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On some peculiarities of organization of mathematical training in English-speaking academic groups for future IT specialists

We consider certain issues of planning and giving online lectures and practical trainings in English to foreign and Ukrainian students studying on IT specialties in National Aviation University. We study specifics of organization of educational process in multinational academic groups, contributing to the formation of students' intellectual skills, which are important for future work in Information Technology.

The opportunity to receive a professional education in English is very important for future aviation professionals, since English is one of the official languages of the International Civil Aviation Organization (ICAO). The program "Higher Education in Foreign Languages" began to work at NAU since 1999. Since a good knowledge of professional English is also important for future specialists in the field of information technology, soon students of IT specialties were also included in this program. Then the program has been extended for many specialties and is successfully operating to this day. Research on teaching mathematics in English to foreign and Ukrainian students of NAU has been carried out by authors within the framework of this program since 2006.

Some of issues of teacher's work with English-speaking students of technical and IT specialties were considered by O. W. Karupu & T. A. Oleshko [1], L. V. Androshchuk & V. I. Trofymenko. [2], S. I Fedak, L. A. Romaniuk, & S. A. Fedak, [3], A. P. Rybalko & K. V. Stiepanova [4], O. W. Karupu, T. A. Oleshko & V. V. Pakhnenko [5–8].

Acceleration of globalization processes has led to the intensification of teaching in English in universities around the world, in particular in Ukraine. General issues of the development of this process in Ukraine were investigated by O. Kvasova, C. Westbrook & K. Westbrook in [9]. Teaching in English contributes to the improvement of the professional skills of university graduates.

We present analysis of some results of our experience of teaching in English foreign and Ukrainian students studying in Field of Study 12 "Information Technology" on Faculty of Cybersecurity, Computer and Software Engineering to mathematical disciplines.

Teachers working in English-speaking academic groups of Specialties 121 "Software Engineering", 123 "Computer Engineering" and 125 "Cybersecurity" have to solve many issues related to the specifics of teaching mathematical disciplines in English.

A specialist of any technical specialty must have specific professional features and competencies. These characteristics of future specialists should preferably be formed in the process of studying both special and general scientific disciplines. This is especially important in teacher's work with students of IT specialties.

Not only knowledge of the basic theoretical foundations of mathematics, but also the possession of skills in their application are important for the professional training of future specialists of all profiles in the field of information technology.

We consider the specific problems of methodical, didactic and organizational nature which arise while teaching mathematical disciplines in English-speaking groups on FC CSE. Some of these problems arise as a result of different approach to teaching mathematics in secondary schools in Ukraine and countries native for our students. Beside this, we study specifics of organization of educational process, contributing to the formation of students' intellectual skills, which are important for future work in field of IT.

We try to link the theoretical constructions to the corresponding problems as much as possible so that students see the use of mathematics.

In our study we consider the specific issues that arise in teaching disciplines "Mathematical Analysis", "Linear Algebra and Analytic Geometry", "Differential Equations", "Theory of Probability and Mathematical Statistics" and "Higher Mathematics" to students who are not native speakers. In secondary school our students, who study at NAU, had studied mathematics in their native languages in Ukraine and in different foreign countries.

It is important for IT specialists to have skills in organizing self-control and mutual control over the correctness of actions, an understanding of their necessity, and also psychological readiness to apply them in professional practice. Development of self-control skills in mathematics traditionally is achieved by solving the problem applying different methods. In addition, to control the correctness of calculations in this case, you can invite students to use CAS. We consider it useful not only to discuss the specifics of each method, but also to point out that the application of all these methods allows the student to independently monitor the correctness of his calculations. For example, development of self-control skills in the process of calculating determinants is traditionally achieved by solving the problem applying different methods. Process of recognition of types of problems is very important also when students are taught to methods for investigation the convergence of number series.

Issues related to the specifics of teaching certain mathematical disciplines were considered by the authors in n [10–19].

Team work skills in a multinational team may be well developed in practical training. For example, a significant problem encountered in teaching mathematical analysis is the lack of skills of many foreign and Ukrainian students in differentiation and integration techniques. Mastering this section is quite difficult for many students, especially in technical universities. In order to eliminate this problem, we practice the following modeling of the professional activity of future IT specialists: we divide the academic group on practical training into subgroups consisting of a performer, a controller and an expert. It is also possible to divide the group into two or three subgroups and suggest to students similar work in teams.

These teams may be constant or may randomly change with each new task or new practical training. As a result, in addition to mathematical skills, the skills of teamwork in a multinational team are formed, a habit of self-control and psychological resistance to external control are developed. Team work skills in a multinational team

are also well developed when performing calculations on mathematical statistics. Some of these issues were considered by authors in [7, 8] and [18–22]. In addition to the mathematical skills and skills of working together in international teams, students studying mathematics by this method, develop a habit of self-control and psychological stability to external control.

The joint study of foreign and Ukrainian students gives them possibility to communicate in English with students who have received language training in different countries and to develop their skills of cooperation among participants in international teams.

We consider it useful to apply a variety of supporting materials, and the adaptation of their form for students of different specialties has certain effectiveness. It should be noted that for students majoring in Computer Engineering, Software Engineering, and Cybersecurity it is better to give reference materials, including flowcharts of relevant algorithms. It is also important to provide students with methods for using CAS and Internet resources. In addition, sufficient attention should be paid to the peculiarity of usage of mathematical terminology.

In recent years teachers faced difficulties connected with introduction of distance and blended learning that has appeared very hard for students studying in English (see [21, 22]). Especially difficult is to organize effective practical classes for the first-year students. At NAU during quarantine distance learning is conducted in Google Workspace (formerly G Suite) using Google Classroom and Google Meet. The work of student teams implemented with the help of Google Jamboard was generally quite effective (see [6–8], [18, 19] and [21, 22]).

This approach primarily contributes to increasing the interest of students in the classroom. As a result, their learning process is accelerated. At the same time, students also better develop teamwork skills, which is very important for aviation professionals. In our opinion, the obtained results show the promise of further study of this approach.

It should be noted that this year from 24 February year all teachers faced new difficulties. t. Many students had difficulties with the Internet and even with telephone communications, which increased the requirements for materials in Google Classroom and led to the need for additional consultations in Google Meet.

Analysis of our practice of teaching mathematics in English-speaking multinational academic groups on FC CSE gives the opportunity to formulate recommendations for the teacher's work. In our opinion, teaching mathematical disciplines in English to Ukrainian and foreign students in multinational academic groups requires teachers to modify standard methods of teaching.

In particular, for Ukrainian and foreign students who are not native English speakers, it is very important to constantly pay attention to mathematical terminology and notation. We give students recommendations for the application of Internet Resources and Computer Algebraic Systems.

In addition, link to applied problems is very important for student's better understanding of the educational material. The joint training of foreign and Ukrainian future specialists in the field of information technology contributes to the development of the skills of cooperation among participants in multinational teams.

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