Analysis of International Students' Math Course Achievement in Higher Education: The Case of Sakarya University of Applied Sciences

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ABSTRACT
This study investigated the academic success of international students who took the course MAT 111 coded Mathematics 1 offered in the Fundamental Sciences of Engineering Departments of Sakarya University of Applied Sciences (SUBU) Faculty of Technology (TF), a state university in Turkey established in 2018, in the fall semester of 2021/22. The end-of-semester grades of all students from SUBU Student Affairs Office and data from SUBU International Student Center were used as data. In the final section, the success status of national and international students is discussed, and suggestions are made for possible failures of international students due to adjustment and mathematical literacy.
Keywords: International students in higher education, academicals success, engineering mathematics, mathematics education.

INTRODUCTION

Nowadays, technological developments affect the educational sector as much as any other. The Covid-19 pandemic, which has affected the whole world, has caused all levels of education to adapt to online education platforms in a short period of time, not only in Turkey but all over the world, as face-to-face teaching has been eliminated. Although online education is not as efficient as face-to-face education in terms of motivation and quality, the adaptation process has been beneficial, at least in terms of the use of technology, as continuous training is necessary.

Students can continue their education both abroad and at home, with the bachelor's, master's and doctoral programs offered by universities, as well as international exchange programs (Erasmus+ and Mevlana Exchange Programs). For this reason, universities create an educational market in the globalized world, especially with their academic achievements, the needs of their location region and the diversity of programs compatible with the industry. International students are an important part of this educational market.

In this sense, Turkey has become an education and training center for international students in recent years. Therefore, the search for a common market in the economic sector has begun to extend to the educational sector, and the movement of international students is an important pillar of this market. The growing number of international students studying at almost all Turkish universities can therefore contribute to the socio-cultural and economic life of the city in which they live.

In particular, international students who have studied at universities like SUBU that implement the +1 internship model (https://kesfet.subu.edu.tr/tr/node/846) can connect and collaborate with the company where they are doing their internship when they return to their country. By learning about our country and culture, they have the potential to volunteer and form a network with students from different countries with different geography and different identities based on the friendship they made during their education.

International student mobility started in 1981 with the Examination for Foreign Students (YOS), which was organized for those who want to pursue higher education in Turkey with their own resources (Kıroğlu, Kesten & Elma, 2010). In addition, this program consists of students from Turkish republics, Turkish and related communities, Turkish Higher Education Council (YÖK) scholars, students supported by the Islamic Development Bank, and students coming through exchange programs (mutually agreed students) (Şahin & Demirtaş, 2014). In addition, YÖK has started to introduce MYOS, the central examination for foreign students, instead of YOS from 2023, and is planning to introduce additional conditions for the admission of international students in some departments.

Universities must be able to easily handle the increasing number of international students. It is important that these students do not compromise the quality of education and behave fairly in adjusting and participating in courses. It should not be forgotten that it is necessary to cope, manage and control the work without affecting the performance

and satisfaction of the university staff (Yıldıran, Özkan & Büyükyılmaz, 2016). Therefore, it has been proposed to create a platform for lecturers where instant and quick communication is possible in digital environments, where problems are communicated and solutions are worked out, and where functional seminars based on online or face-to-face experience are conducted by competent people (Erol, 2021).

In this study, the success rates of international students who took the course MAT 111 coded mathematics 1 of SUBU TF Computer, Mechatronics, Mechanical Engineering, Electrical Engineering-Electronics, Civil Engineering, Metallurgy, and Materials Engineering in the fall semester 2021/22 were investigated and also analyzed based on their countries and compared with national students. Conclusions and recommendations are then given in the last section.

To this end, the research problem was set as follows: "Does the MAT 111 coded mathematics 1 course success rate of international students at Sakarya University of Applied Sciences show a statistically significant difference compared to the general levels of classes?" An attempt was made to find answers to this problem by creating the following sub-problems:

1. Success rates of international students MAT 111 coded mathematics 1 course,
2. Success rates by gender,
3. Success rates of international students by country,
4. Comparison of success rates of national and international students.

METODOLOGY

Purpose and Contribution of the Study

Viewing mathematics as a subject that all students struggle with can make it difficult for international students to succeed because they are being taught in a culture and language different from their native language. Therefore, the aim of the study in this article is to compare and analyze the mathematical competencies of international students in different subject areas of TF on a country-by-country basis and in general. It is expected that a study to be conducted for this purpose will provide the necessary evidence to determine whether mathematics education should be provided in addition to Turkish education for international students who choose Turkey and SUBU in particular, in order to improve the current situation and to obtain education in the future.

Population and Sample

The population of the study consists of international students studying at the TF engineering departments of SUBU. According to the SUBU Student Affairs Department, there are 205 international active students who took the course MAT 111 in the fall semester of the academic year 2021/22. In this article, this study was used as an examination of the success and failure rates of these students at the end of the semester.

Data Collection and Analysis Method

The content of the MAT 111 coded course to collect data is:

- Basic concepts of mathematical analysis,
- Concepts of sets and numbers,
- Functions and special functions,
- Limit concept, right and left limits,
- Continuous functions and properties,,
- The concept of the derivative
- Higher order derivatives,
- Geometric and physical meaning of derivatives, derivative theorems,
- Indefinite forms,
- Curve drawings corresponding to the distribution of the main title and
- Comprehensive knowledge of mathematics, science, and related engineering disciplines; ability to apply theoretical and applied knowledge in these areas in solving complex engineering problems,
- Ability to identify, formulate, and solve complex engineering problems; ability to select and apply appropriate analytical and modeling methods for this purpose.

In accordance with the learning objectives, the general achievement lists and general program outputs obtained through the SUBU student affairs system and the SABIS information system (https://sabis.subu.edu.tr/) were evaluated. These general lists were analyzed based on international students and a frequency analysis was applied.

FINDINGS

This section presents findings and opinions about the success of international students in engineering departments at SUBU TF.

Mathematics 1 course success levels of international students

The success rates of international students who took the Mathematics 1 course coded MAT 111 in the fall semester of the 2021/22 academic year are shown in Figure 1.

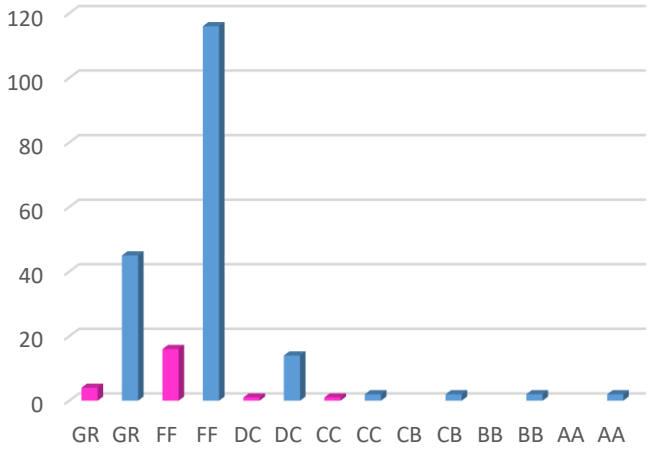


Figure 1. Semester success grades of international students in MAT 111

In Figure 1, blue colors represent male students and pink colors represent female students. End-of-semester success rate of 205 international students who participated in the course;

- 49 students who did not take the course, with GR,
- 132 students who failed the course with FF,
- 15 students with a grade of DC,
- 3 students with a grade of CC,
- 2 students with the grade CB,
- 2 students with the grade BB,
- 2 students with the grade AA

occurred in the form.

Achievement levels by gender

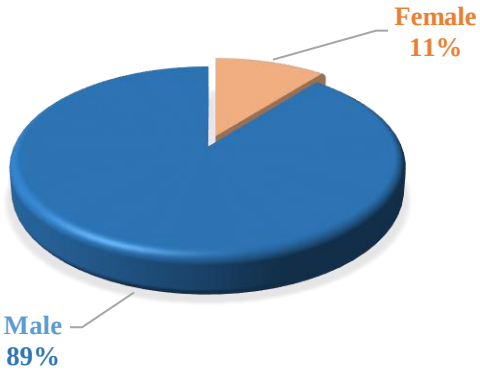
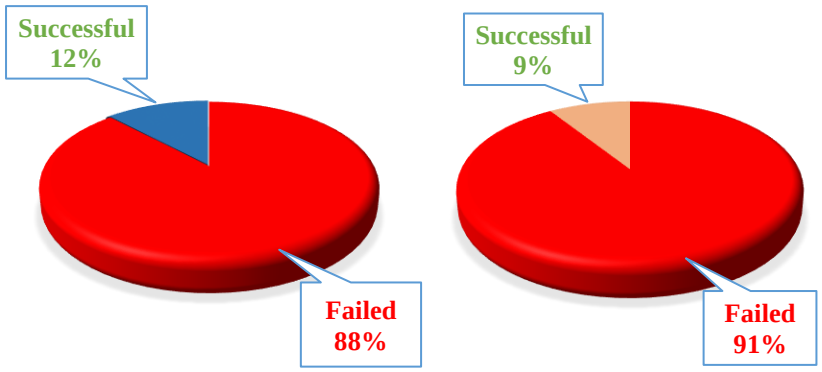


Figure 2. Distribution of total international students by gender

Of the 205 international students who took the MAT 111 course at SUBU TF in the fall semester of the 2021/22 academic year, 22 (11%) were female and 185 (89%) were male (Figure 2).



(a) (b)

Figure 3.a) Success rate of male students, b) Success rate of female students

Overall, as shown in Figure 3(a) and (b), 161 of 185 male students, (88%) were unsuccessful and 24 (12%) were successful; 20 of 22 female students, (91%) were unsuccessful, 2 (12%) were successful.

Achievement levels by country

The density of the 205 international students from 32 different countries, Faculty of Technology of the SUBU, who took the course MAT 111 is distributed as shown in Figure 4.

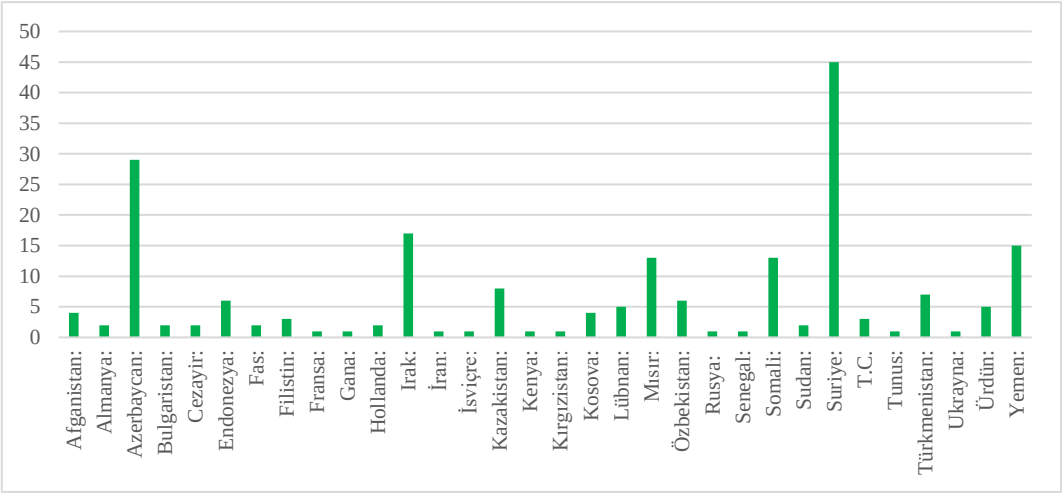


Figure 4. Density of 205 international students taking MAT 111 course by country

As shown in Figure 5, 181 of these 205 international students, or 88%, failed the course MAT 111.

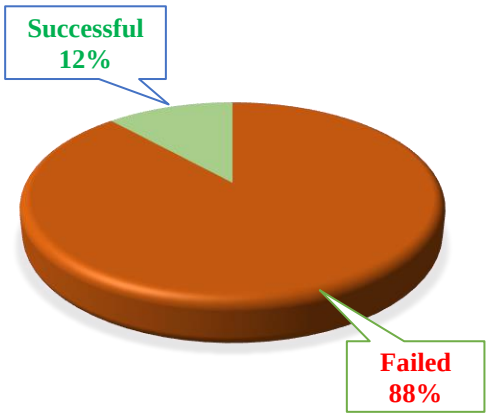


Figure 5. General success status of international students at the end of the semester

If we analyze the success situation using the countries of Azerbaijan, Syria, Iraq, Yemen, Egypt and Somalia, where there are many international students:

- 26 out of 29 Azerbaijani students are unsuccessful, 3 are successful,
- 37 out of 45 Syrian students are unsuccessful, 8 are successful,
- 17 out of 17 Iraqi students are unsuccessful,
- 13 out of 15 Yemeni students are unsuccessful, 2 are successful,
- 10 out of 13 Egyptian students are unsuccessful, 3 are successful,
- 13 out of 13 Somali students are unsuccessful, 0 are successful.

Thus;

- The success rate of students from Azerbaijan is 10%,
- The success rate of Syrian students is 18%,
- The success rate of students from Iraq and Somalia is 0%,
- The success rate of Yemeni students is 13%,
- The success rate of Egyptian students is 23%.

Comparison of national and international students' achievement status

As can be seen in Figure 6, a total of 950 students, 205 international and 745 national, are enrolled in the MAT 111 course at SUBU TF in the fall semester of 2021/22.

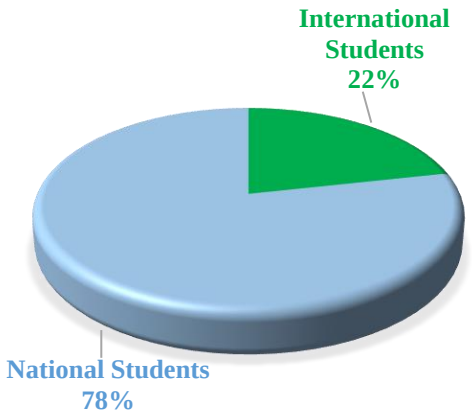


Figure 6. Rates of National and International students

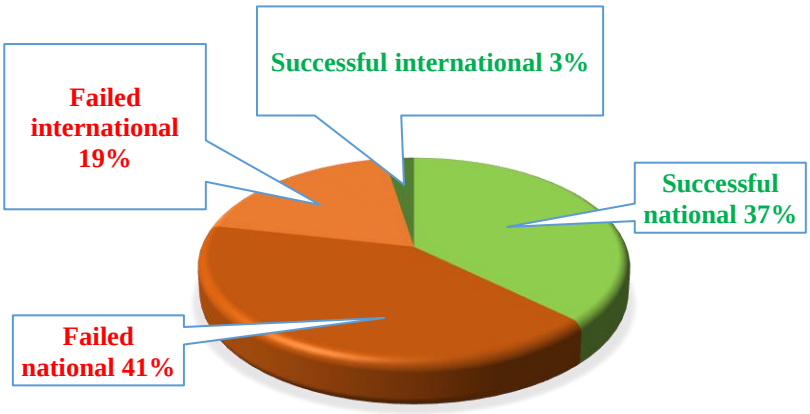
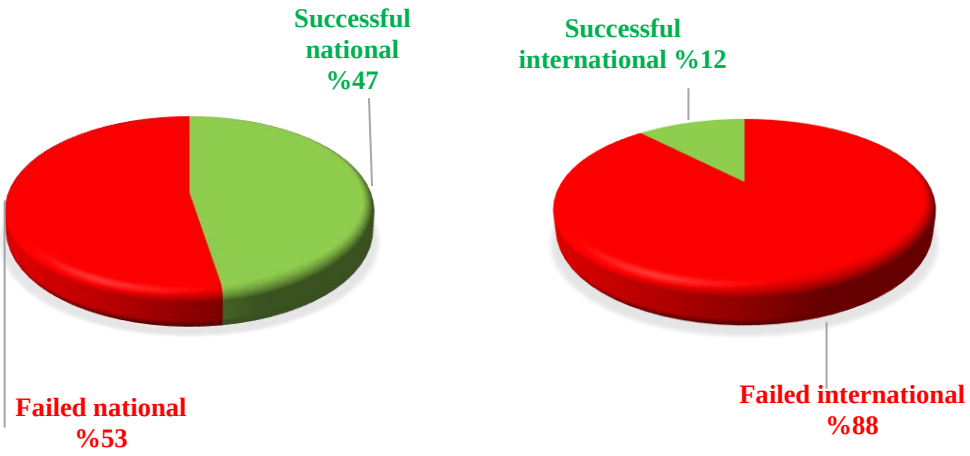


Figure 7. Comparison of national and international students' success rates

Figure 7 shows the success rates of the Mathematics 1 course, coded MAT 111, in which 383 of 745 national students and 24 of 205 international students were successful. This shows that the success rate for national students is 47% (see Figure 8), while for international students it is very low at 12%. Although the success rate of national students is 47% (see Figure 8), it is very low for international students at 12%. Although the success rate for national students is 47% (see Figure 8), it is very low for international students at 12%, for international students at 12%.



(a) (b)

Figure 8. (a) Success rates of national students, (b) Success rates of international students

CONCLUSION AND SUGGESTIONS

It is obvious that international students will contribute not only in education but also in the economy of our country, in accordance with the policies implemented by YÖK. Therefore, the quality of education should be kept high by increasing both the quality and quantity of international students.

With this study, which was conducted to determine the success status of international students studying the MAT 111 coded Mathematics 1 course at Sakarya University of Applied Sciences Faculty of Technology, the students' basic mathematical background, success level, and skills in the course were investigated.

With these considerations, our study was conducted with the success of 205 international students from 32 different countries who took the course MAT 111 coded Mathematics 1 in the fall semester of the academic year 2021/22 at the Faculty of Technology of SUBU TF.
As shown in achievement levels by country section, it is very thought provoking that the success rate of students from Iraq and Somalia is 0%. The fact that the maximum success is 23% suggests that some action should be taken to increase these success rates.
As it can be seen from our study, in case of 88% failure in Mathematics 1 course in the fall semester of 2021/22, it is necessary to prepare the education with basic academic courses in Turkish language.
The universities, which are especially concerned about the number of international students, have to work very sensitively. For this purpose, this study is extended by applying it to about 2800 international students of all faculties and departments of SUBU. In this way, an overall impression for all international students will be obtained and the student placement policy will be reviewed more clearly.

ACKNOWLEDGMENT

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