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### **Beyond Degrees: The Complex Interplay of Youth Unemployment and A Rising Supply of Engineering Graduates in An Emerging Economy**

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The Editor-in-Chief

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**Subject:** Submission of Manuscript – *Beyond Degrees: The Complex Interplay of Youth Unemployment and a Rising Supply of Engineering Graduates in an Emerging Economy*

Dear Editor,

On behalf of my co-authors, I am pleased to submit our manuscript titled “**Beyond Degrees: The Complex Interplay of Youth Unemployment and a Rising Supply of Engineering Graduates in an Emerging Economy**” for consideration for publication in the *Journal of Emerging Economies and Workforce Development*.

This paper critically examines the multifaceted relationship between the oversupply of engineering graduates and persistent youth unemployment in emerging economies, offering both empirical data and policy recommendations. The study’s interdisciplinary approach aligns with the journal’s mission to advance knowledge in workforce dynamics, higher education, and economic development.

We confirm that the manuscript is original, has not been published before, and is not under review by any other journal. All authors have read and approved the final version and have contributed significantly to the research work.

We appreciate your consideration of this work for publication in your esteemed journal and look forward to your response.

Thank you for your time and attention.

Sincerely,

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**Beyond Degrees: The Complex Interplay of Youth Unemployment and A Rising Supply of Engineering Graduates in An Emerging Economy**

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**Abstract**

This research uses a mixed-method exploratory design, including interviews with 56 participants and a survey of 1,243 unemployed engineers, to explore the relationship between engineering education and graduate employability in Türkiye. The findings highlight several systemic problems in engineering education: inadequate academic preparation of students; theoretical education often not aligned with industry needs; a shortage of quality faculty; limited practical education; capstone projects not related with industry needs. The study also highlights challenges in assessment methods, which rely heavily on rote learning and lack standardization. As a result, many engineering graduates in Türkiye lack both technical skills and professional competencies, leaving them underprepared for the labor market. To address these challenges, the study suggests raising admission standards, increasing the number of faculty members, modernizing curricula to include more problem-based learning, strengthening university-industry collaboration, standardizing assessment methods, and integrating real-world industry challenges into capstone projects.

**Key words:** engineering education, graduate employability, young engineer unemployment, labor market dynamics

As with other rapidly expanding higher education systems, Türkiye has encountered new challenges alongside the growth of higher education (Özoğlu, Gür & Gümüş, 2016). One of these challenges manifests itself as a rise in unemployment among educated youth. Despite the net enrollment rate for individuals aged 18 to 22 surging from 12% in 2000 to 46% in 2022 (Gür et al., 2018; Yurdakul and Şahin Demir, 2023), this period also witnessed a concurrent rise in overall youth unemployment within the same age group. While there were 42.000 unemployed engineers in Türkiye in 2012, this figure soared to 99.000 by 2024 (TurkStat, 2025). Furthermore, statistics from the Turkish Employment Agency (İŞKUR) indicate that engineer unemployment predominantly affects the youth demographic. Notably, nearly two-thirds of unemployed engineers seeking assistance from İŞKUR are aged 29 and below (İŞKUR, 2023). Consequently, it is claimed that the massification of higher education has failed to offer feasible employment prospects for numerous young people (Doğru, 2024).

Global examples underscore that rapid and uncoordinated expansion in higher education causes challenges within the labor market. In a comparative study on European countries, the researchers concluded that the labor force in every examined country is becoming more educated, and this represents “a social revolution in the spread of education among working populations” (Green & Henseke, 2020, p. 175). Woodley and Brennan (2010) suggest that the sudden popularization of higher education has resulted in a surge in the number of unemployed university graduates and an imminent decline in permanent employment opportunities. Similarly, Schomburg (2000) deduces that the quantitative expansion of higher education amplifies unemployment rates among university graduates, while Plumper and Schneider

(2007) discover a positive correlation between the rise in university enrollments and youth unemployment levels in Germany.

Studies linking engineer unemployment to engineering education underline various challenges within engineering education such as the academic preparedness of students enrolled in universities (Bilgin et al., 2013; Ersoy & Yavuz, 2019) and their interest and ability in engineering (Yaşar & Ulugergerli, 2017). Furthermore, concerns regarding the quality of engineering education (Bilgin et al., 2013; Birinci & Koç, 2007) are also highlighted. It is asserted that many engineering programs are not sufficiently updated to align with contemporary requirements and the evolving needs of the industry (Özbayoğlu, 2011) and the interaction between faculty members and students in engineering departments is often inadequate (Gedik et al., 2018).

Another important indicator of the quality of engineering education is the student-to-faculty ratio, as it is closely linked with academics' workload and performance, faculty-student interaction, and course delivery. Concerns arise regarding crowded classrooms limiting students to effectively follow lectures, diminishing the efficacy of applied engineering lessons, and loading a heavy burden on faculty members for the assessment of assignments and examinations (Bodur, 2016). The rising number of students, also, is a threat for the quality of engineering education (Karaca et al., 2016). In Türkiye, the student-to-faculty ratio was 22 in 2020, significantly higher than the OECD average of 15, with Türkiye ranking fourth from the bottom among 45 countries (OECD, 2022a) which is a clear sign that Türkiye exhibits a notably high student-to-faculty member ratio. Alternatively, this indicates a pronounced deficit in teaching staff within the Turkish higher education system. As of 2019, the country employs 123,827 teaching staff, falling short by 82,551 based on a calculation considering the OECD average (Gür & Yurdakul, 2020). Furthermore, in engineering faculties, the student-to-faculty ratio surpasses the national average. In 2022, there are 13,429 faculty members and 457,318

undergraduate students in engineering and related majors, resulting in a ratio of 34.1 students per faculty member. However, this disparity varies significantly among faculties, with a trend against newly established universities (Özer, 2011).

The expansion of student enrollment may also negatively affect the expenditure allocated per student. While the average expenditure per student in higher education surged from \$13,132 to \$17,065 in the OECD average from 2011 to 2018, it declined from \$10,815 to \$10,008 in Türkiye (OECD, 2022b). Basically, the reduction in expenditure per student in Türkiye can be attributed to the quantitative expansion of higher education and difficulties of funding this growth.

Given the challenges in engineering education in Türkiye, there have been various researches regarding the professional competence of engineering graduates (Bilgin et al., 2013; Gedik et al., 2018; Özbayoğlu, 2011; Yaşar & Ulugergerli, 2017; Ersoy & Yavuz, 2019). However, these studies may lack comprehensiveness as they prefer focusing solely on one side of the problem and having a small sample. This study, on the other hand, aims to focus on all possible aspects of engineering education and engineer unemployment in Türkiye. For this reason, entry requirements to the engineering faculties, students' motivation, the quality of theoretical education and practical education, the capstone project, assessment and evaluation methods, graduates' employability skills are all examined. Besides, while many former studies include one participant group such as engineers, employers, or faculty; this study has a wide range of participants like unemployed engineers, employers, faculty, and chamber representatives.

### Higher Education System in Türkiye

The current higher education system in Türkiye is governed by the Higher Education Law No. 2547, which was enacted in 1981. The most important feature of the law is the creation of a centralized structure, the Council of Higher Education (CoHE), to govern all higher education

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institutions in Türkiye (Gür, 2016; Gür & Çelik, 2016). The law gave the President of the Republic of Türkiye wide powers in the formation of the CoHE and the power of appointment of all rectors. Due to the highly centralized structure of the higher education system in Türkiye, the autonomy of Turkish universities is low compared to most OECD countries (Çelik & Gür, 2014). The most important tool used by the CoHE for quality control purposes is the approval processes of new departments and programs as well as of admitting students to these programs. Allowing a program to start based on certain criteria is a form of pre-accreditation by the CoHE (Özer, Gür, & Küçükcan, 2011). Although the CoHE has established a set of quality criteria for the opening of associate, undergraduate and graduate programs, there are concerns about whether these criteria act as a filter to improve the quality of higher education (Özer, Gür, & Küçükcan, 2011).

In addition to CoHE, the Turkish Higher Education Quality Council (THEQC), which operated within CoHE until July 2017, is the main quality assurance institution in Türkiye. It is now a public legal entity with administrative and financial autonomy (Eurydice, 2023). THEQC monitors the accreditation activities of national and international accreditation agencies operating in Türkiye and conducts the processes of authorization and recognition of agencies (Eurydice, 2023). According to the regulation, all higher education institutions in Türkiye are required to submit annual self-evaluation reports to THEQC and to be evaluated by THEQC at least once every five years as part of the Institutional External Evaluation Program (Eurydice, 2023). THEC also approves the accrediting bodies for individual programs. The accreditation of engineering programs has been carried out by MUDEK since 2002 (Eurydice, 2023). THEQC is a relatively new institution and still faces the challenges of working “independently without any direct influence from the CoHE, other governmental organizations, and higher education institutions themselves” (Gumus, 2018, p. 58).



## Engineering Education in Türkiye

Engineering education has conventionally prioritized the acquisition of theoretical knowledge since a comprehensive mastery of foundational engineering principles assumes a pivotal significance in confronting engineering problems and attaining favorable project results. This viewpoint contends that students should accord primacy to theoretical engineering expertise, recognizing it as the linchpin for nurturing the pragmatic competencies necessary for competently addressing complex engineering problems (Bruegge et al., 2015).

Presently, engineering is regarded as a vocation that emphasizes professional qualifications, competency in communication, collaboration, proficiency in contemporary methodologies, and the capacity to lead transformative initiatives alongside technical mastery. Students are expected to employ their engineering expertise and proficiency gained during tertiary education to solve potential challenges and offer viable solutions (ABET, 2021: 5-6). However, such endeavors necessitate the realization of field-specific insights (Case & Marshall, 2016). Therefore, ensuring curricular relevance with up-to-date knowledge as well as labor market developments assumes great significance. In this regard, the integration of problem identification, experiential learning, and problem-solving tasks into the curriculum is suggested (Blom and Saeki, 2011).

The merit of engineering education is closely linked with the quality of both the curriculum and the faculty members, as well as the academic proficiency of the students. Union of Chambers of Turkish Engineers and Architects (TMMOB, 2017) acknowledges that this relationship stems from the fact that the acquisition of engineering knowledge and skills heavily relies on the readiness of the students. Given that the comprehension of complex theoretical concepts necessitates a certain level of academic capability, measuring the academic competency of students admitted to engineering faculties is necessary. In Türkiye, admission to engineering programs requires successful performance in two distinct examinations: the TYT

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(Basic Proficiency Test) and the AYT (Field Proficiency Test). These exams include 140 questions covering subjects such as mathematics (70 questions), geometry (10 questions), physics (21 questions), chemistry (20 questions), and biology (19 questions). Examining the scores of the candidates admitted to Mechanical, Electrical-Electronics, Civil, and Computer Engineering departments in 2021 (YÖK Atlas, 2022) reveals that attaining a high score in quantitative tests is not necessary for admission to programs other than the most prestigious ones. For instance, despite there being over 180 programs in mechanical and civil engineering in 2021, a score of 32 out of 140 in quantitative questions was sufficient for placement in the 51st ranked program in civil engineering, while a score of 37.5 was adequate for the same rank in mechanical engineering. Moreover, the scores of candidates admitted to the 51st and 101st ranked programs are closely aligned, indicating that students with relatively lower scores can enroll into any engineering program except for the top-tier ones.

The varying degrees of readiness among students upon entering engineering programs can significantly influence their performance during their education. Akdeniz (2017), a faculty in Electronics and Communication Engineering at a mid-tier university finds that students admitted to this program showed a declining performance in the university admission exam with each passing year, consequently exerting a negative impact on the foundational theoretical courses essential for their engineering education. Besides, the proportion of students succeeding in most theoretical courses has declined over the years. For instance, the success rate in the differential equations course plummeted from 87% to 32%, and in the numerical analysis course, it dwindled from 97% to 24% from 2009 to 2015. While solely attributing this decline in achievement to students' academic shortcomings may be deemed unjust, as noted by Akdeniz (2017), the diminishing success in the university admission exam serves as an indicator elucidating the reasons behind students' weak performance in departmental courses.

## Unemployment among Young Engineers

Engineering unemployment exhibits significant variation across different countries. Nonetheless, a prevailing trend is the challenge encountered by newly graduated engineers in securing suitable employment during the initial years following graduation, with variations observed across countries and time periods. Notably, engineer unemployment rates surpassed 3% in the US between 2003 and 2017 (Burke, 2019), approximately 4% in Canada (Engineers Canada, 2015), and around 5% in the United Kingdom (Cole, 2020). In Japan, despite the exacerbation of labor market conditions due to the pandemic, 96% of newly graduated engineers secured employment in 2020 (The Japan Times, 2021). Conversely, India grapples with significant engineer unemployment, with an approximate 50% unemployment rate among engineers between 2014 and 2022, as per an online survey encompassing 300,000 participants (Statista, 2022). Similarly, Spain experiences elevated engineer unemployment rates, prompting calls for additional skills such as entrepreneurship among engineers (Barba-Sánchez & Atienza-Sahuquillo, 2018). In Malaysia, reports indicate that engineering graduates are often faced with unemployment due to skills mismatch (Zaharim et al., 2009), while in Nigeria, engineer unemployment is deemed alarming, leading engineers to seek employment in disparate fields (Aluyor & Otoikhian, 2021). In Türkiye, engineer unemployment has increased in recent years, with an average rate of approximately 9.8% between 2009 and 2024 (TurkStat, 2025). Particularly, the unemployment rate among newly graduated engineers exceeds the overall engineer unemployment rate, with approximately two-thirds of engineers who applied for employment assistance in Türkiye being 29 years old or younger (İŞKUR, 2023).

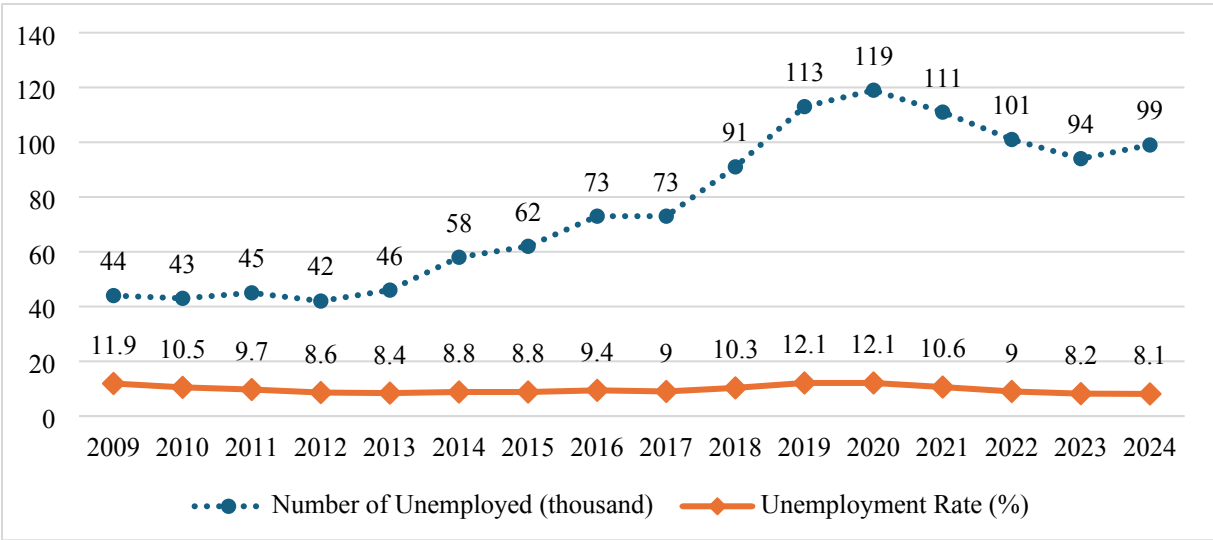


Figure 1: Number (Thousand) and Rate (%) of Unemployed Engineers (2009-2024), TurkStat (2025)

Figure 1 illustrates that the number of unemployed engineers in Türkiye remained relatively stable, while the unemployment rate of engineers experienced a notable decrease between 2009 and 2013. Over the following four years, there was an increase in the number of unemployed engineers, although the unemployment rate remained relatively constant. However, between 2018 and 2020, the number of unemployed engineers reached 119,000, and the unemployment rate to 12%. In the subsequent four years, there was a decline in the rate of unemployed engineers (TurkStat, 2024). As of 2024, there were about 99 thousand unemployed engineers in Türkiye. In short, there has been chronic unemployment in engineering in Türkiye, with young engineers bearing a disproportionate burden.

AIM OF THE RESEARCH and RESEARCH QUESTIONS

The aim of this research is to closely examine the causes of unemployment among young engineers in Türkiye and to formulate policy recommendations aimed at resolving this issue. The following questions are asked to the stakeholders:

1. What are the opinions of unemployed young engineers, officials from TMMOB, employers/employers' representatives, and engineering faculty members regarding the reasons for unemployment among young engineers in Türkiye?
2. What are the opinions of unemployed young engineers, TMMOB officials, employers/employers' representatives, and engineering faculty members regarding the solutions and prevention measures for unemployment among young engineers in Türkiye?

## THE IMPORTANCE OF RESEARCH

The literature review highlights a significant research gap concerning the unemployment of young engineers in Türkiye. Most studies tend to focus on isolated aspects of engineering education, resulting in a fragmented understanding of the issue. While some studies explore the enrollment system in engineering faculties (Akdeniz, 2019; Bayram et al., 2015), others address problems within theoretical and applied education (Bilgin et al., 2013; Bodur et al., 2016; Bulut & Soylu 2009; Karaca et al., 2016; Özbayoğlu, 2011), or examine the credentials of graduates (Akgül et al., 2013; Yaşar & Ulugergerli, 2017). Additionally, issues such as quotas in engineering faculties (Bayram et al. 2015; Birinci & Koç, 2007; Ersoy & Yavuz, 2019), capstone projects (Karakaya & Bostan, 2015), and the assessment and evaluation system (Gedik et al., 2018; Oğuz et al., 2009) have also been subject to investigation. In contrast, this study adopts a more comprehensive approach by examining the impact of engineering education on engineer unemployment across all its sub-dimensions. By integrating insights from interviews with 56 participants and a survey involving 1243 participants, this study offers a detailed analysis of various factors directly related to engineering education. These include the admission system to engineering programs, the quality of theoretical and applied education, the assessment and evaluation system, capstone projects, and overall education quality. The extent and depth of this study distinguish it from existing research, underscoring its significance in

shedding light on the multifaceted challenges surrounding unemployment among young engineers in Türkiye.

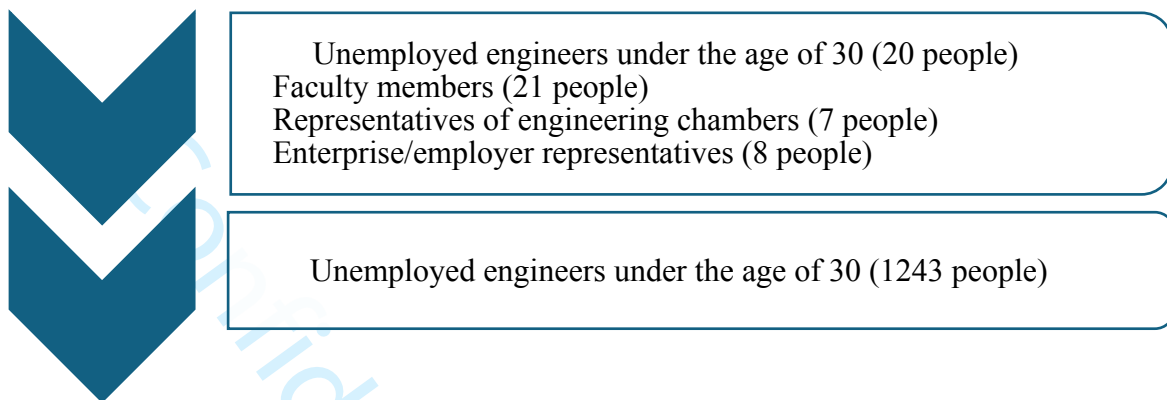
**METHOD**

**Research Design**

The study employed an exploratory design, a mixed methods approach integrating qualitative and quantitative research methodologies (see Figure II). Within mixed methods, the concurrent collection of qualitative and quantitative data facilitates a meticulous evaluation of their compatibility (Büyüköztürk et al., 2017). The exploratory design initiates with qualitative inquiry, followed by quantitative data gathering based on the insights gleaned from this preliminary investigation (Creswell & Plano Clark, 2007).

Qualitative research within this framework entailed interviews conducted with unemployed engineers under 30 years old, TMMOB officials, employers, and faculty members in engineering faculties. Snowball sampling was used to reach unemployed engineers under the age of 30 and TMMOB officials, a technique particularly useful for accessing individuals regarded as valuable sources of information pertinent to the research question (Yıldırım & Şimşek, 2016). Conversely, criterion sampling, a purposive sampling method, guided the selection of participants for interviews with employers and engineering faculty members. Criterion sampling stipulates the selection of observation units possessing specific qualities among people, events, objects, or situations (Büyüköztürk et al., 2017). In this study, unemployed engineers were required to be unemployed for at least six months and be aged 30 and below. Since unemployment in this age group is more prevalent, they were thought to offer more insights into the link between employment opportunities and their education, which may have ended several years ago. On the other hand, employers were required to meet at least one criterion, such as being an engineer, having a minimum of five years of professional experience, or employing 10 or more engineers while faculty were expected to fulfill at least one of the

criteria including having at least five years of teaching experience, engaging in industry collaboration, or conducting research on engineering unemployment or engineering education.



*Figure 2: Exploratory Mixed Research Design*

In this study, the primary qualitative data collection tool was in-depth interviews. In-depth interviews provide participants the opportunity to articulate their personal experiences, perspectives, and insights in their own words (Neuman, 2013). Widely recognized as a cornerstone of qualitative research, interviews are structured around a set of predefined questions or topics, facilitating the extraction of comparable information across diverse participants (Patton, 1987). The research data were gathered using semi-structured interview protocols developed by the researcher. Semi-structured interviews are characterized by flexible questioning, allowing the researcher to delve deeper into emergent themes and probe for nuanced responses (Merriam, 2019).

While preparing the interview forms, literature was reviewed to find out where the problems are concentrated. Based on this, separate items were prepared for each participant group. The interview form was examined by a language expert for its suitability to the objectives of the research and the comprehensibility of the items. Then, a separate pilot study was conducted for each participant group and included three unemployed engineers, two faculty members from engineering departments, a representative from the chamber of engineers and an employer. The interview form was revised with the feedback obtained in the pilot study.



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When the qualitative data was being collected, two important points were taken into consideration. First, the data obtained from the previous interviews helped shape the following interviews and the survey. Thus, each interview was used as a tool to address every implicit aspect. Second, not only participants’ answers but also their feelings and reactions to the questions were analyzed. That is, the interviews were also an attempt to reveal the experiences of the participants and how they felt about the research topic. Herein, participants’ tone of voice and gestures, the stressed and repeated words were paid attention during the interviews ranging from 36 to 132 minutes. Initially, face-to-face interviews were conducted with a group of 20 unemployed engineers between August and October 2019. Here, graduates from various universities and programs are proportionally included to ensure diversity. Subsequently, discussions were held with seven presidents of TMMOB from October to December 2019. Following this phase, further face-to-face interviews were undertaken with representatives from eight companies employing between 10 and 70 engineers, conducted between December 2019 and March 2020. These businesses predominantly operated within the machinery, electrical-electronics, construction, chemical, food, and energy sectors. Lastly, a series of interviews were conducted with 21 faculty members from May to July 2020. Notably, to sustain diversity among the participants, factors such as administrative roles, industry experience, and academic tenure, among others were considered.

The study employed grounded theory as its qualitative research methodology. Grounded theory, as conceptualized by Glaser and Strauss (1967), entails a systematic process of data collection and analysis aimed at uncovering novel phenomena. It is particularly recommended when the objective is to develop a new theory rather than testing an existing one within a specific field. Put simply, grounded theory endeavors to generate novel theoretical frameworks through the systematic collection and analysis of data throughout the research process (Corbin & Strauss, 2008).



Following this, the quantitative phase started. Here, the survey model was adopted. A survey entails the systematic collection of quantitative data through responses provided by a representative sample of the population to questions pertaining to a specific problem (Karasar, 2005). This methodology is favored for its flexibility, efficiency, and the potential generalizability of its findings (Check & Schutt, 2012). Unlike endeavors focused on establishing causal relationships, the survey model aims to depict and interpret the expectations, beliefs, characteristics, ideas, actions, attitudes, and behaviors prevalent within a given group (Creswell, 2012). In alignment with the premises of the survey research, this study aims to scrutinize the perspectives of unemployed young engineers regarding the influence of engineering education in Türkiye on the employment prospects of young engineers.

There are around 99 thousand unemployed engineers in Türkiye (Turkstat, 2025). A significant portion of this group is aged 30 and below. Statistics from İŞKUR indicate that unemployment among engineers primarily affects young people. It is noteworthy that around two-thirds of unemployed engineers seeking assistance from İŞKUR are aged 29 or younger (İŞKUR, 2022). The sample of the quantitative research comprises 1,243 unemployed engineers under the age of 30 falling within this population and the sample of the qualitative research includes unemployed engineers under 30 years old, TMMOB officials, employers, and faculty members in engineering faculties.

## Data Analysis

Grounded theory methodology entails the concurrent execution of data collection, data analysis, and theory construction processes (Corbin & Strauss, 2008). Throughout this iterative process, the researcher endeavors to unearth novel concepts and theories inherent within the data. Rather than imposing pre-existing categories onto the data, the researcher seeks to develop emergent theories grounded in participant narratives. This approach enables participants to articulate their perspectives authentically, thereby contributing to the formulation of theories

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rooted in their experiences (Stephens, 2009). To facilitate the development of these theories, analytical codes and thematic patterns are distilled from the data. Moreover, the constant comparative method is used at every juncture of analysis, facilitating comparisons between categories and the identification of relational dynamics. For example, for the reasons of engineer unemployment, codes such as low wages and heavy workload by engineers, and lack of experience by employers were numerously stated under the labor market theme. Herein, a theoretical framework was built by comparing each stakeholder’s perspective.

During the analysis of the interview data, a qualitative data coding approach encompassing three sequential stages—open coding, axial coding, and selective coding—was employed. While open coding involves the initial identification and labeling of fixed codes within the data, axial coding interconnects these codes to delineate relationships, leading to the subsequent phase of selective coding where a central category is singled out for detailed explication (Punch, 2011).

To illustrate, during the open coding phase, analysis of statements from unemployed engineers revealed sub-categories within the broader category of challenges in engineering education. These included issues such as the entry requirements to engineering programs, inadequate practical training, and ineffective course content. Subsequently, in the axial coding phase, a detailed examination of faculty members' statements suggested that a considerable number of students admitted to engineering programs lack the academic preparedness required for such education. This situation often results in two possible outcomes: either a high failure rate among students or the lowering of academic standards through simplified examinations to enable more students to pass. The faculty members’ responses indicate a preference for the latter approach, which, consequently, allows some students to graduate without acquiring the fundamental competencies of engineering. Finally, in the selective coding phase, analysis of

statements from the participant groups led to a conclusion regarding the impact of engineering education on the unemployment of young engineers.

In order to ensure the study's reliability, recommendations outlined by Creswell (2012) were adhered to, emphasizing prolonged engagement with participants and comprehensive examination, interpretation, and conceptualization of interview data. Furthermore, to enhance the validity of findings, various strategies including triangulation, peer review, and the establishment of an audit trail were used.

The researcher developed a quantitative data collection instrument called “The Opinion Form on Young Engineer Unemployment”, specifically for this research. This survey comprises 14 items with a five-point Likert-type scale. The issues identified during the interviews and insights from current literature on engineering unemployment were carefully reviewed to design the survey. Following this, the survey was shared with three faculty members and three unemployed engineers to receive feedback and revise its items. Following the revisions, a pilot study was conducted with 256 unemployed engineers, and the data were analyzed using SPSS. Factor analysis led to the removal of several items and those grouped within the same sub-dimension, reducing the total number of items to 14. These items were subsequently categorized into three sub-dimensions: issues related to engineering education, internship programs, and the labor market. Survey participants were categorized into seven distinct groups based on their engineering disciplines: "mechanical", "civil", "electrical-electronics", "food", "metallurgy-materials", "industrial", and a miscellaneous category labeled "other".

## RESULTS and DISCUSSION

The study, through interviews and the survey, has brought to light numerous challenges confronting engineering education and young engineer employment in Türkiye.

### Academic Skills of Students and Entry Requirements for the Engineering Programs

The data obtained from the interviews with unemployed young engineers suggests that entering into an engineering program is not particularly challenging or selective. This perspective is similar to that of faculty members. Having a similar approach, most faculty members are of the opinion that the university admission system lacks selectivity and allows low achievers to be admitted to the engineering programs. A faculty member expressed his discontent with the current students' academic level by stating that in the past, they had students with rankings around top 40 thousand (in the university admission exam), but now students ranked around 150 thousand are being admitted, and this significantly lowers the quality of teaching. This perspective is aligned with the official data showing raw scores of students that is around 50 correct answers (with penalty applied for incorrect answers) out of 140 questions in the quantitative subjects can be admitted to an engineering program except for the top-tier ones.

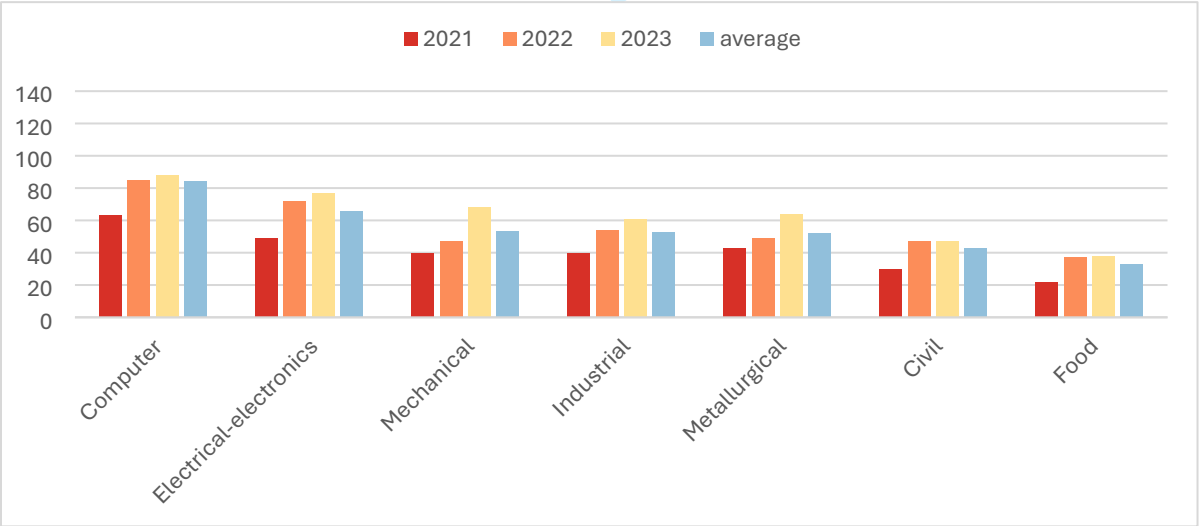


Figure 3: The required number of correct answers in quantitative subjects to be accepted into an engineering program (YÖK Atlas, 2024)

Figure 3 presents the required number of correct answers in quantitative subjects to enroll in the average engineering program. More specifically, considering that there were 130

computer engineering programs in the state universities in 2021, Figure 3 shows the details of the 65<sup>th</sup> program in the ranking. This figure suggests that the entry requirements to an engineering program may lack selectivity. Most faculty members, in this regard, assert that many students lack the necessary academic skills to excel in core subjects such as mathematics and physics, as well as in essential departmental courses, which is supported by numerous studies (Bilgin et al., 2013; Ersoy & Yavuz, 2019; Karaca et al., 2016; Birinci, 2009). Likewise, most survey participants (93.2%) suggest the adoption of a more selective admission system for engineering programs.

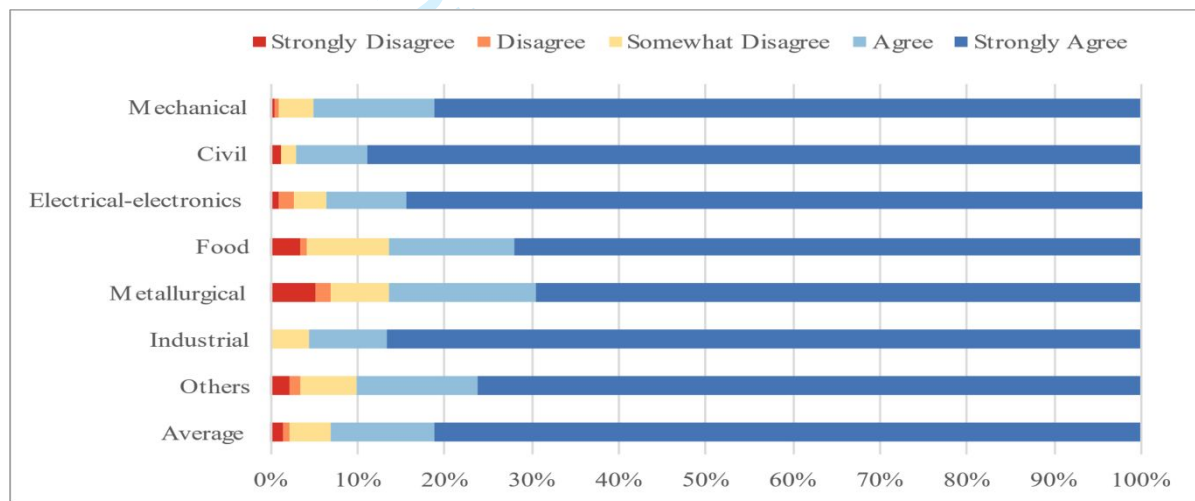


Figure 4: There should be a more selective system for students enrolling to engineering faculties.

Figure 4 depicts that for a huge majority of unemployed engineers, the entry requirements to enroll in an engineering program lacks competitiveness. Despite the arguments that many students may lack the necessary academic skills and competency, the findings suggest that students enrolling to the engineering programs have a genuine interest in the field as 64% of respondents affirmed a strong desire to study the major they graduated from (Figure 5).

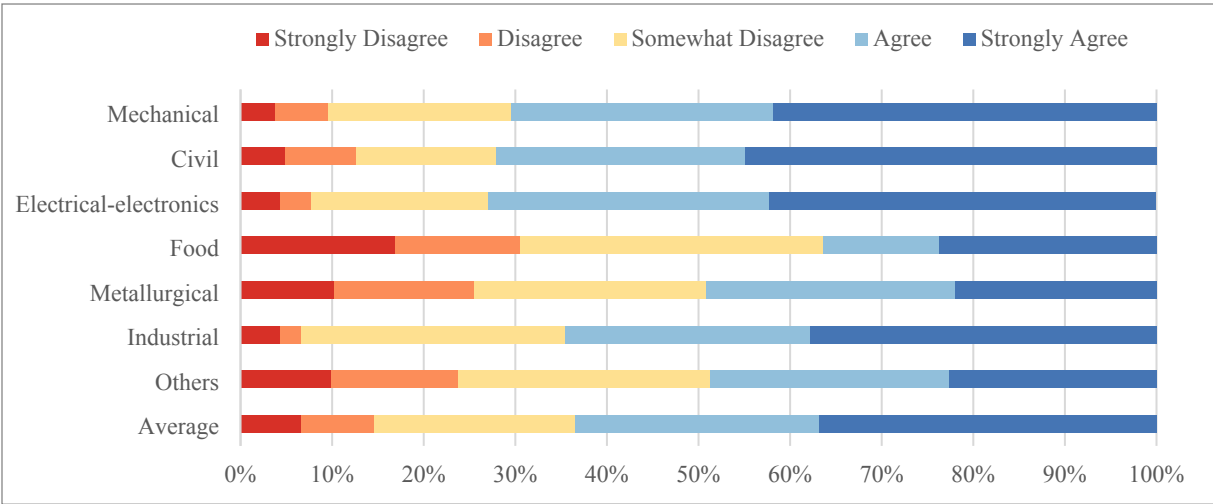


Figure 5: *I really wanted to study in this field.*

This implies that there might be a disparity between students’ desired major and their academic capability and awareness. However, being partly capable of studying a major may not be a challenge when the entry requirements are not discriminating. Herein, it can also be argued that there exist counter arguments suggesting that occupational interest stands as the primary stimulus behind major preferences (Bayram et al., 2015). This finding agrees with the literature which proposes that students may sometimes choose their majors without thorough research or be potentially influenced by family pressures (Yaşar & Uluggergerli, 2017), or that engineers may possess limited awareness regarding the scope of professional roles (Royal Academy of Engineering, 2016).

On the other hand, 54.3% of the survey participants stated that they were informed about the employment prospects in the major they chose prior to studying it (Figure 6).

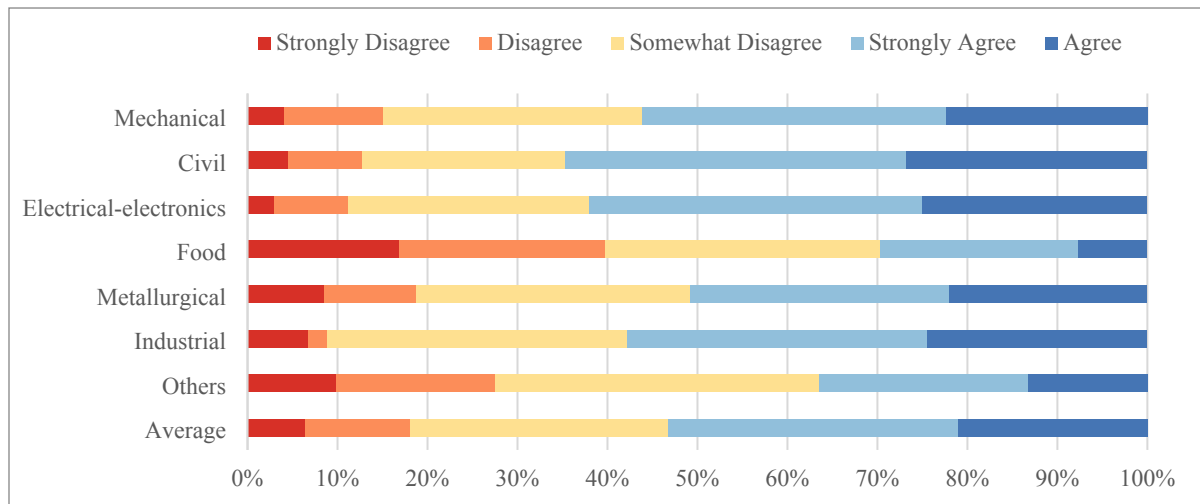


Figure 6: *I was well-informed about the job opportunities related to the major I chose.*

This might be a sign that half of the students are aware of the potential job opportunities or being unemployed. However, it can also be assumed that the other half choose a major without considering the possible opportunities and threats.

The assertion by two-thirds of participants that they actively pursued professional development during their undergraduate study serves as indicative evidence of their occupational enthusiasm.

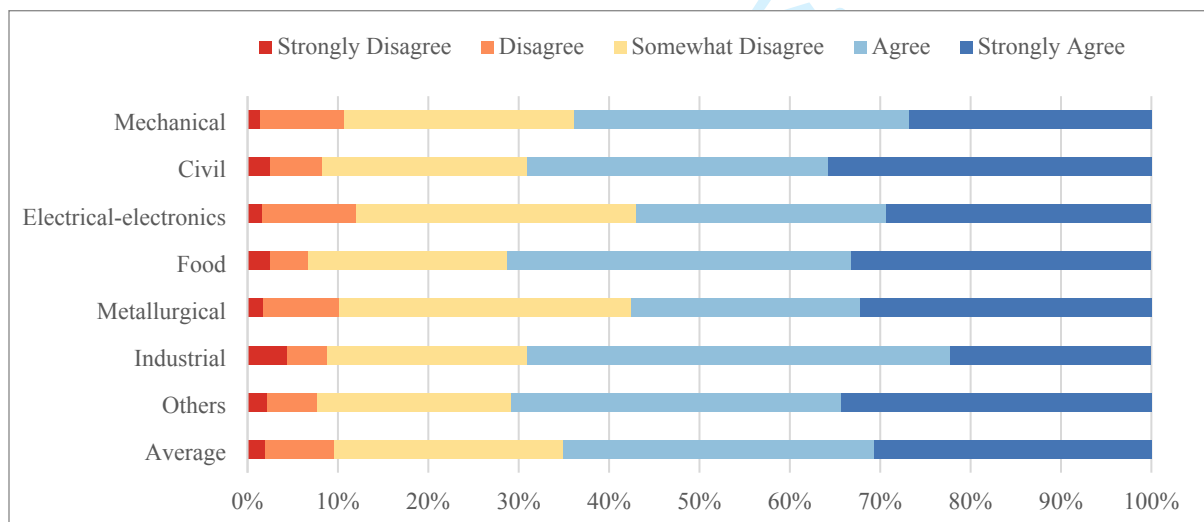


Figure 7: *I strived to improve myself professionally during my undergraduate education.*

Figure 7 shows that most participants might be dedicated to improving their professional skills. However, literature presents contradictory findings as well. Akdeniz (2017), a faculty member in a mid-tier university, studied the success rate of students in the program he has lectured. The result of Akdeniz’s study proposes that nearly every passing year from 2010 to 2016, the ratio of students passing the given courses declined. For example, considering the ‘Differential Equations’ course, the success rate fell from 87% in 2009-2010 to 32% in 2015-16. Hence, it can be thought that the potential gap between students’ academic capabilities and their self-assessment may need to be revised.

All in all, the findings of this study proposes that an average student enrolling to an engineering program may lack some of the fundamental academic skills and competencies, indicating that the university admission system may inadequately assess and differentiate candidates' suitability for the engineering programs.

**Motivation Level of Students**

The interviews reveal that students may not be fully motivated to improve their professional skills. Although Figure 7 presents that a majority of students were zealous to improve their employability skills, many faculty believe that students’ primary goal is only passing the courses and getting a diploma, which refers to a notable absence of commitment for academic growth. In line with these, the interviews with the employers indicate that young engineers may not be highly motivated to improve their professional skills. Many employers claim that young engineers usually tend not to be dedicated to their workplace and regard it as a place to earn money rather than an opportunity for professional growth. Therefore, they may avoid taking initiatives when a problem occurs or prefer complaining about the working conditions. On the other hand, the interviews with unemployed engineers uncover that many students were inadequately motivated for scholarly growth during their undergraduate studies.



They attributed this phenomenon primarily to a sense of hopelessness stemming from challenges in employment prospects. That is, since many students are pessimistic about finding a proper job upon graduation, they are not compelled or prompted to fulfill their potential. Apart from the difficulty of finding a stable job, they may face long shifts, low income, and disproportionately high employer expectations. Those engineers, many of whom had numerous interviews and worked at a company for a while, highlighted that they were offered salaries around the minimum wages which is barely enough for a living unless they live in their family house. Realizing these may demotivate the students, as stated in the interviews. However, a more significant factor, as highlighted by unemployed engineers, was the courses that lack attractiveness, originality and productivity. In this respect, about three-fifths of respondents expressed that the departmental courses were unproductive.

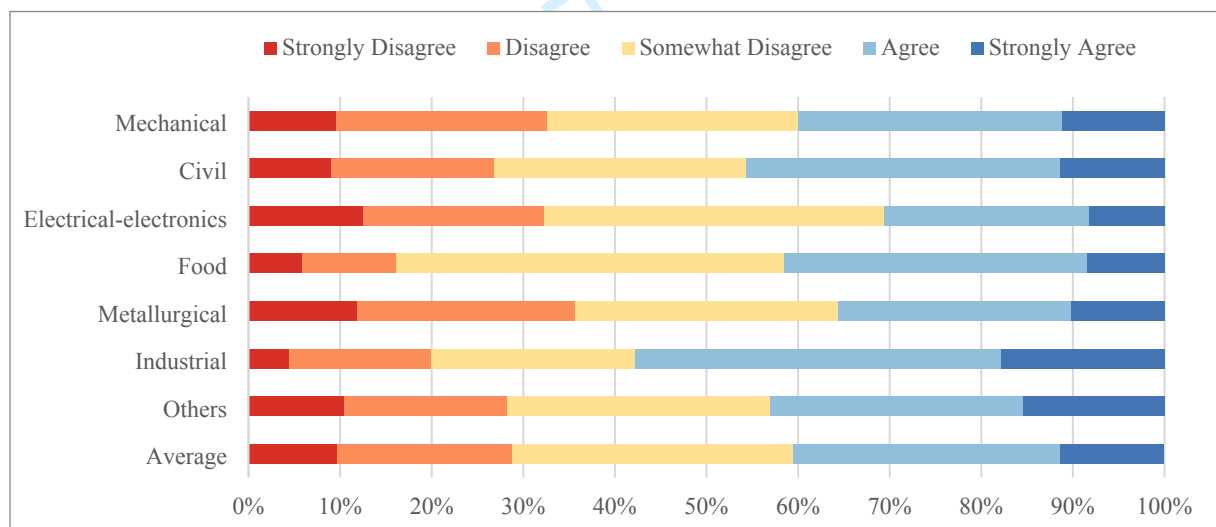


Figure 8: Departmental courses were productive.

As shown in Figure 8, the unproductivity of the departmental courses is a driving force that might inhibit students from being determined for their academic growth. While some faculty share a similar perspective and consider some courses to be boring or not in line with an ideal engineering education for reasons such as problems with faculty expertise, heavy

workloads, lack of hands-on training that causes theoretical education to fall short, and large class sizes that inhibit student-faculty interaction, some others believe that they provide adequate theoretical education despite problems with hands-on training.

In conclusion, there is a consensus that students lack motivation for their academic development. However, the underlying reasons vary among the participant groups. While unemployed engineers consider it a result of poor and outdated teaching and lack of or unsatisfying job opportunities, faculty regard it a lack of ability, and employers a lack of dedication to the workplace. This discrepancy may indicate how deep the problem is since the stakeholders are busy blaming, rather than listening, to each other.

**Issues with Theoretical Education**

The study reveals that problems with theoretical education are mainly about the competency of the academics, the interaction between students and academics, and class size.

Findings indicate that most of the academics are of the opinion that the problems with theoretical education are not related to their competency. They indicate that their academic productivity may decrease due to several factors. Many faculty members expressed that their excessive workloads and students’ academic weaknesses may create an ineffective teaching environment. Some of them assert that their workload is too much to teach effectively. They pointed out their discontent that their workload such as long teaching hours, high number of assessments, or administrative duties might be overwhelming, thereby lowering their effectiveness. In addition to that, academics complain that they are unable to teach in depth when the students’ academic preparedness is low. Many claim that they superficially cover topics because many students lack foundational knowledge. Besides, especially in the newly established universities, many academics may teach courses in the fields they are not specialized in. At this point, a TMMOB chairman who worked as an associate professor in

several newly established universities affirmed that lecturing in non-specialized areas was a common situation for many academics due to the short number of academics. This finding corroborates with literature. It is highlighted that while faculty members are concentrated in older universities with robust research infrastructure (Turhal, 2009), newly established institutions in smaller cities struggle to attract qualified academics (Karaca et al., 2016). Clearly, all issues above cause problems in theoretical education as reflected by the unemployed engineers.

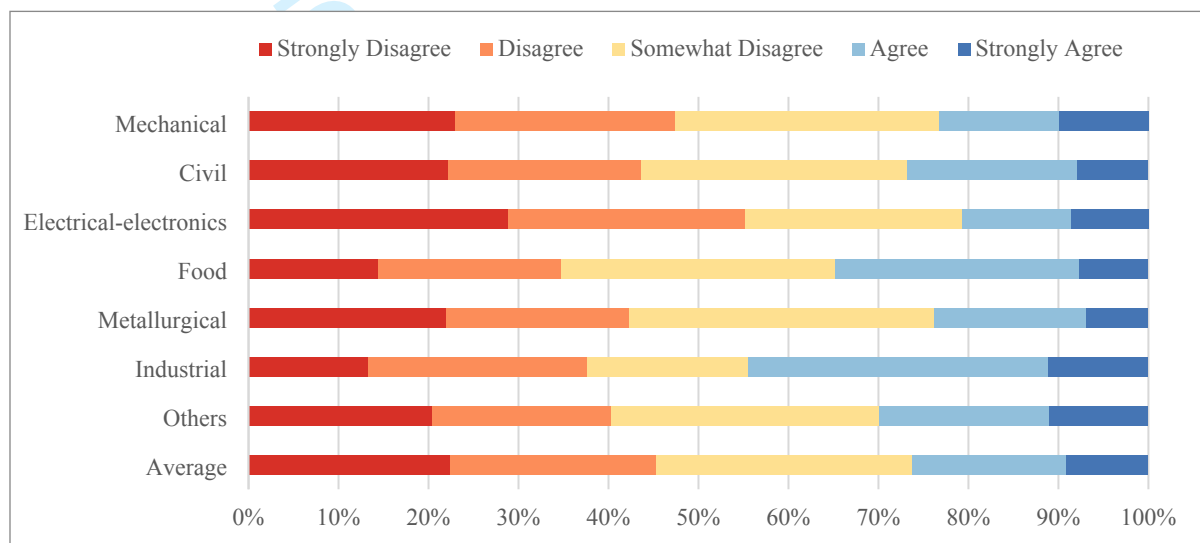


Figure 9: The theoretical education I received was sufficient for my profession.

As depicted in Figure 9, around three quarters of survey participants are disappointed with the theoretical education they receive. Consistently, in the interviews, unemployed engineers highlight that most lectures predominantly rely on rote memorization without adequate elaboration and visualization. They mean that the classes might be monotonous and involve no or limited originality. For example, the slides, which haven't been updated for years, are employed as an end rather than a means of teaching. They state that they may face difficulties in obtaining satisfactory answers to their questions in class. Additionally, they indicate that the lack of practical education to reinforce theoretical knowledge causes a gap in learning.

Figure 10 highlights that three-fifths of unemployed engineers believe that they were not taught up-to-date information about their majors. This shows that academics may fail to follow the latest developments in their fields.

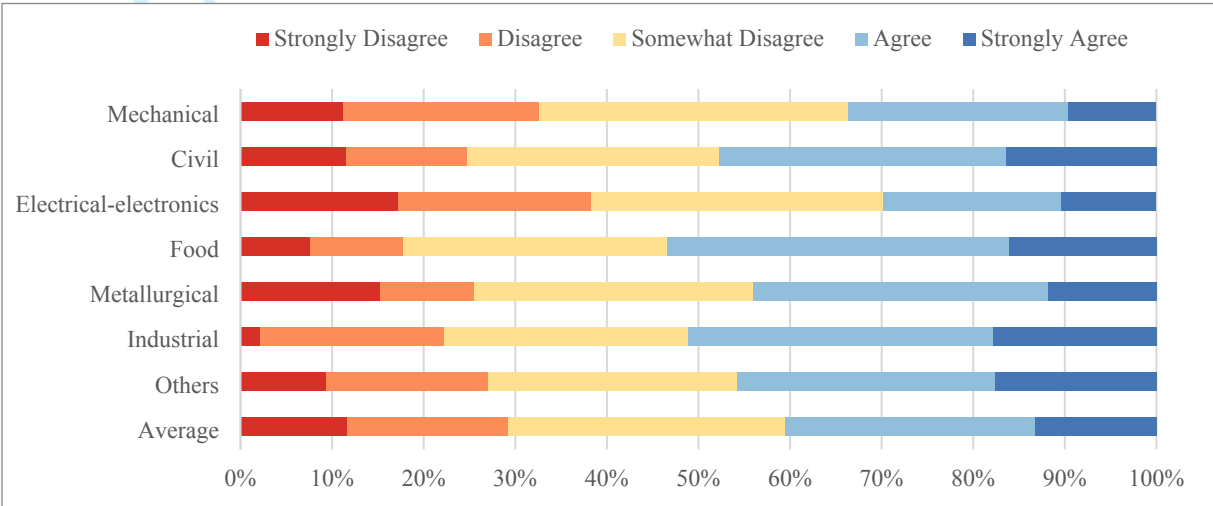


Figure 10: Our departmental courses included up-to-date information about the field.

In this vein, survey participants expressed their dissatisfaction with the relevance and effectiveness of departmental courses, with 62% indicating that undergraduate education inadequately prepared them to innovate and address professional challenges (Figure 11).

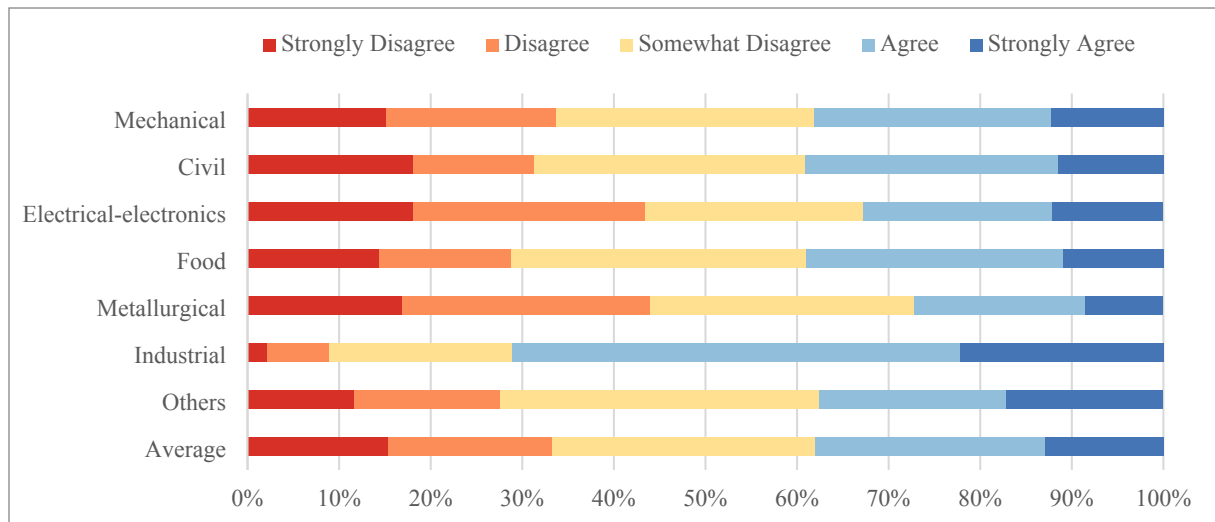


Figure 11: The engineering education I received equipped me with the ability to solve problems related to my profession.

These findings align with Özbayoğlu's (2011) study, which suggest that many engineering programs are outdated and therefore fail to match industry demands. Herein, it should be noted that most employers regard only a small number of young engineers fit to work as an engineer. They put forward the idea that many engineers may lack foundational knowledge such as fluid mechanics or have difficulty even in area calculation which, according to employers, is a sign of the weakness of theoretical education.

Another major issue with theoretical education is the interaction between students and academics. The findings underline a significant deficiency in the interaction between faculty members and students, which negatively affects the quality of engineering education. The majority of unemployed engineers cited a notable absence of mentorship and guidance from academics. Conformably, most faculty members acknowledge an inadequacy in their engagement with students, attributing this shortfall to their high workloads and overcrowded classrooms. This finding corroborates with the studies of Gedik et al. (2018) and Oğuz et al. (2009) who suggested that the interaction between students and faculty members is limited.

Class-size can also be a problem for the quality of theoretical education. It is revealed that the student-to-faculty member ratio within many engineering programs was high. In this regard, faculty members uniformly expressed concern regarding the overcrowded classrooms and their adverse impact on the quality of education. 52% of unemployed young engineers perceived their classes as excessively large, with variations observed across departments and universities (Figure 12).

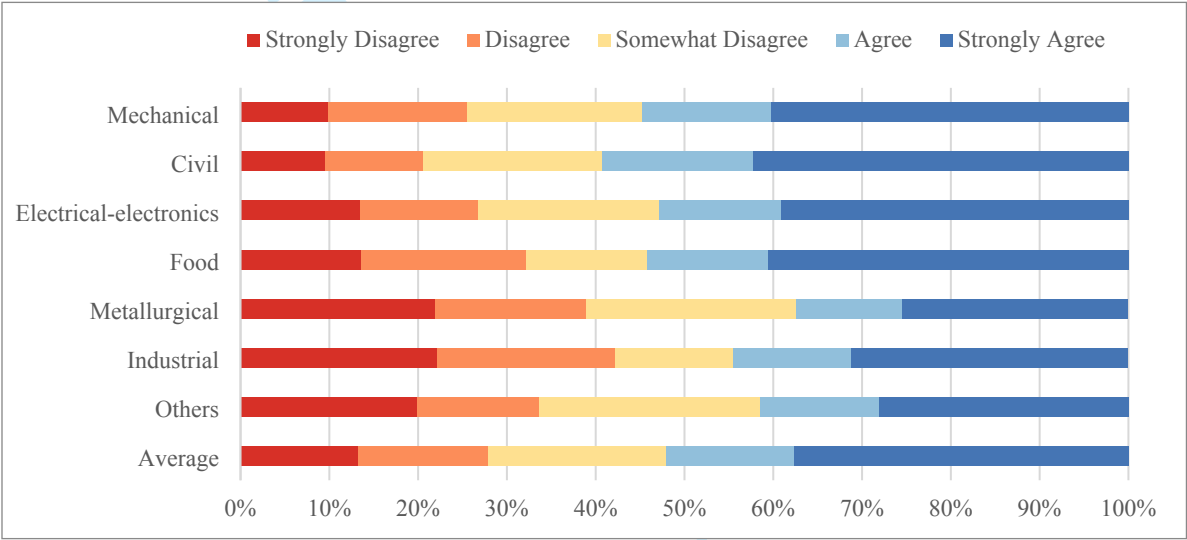


Figure 12: Our class size was higher than it should have been.

Consequently, findings of this study reveal that theoretical education at many engineering programs might be of low quality because academics may teach subjects outside of their expertise or suffer from heavy workloads, many students may fall short of academic competency, the interaction between students and academics is limited, and classes can be overcrowded.

Issues with Practical Education

Findings indicate that there are widespread challenges in practical education in Türkiye. Faculty members highlight significant deficiencies in practical education. They identify

problems under three sub-categories: financial, bureaucratic, and physical. Financial problems are generally about buying new equipment or upgrading the old ones. Accordingly, they suffer from the absence of necessary equipment to carry out an experiment, either the equipment is expensive, or the existing one is old or nonfunctional. When new equipment is needed, the bureaucratic process is usually long and requires a lot of paperwork. Also, the physical conditions may be unworkable such as having small laboratories, sharing them with many students, and being short of assistants who prepare the laboratories before the experiments. These findings align with studies of Bodur et al. (2016) and Oğuz et al. (2009), which pointed out systemic challenges in practical education as well.

Unemployed engineers share a common perspective with academics. In the interviews, they state that practical education is less successful than the theoretical one. Most of them confirm that the laboratories are inadequate if there is any. They face problems such as not touching or using the equipment, or 20 students sharing the same equipment. Consistently, two-thirds of survey participants believe that equipment, hardware or laboratory were inadequate in their departments (Figure 13).

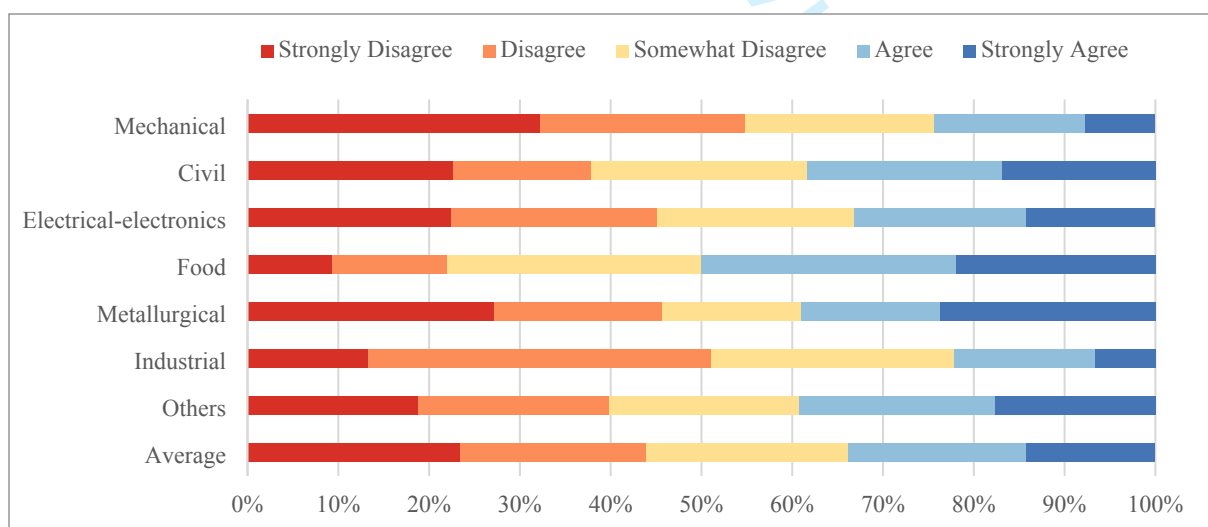


Figure 13: My department was adequate in terms of equipment, hardware and laboratory.

According to them, a greater proportion of class hours are allocated to theoretical education and practical education is frequently skipped. As a result, participants believe that practical education receives less emphasis and depth of coverage within the curriculum, leading to a disparity in the effectiveness of theoretical versus applied education. The survey findings highly corroborate with the interviews. Specifically, 86.8% of respondents perceive practical education as unsuccessful (Figure 14).

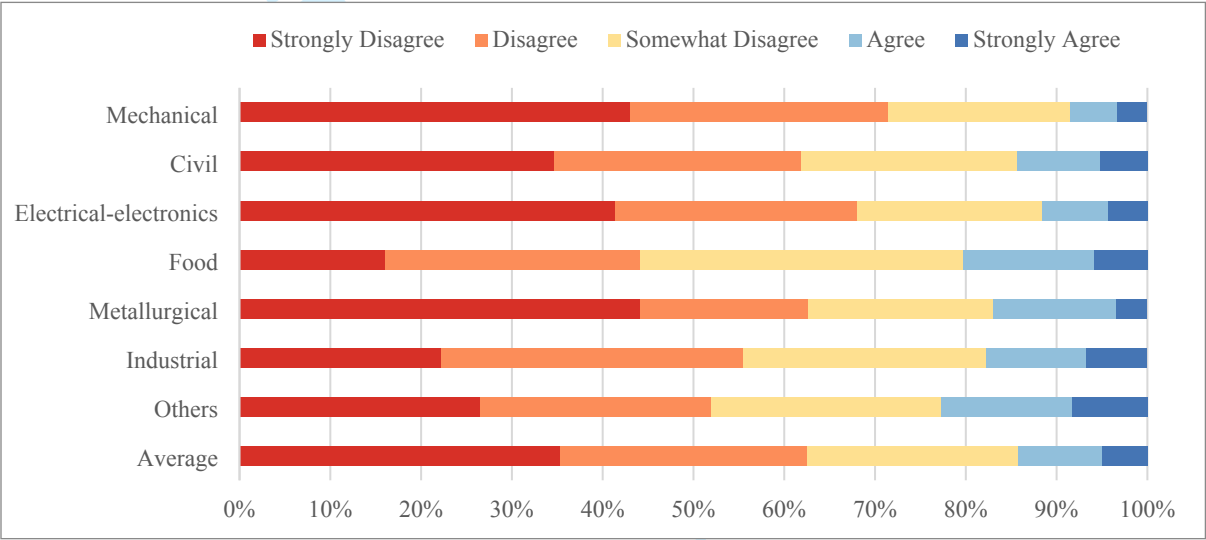


Figure 14: The practical training I received was sufficient for my profession.

The figure clearly shows that nearly nine out of ten unemployed engineers consider the practical education they receive as insufficient to improve their professional skills.

Unemployed engineers further emphasize that the inadequacy of practical education to strengthen theoretical knowledge leads to monotonous lessons and diminishes their motivation. This finding matches those of Mistry and Knowles (2019), who, in a study involving 114 academics in the United Kingdom, indicated that practical education has a pivotal role in enhancing student motivation and addressing skills gaps, thereby bolstering graduates' employability.



The interviews with the employers revealed that many new graduates are uninformed about how to use most of the devices, and they frequently learn it at the workplace. Therefore, employers tend not to allow new graduates to use expensive devices in order to avoid any accident or breakdown. This, consequently, slows the learning and professional development pace of many engineers.

TMMOB chairmen, confirming the inadequacy of the practical education, engaged this problem with the opening of new engineering programs in the last two decades without employing academics sufficient in number and quality, and providing the necessary equipment and physical facilities.

To summarize, each participant group agrees that the practical education at many engineering programs is ineffective. The reasons for this are mainly the lack of necessary equipment, laboratories, or physical facilities.

### **Issues with the Capstone Project**

The capstone project represents a significant point where an engineer candidate may present and refine their existing knowledge and competencies. Statements of unemployed engineers emphasize a widespread recognition of this reality. They agree that a meticulously executed capstone project may play a crucial role for employment. Nonetheless, this study reveals that such recognition is not robustly reflected in the quality of capstone projects as shown in Figure 15.

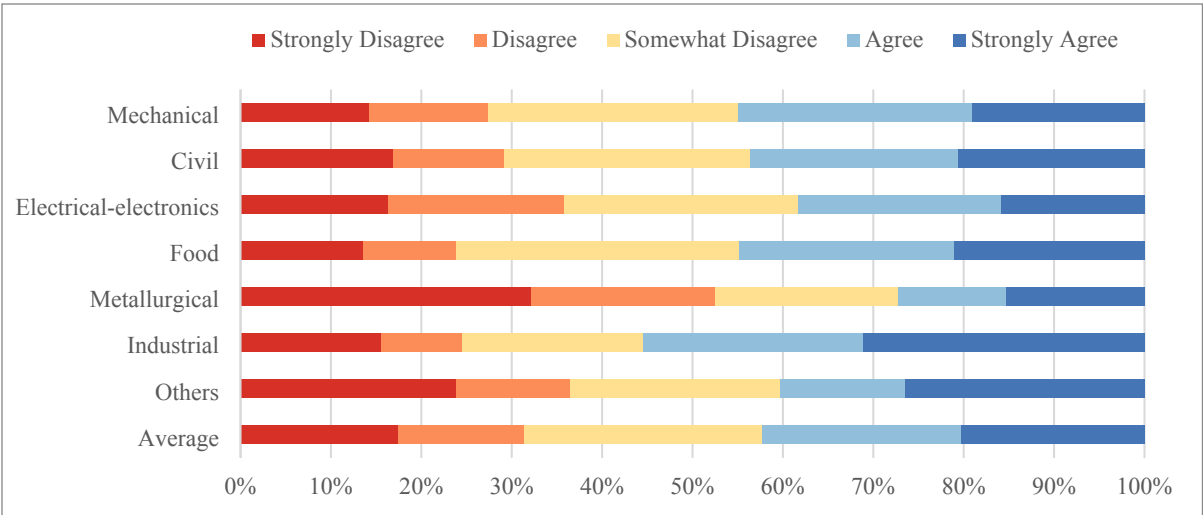


Figure 15: My capstone project developed me professionally.

Figure 15 indicates that less than half of the survey participants (42.4%) benefited from the capstone project. It, therefore, can be claimed that many capstone projects fail to support graduates’ professional growth and meet their intended purpose. This finding matches with the literature, as evidenced by studies such as that of Karakaya and Bostan (2015).

The interviews suggest a lack of standardization in the execution of capstone projects, with considerable differences based on both academics and student factors. Generally, faculty members observe that a significant portion of students fail to allocate adequate attention to their capstone projects, with some only aiming to get a passing score. Conversely, those who engage with the capstone project earnestly may experience accelerated growth in both their academic and professional abilities, consequently enhancing their employability skills. Nevertheless, it is also found that a small number of faculty members utilize capstone projects to address sector-specific issues since they have limited or no connection with the businesses which causes them to be usually unaware of current issues. Recognizing this, most students are discouraged from undertaking projects aimed at identifying and solving sector problems.

The findings suggest that the high number of supervised students per faculty member adversely impacts the quality of capstone projects. This results in insufficient time allocation by faculty members for overseeing these projects. Moreover, it has been revealed that students

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3 have difficulties in determining the topic of the dissertation due to inadequate familiarity with  
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5 occupational issues. Hence, a substantial amount of time in numerous projects is wasted to  
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7 decide what to research because of the absence of proper guidance.  
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10 To conclude, while an elaborate dissertation notably enhances graduates' employability,  
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12 many projects fall short of being beneficial.  
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### 15 16 17 **Issues with Assessment and Evaluation Methods** 18

19 Assessment methods have a crucial role in shaping an educational program. During  
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21 interviews, many unemployed engineers expressed that outcomes-based assessment methods  
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23 are preferred to process-oriented ones such as projects or portfolios. They highlighted concerns  
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25 regarding traditional written exams, often characterized by questions that may deviate from the  
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27 curriculum or resemble those from previous years. This, as a result, may urge students to  
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29 prioritize exam outcomes over the improvement of their professional competencies. In other  
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31 words, a predominant reliance on rote memorization-based examination systems emerges as a  
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33 significant factor impeding the effectiveness of courses (Gedik et al., 2018). Moreover, many  
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35 unemployed engineers question the ability of the assessment and evaluation system to  
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37 accurately classify students' level of attainment. According to them, the exam results, in some  
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39 cases, are predominantly shaped by the personal preferences of the academics rather than the  
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41 inherent difficulty of the course content.  
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46 On the other hand, a number of faculty members express that the inefficiency of the  
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48 assessment and evaluation system stems from students exhibiting low academic proficiency.  
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50 Many academics assert that the academic inadequacy of many students forces them to lower  
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52 the difficulty level of exams. Despite these adjustments, a considerable number of students keep  
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54 failing, and some of them apply various complaint mechanisms to exert pressure on faculty  
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56 members. Besides, in some cases, administrators may recommend academics to prepare exams  
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with a lower difficulty level so as to avoid student complaints. Consequently, some faculty members may opt for assessments with reduced difficulty levels to overcome such challenges.

It should be noted that the above-mentioned problems usually occur in programs admitting students with lower levels of achievement. There, two prominent cases may emerge: either a high failure rate leading to overcrowded classes, or the adoption of an education program and assessment system designed to allow many low achievers to pass. These factors collectively undermine both the effectiveness of the assessment and evaluation system and the overall quality of education.

Issues with Employability Skills of Graduates

The evaluation of graduates' employability constitutes a fundamental aspect in assessing the quality of engineering education. The findings indicate that a great portion of graduates lack essential engineering skills. It is noteworthy that solely a fifth (21.9%) of survey participants affirmed possessing adequate engineering skills upon graduation (Figure 16).

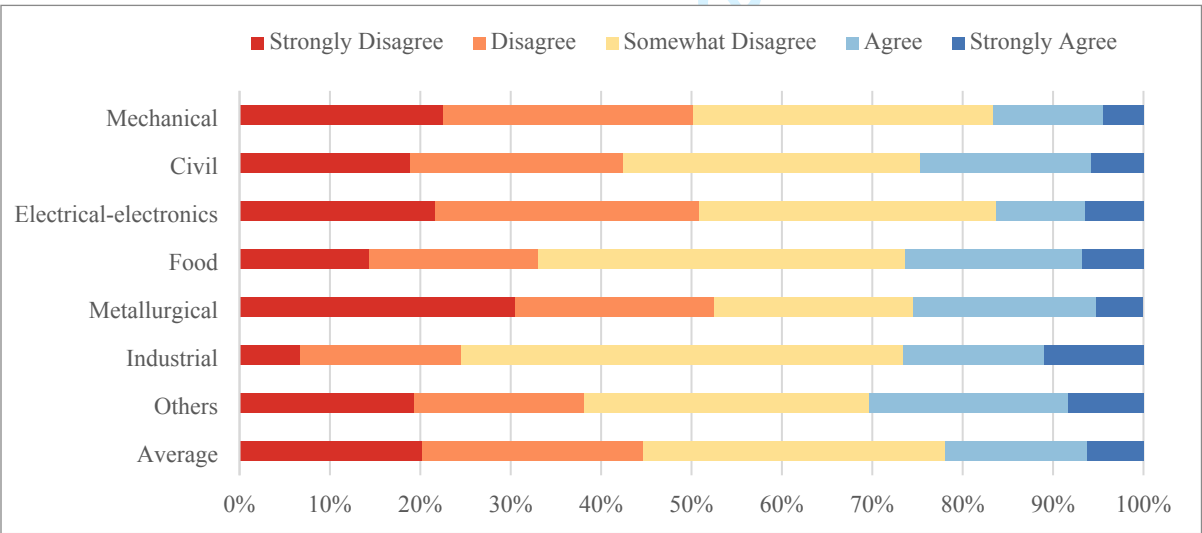


Figure 16: I had the engineering skills upon graduation.

Herein, an unemployed engineer points out that many graduates do not possess the competency of an engineer despite holding a diploma. Insights from interviews with unemployed engineers indicate various systemic challenges contributing to this negative situation, including deficiencies in the academic preparedness of engineering students upon admission, shortcomings in theoretical and applied education, large class sizes, inadequacies in the expertise of academics, and a lack of interaction between academics and students. These findings corroborate with many studies in literature (Akgül et al., 2013; Gedik et al., 2018; Yaşar & Ulugergerli, 2017). Unemployed engineers also state that companies prefer to hire engineers with a previous work experience or whom they have already known, yet many graduates have no or limited contact with the companies they seek employment before graduation. Graduates having no work experience, thus, struggle to be involved in the labor market.

Due to such problems, the graduates may fail to meet the market demands as seen in the following figure.

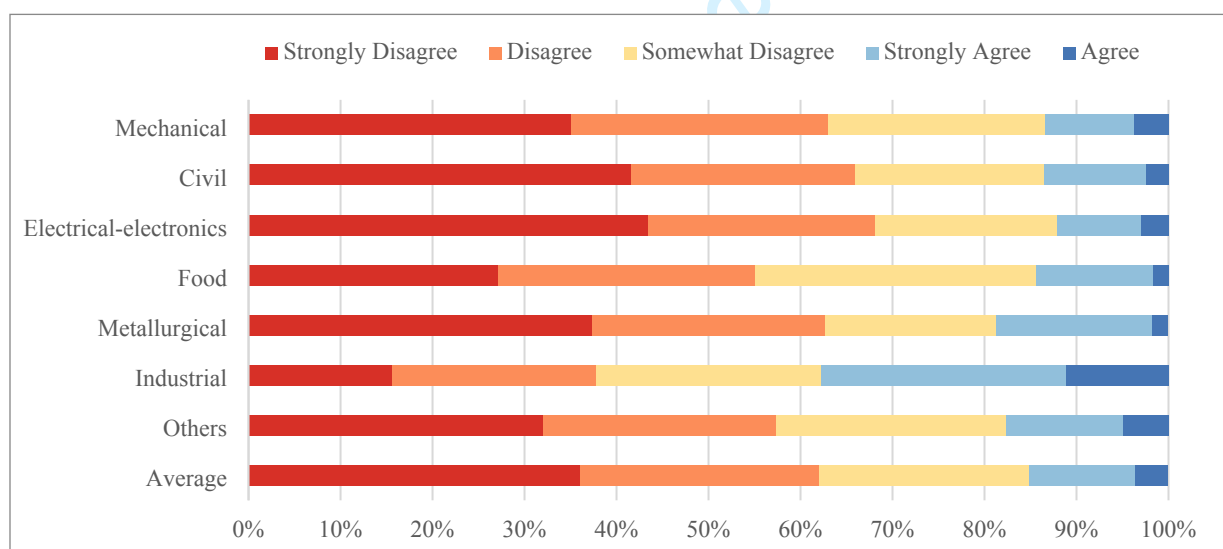


Figure 17: The education I received at university is in line with the skills the market demands.

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Considering the details of Figure 17, it is evident that a huge majority of graduates believe that their employability skills do not suit the market expectations.

Conformably, a majority of faculty members hold a pessimistic standpoint regarding the employability of many graduates. They attribute this to several factors including students' academic weakness upon starting their undergraduate studies, students' low motivation for improving their employability skills, problems particularly in applied education, crowded classrooms, shortcomings in the professional competence of several faculty members, and academics' excessive workloads. At this point, it is noteworthy that academics' expressions on the problems with the employability of graduates can be regarded as an admission that they also fail to properly educate those academically weak students at the start of the degree program.

Chairmen from TMMOB have also voiced concerns regarding the academic quality of graduates, asserting that a significant portion of graduates complete their programs without acquiring some essential engineering competencies. They highlighted various issues such as the inadequate infrastructure and resources especially in the recently established engineering faculties, the academic incompetency of many students enrolling into engineering programs, and challenges related to the professional qualifications of some academics.

Employers participating in the interviews also expressed predominantly negative opinions regarding the competence of graduates. They propose that a considerable number of young engineers facing unemployment are weak in technical skill sets and professional competency. Employers attribute responsibility for this issue not only to shortcomings within the education system but also to the engineers themselves.

Most employers agree that effective communication, language skills, work experience, problem solving skills, working hard and being self-disciplined are among their priorities when hiring an engineer. Some employers claim that they prefer strategies like hiring vocational high school graduates instead of engineers who lack practical skills.They state that while most

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3 engineers are better equipped with communication and language skills, some vocational high  
4 school graduates outperform on practical skills and problem solving skills. That means  
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7 employers focus more on the practical skills the employees possess rather than whether they  
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10 have engineering education or not. This finding suggests that more research needs to be done  
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13 on whether it is really about engineers not having practical skills or whether it is about the work  
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16 being less complex and not requiring engineering skills.

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18 However, as stated by many employers, new graduates are usually inclined to avoid  
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21 working hard. According to them, considering professional growth and doing what it requires  
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24 is ignored by many graduates. They claim that young engineers demand to be regarded as a  
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27 senior worker despite not being committed to the workplace. In other words, most employers  
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30 may demand new graduates to work overtime, aid others and be open to communication, search  
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33 for the recent developments in their majors, have a sense of attachment to the company, and as  
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36 a result add value to it. Employers also declare that a new graduate may not earn well till they  
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39 professionally prove themselves. According to them, a proficient engineer can easily find a  
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42 proper job and earn a good amount of income. Yet, those suffering from unemployment usually  
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45 fail to meet market demands or expect a high salary as soon as they start working.

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47 Based on the findings, it can be concluded that a notable portion of unemployed engineers  
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50 complete their education without acquiring essential professional skills. The substantial  
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53 emphasis placed by participant groups on graduates' academic competency and the quality of  
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56 engineering education may highlight the root cause of engineer unemployment.

## 57 58 59 60 **CONCLUSION and RECOMMENDATIONS**

Employing both qualitative and quantitative research methodologies, this study focused  
on the reasons for unemployment among young engineers in Türkiye. The results unveiled

several noteworthy issues concerning the admission process to engineering faculties, the educational standards within these institutions, and the employability skills of graduates.

The findings indicate that the entry requirements for engineering programs lack selectivity. This aligns with various studies in literature (Birinci, 2009; Bilgin et al., 2013; Akdeniz, 2017; Ersoy and Yavuz, 2019). Because the admissions system appears to be more flexible than it should be, many academically unprepared students, who ideally should not be studying engineering, enroll in these programs, and thus the number of students sharing limited physical resources such as classrooms, laboratories, and equipment increases remarkably. It also has a negative impact on the student to faculty ratio. Therefore, it can be claimed that the quality of engineering education is adversely affected by the admission system applying low standards. However, it should also be questioned how those students who have not acquired the necessary theoretical knowledge and practical skills can graduate from engineering programs. The potential error of admitting these students to the engineering programs cannot be attributed to the faculty. However, if they can graduate without being well equipped with the necessary skills and knowledge, the quality of teaching and faculty can also be questioned. Apparently, blaming the admission system is used by the faculty as a way to avoid taking responsibility for providing proper education.

Furthermore, it is found that the motivation level of students is relatively low. Many students are of the opinion that most courses are insufficiently attractive, productive or innovative. On the other hand, faculty members claim that students' main motive is to pass the courses rather than improving their academic skills, which contradicts with graduates' point of view. Similarly, most employers' assertion that graduates are not committed to improving their employability skills disagrees with graduates' claim that they are expected to work long hours for a low payment. Consequently, it may be suggested that stakeholders' expectations from one



another do not match, and each participant group prefers criticizing the others to assessing themselves.

Additionally, numerous issues with theoretical education are discovered, which corroborate and extend upon existing research (Gedik et al., 2018; Karaca et al., 2016; Özbayoğlu, 2011). Herein, evidence suggests that there are problems with the proficiency of some academics, which is more common in the recently established universities. Analysis confirms that it is frequent for academics to teach courses they didn't excel in when the teaching staff is limited in number or variety which means that content of some courses might lack meeting the industry demands and educate employable graduates. Another problem is the inadequate interaction between students and academics which is a direct result of crowded classes, the high number of students per faculty member, and their heavy workloads.

The issues with practical education seem problematic for many engineering faculties. Data shows that many faculties do not have proper laboratories due to financial and bureaucratic problems in their establishment, renewal and operation. It is concluded that faculties have financial problems at establishing or renewing the laboratories, yet bureaucratic problems that slow the process down may occur even when a sufficient amount of finance is found. Also, students are generally inactive in using the equipment as there are too many students per unit device. Besides, the caution to not to harm expensive equipment and the small number of assistant personnel assigned to laboratories diminish the effectiveness of applied training.

This study indicates that the implementation of capstone projects is not standardized. On the one hand, faculty members may not allocate sufficient time or effort to projects due to reasons such as heavy workloads, high number of project students, and disinterest of students who have difficulty at finding a project topic. In such cases, clearly, many capstone projects are conducted as a prerequisite for graduation rather than to increase the employability skills of students. On the other hand, this study finds that a small number of capstone projects are

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conducted by students seriously and zealously under close observation of academics and draw the interest of the job-market. Analyses suggest that such capstone projects increase the employability skills of graduates. However, it is noteworthy that significant proportions of capstone projects do not fully realize this potential and may fall short of being beneficial.

The research uncovers significant issues within the assessment and evaluation system. Accordingly, faculty members frequently make paper-based exams which may assess students' rote memorization skills rather than challenging their creativity and problem-solving skills. Results suggest that the difficulty level of exams are not standardized and may depend only on faculty members' personal choices. While some faculty members prepare remarkably demanding exams that may lead many students to fail, others may prepare relatively easier exams that may unfairly test students' knowledge and abilities. Herein, participants offer contradictory clarifications regarding the root causes of these problems. Faculty members predominantly attribute these problems to the academic weakness of students. Notably, many academics focus solely on criticizing students without referring to their own responsibilities and deviate from the principled approach of educating competent graduates. They further emphasize that the abundance of low achievers in certain programs prevents the courses from being taught in the required depth and leads examinations to be easier than they should ideally be. Conversely, unemployed graduates point out issues such as exam questions exceeding the scope of the course, repetition of exam questions from previous years, and exam results being dependent on instructors' attitudes. Clearly, unemployed engineers tend to attribute the entire problem to faculty members and the assessment tools, and avoid self-evaluation. That means, participants agree on the presence of flaws within the assessment and evaluation process, yet their perspectives vary, with each group blaming the other stakeholder rather than addressing their own shares.

The study reveals that the employability skills and competency of many graduates are questionable due to the aforementioned issues. It is worth mentioning that only a-fifth of survey participants affirmed possessing engineering skills upon graduation. Herein, it is noteworthy that finding a proper job and receiving a good amount of salary may not be challenging for a graduate meeting the job-market demand. Yet, many young engineers usually fail to do so. As highlighted by the employers, avoiding working hard and taking responsibility are common among many new graduates. While most young engineers demand a higher salary and be respected because of their title; they may lack employability skills such as solving occupational problems, being committed to the workplace and adding value to it, working overtime when needed, speaking a foreign language, and good communication skills. It should also be noted that employers prefer to hire new graduates who have work experience, and they are reluctant to hire the ones who lack work experience. However, they avoid answering the question how would a new graduate gain work experience without being employed. This may indicate that many employers choose to employ proficient ones, yet they abstain from investing in the professional development of engineers.

Clearly, these problems are not solely educational and there are personal issues as well. Therefore, the unemployment problem of young engineers can be attributed not only to the shortcomings within the education system or the labor market but also to the engineers themselves.

Based on our findings, we recommend the followings:

- As the academic readiness of many students is questionable, raising admission requirements may help increase the quality of overall education. Setting higher entry requirements could reduce the number of low achievers admitted to engineering programs, lower the student to faculty ratio and hence increase their interaction with one another. Since this enhanced

interaction may offer more time allocation for each student, the quality of teaching and learning may also be improved.

- Since the student to faculty ratio is high and the professional quality of some faculty is questioned, increasing the number of faculty members by revising their employment standards would help diminish their workload, raise their academic proficiency and thereby improve the overall quality of teaching. This would also facilitate diversified and enriched courses offered. Besides, the higher education system in Türkiye assigns academic activities such as publications as a major role in academic promotion and puts nearly no emphasis on teaching quality. Academic promotion criteria should also include academics' teaching quality which can be assessed by students' opinions surveys and the occupational skills of graduates, and also urge academics to strengthen their teaching skills.
- Although certain students may exhibit limited academic proficiency and a lack of interest in their courses, an educational framework integrating modern engineering problems, emphasizing problem and project-based education, and facilitating applied training would raise student curiosity (Davies and Hodgkinson, 2019; Jemmett et al., 2019) and increase the attractiveness of the courses given. To lessen the problems in the measurement and evaluation system, the weight and frequency of project-based assignments should be increased. Project-based assignments can increase students' awareness of engineering problems, help them plan better capstone projects, and measure the process rather than the outcome, thus encouraging students to become more involved in the educational process. In addition, academics can receive training in test writing to design more standardized tests.
- In order to lessen problems in practical education, a system prioritizing practical education, which could create a more proper and dynamic learning environment to better equip students to meet industry demands, should be adopted. Since financial and bureaucratic barriers stand

as a major problem for academics, closer cooperation with industry should be preferred by them to enhance their physical resources and infrastructure. Joint projects with industry would not only increase the field experience of faculty, but also encourage students to closely experience their prospective career and help them to turn their theoretical knowledge into professional skills, and thus enhance their employability. Such collaboration with external partners may reinforce project-based learning. It also helps make capstone projects more relevant to industry needs, and helps students network with their potential employers. As this collaboration can motivate students to improve their engineering and employability skills, they may also be more focused on performing better in school.

- Businesses should take responsibility in improving the facilities like laboratories there, which eventually help better equip their potential employees.

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