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ATTRACTIVENESS OF ENGINEERING HIGHER EDUCATION STUDY AT RTU FOR FOREIGN STUDENTS

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Abstract. Due to a successful commitment to developing an international education offer, the number of foreign students enrolled in studies at Riga Technical University (RTU) is increasing significantly every year. In this paper, the authors describe the reasons why engineering studies at RTU are becoming so attractive to foreign students. The conclusions are made on the basis of student surveys and the long teaching experience of the Professors of the Engineering Mathematics Department.

Keywords: engineering higher education, foreign students, mathematical subjects

Mathematics Subject Classification: Primary 97B40, 97C70; Secondary 97C30

1 Introduction

Riga Technical University (RTU) admits foreign students for studies on the basis of open and equal competition. Any foreign student wishing to enter the RTU undergraduate program must take entrance exams in Mathematics and English, as well as additional exams if the chosen study program requires. The exams may be taken in the student's country of residence or upon their arrival in Latvia. If at the entrance examinations the foreign student's grade in Mathematics and/or English is below "4" (almost satisfactory), the student will be enrolled in the selected Bachelor's program but for one semester only. In this case, the student will be engaged in intensive Mathematics and/or English studies during the first semester. Furthermore, during this semester, and after coordination with the Department of International Cooperation and Foreign Students (FSD), the student may acquire additional individual subjects from the chosen program. At the end of the semester, the student will be required to retake the entrance exams which he/her had previously failed. If the student's knowledge in the previously failed subject is graded below "4" for a second time, the foreign student is excluded from RTU and has to leave the country.

Foreign students are normally admitted to RTU from 1 to 31 August and from 1 to 31 January. If for reasons beyond the control of the foreign student and RTU, it is impossible to admit the student in the above mentioned periods, the student may be admitted to the chosen

study curriculum by compiling an individual syllabus, which provides the possibility of reducing the study load in the first semester [1].

Official data for the 2017/2018 academic year reveals that Riga Technical University (RTU) enrolled a record number of foreign students (14% more than in the 2016/2017 academic year). Over the period 01.10.2017 – 01.10.2018, the number of foreign students studying at RTU continued to increase further, so that by 01.10.2018, foreign student numbers had grown to 19.29% of the total number of RTU students ([2], [3]).

The number of foreign students at RTU has been growing significantly over the last few years, increasing by more than ten times in eight years. Internationalization is one of the most important strategic goals of RTU, and the increase in the number of foreign students is the result of purposeful activity in attracting these students. Most of foreign students studying at RTU come from India, Uzbekistan, Kazakhstan, France and Germany. RTU has students from 80 countries worldwide, including 19 European Union countries. Student enrolments have also come from countries such as Mauritius, Thailand and Bhutan. It is very rare to see students from these countries applying to study in Latvia. Last year, students from Switzerland and Vietnam were admitted to RTU for the first time. The most significant increase in students in recent years has come from Sri Lanka, Kazakhstan, China, Germany, Russia and Mexico.

The growing interest from Asian students wishing to study at Riga Technical University has led to the expansion of RTU activities in South Asia, including the opening of two RTU information and study centers in Sri Lanka and India in October 2019. The main purpose of these centres is to evaluate the readiness of Asian students wishing to study English based curriculums at RTU, and to improve their academic ability, prior to their arrival in Latvia. Moreover, the existence of these centres ensures a continuous presence of RTU in the region and serves as a platform for assessing students. The centres also help to promote academic recognition as well as helping to form stronger cooperative ties between RTU and the leading universities of India and Sri Lanka, both in academic and scientific areas [4].

In the ratings of the world's leading universities, the position of RTU has risen. This is due to the purposeful strategy of internationalization, together with a variety and quality of study curriculums available in English, which has been highly valued by students from Europe, Asia and Latin America. The number of these students has gradually increased, exceeding 3500 students from 80 countries last year [4].

2 Methodology

Since Mathematical subjects are essential for engineering studies, our Professors from the Department of Engineering Mathematics have been increasing their involvement each year in working with foreign students. The rapid growth in the number of foreign students at RTU has caused the Mathematics Professors to consider how to modify and adjust their normal teaching methods for meeting the needs of foreign students and conducting lessons in English.

Knowing the reasons why foreign students have chosen to study at RTU, knowing their aims, hopes and future plans, can assist RTU in both its internationalization strategy and the Professors in their teaching proficiency. These factors have led to the idea of creating 2

surveys for foreign students. The 1st survey was offered to 1st year students studying the Basic Mathematics course, while the 2nd survey was given to those 2nd year students who were studying the Supplementary Mathematics course. The most interesting questions from both surveys are listed below (see Fig. 1).

1) Why have YOU chosen to **STUDY at RTU**? (multiple answers are allowed)
___ Interested in the CURRICULUM;
___ High-quality EDUCATION;
___ RECOMMENDATIONS from other students;
___ Affordable tuition FEES;
___ Easily accessible INFORMATION;
___ Educational DOCUMENTS issued in YOUR home country are easily compatible with RTU;
___ Convenient RESIDENCE processes;
___ Convenient home arrangement;
___ Extensive scientific work OPPORTUNITIES;
___ Familiarity with local LANGUAGES (Latvian, Russian) _____
___ OTHER _____

2) Did YOU consider other Universities as **ALTERNATIVES**?
___ Yes, (which country and University?) _____
___ NO.

3) Have YOUR **EXPECTATIONS** about studies at RTU been met?
___ YES;
___ NO, because the study process is HARDER than I expected;
___ NO, because the study process is EASIER than I expected;
___ NO, because _____

4) What are YOUR **PLANS** after graduating from RTU with a bachelor's degree? I plan to …
___ CONTINUE my studies in RTU;
___ CONTINUE my studies somewhere in Europe;
___ CONTINUE my studies in my home country;
___ RETURN to my home country and start working there;
___ OTHER _____

5) Did YOU have the study subject „Basic Chapters of **ELEMENTARY MATHEMATICS**" at RTU?
___ YES, I have it now;
___ YES, in the spring, before my 1st semester;
___ NO, because my test results were good;
___ NO, because it wasn't proposed_____

6) Do YOU have any **SUGGESTIONS** about improving the study process at RTU for foreign students?
___ YES, these are _____
___ NO, I don't have.

Fig. 1. Selection of some questions from the surveys.

The surveys' results concerning the main reasons of choosing RTU for foreign students and their future plans are show in Fig. 2 and Fig. 3.

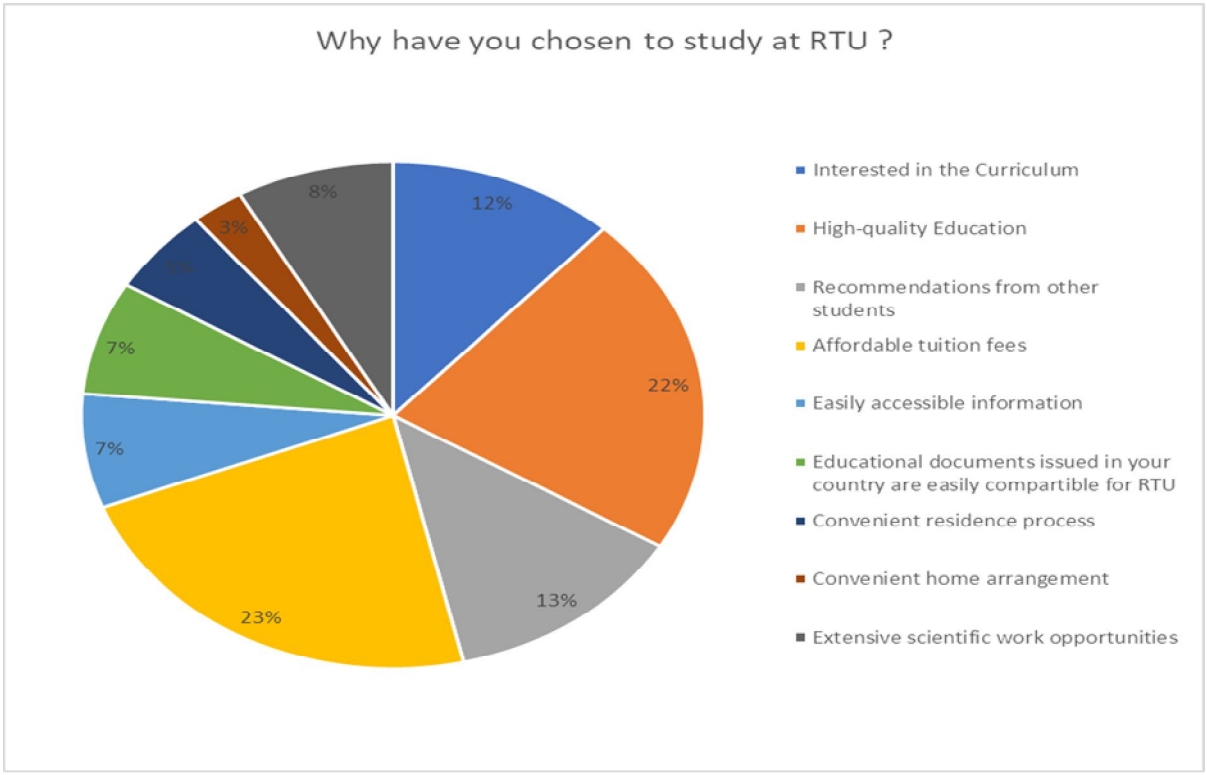

Fig. 2. Main reasons of choosing RTU for foreign students.

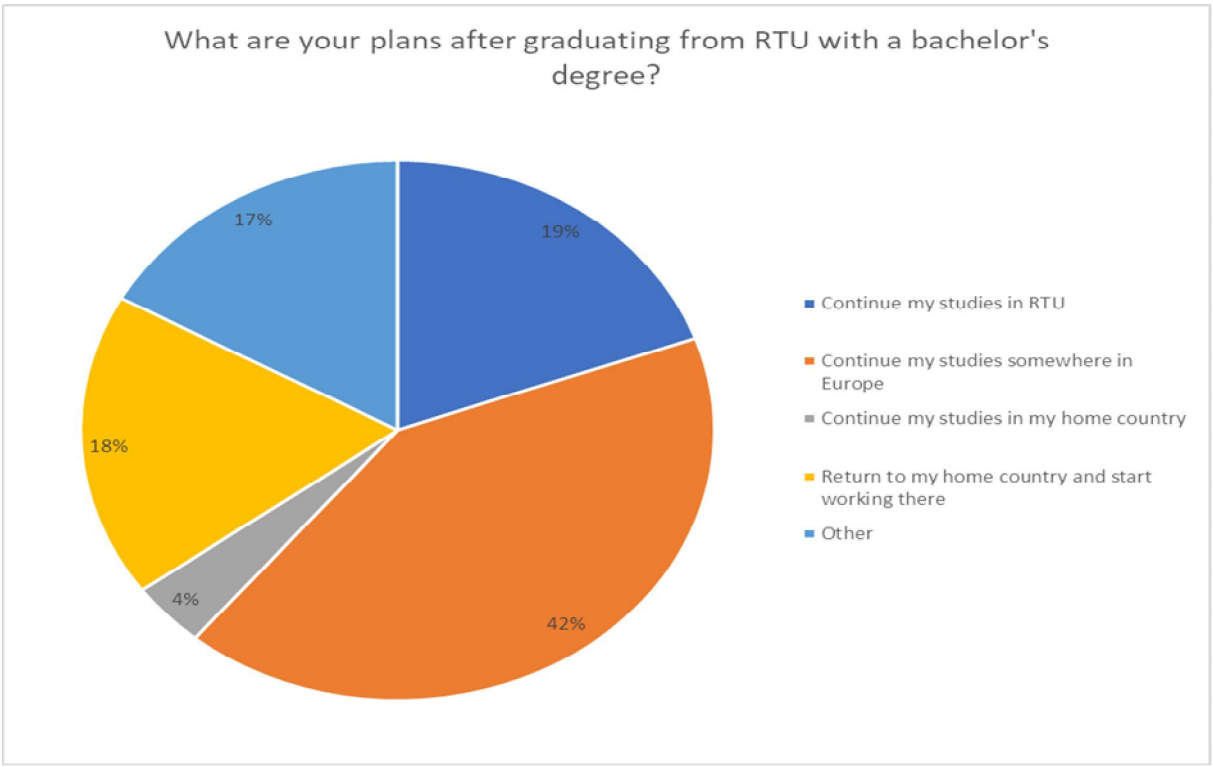

Fig. 3. Future plans of foreign students after graduation at RTU.

The surveyed students were from the Faculty of Mechanical Engineering, Transport and Aeronautics, Faculty of Power and Electrical Engineering, Faculty of Material Science and Applied Chemistry, and the Faculty of Computer Science and Information Technology. In addition to the information in Fig. 2 and Fig. 3, it must be mentioned that about a third of the 1st year students surveyed did not consider other universities as possible alternatives before applying to enter RTU. Of those who did, students named universities in Estonia, Lithuania, Poland, Sweden, Germany, Turkey, the USA, Egypt, Qatar, Sri Lanka, and Hungary as alternative universities, but ultimately made the choice for Riga Technical University. That fact says a lot about the competitiveness of RTU. As well as this, 67 % of the surveyed students replied that their expectations about the studies at RTU have been met, while for 18% the study process is harder then they expected, and for 5% it is easier.

In order to understand the existing background in mathematics of the newly admitted 1st year students, on starting the new academic year, the teaching personnel of the Department of Engineering Mathematics test the 1st year students on their elementary mathematics skills. This test is given during the first mathematics tutorial and consists of 5 simple tasks focusing on operations with parts, expressing a variable from a linear expression, calculating the value of an algebraic function, and properties of exponential and logarithmic functions. Each task is evaluated with 2 points. The student fails the test if his/her score is less than 4 points. It is to be noted that the most serious problem is not that the students cannot acquire knowledge and skills of mathematics, but that they do not want to focus on acquiring them. In order to prevent failure, universities need to make mathematical studies more attractive. Very often, interest in a particular subject comes automatically when there is an understanding of its basic issues. Moreover, experience has shown that it is much easier to study if you have a good basic knowledge of exact subjects.

Recently, RTU has found a way to help students who have a lack of mathematical knowledge, a knowledge which students have not acquired at school. RTU students have a great opportunity to revise the main topics of elementary mathematics by choosing the subject "Basic Chapters of Elementary Mathematics" in the 1st semester. This is a two-credit point course, designed for students who do not have a good background in mathematics. This course is mandatory for those students who failed the elementary mathematics test, but it is also a free-choice course for any 1st year student who may be interested. This course is often taken by students who graduated from school several years prior to lodging their application to study at RTU. The results arising from this experience and subsequent discussions with students has proven that taking the higher mathematics course is significantly easier for graduate students after they have taken the elementary mathematics course.

The foreign students follow the same procedure of testing their elementary mathematics knowledge in the 1st semester. For students admitted to study at RTU in January, their 1st semester of their higher mathematics course does not begin until September, however, in May they have an opportunity to take an intensive course of Elementary Mathematics. In this case, the 1st semester for foreign students becomes easier, as they have already completed the course of elementary mathematics prior to the beginning of the semester. The existence of the elementary mathematics course may be among the reasons why foreign students choose to study at RTU, since it helps them to be more adequately prepared for taking the prescribed mathematical subjects.

Moreover, RTU offers a Foundation Semester in Mathematics as an opportunity and a second chance for students who obtained a grade of not less than 4 out of 10 in the entrance examination, and whose dream is to study engineering or the computer systems, where Mathematics is a prerequisite. This is an intense, 16-week course comprised of 20 contact-hours of Mathematics per week, plus 30 hours of independent study. The course covers all of the topics of the 2-semester course "Higher Mathematics" taught to the 1st year students during the first two semesters.

Since the 2017/2018 academic year, as according to the RTU Rector's order that is a result of an initiative of the Students' Parliament, the final exam mark cannot exceed 50 % of the final grade for any RTU subject. Therefore, all RTU Professors are obliged to grade any study course for a student upon their total work in the semester, and not only upon the student's final exam results. As a result, the head of the Institute of Mathematics has introduced a so-called "Evaluation Formula" for all Mathematical subjects at RTU. The formula, which produces the course's final grade for a student, is based on: 50 % of the marks obtained from the midterm and final exams, taken during the exam period; 40 % of the marks obtained from tests and assignments, taken during the semester; 10 % of the marks obtained from homework solved at home. This approach encourages students to learn deeply and steadily, so that the results rely on a student's knowledge and not completely on their luck during the exam. This evaluation method is appreciated by both diligent students and professors, and is helpful in organizing the less diligent students [5].

Since the majority of Asian students coming to study at RTU are from India, RTU teaching personnel have to understand the needs of Indian students. As a recent example of our teaching staff taking steps to meet this need, in September 2019, RTU professors were invited to attend a lecture on Intercultural Dialogue titled, "How to Understand Students from India?". The lecture covered many topics such as, learning about the Indian education system, its main problems, principles and challenges in the 21st century, the contradictions between traditional lifestyle and modern education, and the differences in the cultural traditions between North India and South India. The main topics of the lecture were, a historical view of the Indian educational system, educational traditions of women and men, and the problems of adaptation faced by Indian students studying outside India. The lecture was presented by emeritus Professor, Dr. habil. Philol. Sigma Ankrava from the University of Latvia, the author of the book "Indian Gods and Goddesses". There were, and there will be in the future, many other seminars about international relations and recommendations for working in the new reality of having classes of foreign students.

Furthermore, the increase in the number of foreign students has caused an increased workload for teaching personnel for two main reasons. The 1st reason is the necessity to create a huge amount of materials, lectures and other helping aids in English. The 2nd reason is that traditionally, Professors have taught only in Latvian (in the State's higher education institutions), and/or in Russian (in private higher education institutions). Study programmes in Russian were legal until 1 January 2019, now they are prohibited by the State. Teaching in English is a new experience for some Professors, and an impossible task for other Professors due to their complete lack of any knowledge of English. However, now there are a number of Professors who want to and/or need to improve their English language skills. In cooperation with Riga Business School (RBS) and with the support of the European foundation ERAF, some intense and some less intense English language courses of different levels for both teaching and administrative personnel have been organized. The primary aim of these courses

being to improve the English language skills of those people who are already involved in teaching in English, or who work with documentation in English, and to introduce English language teaching proficiency for those Professors who are both able to and planning to work with foreign students.

There is also an extra challenge for RTU Professors, and that is the necessity to be able to speak 3 languages, English, Latvian and Russian, particularly during their consultation periods, a time when individual students may come to ask questions and get explanations from their Professors. For most foreign students the working language is English. However, for some foreign students coming from the Post Soviet republics of Central Asia, such as Uzbekistan and Kazakhstan, their preference is to speak Russian. Moreover, due to the fact that about 55% of the citizens in Riga are Russian speakers, there are a significant number of local students who speak Russian as their native language. These students are permitted to ask questions and receive explanations in Russian, but only during consultations. It is strictly prohibited for Professors to even reply to students in Russian during lectures. Thus, the main language at RTU is Latvian, but due to the fast pace of internationalization, the use of the English language is rapidly approaching the point of being on a par with Latvian. Thus, English language proficiency is becoming an important parameter for teaching personnel in RTU.

With all these changes taking place, and taking place so quickly, what must be emphasized is the fact that foreign students appreciate all these efforts of RTU Professors, and this is one of the reasons why they choose to study at RTU.

3 Discussion

Nowadays, adult learning is gradually becoming a way of life. By studying relevant employment statistics and their relation to the level of education in European countries, it becomes increasingly evident that deliberate, life-long learning ensures the personal performance of individuals in both professional and social spheres.

Due to the growing role of mathematics not only in scientific research but also in working with various computer programs, greater attention must be given to the quality of mathematical studies in the higher education curriculum. Therefore, the issue of motivating students for active work, of raising their awareness of the importance of mathematics in everyday life, together with its role in the development of other sciences, and in the development of society and the individual, the importance of mathematics has recently become a very topical subject of research and discussion. However, can mathematics become understandable for a wide range of people? This all depends on the quality of teaching, which involves significant factors, the most important of which is the teacher. Therefore, the aim is to choose teaching methods which promote cognitive development, to develop both learning skills and stimulate the creative use of knowledge. In order to ensure a modern learning process, teachers need to use the newest teaching methods and technical teaching aids in their work. It requires "the continuous updating, broadening and improvement of basic knowledge, its continuous development, its educating always and everywhere" [7]. Besides, the pedagogical process should optimize the relationship between the student’s knowledge and the student's own development so that from the three possible roles of consumer, observer and participant, the student would choose the last one [6].

4 Conclusions

1. Contemporary studies are increasingly characterized by changing attitudes of both the lecturer and the student towards both subject content and the study process. This demands increasing flexibility on the part of the lecturer, and the ability to combine a variety of effective teaching methods, as well as the need to take a personal interest in the mathematical skills of each local or foreign student.

2. The material developed by the authors and tested in practice has been helping students to understand certain mathematical issues and to be better prepared for mathematical tests. It has supported students independent work in mathematics, and as a result, stimulated them to engage in the active learning of mathematics.

3. The growing interest of foreign students in studies at Riga Technical University confirms the quality and international competitiveness of our curriculum. Moreover, students greatly appreciate all the challenges faced by RTU Professors, who have needed to expand their proficiency in order to meet the needs of international students, including the need to conduct their lessons in English.

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