Bozok Journal of Science

Volume 2, No 1, Page 15-23 (2024)

Research Article

An Analysis on the Status of Physics in Higher Education in Turkish Universities between 2018 and 2023

Metin YALVAÇ*

Yozgat Bozok University, Faculty of Arts and Science, Department of Physics, 66100, Yozgat, Türkiye

Abstract

The field of physics has long been facing the issue of not being preferred by undergraduate students, as seen in all fundamental sciences such as chemistry, biology, and mathematics. This study examines the current situation of physics departments in universities offering formal education in our country, specifically focusing on the period between 2018 and 2023. Statistical information regarding the admission of undergraduate students, occupancy rates, changes in quotas, and the reopening or closure of physics departments in private and state universities providing formal education in our country during this period has been analyzed. This analysis has been conducted to evaluate the current reflection of the general trend that began in the second decade of the 2000s, which almost halted undergraduate student admissions in basic sciences in many universities in our country.

Keywords: Physics departments, Undergraduate physics education, Occupancy rates, Quotas, ÖSYM

1. INTRODUCTION

Science and technology have been developing increasingly rapidly since the last century. These advancements compete with each other in medicine, engineering, social sciences, and natural sciences. Although there have been groundbreaking developments in all fields, the progress in physics, chemistry, biology, and mathematics serves as the foundation for all these advancements. These sciences, which we refer to as the basic sciences, emerge as the primary elements in the journey of science and technology to the present day. However, naturally, one of the most essential criteria undergraduate students consider when choosing the departments for their bachelor's education is the job opportunities they will have upon graduation. Erdemir N. states in his study [1] that job opportunity is the second most popular reason for choosing physics in higher education. This study was conducted on 500 Physics Education students in the Faculty of Education from 11 universities in Türkiye in 2007. %24.4 of the students stated that they chose physics because this was their goal in high school. Then, %22.6 of them stated they could easily find a job after graduation.

In 2007, physics graduates could find jobs as physics teachers, but after 2007, physics graduates could not find jobs as easily as before. This problem is stated in Şeremet, M.'s study [2], saying that only %9.7 of the basic science graduates could find a job in Ministry of National Education (MEB) in 2014. Despite the limited choices in job opportunities, the prejudice that studying in physics departments is quite challenging, combined with other factors, causes physics departments to lose their appeal to prospective university students. For reasons like these, throughout approximately 10-15 years, a significant portion of physics departments in our country have either restricted their quotas or have been forced to close due to the inability to admit students. Günay, D. et al. [3] called this situation the "Country's Shake," and they emphasized that Türkiye has found a solution for the less interest of university student candidates in the basic sciences. Their study analyzed the occupancy rates, quotas, number of enrolled students, and number of open/closed departments for basic sciences between 2007 and 2013. For the point of interest, an analysis of the situation for the Physics departments in this study is shown in figures 1–4.

https://orcid.org/0000-0003-4915-9162

*Correspondence: metin.yalvac@yobu.edu.tr **Received:** 16.04.2024 **Accepted:** 15.05.2024

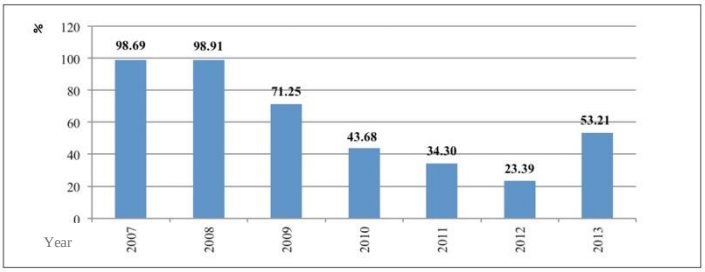

Figure 1. Distribution of occupancy rates of Physics Departments between years 2007-2013, figure taken from [3]

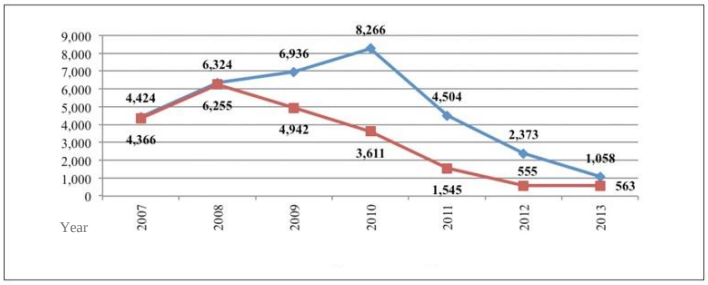

Figure 2. Distribution of total quotas (blue) and the number of enrolled students (red) of Physics Departments between years 2007-2013, figure taken from [3]

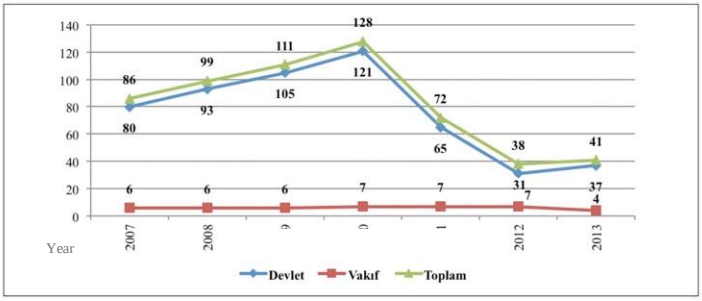

Figure 3. Distribution of number of Physics Departments that admit student between years 2007-2013, Government (blue), private (red), total (green), figure taken from [3]

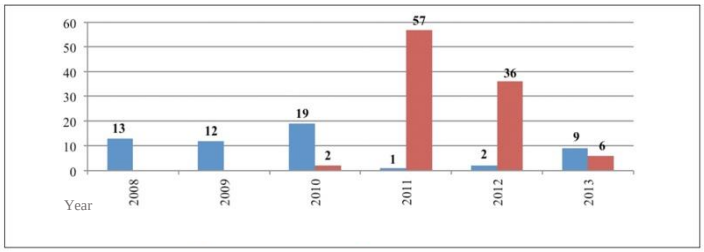

Figure 4. Distribution of opened and closed Physics Departments between years 2007-2013 departments start admitting students (blue) and departments stop admitting students (red), figure taken from [3]

From these four figures, the impact on the physics departments and other basic sciences can easily be seen. Especially in Figure 4, the number of departments closed due to the lack of students is very important. According to the reference studies mentioned above, the physics portion in higher education has been getting smaller and smaller since 2009. During this period, Student Selection and Placement Center (ÖSYM) used different examination types; from 2007 to 2010 (Actually from 1999 to 2010, but since the subject topic in the references starts with 2007), the exam was called ÖSS, from 2010 to 2019 exam was called YGS&LYS and finally from 2020 exam is called YKS. With all these changes in the exams and the economic, sociological, and cultural changes, the situation changes for the physics departments. This study aims to understand those changes and analyze the tendency of the prospective undergraduate students who want to become a physicist. To do that, this study analyzes explicitly the numerical data of students

choosing physics departments due to the trends mentioned above, based on the results of the Higher Education Institutions Examination (YKS) applied in our country between 2018 and 2023. These analyses have been conducted using numerical data provided by the ÖSYM, and the "Council of Higher Education (YÖK) Occupational Atlas". The analyses were based on the total quotas available for physics departments in state and private universities across Türkiye and the number of candidates placed in these quotas based on YKS results between 2018 and 2023. Additionally, variables directly affecting the relevant analysis, such as changes in the number of physics departments admitting students at the undergraduate level, occupancy rates of physics departments admitting students, or changes in total quotas, have also been included.

2. STATUS OF THE PHYSICS PROGRAMS

Data analyzed in this study is taken from ÖSYM [5–16]. There are two different sets of data available from the corresponding ÖSYM tables. The first one is the ÖSYM guide that gives information about the universities, programs, and their quotas, as well as the student enrolled in that program with the lowest and highest score from the YKS exams in the previous year [5–10]. This guide is announced after YKS exams, and using this guide, students can decide on the university and program for their academic journeys. The second set of data is taken from another guide that gives detailed information about the programs of each university after the student's enrollment [11–16].

This study is based on the total numbers of the quotas of the Physics Departments given in the corresponding manuals and the total number of enrolled students given in the corresponding manuals between 2018 and 2023. The number of total physics departments is also studied to observe the change in the popularity of Physics Departments among the candidates for higher education.

Table 1. Total number of quotas for Physics Departments between 2018-2023

Year	General Quota	Valedictorian Quota	Martyr/Veteran's Relative Quota	Women over 34 Quota	Earthquake Victim Quota	Total Quota
2018	1234	51				1285
2019	1229	49				1278
2020	1351	54				1405
2021	1481	55				1536
2022	1485	55				1540
2023	1630	58	1	58	39	1786

Table 1 summarizes the number of students who can choose Physics Departments for their higher education between 2018 and 2023. From this table, it can be seen that there are different categories of quotas. The first one is the general category, which has no special conditions. The second category is given to the high school valedictorians. This category awards the top students for their hard work in high school. The next three category is announced in 2023. A massive earthquake in Türkiye on the 6th of February 2023, affected 11 cities. This category is announced to compensate for the disadvantages of the students from the cities severely damaged due to the earthquake. Figure 5 shows the total quota graphically, admitting that the number of students that can choose physics departments is increasing.

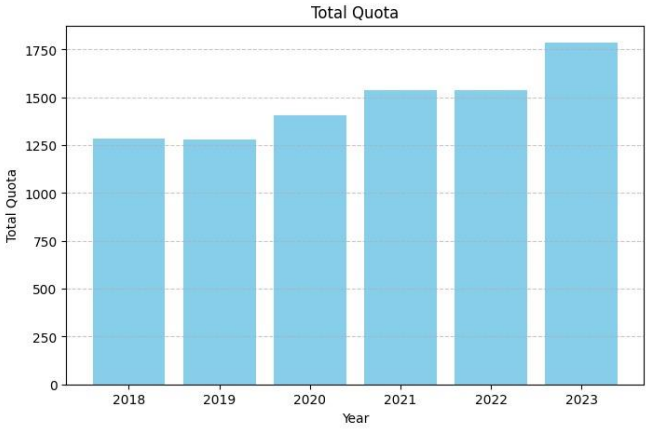

Figure 5. Distribution of total quotas of Physics Departments listed in the ÖSYM guide by year

Table 2. Total number of enrolled students for Physics Departments between 2018-2023

Year	General	Valedictorian	Martyr/Veteran's Relative	Women over 34	Earthquake Victim	Total	Occupancy Rate
2018	1026	6				1032	80.31
2019	1219	5				1224	95.77
2020	1397	7				1404	99.92
2021	1011	6				1017	66.21
2022	1528	12				1528	99.22
2023	1673	15	0	12	39	1739	97.37

Table 2 indicates the number of enrolled students in the physics departments between 2018 and 2023. According to this table, there is an excellent opportunity to understand the tendency of higher education student candidates to be physicists. These analyses can be followed by investigating the Figures 6,7 and 8.

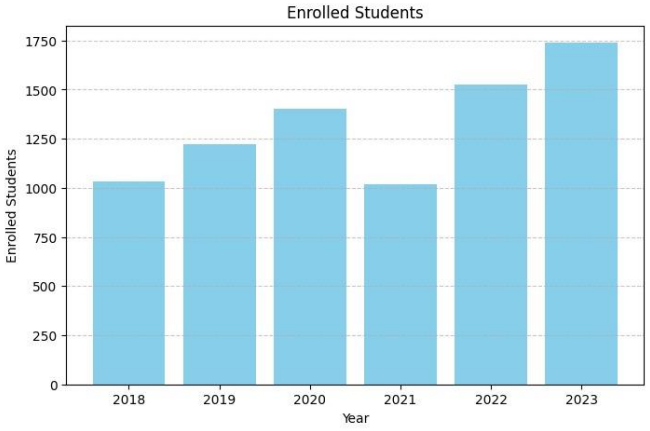

Figure 6. Distribution of the number of students placed in Physics Departments by year

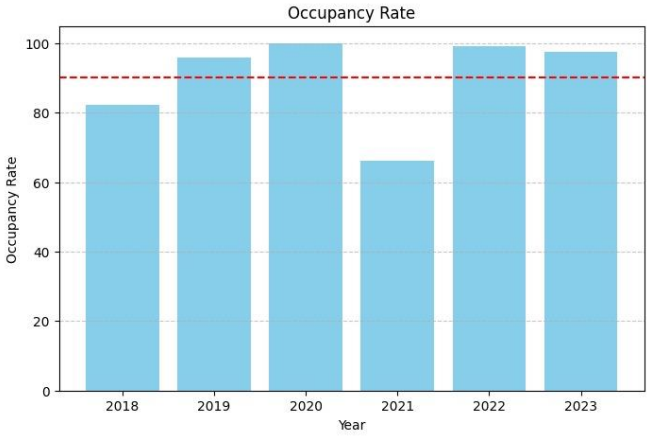

Figure 7. Distribution of occupancy rates of Physics Departments by year. The red line indicates the 90% occupancy rate

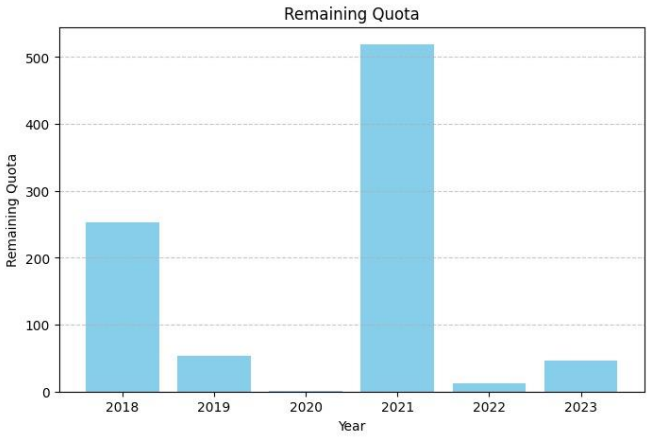

Figure 8. Distribution of the number of remaining vacancies in Physics Departments admitting students by year

Figures 6,7 and 8 summarize Table 2 graphically. Figure 6 shows the number of students selected for the Physics programs in Turkish universities. Except for 2021, the number of students who want to study physics in higher education is increasing. The covid-19 epidemic affected every aspect of our lives, including the students' university plans.

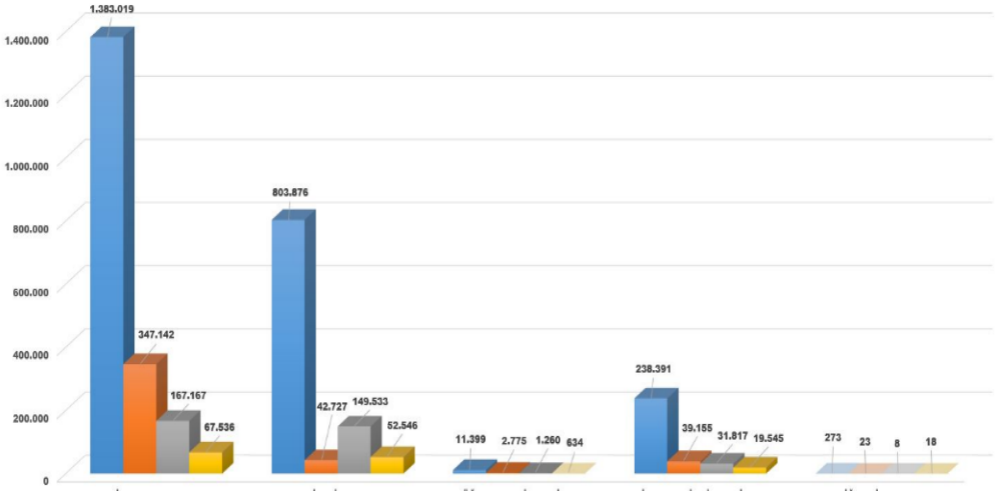

Figure 9. Distribution of the number of students that applied (blue) and enrolled (orange) via 2020 YKS exam is shown in the first bar graph. The next bar graphs show the same distribution for different high school categories

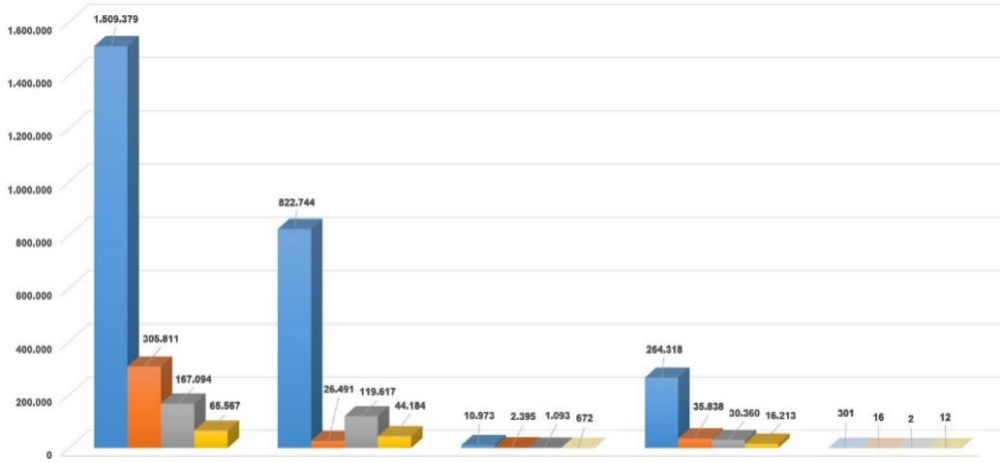

Figure 10. Distribution of the number of students that apllied (blue) and enrolled (orange) via 2021 YKS exam is shown in the first bar graph. The next bar graphs show the same distribution for different high school categories

Anomaly in 2021 is not specific to Physics Departments but is observed in almost all departments due to the sociological and psychological effects of the pandemic on YKS students. This effect can also be observed by examining the distributions in Figures 9 and 10, which show the Transition to Higher Education Statistics taken from the Higher Education Information System [17]. The distributions for 2020 and 2021 are provided in Figures 9 and 10. Looking at these distributions, despite an increase in the number of students taking the YKS exam in 2021, the number of students placed has decreased. This situation supports the occupancy rates above 90% due to the increase in quotas for Physics Departments since 2018 and the increasing interest in these quotas. Figure 7 shows the occupancy rates of the physics programs in which the rates are above 90%, except in 2021. Figure 8 shows the empty quotas for physics programs. Comparing Table 1 and Table 2, there are vacancies in the physics programs, and most of these vacancies come from the valedictorian quota category. Because valedictorian students are the top-rated students in high schools, and they are given an opportunity because of their hard work in high school, as mentioned earlier. However, physics programs are not popular among the valedictorians, so they want to use their advantages in more popular programs like medicine or engineering. Only physics programs at top universities can attract valedictorians.

The statistics above show that students have shown an increasing intention in physics programs in the last six years. Another point of view would be the number of physics programs in Turkish universities admitting students from 2018-2023. These criteria help us understand the general opinion about the popularity of physics programs. That is to say, if students' intention is increased, then the number of physics programs is expected to be increased.

Table 3. Total number of Physics Programs admitting students between 2018-2023

Year	State	State (KKTC Nationals)	Private	KKTC	Total
2018	42	2	7		51
2019	41	2	8		51
2020	39	1	10	1	51
2021	46	1	10	2	59
2022	46		10	2	58
2023	51	3	9	2	65

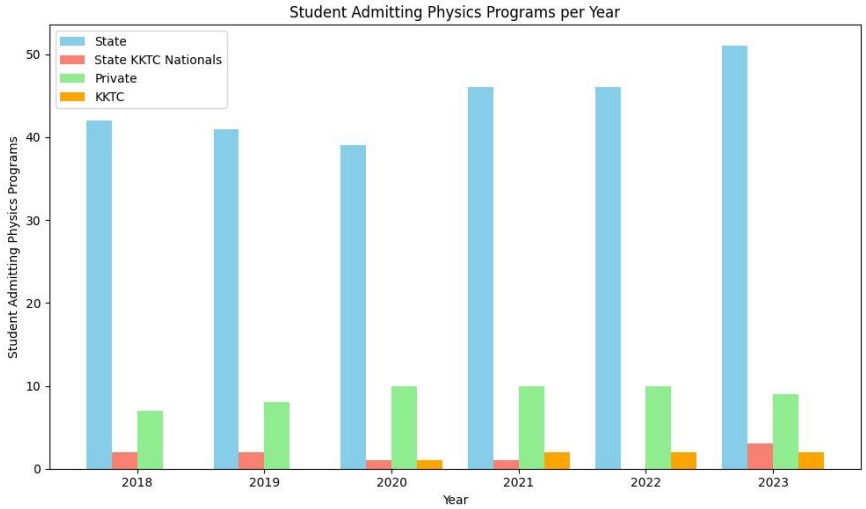

Figure 11. Distribution of the number of student-admitting Physics Programs between 2018-2023

Table 3 and Figure 11 show the open physics programs that accept students according to YKS exam results. Table 3 and Figure 11 show four types of physics programs according to universities. The first is state universities, and the second is state universities. However, only for KKTC nationals, the third one is private universities, and the last one is the universities in KKTC. Most of the open physics programs that admit students are in state universities. From the statistics, it can be inferred that the number of open physics programs increased from 2018-2023. This result is also consistent with the number of students wanting to study physics in higher education. Since the demand for the number of students that study physics increases, the quota and, therefore, the number of physics departments should increase. The results shown in Figure 6 support the expectations, especially after 2021, when there is a visible jump in open physics programs.

3. CONCLUSION

This study aimed to see the changes in the popularity of physics programs among higher education candidate students. From the beginning of the 2010s, high school students lost interest in physics programs for their undergraduate educations. For example in 2009, 2032 places were empty in total 6977 quotas [18]. Which makes up almost 30% of the total quota for the physics programs that high school students did not prefer. This situation brings an end to physics programs in some of the universities. They have to close their physics departments or stop admitting undergraduate students. Only 17 physics programs admitted students in 2015, including state and private universities [19]. Şeremet, M. indicates in his study [2] that most of the problem comes from the employment issue after graduation. He compared the situation of the basic sciences in Türkiye with the same fields in India and the UK. This study shows the similarities between the Turkish and other example countries. According to Şeremet, M., the main problem for all these three countries is the lack of job opportunities after graduation and the curriculum or methods of the physics programs. In particular, YÖK also saw this problem and held a meeting called “Meeting for Basic Sciences” in May 2022 and published a report with the same name [4]. The meeting aimed to improve the encouragement of basic sciences for students with high placement scores in YKS, to make suggestions for the current state of research and technology infrastructure, to find solutions for enhancing the quality of education, and to discuss the employment of graduates. The main topic of the meeting is to discuss the problems and solutions regarding basic science programs. Officials and advisors from YÖK, some universities’ presidents, and academics from the fields of the basic sciences were attended to this meeting. Discussions were made upon job opportunities after graduation, guidance for high-ranked YKS students in basic sciences, student quality, scholarships, research assistantships, academic positions, and physical facilities of the programs. Not only is the undergraduate student problem discussed in this meeting, but graduate education problems are also pointed out. If the number of undergraduate students keeps going low, then the number of graduate students gradually decreases. In this report, possible solutions were suggested, such as training high school teachers to guide high school students to basic sciences in higher education. Alternatively, adding a condition for university exam rankings, like if a student’s ranking is higher than 30-50 thousand, they cannot enroll in basic sciences. Furthermore, therefore, limit the number of students admitting departments only to relatively bigger universities. Another suggestion is to increase funding for scholarships or student projects and create more academic positions. More suggestions are available in the report, but this study might conflict with some of them. For example, there is already a condition for some programs in the faculty of engineering that do not allow students to enroll if they have a ranking larger than 300 thousand. Therefore, middle or low-ranked students who cannot enroll in such programs naturally try to enroll in basic sciences. Especially almost all programs of relatively smaller universities aimed for these rankings in the YKS exams. That is to say,

middle or low-ranked students usually enter relatively smaller university programs. Therefore, it is not a bad idea to say that the situation regarding basic sciences changed after 2018. This analysis shows us that this changed the situation from 2018-2023. Analysis in this study, especially Figures 5,6, and 7, explains that the number of students in physics programs in Turkish universities is an increasing trend, as well as the number of open physics programs, which can be seen in Figure 11. These results are significant for fundamental physics education in Turkish universities at the undergraduate level. According to YÖK Higher Education Information System, there are 87 physics programs that are in active status [20]. If this trend continues, physics departments of the active but not accepting universities would accept students for their physics programs. This is crucial because, without students, academic staff cannot have the proper number of lectures, projects, experiments, and other academic studies. This badly affects the academic performance of the physics departments. Another vital aspect of undergraduate students is that they affect the number of graduate-level students. Since the number of undergraduate students increase, then it is expected that the number of graduate levels will also be increased. These changes will positively affect the physics departments' educational and academic work. In conclusion, this paper shows that prejudice against the physics departments has broken down in the last 6 years, and physics programs now accept more students. This result is significant for the quality of the physics programs in Turkish universities for both academic studies and the quality of undergraduate and graduate-level physics education.

REFERENCES

[1] N. Erdemir, "Fizik Öğretmeni Adaylarının Bölümü Tercih Nedenleri ve Mekanik Konularında Akademik Başarı Düzeylerine Etkisi," Erzincan University Journal of Education Faculty (EUJEF), vol. 12, no. 1, pp.1–14, Jun. 2010.

[2] M. Şeremet, "Temel Bilimlerin Öğrenci Çekmede Yaşadığı Zorluklar: Farklı Bir Perspektif Önerisi," J. Higher Edu. Sci., vol. 2, no. 2, pp. 214–218, Aug. 2015.

[3] D. Günay, A. Günay, and E. Atatekin, "Türkiye'de Temel Bilimlerde Sarsılış: Ülkenin Sarsılışı," J. Higher Edu. Sci., vol. 3, no. 2, pp. 85–96, Aug. 2013, doi: 10.5961/jhes.2013.063.

[4] YÖK, "YÖK Temel Bilimler Toplantısı Raporu," https://www.yok.gov.tr/Documents/Yayinlar/Yayinlarimiz/2022/temel-bilimler-toplantisi-raporu.pdf. [Access Date: 04-05-2024].

[5] ÖSYM, "ÖSYS: Öğrenci Seçme ve Yerleştirme Sistemi," https://www.osym.gov.tr/TR,15240/2018-yuksekogretim-programlari-ve-kontenjanlari-kilavuzu.html. [Access Date: 11-03-2024].

[6] ÖSYM, "ÖSYS: Öğrenci Seçme ve Yerleştirme Sistemi," https://www.osym.gov.tr/TR,16858/2019-yuksekogretim-programlari-ve-kontenjanlari-kilavuzu.html. [Access Date: 11-03-2024].

[7] ÖSYM, "ÖSYS: Öğrenci Seçme ve Yerleştirme Sistemi," https://www.osym.gov.tr/TR,19431/2020-yuksekogretim-kurumlari-sinavi-yks-yuksekogretim-programlari-ve-kontenjanlari-kilavuzu.html. [Access Date: 11-03-2024].

[8] ÖSYM, "ÖSYS: Öğrenci Seçme ve Yerleştirme Sistemi," https://www.osym.gov.tr/TR,21247/2021-yuksekogretim-kurumlari-sinavi-yks-yuksekogretim-programlari-ve-kontenjanlari-kilavuzu.html. [Access Date: 11-03-2024].

[9] ÖSYM, "ÖSYS: Öğrenci Seçme ve Yerleştirme Sistemi," https://www.osym.gov.tr/TR,23885/2022-yuksekogretim-kurumlari-sinavi-yks-yuksekogretim-programlari-ve-kontenjanlari-kilavuzu.html. [Access Date: 11-03-2024].

[10] ÖSYM, "ÖSYS: Öğrenci Seçme ve Yerleştirme Sistemi," https://www.osym.gov.tr/TR,25658/2023-yuksekogretim-kurumlari-sinavi-yks-yuksekogretim-programlari-ve-kontenjanlari-kilavuzu.html. [Access Date: 11-03-2024].

[11] ÖSYM, "ÖSYS: Öğrenci Seçme ve Yerleştirme Sistemi," https://www.osym.gov.tr/TR,15288/2018-yks-yerlestirme-sonuclarina-iliskin-sayisal-bilgiler.html. [Access Date: 04-04-2024].

[12] ÖSYM, "ÖSYS: Öğrenci Seçme ve Yerleştirme Sistemi," https://www.osym.gov.tr/TR,16889/2019-yks-yerlestirme-sonuclarina-iliskin-sayisal-bilgiler.html. [Access Date: 04-04-2024].

[13] ÖSYM, "ÖSYS: Öğrenci Seçme ve Yerleştirme Sistemi," https://www.osym.gov.tr/TR,19460/2020-yks-yerlestirme-sonuclarina-iliskin-sayisal-bilgiler.html. [Access Date: 04-04-2024].

[14] ÖSYM, "ÖSYS: Öğrenci Seçme ve Yerleştirme Sistemi," https://www.osym.gov.tr/TR,21286/2021-yks-yerlestirme-sonuclarina-iliskin-sayisal-bilgiler.html. [Access Date: 04-04-2024].

[15] ÖSYM, "ÖSYS: Öğrenci Seçme ve Yerleştirme Sistemi," https://www.osym.gov.tr/TR,23913/2022-yks-yerlestirme-sonuclarina-iliskin-sayisal-bilgiler.html. [Access Date: 04-04-2024].

[16] ÖSYM, "ÖSYS: Öğrenci Seçme ve Yerleştirme Sistemi," https://www.osym.gov.tr/TR,25736/2023-yks-yerlestirme-sonuclarina-iliskin-sayisal-bilgiler.html. [Access Date: 04-04-2024].

[17] YÖK, "Yüksek Öğretim Bilgi Yönetim Sistemi," https://istatistik.yok.gov.tr/. [Access Date: 04-04-2024].

[18] ÖSYM, "ÖSYS: Öğrenci Seçme ve Yerleştirme Sistemi," https://www.osym.gov.tr/Eklenti/339,lisanskontenjanalanpdf.pdf?0. [Access Date: 04-04-2024].

[19] ÖSYM, "ÖSYS: Öğrenci Seçme ve Yerleştirme Sistemi," https://dokuman.osym.gov.tr/pdfdokuman/2015/OSYS/OSYS2015YerlestirmeMinMaxTablo-423072015.pdf. [Access Date: 04-04-2024].

[20] YÖK, "Yükseköğretim Bilgi Yönetim Sistemi," https://istatistik.yok.gov.tr/. [Access Date: 04-04-2024].