define a structure and linguistic appearance of every text type and create their own secondary texts.

At their classes students have linguistic and conditionally communicative exercises. The choice of practical training is based on the notion that in the process of studying Computer Science, students should know the system of cases, syntactical structure of the Russian language and should also have skills to work with texts, read, write and speak. In addition, in the course of their first semester students undergo an active process of formation an ability to understand general disciplines in the Russian language. Therefore, a Computer Science lecturer has the opportunity to compose exercises to form communicative competence within the boundaries of the discipline [2].

With an information technology progress another type of the scientific text has emerged. It is the instruction text that often appears as a computer presentation. Such texts help students visualize objects, processes and effects they study. These texts are easily shaped, learned and reproduced by students.

Our Computer Science lecturers have developed a complex of computer presentations on each topic. All computer presentations have a common design in presenting the material. All the presentations contain multilevel exercises that include language, speech and subject competence.

The process of creating Computer Science educational and methodical materials is based on the content of general education disciplines, which are studied during a pre-University training course, as students have to see direct correlation between what they study and what they discuss while communicating. However, the sequence of communicative units in the Computer Science Course Manual is determined not by linguistic phenomena typical for the scientific style of speech and texts, but by the logic educational materials are laid out. That is why this aspect has undergone some adjustments in the course of the educational materials presentation. Such approach allows working out a flexible learning model due to the following aspects:

– Contents of text materials in each topic and every task in the Manual correspond with the content of the Computer Science discipline studied during a

pre-University training stage in economic, technical or medical-biological profile;

- Different types of exercises (linguistic and communication) allow the lecturers to work individually with international students in and outside the classroom considering their comprehensive abilities;

- Various types of exercise allow to consider different terms of studying for those on the pre-University education program;

- The Computer Science Course Manual provides for the use of modern education technologies.

The Computer Science Course Manual considers the content of general education disciplines, and its exercises aim to form students' speech habits and skills. Therefore, special attention is paid to professional communicative competence, i.e. communication skills in a professional sphere, during the students' pre-University education within the Computer Science Course, and the Course itself is professionally oriented.

In contrast to the Computer Science Course, the Mathematics Course is divided into introductory and fundamental parts at the pre-University training stage. The main goal of the Mathematics Course is to form a vocabulary necessary for the learners to understand scientific texts. Accompanying tasks may be defined as: acquisition of practical skills of debating and arguing, understanding, setting up and solving the problem.

Within the introductory part of the Mathematics Course, an accumulation of vocabulary by a trainee is moving to the forefront. Primarily our Math students have to deal with language patterns in genitive case such as: "what is written with the help of what", "what consists of what", "what is greater-than what", "what is less than what" and so on. It should be noted that within a Russian language course the genitive case in a spoken language is studied much later. The given example shows that delving into the Russian-speaking environment goes in all directions and has a systemic character.

Next issue we are about to consider is numbers, something essential for mathematics. Putting numerals in a correct form is a difficult task not only for foreign students. Numerals in the Russian Language correspond with nouns, for example, "the number is written as one figure", "the number is written as two, three etc. figures", "the number x is two times greater-than the number y ", "the number x is five times greater than the number y ", "one percent", "two percent", "seven percent" and others.

In mathematics if the concept of a variable and Latin letters are used, attention should be paid to which form of the word "equal" is used for reading such expressions as $x = 1$, $a = 2$ and others, and how to read correctly the numerals here in the same situations (the pattern "what is equal to what" is used).

In our opinion, the biggest challenge for foreign students while reading vulgar fractions and decimal fractions are the rules how to use ordinal numerals. Visual aids such as diagrams, pictures and objects' models come to rescue here to present and teach the rules.

In this context the study guide of Introductory Course of Mathematics [3], written by the lectures of the "General-Theoretical Disciplines" Department

with the assistance of the lectures of the “Russian Philology” Department, pays much attention to understanding, memorizing and training the ability to use necessary lexical models in scientific speech.

Also, animated video clips that illustrate word-formation processes, structures of various mathematic expressions and an order of certain operations improve quality and speed of perception of new lexical information. The moving picture in contrast to the static picture allows drawing students’ attention to certain elements of the object we consider.

The Fundamental part of the Mathematics Course shifts accents from studying the new vocabulary to the active use of the available vocabulary during problems solving. Also in this part of the Mathematics Course a process of systematization of the acquired knowledge and new material needed for further University studies of selected disciplines takes place. The most effective kind of activity there is the following succession: “enumeration of the operations that have been fulfilled during a task solution” – “comment of the executing operations during a task solution process” – “explanation of the operations which should be fulfilled to solve a problem”.

Considering the peculiarities of the fundamental part of the Mathematics Course, the lectures of the Department have created a teaching aid brochure that is still in the approbation phase. Its structure repeats the one of the Mathematics Introductory Course [3]. The main difference is a smaller number of Russian language exercises and a greater accent on mathematics tasks aimed at forming the necessary competences for students.

The Physics Course as well as the Mathematics Course consists of introductory and fundamental parts. On the introductory stage foreign students make attempts to speak in Russian about physics.

In the beginning of the physics course foreign students face considerable difficulties as their Russian is not sufficient enough to understand and explain various physical effects. Even the very first topics require many new words that are not used by lecturers of other academic disciplines.

The figurative way lecturers present their material helps students with a limited vocabulary get oriented in the discipline. Here of course we speak of a lecturer’s charisma itself: his or her knowledge, ability to use different methods and material presentation forms, emotions, charisma, ability to increase interest in the discipline, ability to find contact with trainees. The process of teaching foreign students happens in fact in an individual manner. Students fully understand the level of material a lecturer teaches them.

If there are not enough words, then an audio-visual presentation helps to understand things and ideas. Pictures, video and audio materials are used in every topic. All of this is combined in a multimedia complex. And of course laboratory facilities are used for demonstration purposes as well.

While teaching students in Russian as a foreign language questions “What is this?”, “What is this ... in Russian?”, “How is this ... defined?” along with other questions) may be asked with the help of pictures, video and audio materials. The video materials we use comprise the latest domestic and international scientific achievements and expertise. It is also possible to get literature and poetry involved. We have something to be proud of to

demonstrate culture even at physics lessons. Education methods play an important role in foreign students' pre-University training activities. There is always a place for an explanation of an accompanying physical effect in Russian. Education methods play an important role in foreign students' pre-University training activities.

Homework usually implies the reading of the topic of the studied material, planning of the delivery of the topic and then the topic delivery itself. In the beginning of the physics studies students often memorize texts, and it takes them several weeks to start retelling texts as they understand them. Usually they lack the necessary amount of the Russian language vocabulary to be able to talk "as they understand". Therefore, students often use the board and laboratory facilities in the classroom. They prepare small reports where both, those who talk and those who listen, experience difficulties. Words can get distorted so that even lecturers may not understand the sentence's construction. An effort is needed here not to turn an independent student's answer into a repetition of a correct answer after the lecturer. Sometimes discussing a drawing on the board leads to a better understanding as well as correct compiling of a plan of speech and its delivery.

Exercises with different grammatical constructions usually don't cause any difficulties. But compiling of questions and answers require not just the knowledge of the Russian language and the discipline itself but also the ability to understand an interlocutor. This part of homework is difficult to fulfill but very interesting and important for future engineers who should always be ready to correctly ask a question like "why?" and "what for?" and then answer it. Ability to asking questions develops strong curiosity and inquisitiveness among students.

Despite the issues we mentioned before a lecturer during a pre-University training stage has to organize an education process the way every trainee may realize their abilities.

Let us consider some principles of how the education process arranged. These principles are used by lecturers of the "General-Theoretical Disciplines" Department to intensify education process at a pre-University training stage for foreign students. The principles make it possible to improve and accelerate the process of learning and actively develop various students' abilities.

Science-based arrangement of the pedagogic process for foreign students serves to develop knowledge, abilities, consciousness and behavior of students. Scientific nature of the principle of education relates to methods of pedagogic activity and foreign students' activity. According to that principle pedagogical interaction is directed towards developing students' cognitive activity and formation of their scientific search abilities, as well as their acquaintance with a means of scientific approach to the educational process.

Continuity of the process assumes the creation of a certain system and a sequence in teaching and training since complex problems cannot be solved in a short term. K. D. Ushinskiy wrote: "Only a reasonable system that emerges from the very essence of objects gives us full power over our knowledge" [4]. A continuity requirement implies the following arrangement of a pedagogic process for foreign students when studies and activities are a logical

continuation of work that has already been done. It bolsters and develops what has been achieved and brings foreign students on a higher level. Educational process at the International Education Faculty of the TSTU always considers students unique individuality and appeals to their integrated personalities. But every case is unique and every time a lecturer of the “General-Theoretical Disciplines” Department solves a specific pedagogic problem. Connection and continuity of these problems ensure a smooth passage from simple to more complex forms of teaching foreigner students and their consistent improvement and development.

In practice, the principle of continuity, systematic character and succession used during an educational process at the “General-Theoretical Disciplines” Department is being realized in the process of planning.

During the planning of topics lecturers of the department plan sequence of studying different topics within various subjects, select content, design a system of lessons and other forms of an educational process, plan reviews, fix the learned material and ways to control the process. In lesson-to-lesson planning lecturers of physics, mathematics and computer sciences arrange topics in such a way that basic concepts are studied in the first place and training exercises follow theoretical studies.

Also lecturers often use a visualization principle in their activities with foreign students. Visualization in the pedagogic process at the “General-Theoretical Disciplines” Department of TSTU is based on regularities of cognition of surrounding reality and mental development that advances from concrete to abstract. Visualization in pedagogic process at the “General-Theoretical Disciplines” Department in particular implements various illustrations, demonstrations, laboratory works, presentations, colorful examples and facts from real life. Application of visual aids, illustrations, maps, schemes, etc. takes a special place in visualization. Visualization is used by the “General-Theoretical Disciplines” Department at all stages of pedagogic process for foreign students.

Therefore, scientific and methodological work of the “General-Theoretical Disciplines” Department of the International Education Faculty of Tambov State Technical University is directed to analysis and description of scientific speech from a position of communicative grammar and creation of learning aids and information materials which enable to form, develop and improve competence of students and postgraduate students in educational and professional spheres. Accumulated pedagogic experience and scientific and methodological potential of the department staff allow solving important problems on improvement and intensification of educational system in teaching the Russian language (as non-native) as well as teaching natural-science disciplines in the Russian language. Also the department makes major efforts at creating educational and methodological provisions of educational processes at a high level, according to present-day requirements.

Currently an education situation in Russian higher school institutions defines as a diversity of approaches, concepts, technologies and educational systems. So, professional educators need to have special skills that help adapt foreign students to educational environment of non-native universities of

Russia. A lecturer that teaches foreign students has to clearly see results of his or her work, and aspire to expand the diapason his or her influence on students. Teaching process could be intensified by extracurricular lessons that include academic competitions or Olympiads enabling to define potential abilities of a trainee at assimilating studied material. Also, it unveils a potential to use unconscious activity in the academic process.

Students of the pre-University Faculty of the TSTU take active part in extracurricular activities.

Every second semester the “General-Theoretical Disciplines” Department holds academic competitions (Olympiads) in physics, mathematics, computer science and chemistry. In the beginning, they had inter-university status but over the years they will transform into international competitions.

Implementation of this approach is aimed at solving several problems: knowledge assessment, learning motivation, establishing contacts between students of different universities, realization of educational work and so on. Also at Olympiads levels of training of Russian-speaking school graduates and the Department graduates can be compared as well as results of work of sub-department’s lecturers. The lecturers of the “General-theoretical disciplines” Department create atmosphere of collaboration, cooperation, immunity and emotional comfort both for learners and between learners and lecturers at the academic competitions (Olympiads) where foreign students participate.

All the assignments are developed by a team of authors in specified fields of the studied disciplines. A competition is divided into two parts – during the first one, foreign students of all universities participate in the competition off-site. Based on the results of the first part of the Olympiad, teams are formed to take part in the second half of the competition. The second part of the competition is on-site. The winners are awarded with expensive prizes. The victory in academic competitions gives participants additional confidence at entering higher education institutions.

“General-Theoretical Disciplines” Department staff members create an atmosphere of openness and tolerance during communication between students at such extracurricular activities.

In their work the lecturers practice scientific principles of educational process’s organization which help them achieve high results in professional activity and develop creativity among foreign students.

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Особенности преподавания естественнонаучных дисциплин для студентов-иностранцев

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Ключевые слова и фразы: естественнонаучные дисциплины; олимпиада; русский язык как иностранный; учебно-методические материалы.

Аннотация: Рассмотрены методические принципы обучения иностранных граждан информатике, математике, физике на русском языке как иностранном на подготовительном отделении факультета международного образования, особенности использования учебных пособий, а также опыт проведения межвузовской олимпиады по естественнонаучным дисциплинам на кафедре «Общетеоретические дисциплины».

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