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Examining Occupation Fields of Programs According to Artificial Intelligence: Anadolu University Open Education System Case

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Abstract. Anadolu University's Open Education System (OES) accommodates over one million students and has incorporated an AI-based Virtual Assistant for non-academic support since 2022. While OES offers abundant information about its programs on its website, there is a notable absence of support services providing job recommendations related to students' chosen programs. This gap in student support extends to the post-graduation phase, with the Virtual Assistant lacking a concept for guiding students in finding employment opportunities. Recognizing the need for comprehensive assistance, this study sought to leverage AI capabilities to offer job recommendations by extracting information from the objectives of 63 OES programs. The initial inquiry involved requesting AI-generated job recommendations based on the stated objectives of these programs. Subsequently, the Virtual Assistant was tasked with providing insights into the occupation fields associated with OES programs. Analysis of the AI's responses, along with the classification of occupations according to the International Standards of Classifications of Occupations (ISCO) and the International Standard Classification of Education (ISCED), forms the core of this study. Contrary to trends observed in most European countries, the predominant number of graduates in Türkiye emerges from business and management fields. However, the correlation between graduation rates and subsequent job placements appears suboptimal within the labor force and employment landscape. The study advocates for the integration of AI in offering job recommendations, incorporating graduation and employment rates. This approach enables students to seek guidance on suitable programs aligned with their skills, fostering a more informed decision-making process. The study underscores the potential for higher education institutes to share employment and labor force data.

Keywords: Higher education, open education, student support, artificial intelligence.

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Artificial intelligence, which has a broad range of applications in today's world, essentially refers to a machine's ability to exhibit behaviors resembling human intelligence. Through machine learning, artificial intelligence obtains insights from data, providing exceptional opportunities for analysis, mapping, and prediction in fields such as language, finance, medicine, space, science, and more. Although tracing the origins of artificial intelligence is not easy, the concept was first encountered in Asimov's work "Runaround," written in 1942 (Haenlein & Kaplan, 2019). In real life, artificial intelligence emerged in 1945 when Vannevar Bush proposed a system to enhance human knowledge and understanding. This was followed by Alan Turing, who wrote an article on the capabilities of machines to simulate human beings and perform intelligent actions such as playing chess in 1950 (Negnevitsky, 2005). It is difficult to pinpoint the beginning of AI, the discipline. The Dartmouth Summer Project assumed the first event about AI in 1956 (Kline, 2011). In literature, different institutions worldwide have used AI for a long time.

AI is used for job automation, education, business, communication, etc. The first generation of AI was a rule-based model, the second generation was an optimal model for statistics, and the third generation has a brain model with an improving recognition performance (Zhai et al., 2021). Notably, the prominence of AI gained momentum with the establishment of OpenAI in 2015. The transformative impact continued with the introduction of ChatGPT-3 in 2020, marking a milestone in optimized language models (Fitria, 2023). Integrating AI in education has revolutionized the learning landscape, providing personalized learning experiences and unique opportunities for each student (Süral, 2008). As the latest and widely recognized technology in education, AI has been consistently adopted by higher education institutions since its initial development. Notable institutions, such as Anadolu University, a mega university boasting over one million students in the Open Education System (OES), harness the power of AI for learning, registration, and student support (Bozkurt, 2013).

Since 2022, OES has been utilizing an AI-based Virtual Assistant to address student inquiries for support. Additionally, higher education institutions globally have embraced the integration of AI-based chatbots for student assistance. AI supports various areas, including registration, course selection, examinations, and graduation information. The continuum of student support extends from pre-registration to post-graduation in higher education institutions. Notably, open education students can effortlessly register for a program online. Despite the student's responsibility for choosing a program, institutions play a crucial role in furnishing information about programs and courses. If students refrain from seeking help from professionals or need more adequate program information,

there is a risk of dropout. Furthermore, the challenge of securing employment commensurate with their skills may arise even after graduation.

In the realm of literature, the concept of student support, as outlined by Tait (2000), encompasses various facets, including course materials support and the creation of conditions for emotional support, work commitment, motivation, and components support. Following the holistic model Simpson (2012) presented, learner support is organized into academic and non-academic assistance categories. Thorpe (2002) further elaborates on this by breaking down learner support systems into phases – pre-study, during, and after learning. Armed with these insights, it becomes apparent that offering job recommendations based on program objectives after learning and during pre-study is an integral aspect of student support. Moreover, recognizing that some students may require individualized job suggestions even before the registration stage highlights the personalized nature of this support.

Job recommendations are seamlessly woven into various job search assistance modules uncovered in the literature review. Wegmann (1979) delved into a Job Search Assistance program in the USA, renowned for its high success rate in aiding individuals in securing employment. Building on this, Cottier et al. explored the impacts of a job search assistance program on overall employment outcomes. Adding a different perspective, Tovar (2014) asserts that support services, particularly those involving significant interactions with counselors during program selection, are crucial in influencing students' academic success. According to the findings, Xiong et al. (2011) found that a job research assistant is one of the students seeking specific services. Whereas Holmegaard (2014) et al., Korkut-Owen et al. (2013), and Aydemir (2018), the process of choosing what to study in higher education and their research job preferences was one of the choosing factors. Besides, some researchers have studied job search modules with AI. Verma et al. (2022) investigated skill requirements in artificial intelligence and machine learning job advertisements, revealing that skills acquired in higher education could be instrumental in the hiring process.

Kingchang et al. (2024) state that AI-based chatbots can also be used as tools that offer suggestions on education. Hou et al. (2024) examined the demands of learners enrolled in Computer Programming in the productive AI-based ChatGPT application; they found that the application yields better results only when learners write messages clearly and understandably. Melina et al. (2023) conducted a study on a web-based information system with database modeling and design that will help to identify and report students' activities and achievements in student affairs. Institutions must

understand that they can effectively implement AI technology (Kim et al., 2022). Higher education institutions should research and assimilate AI-based technologies for teaching, learning, student support, and administration. Dunn et al. (2021) state that it is vital for the staff working in student affairs in a higher education institution to spend all their time with students seeking support and that staff with leadership qualities should try to solve the problems experienced by students. However, it is impossible for centralized open education institutions such as Anadolu University, called Giga universities, to deal with students one-on-one regarding human resources. Learners who experience inadequacy in support services from the beginning and even realize that the program they enrolled in is far from their skills may fail academically or even drop out. In this context, higher education administrators should clearly state the program's aims before learners enroll and clarify in which field and occupational group those who enroll can work upon graduation. However, artificial intelligence-based support systems can provide this information in institutions such as open and distance education institutions, where the number of learners and employees could be higher. Within the scope of the Bologna Process and National Qualifications Framework for Higher Education, higher education institutions in Türkiye determine the aims, outcomes, curriculum, and ECTS credits of the program in specific standards and publish them on their websites. Although some higher education institutions include program objectives and future information, ISCO or ISCED standards are not related to the vocational fields of the programs.

There are established standards in determining the professional fields for programs in higher education institutions. Anadolu University, for instance, now mandates the identification of appropriate codes from the International Standards of Classifications of Occupations (ISCO) and the International Standard Classification of Education (ISCED) when proposing new programs. These standards play a crucial role in statistical processes, guiding the determination of program registration quotas and their associated employment areas. The initial occupational classification, originating in Europe in the 1940s, includes well-known systems like ISCO (Ganzeboom & Treiman, 1996). The main standardized occupational classification used in the USA, Europe, and other countries is the ISCO classification. Widely recognized, the ISCO classification is a critical standard in the USA, Europe, and globally. Its development by the International Labor Office (ILO) dates back to 1958, with the 1988 revision aiming to establish itself as the international standard for occupational classification (Kromhout, 2003). The last version of ISCO-08 is categorized as a four-digit code. ISCO is classified as a four-digit code. The first digit is the major group, the second is the sub-major

group, the third is the minor group, and the fourth is the unit group (Züll, 2016). The codes of Major ISCO-08 are listed as follows:

1. Managers
2. Professionals
3. Technicians and Associate Professionals
4. Clerical Support Workers
5. Services and Sales Workers
6. Skilled Agricultural, Forestry and Fishery Workers
7. Craft and Related Trades Workers
8. Plant and Machine Operators and Assemblers
9. Elementary Occupations
00. Armed Forces Occupations

The standard used to determine which professional fields the programs in higher education institutions are included in is ISCED. UNESCO designed it in the 1970s to provide statistics on education for robustness and, despite its limitations, as a qualification period (Chhinzer & Russo, 2018). The main aim was to create a statistical preview of study programs following primary, secondary, and higher education. Following the Bologna process in higher education, ISCED took a new form, and a new application was published in 2011 (Silvestru et al., 2018). The last Broad ISCED codes are the same as the ISCO digit system. The first two digits show broad fields. The late version of ISCED, what is called ISCED-F, is expressed below (ISCED).

00. Generic programs and qualifications
01. Education
02. Arts and humanities
03. Social sciences, journalism, and information
04. Business, administration, and law
05. Natural sciences, mathematics, and statistics
06. Information and Communication Technologies (ICTs)
07. Engineering, manufacturing, and construction
08. Agriculture, forestry, fisheries and veterinary
09. Health and welfare
10. Services

In 1997, the Lisbon Recognition Convention was signed, aligning with the Convention on the Recognition of Documents Related to Higher Education in European Countries, signifying a collective decision to acknowledge education obtained from European nations. In tandem with the Bologna Declaration, standards were established as part of the Bologna Process, encompassing the recognition of secondary education degrees, higher education, learner mobility, lifelong learning, and European Credit Transfer (ECTS) for course counting (Kehm, 2010). One of the main topics of the Bologna process is lifelong learning and student mobility (Zgaga, 2006). Türkiye also set standards in this context by creating the Core Competencies Framework in 2015 (Baykal, 2017). Higher education institutions offering education through the open education system extend accessible and distance learning opportunities to those pursuing lifelong learning. However, it is worth noting that while students enrolling in the Open Education System or other higher education institutions aim for lifelong learning, one of their crucial career goals after graduation is to secure a job related to their enrolled program. The European Union Commission, as part of the Bologna Process, conveyed six essential messages in their Lifelong Learning studies, emphasizing "New skills for everyone, more investment in human resources, bringing learning home, evaluating learning, rethinking guidance and consultation, innovations in teaching and learning" (Kaya, 2016). The Open Education System, which serves lifelong learning in Türkiye, allows students enrolled in a higher education institution to enroll in a program and thus develop their skills in different fields.

After graduating from a higher education institution, finding a job related to your field comes with various scenarios. Meanwhile, the job market and employment data in a particular field can offer insights to both students and institutions (Rahmat et al., 2012). It is essential to note that job trends and opportunities can fluctuate over time and across different locations. Consequently, individuals entering higher education to secure employment are encouraged to anticipate the professional landscape they might encounter post-graduation from their enrolled program (Stiwne & Alves, 2010). Recognizing that this can be a complex matter, especially for recent high school graduates, higher education institutions must extend support to students after they graduate (Tait, 2010). Higher education institutions that provide face-to-face education can provide this service at a higher rate in practice than institutions that open education (Öztürk, 2018). As exemplified by the Anadolu University Open Education System in Turkiye, open education institutions have proactively developed support services and integrated new technologies. To this end, artificial intelligence-supported Virtual Assistants and chatbots address prospective students' inquiries before officially registering, complementing human-based academic or non-academic support. Despite the widespread

association of artificial intelligence with chatbots or virtual assistants, it plays diverse roles, from driving cars to engaging in creative endeavors like music and painting. Artificial intelligence strives to deliver swift and accurate responses based on available datasets. In the current landscape, AI can amalgamate vast amounts of data and provide precise recommendations tailored to users' needs.

It is essential for Giga Universities such as Anadolu University, which has more than one million learners enrolled in the Open Education System, to provide instant and accurate support to learners. Learners who enroll in a program online need an advisor to measure whether the program suits them adequately. However, they can only understand the program's suitability within a few semesters. In addition, the program's objectives and outcomes may differ from the learner's skills and professional ability. At this point, artificial intelligence-supported applications can show which occupational groups the programs cover. In this field, the learners can find a job after graduation, and the employment status of the field to the learners before they enroll. This data can be meaningful for learners who register with the concern of finding a job. The administrators of the higher education institution can also determine the quotas of the existing programs by considering the employment and graduation data and deciding in which field the programs should be opened. At this point, artificial intelligence-based support systems are important for employees, managers, and learners. With the support of artificial intelligence, learners who enroll in the program from the right occupational group will be more likely to show academic success as they study in their field of interest. They will be expected to show high performance in their possible future job as they will be more likely to find a job in the relevant field when they graduate. However, learners who are not guided correctly can be expected to be unhappy or underperform in their jobs even if they graduate and find a job in the field they graduated from.

This study deals with the data that will emerge in the case of using an artificial intelligence-based support system that will recommend a program according to the profession and give an idea by sharing employment data related to the occupational field before enrolling in the program to learners who cannot access enough information on open and distance education websites and cannot get instant information due to the limited number of staff. Artificial intelligence-based support systems can share the information in this study with learners instantly and quickly. According to this study, higher education administrators may decide they do not need an AI-based support system.

In this context, the questions were proposed for the research:

1. Can AI recommend jobs based on OES program objectives? If it can, what jobs are recommended by AI?
2. How can AI classify the OES programs based on occupation fields?
3. What are OES's graduation and employment rates based on AI's occupation fields?
4. How can graduation rates be compared based on occupation fields?

Method

This study's research model, data collection tools, process, and data analysis are explained under the headings below.

Research Model

A case study design was used for the research in which the qualitative research method was adopted. The data collected through document analysis were analyzed using frequency and descriptive analysis (Karadağ, 2010). In a case study, the approach used for data analysis may differ. Some case studies involve the analysis of more than one unit within the situation, while others report the entire situation. A good case study research must describe the situation (Creswell, 2013). Document analysis is conducted through interviews, observations, interviews, and analysis of documents. Specifically, document analysis was employed, presenting situational themes according to Yin (2009). As highlighted by Yıldırım & Şimşek (1999), document analysis can be considered a research method. To ensure a systematic approach, this research followed the steps. Document analysis involves meticulously examining extant documents or records as a data source. This process involves the analysis of written materials that contain information pertinent to the subjects under investigation. Employed to garner data essential for the study's objectives, this method facilitates the extraction of findings from the analyzed data.

Moreover, document analysis allows for deriving generalizations and interpretations by synthesizing data gleaned from the scrutiny of verbal, printed, and other material forms that encapsulate information on the intended research topics. This study applied the descriptive analysis technique to assess the data collected. This approach permits the reorganization of research findings in alignment with the investigative problems or their presentation through various dimensions, considering different aspects.

Bowen (2009) highlights five specific functions of documents in research: providing contextual data, suggesting research questions and observations, offering supplementary data, enabling tracking

of change and development, and serving to verify findings or corroborate evidence from other sources. These functions underscore the versatility of document analysis in enriching the understanding of research topics by offering historical insights, informing the research process, and contributing to the robustness of qualitative analysis. This statement underscores the importance of accurately reflecting participants' perspectives in research findings. The methodologies employed, particularly document and thematic content analysis, are lauded for their systematic approach to data organization and interpretation. This precision facilitates crafting recommendations that resonate with the participants' core beliefs, values, and attitudes. By providing a structured model for data analysis, these methods are invaluable in thematic analysis and fostering interdisciplinary collaboration, making them ideal for projects that span multiple fields of study. For instance, in a health and social sciences project, such a methodological approach can ensure that policy recommendations align with patient experiences and expectations, thus enhancing the applicability and impact of research outcomes (Armstrong, 2021).

Data Collection Tools

For this purpose, program outcomes on the website were transferred to a database individually. Sixty-three program objectives available on the OES website were gathered and compiled into a database using Google Spreadsheets. The integration of GPT-3.5 with Spreadsheets allowed for direct interactions, prompting GPT to provide three job recommendations based on the program objectives listed on the OES website. GPT delivered three job suggestions and detailed job descriptions, all recorded on Spreadsheets. The job recommendations for each program were cross-referenced with the corresponding ISCO and ISCED codes. Subsequently, the registration and graduation statistics for the programs were compared with employment statistics from TÜİK and OECD.

Process

This study seeks to analyze AI's job recommendations, as depicted in Figure 1. To initiate the analyses, we compiled 63 program objectives from the OES website, creating a database on Google Spreadsheets. Leveraging the integration of OpenAI's GPT-3.5 with Spreadsheets, we engaged GPT to provide three job recommendations based on the program objectives listed on the OES website. GPT generated three job suggestions and detailed descriptions, all meticulously documented on Spreadsheets. The job recommendations for each program were cross-referenced with the corresponding ISCO and ISCED codes to ensure alignment. Subsequently, we compared the registration and graduation statistics of the programs with employment data from TÜİK.

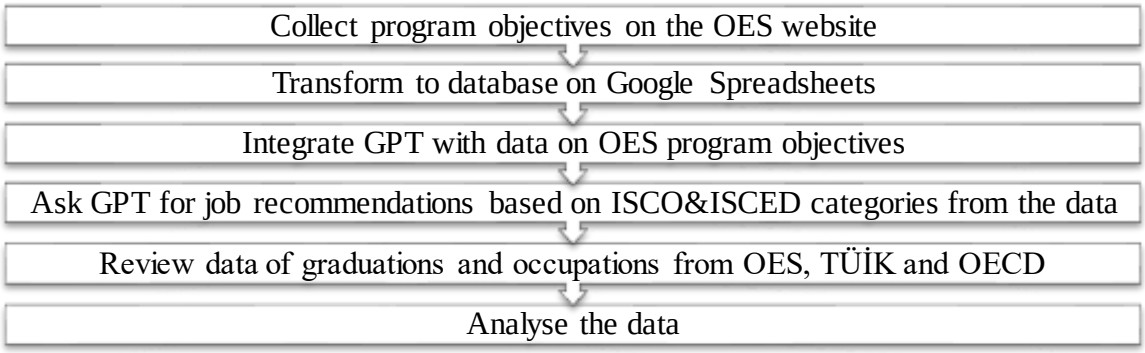

Figure 1. Steps in the Study.

In this research, we exemplify how artificial intelligence was incorporated, illustrating the process in Figure 2. The model depicted in this figure outlines the professions recommended by AI based on the objectives of the Call Center Services program and aligns these suggestions with occupation fields by ISCO and ISCED standards.

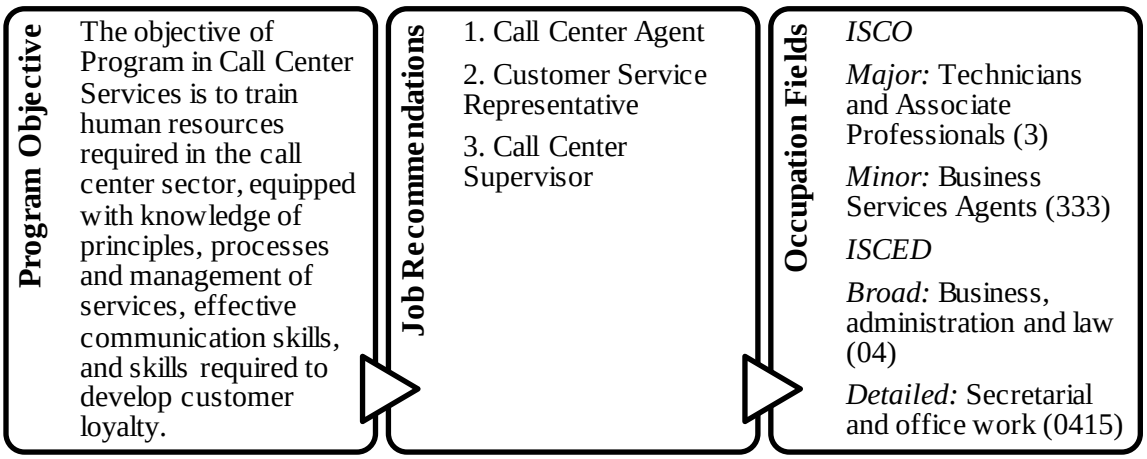

Figure 2. An Example of a Program's Classification: Call Center Services Program.

Data Analysis

This research examined AI's job recommendations based on document analysis from OES's program objectives. Then, AI classified programs in ISCED and ISCO categories; after the classification, OES compared graduation and employment rates based on TÜİK and OECD. After collecting all the data needed through artificial intelligence, the documents were analyzed descriptively according to the research questions. In summary, the data obtained in the study were analyzed on the question, "If there was an artificial intelligence-based support system, how would the program occupational fields be shown?".

Results

This research's findings were listed with headings per the research questions in this section.

Findings on Job Recommendations

When we sought job recommendations from AI based on program objectives, it provided 189 distinct job suggestions, 160 of which were unique. Notably, twenty-one jobs had a frequency greater than two. The frequency of employment with more than two is shown in Table 1.

Table 1.

AI's job recommendations from program objectives (Frequency is more than two)

Job Recommendation	f
Financial Analyst	4
Public Relations Specialist	4
Event Planner	3
Policy Analyst	3
Social Media Manager	3
Social Worker	3
Business Analyst	2
Diplomat	2
Entrepreneur	2
Health Services Manager	2
Healthcare Consultant	2
Hospital Administrator	2
Hotel Manager	2
Human Resources Manager	2
Interfaith Dialogue Facilitator	2
International Organization Officer	2
International Trade Specialist	2
Marketing Manager	2
Policy Advisor	2
Supply Chain Analyst	2
Travel Consultant	2

Based on the insights from Table 1, it is notable that the top-recommended positions include Financial Analyst and Public Relations Specialist. The Financial Analyst role emerged as a top suggestion for programs like Accounting and Taxation, Banking and Insurance, Economics (English), and Securities and Capital Markets. On the other hand, the Public Relations Specialist position was prominent in recommendations for Media and Communication, Political Science and Public

Administration, Public Relations and Advertising, and Public Relations and Publicity programs. The roles of Event Planner, Policy Analyst, Social Media Manager, and Social Worker are closely in second place, each recommended for three programs. Interestingly, the data indicates that among the fifteen jobs considered, their program frequency is consistently two.

Findings on the Classification of Programs Based on Occupation Fields

In this study, we utilized ISCO and ISCED occupation fields. AI played a crucial role in classifying each program in OES according to its objectives. Then, the findings were analyzed.

Table 2.

Occupation Categories of OES Based on ISCO

Occupation	**f**	**%**
2. Professionals	24	38.10
3. Technicians and Associate Professionals	19	30.16
1. Managers	13	20.63
9. Elementary Occupations	4	6.35
5. Services and Sales Workers	3	4.76
Total	*63*	*100*

Table 2 presents the data regarding the classification of programs into ISCO categories. The data highlights that AI suggested five occupations for all OES programs despite ISCO encompassing ten major occupation categories. These ISCO occupation fields, listed from most to least, include technical and associate professionals, managers, elementary occupations, and services and sales workers.

Table 3.

Occupation Categories of OES Based on ISCED

Occupation	**f**	**%**
04. Business, Administration and Law	27	42.86
10. Services	8	12.70
02. Arts and Humanities	7	11.11
09. Health and Welfare	6	9.53
03. Social Sciences, Journalism and Information	5	7.94
06. Information and Communication Technologies (ICTs)	4	6.35
08. Agriculture, Forestry, Fisheries and Veterinary	2	3.17
01. Education	2	3.17
07. Engineering, Manufacturing and Construction	2	3.17
Total	*63*	*100*

Similar to ISCO, ISCED comprises ten major occupation categories, though the types differ. Table 4 presents the occupation fields and the frequency of programs. The data from this table reveals that AI classified OES programs into nine ISCED occupations. Business, administration, and law comprise 42.86% of the occupations, while agriculture, forestry, fisheries, veterinary, education, engineering, manufacturing, and construction collectively account for only 3.17%.

Findings on Graduation and Employment Rates Based on Occupation Fields

Understanding the classification of occupation fields provides insights into employment trends. Table 4 illustrates the number of graduated students in OES and the employment of occupations in Türkiye based on ISCED areas over the years (Anadolu Üniversitesi, TÜİK).

Table 4.

OES Graduations and Employment of Occupation in Türkiye

Year	Occupation	Graduated Students in OES	Employment of Occupation in Türkiye
2020	Managers	73.454	1.468
	Professionals	114.592	3.235
	Technicians and Associate Professionals	54.369	1.628
	Services and Sales Workers	676	5.179
	Elementary Occupations	7.127	3.881
2021	Managers	79.905	1.565
	Professionals	121.650	3.513
	Technicians and Associate Professionals	63.582	1.819
	Services and Sales Workers	2.139	5.370
	Elementary Occupations	8.822	4.462
2022	Managers	29.912	1.677
	Professionals	44.196	3.730
	Technicians and Associate Professionals	29.194	1.991
	Services and Sales Workers	1.042	5.957
	Elementary Occupations	4.011	4.711

Analyzing Table 4 reveals that the most graduated students fall under the professionals category, with the most employed individuals in the services and sales workers field. Interestingly, even though services and sales workers are the most engaged, they consistently have the lowest number of graduated students each year in Table 4. Notably, the overall graduation rate in OES saw a significant decline in 2022, with only the services and sales workers field experiencing an increase in the number of graduated students compared to 2020 and 2021.

Comparing the number of graduated students from OES with the number of employed individuals in Türkiye based on ISCO fields provides insights into the ratio of graduates to employed individuals. While the data merges two different sets of information, it does not specify how many graduated OES students were employed. This nuanced perspective is comparatively presented in Figure 3 (Anadolu Üniversitesi, TÜİK).

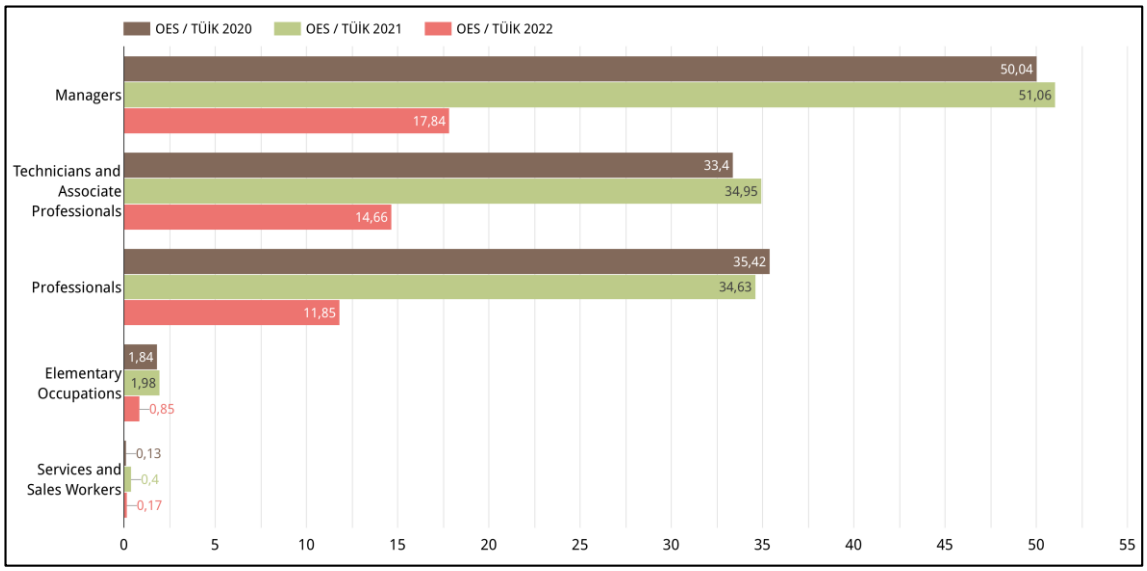

Figure 3. Comparison of OES and TÜİK.

Figure 3 provides a glimpse into the dynamics of employment in different fields. Notably, in the managerial domain, the number of graduated students was nearly 50 times more than those employed in 2020 and 2021, but this ratio dropped to almost 15 in 2022. Over the years, managers consistently held the highest coefficients. While the coefficient of technicians and associate professionals increased in 2021, it declined in 2022. Professionals, on the other hand, have witnessed a decrease since 2021.

Examining the comparison between the number of graduated students in OES and the employment of occupations, the chart indicates that services and sales workers consistently had the lowest coefficients across all years. Interestingly, unlike other fields, the number of people finding jobs in services and sales workers exceeded the number of graduates. For a detailed overview of the number of graduating students from OES and the Labor Force Status of Graduates in Türkiye based on the occupation fields of ISCED, refer to Table 5 spanning from 2020 to 2022 (Anadolu Üniversitesi; TÜİK)

Table 5.

OES Graduations and the Labour Force Status in Türkiye

Year	Occupation	Graduated Students in OES	The Labour Force Status of Graduates in Türkiye
2020	Education	3.121	1.103
	Arts and Humanities	39.922	592
	Social Sciences, Journalism and Information	14.859	565
	Business, Administration and Law	134.410	2.280
	Information and Communication Technologies	7.228	107
	Engineering, Manufacturing and Construction	1.810	1.273
	Agriculture, Forestry, Fisheries and Veterinary	6.884	190
	Health and Welfare	31.160	596
	Services	10.824	318
2021	Education	3.256	1.195
	Arts and Humanities	42.060	659
	Social Sciences, Journalism and Information	13.653	630
	Business, Administration and Law	139.082	2.497
	Information and Communication Technologies	10.283	105
	Engineering, Manufacturing and Construction	2.596	1.374
	Agriculture, Forestry, Fisheries and Veterinary	10.022	206
	Health and Welfare	34.303	696
	Services	20.843	348
2022	Education	2.063	1.269
	Arts and Humanities	12.126	695
	Social Sciences, Journalism and Information	6.620	659
	Business, Administration and Law	52.526	2.653
	Information and Communication Technologies	6.525	123
	Engineering, Manufacturing and Construction	957	1.471
	Agriculture, Forestry, Fisheries and Veterinary	3.898	215
	Health and Welfare	12.321	747
	Services	11.319	384

Analyzing Table 5 shows that business, administration, and law consistently recorded the highest numbers in graduation and the labor force across all the years. However, its graduation numbers dipped in 2022. On the flip side, even though engineering, manufacturing, and construction consistently had the lowest graduation numbers, they secured the second-highest position based on the labor force.

Figure 4 highlights the ratio of OES students graduating to the labor force in different fields. Notably, in the managerial domain, the number of graduated students was nearly 50 times more than those employed in 2020 and 2021, but this ratio dropped to almost 15 in 2022. Over the years, managers consistently held the highest coefficients. Conversely, services and sales workers consistently held the lowest coefficients.

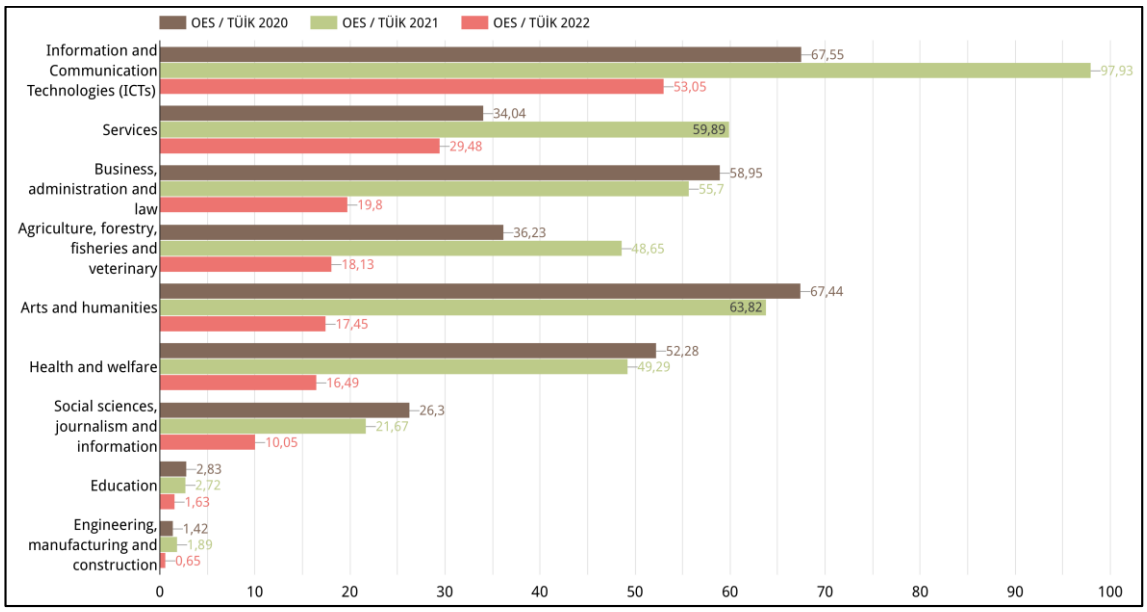

Figure 4. OES vs. TÜİK (ISCED).

Findings on the Comparison of graduation Rates Based on Occupation Fields

In this study, we delved into the variation in the number of graduate students in higher education, focusing on the occupation fields of ISCED. To achieve this, we examined the data for France, Germany, Italy, Türkiye, and the United Kingdom in 2021, as outlined in Table 6 OECD).

Table 6

Occupation Stats

Occupation	France	Germany	Italy	Türkiye	UK
Education	6.672	42.549	23.481	52.400	13.306
Arts and humanities	46.523	24.531	49.884	82.689	84.664
Social sciences, journalism, and i.	31.101	25.949	42.529	103.434	72.813
Business, administration and law	98.740	113.387	42.218	139.116	92.606
Natural sciences, mathematics and s.	29.856	18.859	17.890	15.660	51.984
Information and Communication Tech.	10.687	20.412	3.767	7.684	18.201
Engineering, manufacturing and c.	20.953	96.987	32.139	84.358	39.953
Agriculture, forestry, fisheries and vet.	1.547	6.345	5.512	6.151	3.641
Health and welfare	41.695	22.055	24.679	38.010	67.371
Services	16.654	15.362	12.412	23.849	0
Generic programs and qualifications	0	0	0	0	3.248
Field unspecified	804	2.296	265	0	0

According to Table 6, business, administration and law had the highest numbers in all countries except Italy. Arts and humanities were the first fields in Italy. Considering the number of students graduating from all higher education institutions in Türkiye, engineering, manufacturing and construction were the second. The results show that agriculture, forestry, fisheries, and veterinary had the lowest numbers in Türkiye. When the weakest figures were examined except 'field unspecified,' the lowest numbers were identical for each country except Italy. Agriculture, forestry, fisheries, and veterinary had the most insufficient numbers in France, Germany, and the United Kingdom, like Türkiye. Information and communication technology was the most downfield in Italy. The chart of these findings is shown in Figure 5.

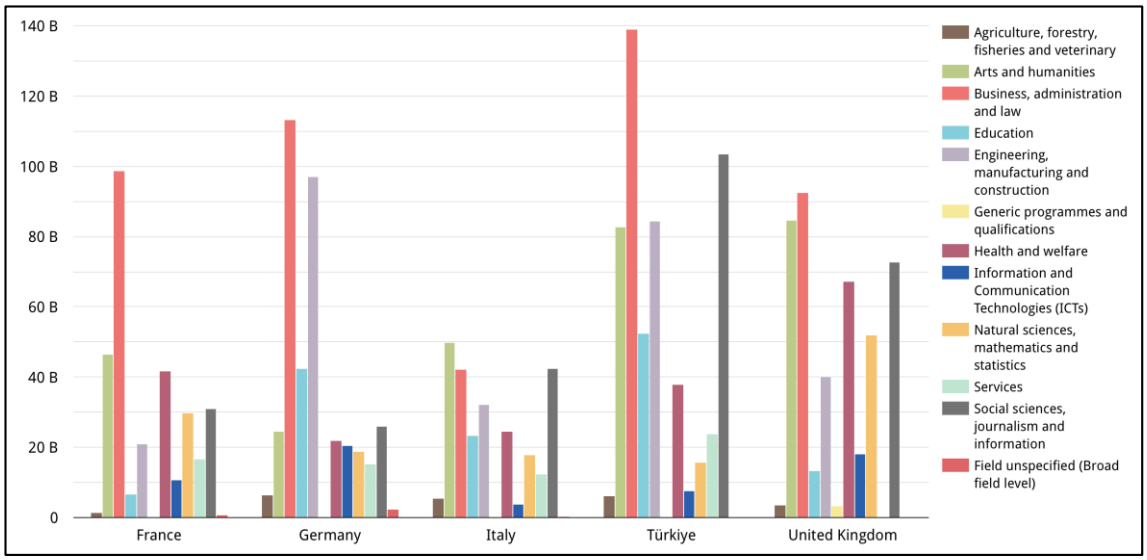

Figure 5. Graduates by Fields (OECD, 2021).

The data from TÜİK's The Labour Force Status of Graduates in Türkiye in 2021 and OECD's data from higher education graduates by fields in Türkiye in 2021 were compared in Figure 6 (TÜİK, OECD). According to the comparison result in this figure, students graduating from agriculture, forestry, fisheries and veterinary (3.35%) had the highest employment potential. This is followed by education (2.28%), health and welfare (1.83%), business, administration and law (1.79%), engineering, manufacturing, and construction (1.63%), services (1.46%), information and communication technologies (1.37%), art and humanities (0.80%), social sciences, journalism and information (0.61%) respectively. According to the comparison of 2021 data, forestry, fisheries, and veterinary were more than five times to social sciences, journalism, and information.

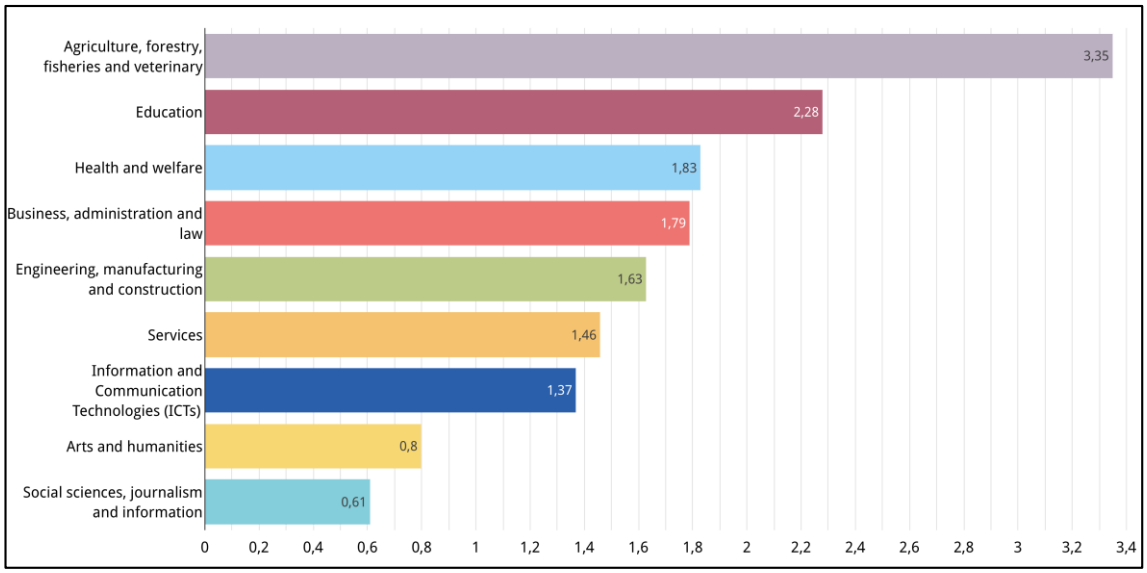

Figure 6. TÜİK & OECD Türkiye Percentage (%) Rates 2021.

Discussion and Conclusion

As efforts persist to integrate artificial intelligence into applications like chatbots and virtual assistants, several higher education institutions leverage it to enhance student support systems. Given GPT's versatility across various domains, this study initially explored the feasibility of generating professional suggestions based on the program outputs on the Anadolu University Open Education System website. Despite GPT consistently providing accurate responses post the implementation of artificial intelligence-supported GPT 3,5; it is crucial to acknowledge the potential for occasional inaccuracies. In today's landscape of AI-supported student support systems, users still exhibit a preference for interactions with humans. However, it is anticipated that virtual assistants equipped to scour the entire internet swiftly will respond and conduct analyses for the user (Babori et al., 2019).

Like other artificial intelligence applications, GPT can be a recommender in different branches. Liu et al. (2023) studied "Is ChatGPT a Good Recommender?". They conclude that for the study, "Despite GPT's limitations, it outperforms state-of-the-art methods in human evaluation for explainable recommendation tasks, highlighting its potential to generate explanations and summaries." Through the GPT plug-in integrated into the Google Sheets application, artificial intelligence made three career suggestions quickly and easily based on the information from 63 programs. Moreover, while doing this, he made statements about professions. According to the programs and their outputs, artificial intelligence made the most recommendations for Business, Administration, and Law. Considering that these recommendations were made for Accounting and Taxation, Banking and Insurance, Economics (English), and Securities and Capital Markets Programs, it can be said that artificial intelligence operates reasonably.

After making a program recommendation, the artificial intelligence was asked to classify the Open Education System programs according to ISCED and ISCO codes. Artificial intelligence has classified all programs according to the desired standards. However, it should be remembered that this is not done by field experts but rather among the categories specified according to the classification feature of artificial intelligence. According to the professional classification of artificial intelligence in ISCO, most programs in OES are in the field of professionals.

In Wan et al.'s (2023) research focusing on ISCO for automating the coding of job descriptions derived from a general population study, various automated job coding tools were employed to assess their coding performance. The findings indicated a low absolute consensus in job coding across all three instruments. Beyond underscoring the significance of conducting study-specific evaluations

before employing coding tools, their research highlights the pressing need for enhanced and evaluated automated coding tools.

Based on ISCED, the predominant program category is in business, administration, and law. These findings suggest a higher concentration of business administration, economics, and management programs. However, it is crucial to note that the significance lies in the quantity of programs and whether the occupational areas align with the country's needs. In the subsequent stage of our research, we delve into the discussion about programs in terms of employment and workforce, considering occupational fields. The intricate relationship between the employability-development opportunities provided by higher education institutions and graduates' work is further complicated by the influential role played by employers. Ultimately, employers play a pivotal role in translating a graduate's employability into a tangible job opportunity (Harvey, 2001).

Ortiz (2008) delved into the Spanish case of classifying occupational fields based on ISCED and highlighted a notable limitation—the apparent absence of a clear distinction between lower and upper university degrees. As indicated by the study findings, considering that around 40% of Spanish university graduates hold lower university degrees, it becomes pertinent to examine the job-finding scenario after graduation through economic and sociological lenses. Similarly, the statistical information does not encompass graduation levels in our research.

An interesting trend emerges when scrutinizing the graduation figures of students in OES programs and correlating them with employment numbers in ISCO professional fields. While a significant portion of OES graduates falls into the professional field, there are other areas with the highest employment rate. Despite appearances suggesting a substantial presence in the services and sales workers' field, the number of OES graduates could be a lot higher. Even though only three programs in OES are categorized under services and sales workers, administrators of higher education institutions should carefully assess these findings. The lower number of graduates or a potential lack of demand in a field with higher employment opportunities within OES, which offers abundant second university chances, could be explored. This sheds light on the importance of students' job readiness post-graduation. Additionally, the readiness of individuals engaged in lifelong learning, contributing to knowledge and academic enhancement, is crucial in their job search endeavors (Ng et al., 2022).

Examining the graduation figures of students in OES programs based on job statuses in ISCED professional fields reveals a distinct pattern. The field of business, administration, and law

significantly outpaces others in producing graduates, a trend that gains meaning when considering the corresponding number of programs offered. Similarly, business, administration, and law boast high employment rates in professional realms. However, a closer inspection of the data, comparing graduation and employment figures, reveals a noteworthy disparity. In specific years, the number of students graduating in the managerial field is nearly 50 times higher than those securing employment in this domain. Managers consistently hold the highest coefficients across all years, while service and sales employees consistently have the lowest. Even though these statistics may not unequivocally demonstrate that OES graduates are successfully finding employment, as mentioned earlier, they yield crucial insights for juxtaposing graduation and employment dynamics. While education actively contributes to individual self-improvement and enhances employability by preparing individuals for the job market, the contemporary landscape suggests that being a university graduate is gradually losing its conventional role in securing a profession. The employability of diplomas appears to be experiencing a gradual decline in today's context (Gönültaş Çelik, 2019).

Can (2019) suggests that the graduation numbers from OES should be considered in relation to the enrollment figures. In Can's study, while the total number of undergraduate students in open and distance education in Türkiye from 2013 to 2018 closely rivaled the number in formal education, the count of graduate students was higher in formal education, indicating that graduation rates in open and distance education tend to be relatively lower compared to formal education. According to the research conducted by Akoğlan Kozak & Dalkıraoğlu (2013) on careers with 2901 associate and undergraduate students who graduated from Anadolu University, students were not given sufficient guidance in their career decisions, they made their career decisions according to traditional patterns, financial concerns took precedence over career opportunities, and pursuing a master's degree was an important issue. It was concluded that they saw it as a career opportunity.

Except for Italy, business, administration, and law boast the highest graduation rates in higher education institutions across France, Germany, Türkiye, and the United Kingdom. Italy, on the other hand, stands out in its focus on the arts and humanities. Countries generally tailor their higher education planning to meet their needs and facilitate job opportunities for graduates in relevant fields. Consequently, the areas in demand for employment may vary from one country to another. However, higher education institutions producing graduates in fields unrelated to current needs could potentially lead to issues like unemployment. According to OECD data, an analysis of employment numbers in Türkiye based on fields suggests that agriculture, forestry, fisheries, and veterinary program graduates

are more likely to find employment. Conversely, graduates in social sciences, journalism, and information appear to face lower employment prospects in Türkiye, as indicated by these results.

Tarvid's (2015) study of over education in Europe shows that administrative services have the highest risk. In contrast, the most and the least affected industries differ considerably. So, institutes must control enrollment to graduation rates in terms of employability. The differences in graduate employability might be related to the country's economic capacity or specificities (Ilieva-Trichkova & Boyadjieva, 2017). Weligamage et al. (2014) claim in their study that higher education institutes may conduct employers' skill requirement surveys to identify employers' actual skills. Also, government organizations investigate to determine this skill requirement. Businesses should cooperate with educators to review and redevelop their curriculum and change delivery methodology to support the development of these skills and attributes.

Higher education institutes widely employ AI for their chatbots and virtual assistants, primarily in a text-based format. However, this study demonstrates the broader potential of AI in providing student support, encompassing the revelation of occupation fields related to OES programs, insights into employment scenarios, and an understanding of the labor force landscape. As numerous institutions deploy algorithms capable of delivering personalized predictions, it underscores the evolving responsibilities of higher education institutions in the realm of education.

Recommendations

In this study, we delved into the professions suggested by artificial intelligence and their alignment with the professional fields categorized in ISCO and ISCED classes. This analysis was based on the program outputs available on the website of 63 programs offered through the Anadolu University Open Education System. GPT efficiently addressed all inquiries and shared the requested data throughout the study. However, it is important to note that GPT's highly accurate responses do not guarantee 100% reliability. Institutions are encouraged to leverage artificial intelligence to streamline processes, but caution is warranted, assuming that responses may not be flawless. Particularly in official transactions, experts should verify data provided by artificial intelligence to ensure accuracy. Therefore, the limitations of this research lie in the responses provided by artificial intelligence, and the study's data should be assessed within this context. Future research could explore the accuracy of artificial intelligence responses, especially in areas involving determining professional standards and seeking expert opinions.

Higher education institutions should adopt internationally standardized platforms to disseminate information about their programs, going beyond conventional course lists, objectives, and outcomes presented in information packages aligned with the Bologna Process. Institutions can augment their disclosures to enhance precision by specifying their programs' ISCED and ISCO professional fields. Additionally, leveraging artificial intelligence, chatbots, and virtual assistants fueled by web data can provide workforce insights and employment opportunities linked to specific professional domains. While prioritizing data privacy, these systems can give students personalized information about their prospective employment outcomes based on their chosen profession before enrollment. Although statistical agencies furnish such data, the complexity of analysis poses challenges for students. However, well-trained artificial intelligence-supported student support systems can swiftly and accurately guide students, offering program recommendations aligned with career aspirations. Furthermore, they can provide virtual counseling during registration by accessing real-time employment status data from relevant statistical institutions. Developing a robust support system that factors in professional data is crucial, especially for open education system students undertaking remote registration and studentship procedures, thus bridging the gap for those distanced from the formal enrollment system.

Enhancing student support in higher education, particularly in distance learning, requires a more human-centered approach. Integrating GPT into a Virtual Assistant can prove beneficial, offering personalized recommendations to students even without navigating a website or dashboard. By accurately analyzing individual student characteristics, AI can suggest programs aligned with their interests during registration. This AI-driven student support could evolve into a form of professional counseling, guiding students on registration and graduation decisions in the future.

While institutions offering distance higher education, like the open education system, share extensive information on their websites, students often need help accessing the specific information they need. Issues such as navigating the web and using technology can lead to delays or the inability to find relevant information. Due to these challenges, some students might enroll in programs without adequate knowledge, resulting in potential academic struggles, especially in courses aligned with their program's requirements. Those facing program-related issues may discontinue their education, impacting their academic journey. Even after graduation, students may encounter challenges finding jobs in their professional field, potentially prompting them to explore opportunities outside their expertise.

Establishing and maintaining an up-to-date database containing ISCED and ISCO codes for all institutions and programs is crucial. Beyond solely employing these codes for statistical analyses on professions, they should be readily shared with students and institutions. Sharing professional fields within programs based on international standards is essential for maintaining quality standards, facilitating student mobility, and streamlining equivalence procedures. In institutions delivering education through open education systems with a high volume of students, sharing ISCED and ISCO codes via web services is imperative.

Higher education institutions must regularly assess workforce and employment data within the professional domains of their programs to determine appropriate quotas. When contemplating introducing new programs, it is essential to consider statistical institution data aligned with ISCED and ISCO standards, focusing on areas with a professional demand. Furthermore, researchers can conduct various studies utilizing statistics from educational institutions or countries. As this research specifically addresses open education activities in Türkiye and Anadolu University, within the context of the Bologna Process, comparisons were limited to a selection of European countries.

Until the hypothetical scenario of artificial intelligence completely taking over jobs, akin to depictions in dystopian movies or TV shows, why not leverage artificial intelligence for career guidance? AI has the potential to provide valuable insights into future job prospects, all for the benefit of individuals. This study seeks to understand the optimal utilization of artificial intelligence in this context.

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Conflict of Interest

The authors have reported that there is no conflict of interest.

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Ethical Standards

The study was carried out within the framework of the Helsinki Declarations. The data does not require any ethical permission.

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Attachment

Job Recommendations, ISCO, and ISCED Fields of OES Programs According to AI

Program	Job Recommendations	ISCO No.	ISCO Field	ISCED No.	ISCED Field
Accounting and Taxation	Tax Accountant, Financial Analyst, Auditor	121	Business Services and Administration Managers	0411	Accounting and taxation
Agriculture Technology	Agricultural Technician, Greenhouse Manager, Agricultural Product Quality Control Specialist	921	Agricultural, Forestry and Fishery Labourers	0811	Crop and livestock production
Aviation Management	Aviation Marketing Manager, Aviation Financial Analyst, Aviation Safety Manager	143	Other Services Managers	0413	Management and administration
Banking and Insurance	Bank Manager, Insurance Underwriter, Financial Analyst	241	Finance Professionals	0413	Management and administration
Brand Communication	Brand Manager, Marketing Communications Specialist, Public Relations Manager	243	Sales, Marketing and Public Relations Professionals	0414	Marketing and advertising
Business Administration	Entrepreneur, Business Analyst, Marketing Manager	121	Business Services and Administration Managers	0413	Management and administration
Business Administration (English)	Business Analyst, Marketing Manager, Entrepreneur	121	Business Services and Administration Managers	0413	Management and administration
Business Management	Business Development Manager, Entrepreneurship Educator, Innovation Consultant	121	Business Services and Administration Managers	0413	Management and administration
Call Center Services	Call Center Agent, Customer Service Representative, Call Center Supervisor	333	Business Services Agents	0415	Secretarial and office work
Child Development	Child Development Specialist, Early Childhood Educator, Child Life Specialist	234	Primary School and Early Childhood Teachers	0922	Child care and youth services
Civil Air Transport Management	Airport Operations Manager, Airline Operations Coordinator, Cargo Operations Supervisor	933	Transport and Storage Labourers	1041	Transport services
Communication Design	Graphic Designer, Designer, Branding Specialist	343	Artistic, Cultural and Culinary Associate Professionals	0212	Fashion, interior and industrial design

Program	Job Recommendations	ISCO No.	ISCO Field	ISCED No.	ISCED Field
Computer Programming	Software Engineer, Web Developer, Data Analyst	351	Information and Communications Technology Operations and User Support Technicians	0611	Computer use
Culinary Arts	Chef, Food and Beverage Manager, Culinary Instructor	343	Artistic, Cultural and Culinary Associate Professionals	1013	Hotel, restaurants and catering
Cultural Heritage and Tourism	Cultural Heritage Manager, Tourism Development Officer, Tour Guide	343	Artistic, Cultural and Culinary Associate Professionals	1015	Travel, tourism and leisure
Disability Care and Rehabilitation	Disability Support Worker, Rehabilitation Therapist, Special Education Teacher	325	Other Health Associate Professionals	0921	Care of the elderly and of disabled adults
Economics	Economic Analyst, Policy Advisor, Market Researcher	241	Finance Professionals	0311	Economics
Economics (English)	Economist, Financial Analyst, Policy Analyst	331	Financial and Mathematical Associate Professionals	0311	Economics
Elderly Care	Elderly Care Program Coordinator, Elderly Care Trainer, Elderly Care Service Provider	226	Other Health Professionals	0921	Care of the elderly and of disabled adults
Electric Power Generation, Transmission and Distribution	Electrical Engineer, Power System Operator, Energy Analyst	215	Electrotechnology Engineers	0713	Electricity and energy
Emergency and Disaster Management	Emergency Management Specialist, Disaster Recovery Coordinator, Crisis Communication Manager	226	Other Health Professionals	1032	Protection of persons and property
Foreign Trade	International Trade Specialist, Customs Broker, International Business Consultant	333	Business Services Agents	0413	Management and administration
Geographic Information Systems	GIS Analyst, GIS Technician, GIS Specialist	252	Database and Network Professionals	0612	Database and network design and administration
Healthcare Management	Hospital Administrator, Healthcare Consultant, Health Services Manager	143	Other Services Managers	0413	Management and administration
History	Online History Educator, Historical Researcher, Curriculum Developer	231	University and Higher Education Teachers	0114	Teacher training with subject specialization

Program	Job Recommendations	ISCO No.	ISCO Field	ISCED No.	ISCED Field
Home Economics	Home Economics Teacher, Family and Consumer Sciences Educator, Home Economics Consultant	235	Other Teaching Professionals	0114	Teacher training with subject specialization
Human Resources Management	Human Resources Manager, HR Consultant, Talent Acquisition Specialist	121	Business Services and Administration Managers	0413	Management and administration
International Trade and Logistics	Logistics Manager, International Trade Specialist, Supply Chain Analyst	933	Transport and Storage Labourers	0413	Management and administration
Labor Economics and Industrial Relations	Labor Economist, Human Resources Manager, Labor Relations Specialist	263	Social and Religious Professionals	0413	Management and administration
Laboratory and Veterinary Assistance Services	Veterinary Laboratory Technician, Veterinary Clinical Assistant, Animal Breeding Technician	324	Veterinary Technicians and Assistants	0841	Veterinary
Local Governments	Local Government Administrator, Community Development Specialist, Urban Planner	335	Government regulatory associate professionals	0731	Architecture and town planning
Logistics	Logistics Coordinator, Supply Chain Analyst, Warehouse Manager	933	Transport and Storage Labourers	0413	Management and administration
Management Information Systems	Systems Analyst, Database Administrator, IT Project Manager	133	Information and Communications Technology Services Managers	0611	Computer use
Management of Healthcare Organizations	Hospital Administrator, Healthcare Consultant, Health Services Manager	143	Other Services Managers	0912	Medicine
Media and Communication	Media Journalist, Public Relations Specialist, Social Media Manager	133	Information and Communications Technology Services Managers	0321	Journalism and reporting
Medical Documentation and Secretary Training	Medical Documentation Specialist, Medical Secretary, Healthcare Administrative Assistant	334	Administrative and Specialized Secretaries	0415	Secretarial and office work
Occupational Health and Safety	Occupational Health and Safety Technician, Safety Coordinator, Environmental Health and Safety Specialist	325	Other Health Associate Professionals	1022	Occupational health and safety
Office Management and	Executive Assistant, Office Manager, Administrative Assistant	334	Administrative and Specialized Secretaries	0415	Secretarial and office work

Program	Job Recommendations	ISCO No.	ISCO Field	ISCED No.	ISCED Field
Executive Assistant Training					
Philosophy	Philosophy Professor, Ethicist, Writer or Journalist	264	Authors, Journalists and Linguists	0223	Philosophy and ethics
Photography and Camera Operation	Photographer, Camera Operator, Photo Editor	343	Artistic, Cultural and Culinary Associate Professionals	0211	Audio-visual techniques and media production
Political Science and Public Administration	Government Policy Analyst, Nonprofit Program Manager, Public Relations Specialist	335	Government regulatory associate professionals	0413	Management and administration
Political Science and Public Administration (English)	Political Analyst, Public Policy Advisor, International Relations Specialist	335	Government regulatory associate professionals	0312	Political sciences and civics
Program in International Relations	Diplomat, International Organization Officer, Coordinator	235	Other Teaching Professionals	0413	Management and administration
Program in International Relations (English)	Diplomat, International Organization Officer, Program Manager	231	University and Higher Education Teachers	0413	Management and administration
Public Finance	Public Finance Analyst, Budget Manager, Policy Advisor	241	Finance Professionals	0413	Management and administration
Public Relations and Advertising	Public Relations Specialist, Advertising Account Executive, Social Media Manager	243	Sales, Marketing and Public Relations Professionals	0414	Marketing and advertising
Public Relations and Publicity	Public Relations Specialist, Communications Coordinator, Media Relations Manager	243	Sales, Marketing, and Public Relations Professionals	0414	Marketing and advertising
Radio and Television Program Production	Radio and Television Program Producer, Broadcast Journalist, Media Production Coordinator	351	Information and Communications Technology Operations and User Support Technicians	0211	Audio-visual techniques and media production
Real Estate Management	Real Estate Appraiser, Real Estate Marketing Specialist, Property Manager	121	Business Services and Administration Managers	0413	Management and administration
Retailing and Store Management	Store Manager, Visual Merchandiser, E-commerce Specialist	524	Other Sales Workers	0416	Wholesale and retail sales
Securities and Capital Markets	Financial Analyst, Stockbroker, Investment Banker	241	Finance Professionals	0412	Finance, banking and insurance

Program	Job Recommendations	ISCO No.	ISCO Field	ISCED No.	ISCED Field
Social Media Management	Social Media Manager, Content Creator, Digital Marketing Specialist	524	Other Sales Workers	0414	Marketing and advertising
Social Services	Social Worker, Case Manager, Community Outreach Coordinator	226	Other Health Professionals	0923	Social work and counselling
Social Work	Social Worker, Community Organizer, Policy Analyst	325	Other Health Associate Professionals	0923	Social work and counselling
Sociology	Social Researcher, Social Worker, Policy Analyst	263	Social and Religious Professionals	0314	Sociology and cultural studies
Sports Management	Sports Facility Manager, Sports Marketing Coordinator, Sports Event Planner	342	Sports and Fitness Workers	0413	Management and administration
Theology	Theology Teacher/Professor, Interfaith Dialogue Facilitator, Religious Counselor	263	Social and Religious Professionals	0221	Religion and theology
Theology (Arabic)	Interfaith Dialogue Facilitator, Religious Educator, Chaplain	263	Social and Religious Professionals	0221	Religion and theology
Tourism and Hotel Management	Hotel Manager, Event Planner, Travel Consultant	143	Other Services Managers	1015	Travel, tourism and leisure
Tourism and Travel Services	Travel Agent, Tour Operator, Event Planner	511	Travel Attendants, Conductors and Guides	1015	Travel, tourism and leisure
Tourism Management	Hotel Manager, Event Planner, Travel Consultant	231	University and Higher Education Teachers	1015	Travel, tourism and leisure
Turkish Language and Literature	Turkish Language and Literature Teacher, Researcher in Turkish Language and Literature, Editor or Content Writer	264	Authors, Journalists and Linguists	0231	Language acquisition
Web Design and Coding	Web Designer, Front-end Developer, Full-stack Developer	133	Information and Communications Technology Services Managers	0611	Computer use