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Ready for a Career in the Agriculture Sector in Egypt? Perceptions of Students, Faculty, and Employers on the Value of Essential Technical and Employable Skills

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Abstract: High unemployment among college graduates has been a big concern in Egypt for many years now. Mismatch in technical competencies and lack of job-oriented skills and inequity in education and career by gender pose a major constraint for Egyptian youth to find employment. Information about whether the gender of the mentor has any effect on the quality of mentoring is also nonexistent. Using web and in-person survey data among agricultural students, faculty, and potential private sector agribusiness employers, this paper attempts to investigate whether there are any significant differences in the application and use of career guidance by male and female students to prepare for careers prospects and align with the industry needs. The results will validate if there are significant differences in between male and female faculty in their perception of relevance of technical and employable skills as well as the use and application of career guidance and mentoring by students to increase their prospects with employers. The findings will be used to develop interventions that would help align student skills with employer expectations as well as upgrade faculty competencies.

Keywords: youth; gender; advising; mentoring; skills; employment

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1. Introduction

With a population exceeding 100 million people, Egypt has made some notable improvements with regard to some key human development parameters. Egypt's human development index (HDI) value rose from 0.546 to 0.700 as life expectancy index and education index, consisting of average years of schooling received and expected years of schooling, increased between 1990 and 2019 [1]. Despite these favorable developments, labor force participation remains low at less than half of the working-age population [2]. Overall, the unemployment rate has remained around 11 percent, but it has doubled among women. According to the United Nations, Department of Economic and Social Affairs [3], Egypt's population is relatively young, with one-third of the population being under 15 years of age and another 17 percent between the ages 15 and 24.

Providing employment opportunities for the growing youth population is a monumental task for the Egyptian government given the current employment situation, which is already problematic, with one in three persons between the ages 15 and 24 being unemployed (Figure 1) [4]. The unemployment rate is even more concerning in the agriculture sector, where in 2018/2019, females constituted 46% of agriculture university students in public universities [5], yet only 18% were employed in agriculture-related occupations [6].

Since 2011, youth unemployment in the country has been on the rise. This situation is concerning because a growing body of literature shows the social, economic, and political threats resulting from youth unemployment and underemployment [7]. The lack of jobs and alternative economic opportunities trigger detrimental socioeconomic consequences, leading to rampant unemployment and poverty. They also increase the likelihood of youth

engaging in crime, violent behavior, and acts of political aggression [8]. The nationwide protests led by Egyptians youth in January 2011 is a prime example of the ramifications of youth unemployment leading to economic and political upheaval and instability.

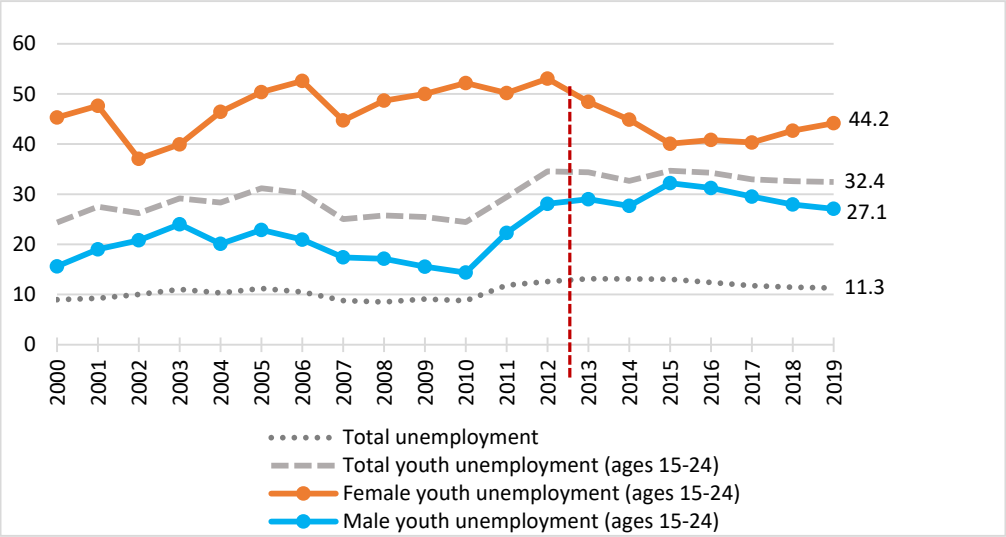

Figure 1. Unemployment (% of total labor force) (modeled ILO estimate); Source: [4].

Promoting youth employment has been a priority in Egypt's policy discourse, and large investments have fueled youth employment projects in the country to assist youth in finding wage-based employment or provide them support to start micro-businesses. In the aftermath of the Arab Spring, the Government of Egypt launched programs to provide short-term employment opportunities for the unemployed, unskilled, and semi-skilled workers; access to basic infrastructure and community services; and short-term training and other support services to enhance the employability of youth [9]. Most policies prioritize stabilizing the economy and creating a conducive business environment to stimulate investments. As such, interventions are needed to advance youth education, skill building, and technical competency along with the programs that can stimulate economic growth and job creation, polices, and investments. Proper mentoring and advising to youth while they are at the schools and colleges is very important to keep them focused on their studies and help them attain learning that could enable them to succeed in the post-college life [10]. The following section discusses mentoring areas, namely mentoring and its role as a student career preparation tool, mentoring in higher education settings, and outcomes of mentoring and advising to students and professors.

1.1. Mentoring and Its Role as a Student Career Preparation Tool

Advising and mentoring are key functions in preparing students for career opportunities [11,12]. The terms mentoring and advising are commonly used interchangeably in the literature to refer to the formal and informal interactions between students and a trusted guide. In university settings, faculty members and counselors perform these functions both in a coordinated and casual manner [13]. It is important to note though, in higher education, advising is primarily focused on academic success except when special advising is provided for career and other aspects of university life. McWilliams and Beam [12] further noted that guidance for career preparation provided through mentoring, on the other hand, whether formalized or otherwise, extends beyond teaching and learning engagements and includes career functions. This session discusses the concept of mentoring as an apparatus for career guidance for students.

Mentorship is defined as "a professional, working alliance in which individuals work together over time to support the personal and professional growth, development, and success of the relational partners through the provision of career and psychosocial

support" [12]. Ideally, mentoring is to be provided to students of either gender equally and without any biases and by mentors of either gender. However, Shapiro et al. (1978) [14] and Hunt and Michael (1983) [15] noted many scenarios of mentoring relationships by both genders and the possible effect of those relationships (Table 1).

Table 1. Gender-based variations in advising relationships.

		Gender of Protégé			
		Male	**Female**		
Gender of mentor	Male (M)	MM, F	MF, F	Formal	Basis
	Female (F)	FM, F	FF, F		
	Male (M)	MM, I	MF, I	Informal	
	Female (F)	FM, I	FF, I		

Adapted from [14,15].

The basic notion of mentoring could create the impression that it is a one-way process where information and guidance is transferred from mentor to mentee. Most mentoring functions can result in mutual growth of two types, namely psychosocial and career development [16]. Psychosocial development results from mentoring that enhances the sense of competence, self-confidence, and effectiveness in a given role, while career development enables career advancement opportunities through functions such as sponsorship, exposure and visibility, coaching, protection, and challenging assignments.

While recognizing the idiosyncratic attributes of student–faculty mentoring relationships, this study will align with the eight features of mentoring laid out by Johnson (2015) [17]: (1) mentorships are enduring personal relationships; (2) mentorships are reciprocal and mutual; (3) compared to mentees, mentors demonstrate greater achievement and experience; (4) mentors provide mentees with direct career assistance; (5) mentors provide mentees with social and emotional support; (6) mentors serve as models; (7) mentoring results in an identity transformation; and (8) mentorship offers a safe harbor for self-exploration. It is clear from this discussion that mentors have more and greater roles to play in mentorship; however, mentoring relationships are intrinsically interactive and have varying degrees of mutuality, congruence, and gender sensitivity [18]. A study involving Morocco, Algeria, Tunisia, and Egypt demonstrated that male and female enrollment in tertiary education has a positive influence on economic growth and further emphasizes that women's education and their participation in the labor force can contribute to economic development [19].

Accordingly, as the relationship progresses, the parameters of the relationship are likely to evolve. According to Kram (1983) [16], mentoring relationships typically go through four phases: an initiation phase, a cultivation phase, a separation phase, and a redefinition phase. Usually, the outcome of this interaction is a gain in interpersonal respect, professionalism, collegiality, and fulfillment of responsibilities [20]. There is a vast body of empirical research exploring the outcomes of mentoring on career development [20–23]. An initial conceptual framework consisting of context, characteristics of the mentor, characteristics of the protégé, stages and durations of the mentoring relationship, and the positive and negative outcomes of the relationship to the mentor, the mentee, and their organization was presented by Hunt (1983) [15].

Globally, the number of women in tertiary education is gradually surpassing the number of male students. Traditionally, women were limited to pursue degree programs in some disciplines such as humanities, liberal arts, and education [24]. However, in recent times, this trend is slowly disappearing, and women are entering undergraduate programs in science, technology, engineering, and mathematics (STEM) fields. Despite women's increased participation in traditional and non-traditional disciplines, the institutional mechanisms, such as formal outlets for career preparation to support women to succeed in particularly non-traditional fields, are still lagging. As a result, women around the world

continue to face challenges in gaining visibility and receive fewer opportunities in STEM fields compared to men [25]. In addition, the STEM and Gender Advancement project of the United Nations Educational, Scientific, and Cultural Organization reports "the gender gap in science widens significantly in the transition from bachelor's to postgraduate levels (e.g., master's or doctorate levels) and into research and careers" (Figure 2) [26]. While this outcome is troubling, the aggregate numbers mask the country-level variations in women's representation in STEM fields driven by contextual factors that could be more concerning. Yet, there is a limited body of literature focusing on gender differences in mentor–mentee mentoring relationship and outcomes related to career development.

Figure 2. World average of the proportion of male and female students in higher education programs and research; Source: [26].

Contrary to the male counter parts, women also face limitations due to prevailing social norms and the value systems that traditionally assign women into preconceived social roles that provide minimal opportunities for women to advance academically and professionally.

Authors such as Balckwell (1983) [27], who examined mentoring relationships among African American students in graduate and professional schools, found that those women are less likely to have mentors compared to men, but Leck, Orser, and Riding (2009) [28] found no difference amongst men and women in their proclivity towards being mentored. Nevertheless, the findings of [27] divulged that under certain sociocultural circumstances, such gender, race, and ethnicity, opportunities to enter mentoring relationships may become more challenging. Under such circumstances, mentoring offered through formal programs becomes an avenue to engage with a mentor for minority groups, including women [29]. Attitudes pertaining to the potential outcomes of mentoring could vary between women and men due to underlying gender-based career impediments resulting from discrimination and prevailing male hierarchies [30].

Some literature states that mentors and mentees desire homogeneity in mentoring relationships, implying that most female mentees prefer to have female mentors and vice versa, especially in fields dominated by women [29,31]. Single-gender dyads have been found to promote interpersonal comfort [32] and provide better psychosocial and career development experience [30,33].

Sosik and Godshalk (2000) [34] conducted research to ascertain the perceptions of 200 protégés on the extent of role modeling as well as psychosocial and career development from their experiences with mentoring relationships of different gender combinations. They found that female mentors provided more role modeling but less career development in both homogenous and heterogeneous mentoring relationships. Interesting, the degree of ca-

reer development was highest in relationships involving male mentors and female protégés. Other studies have shown that successful mentoring relationships even with diverse modes and paradigms have helped women overcome some of prior mentioned constraints, exert agency and power, gather useful information and insights about career advancement and organizational politics, and attain better access to resources and networks [35–41].

1.2. Mentoring in Higher Education Settings

The importance of mentoring for both undergraduate and graduate students is widely discussed in the literature. A systematic and comprehensive review was conducted initially by [42] covering empirical research on undergraduate students' mentoring from 1990 to 2007 and subsequently expanded to a compilation comprising scholarship from 2008 to 2015 [43]. Across the board, both publications attested to the importance of mentoring as an effective tool for "supporting undergraduate students' development and success" and "promoting social justice and equity and diversity, particularly in STEM fields" [43] (p. 73, 74). The authors present a conceptual framework founded on the work conducted by Hunt and Michael (1983) [15] on undergraduate students' mentoring. This framework recognizes links between students' characteristics and educational context, their collective contribution to relationship features, and forms of support, which ultimately result in students' positive experiences and outcomes.

The form of relationship specifies the individual with whom mentoring relationships can be formed, such as faculty, staff, graduate students, peers, and relationship structure, which can be one-on-one, e-mentoring, group, etc. The developmental relationship that serves as the mechanism for receiving guidance and support and materializes from these factors is influenced by relationship features and forms of support, which are in turn shaped by the educational context and students' characteristics. This interplay between the model elements characterizes and differentiates each mentoring relationship [43]. The model has the flexibility to adapt with various relationship forms and structures and help differentiate mentoring relationships and their functions from a supportive relationship, for example, short-term academic advising [17].

Professors' role in the university extends beyond their primary role as an educator and a supervisor for educational and research activities. Student often look up to their professors for reliable direction and guidance to shape their personal traits, academic goals, and career path. In literature, the "faculty" in a student-faculty mentoring relationship of this nature is referred to by different terms: advisor, counselor, role models, and mentors, among others [44–46]. A student is the mentee or the protégé. Interchangeable use of various terminologies to characterize the faculty's role in a student-faculty mentoring relationship makes it difficult to arrive at one functional definition for this interaction. In higher education settings, mentoring can take place formally and informally [47]. Therefore, except when there is a formalized arrangement or program in place, the parties are left to their own interpretation and have the flexibility to form their own construct [48]. Whatever the arrangement, effective mentoring is critical to shaping and guiding undergraduate students [43]. In this paper, "faculty-student" and "mentor-mentee" terminologies are used interchangeably.

The foundation for the success of student-professor mentoring relationship is to find the right professor who can serve as an effective mentor [49] who can understand the mentee's needs, set clear mentoring goals, focus on building competence, and provide continuous support, among others [50]. However, a body of literature highlights that women have fewer opportunities to find mentors because they encounter a plethora of constraints. Some of these challenges include lack of access to mentors [51], scarcity of potential female mentors [52], exclusion of women from formal mentoring programs [53], and gender-based discrimination [54]. Further, inability to build rapport and address gender-specific problems may deliberately discourage women pursuing cross-gender mentoring relationships [55]. The findings of a study involving female African American school administrators demonstrated that forming supportive relationships were not as difficult as

finding mentors who could provide genuine support and opportunities [56]. Though these insights were drawn primarily from non-academic settings, similar issues can transpire in higher education. Contrary to the above findings, Burke (1984) [57] concluded that women were just as capable as men of having a mentor.

The literature is divided when it comes to students' gender preferences for mentors. There is a tenet in some academic circles that female professors are preferred by female students [58]. Certainly, female students can be inspired to achieve academic and career success by emulating their female professors. The caveat is that female students in academic fields dominated by men may have limited access to female mentors. In such a situation, female students seeking mentoring will need to form cross-gender mentoring relationships. In predominantly male academic cultures, fewer female faculty members are in positions of authority and power and may not always have access to important information and knowledge that can enrich the mentoring experience of their students. Another study by Erkut and Mokros (1984) [58] found proportionality in female students' selection of female professors in the faculty to the number of female professors, but the fraction of male students selecting female professors was considerably small. Tenenbaum et al. (2001) [59] reported that, proportionate to the number of male and female professors, both male and female students were more likely to work with male mentors, but male students showed a preference for homogenous mentoring relationships.

Students' selection of their mentors can be driven by reasons other than mentors' gender. The work by Jacobi (1991) [60] showed that male students choose their mentors on the basis of their reputation, power, and ability to assist with career development. Female students, on the other hand, sought mentors with successful professional and personal lives from whom they could model their own lives. According to [58], academic interest is a key commonality between students and their mentors.

1.3. Outcomes of Mentoring and Advising to Students and Professors

A combination of technical (hard) skills are generic skills learned at educational and vocational training institutions or on-the-job and non-technical (soft) skills, such as communication, interpersonal, writing, and presentation skills [61], that make-up employability skills [62,63]. Employability skills, also known as job-readiness skills [64], constitute an assortment of work-related knowledge, skills, and attributes [65]. Riley (2006) [66] stated that mentoring relationships can contribute to the development of both technical and soft skills. Accordingly, a graduating student's employability can be enhanced through an efficacious and progressive mentoring process. Soft skills, also known as transferable skills, comprise "character tOraits, attitudes, and behaviors—rather than technical aptitude or knowledge," which are generally" intangible, nontechnical, personality-specific skills that determine one's strengths as a leader, facilitator, mediator, and negotiator" [67] (p. 457). Psychosocial support and career guidance are the most common factors motivating students to seek mentoring [16,23,68]. There have been several attempts by scholars to expound on mentors' functions toward psychosocial support and career growth in students. One such model by [69] is shown in Figure 3.

Overall, these mentoring functions aim to instill confidence, independence, and competencies in mentees [70]. The sharing of complete and accurate of information, providing clear guidance on academic matters, and supporting with academic planning are key characteristics of high-quality mentoring [71]. The conception of career guidance adopted here is not confined to mentoring that helps students find employment opportunities. It involves the preparatory work and the creation of pathways through a concerted mentoring process to build skills, competences, and personal attributes, resulting in and leading to lucrative academic and career outcomes through alignment with the demands of the job markets.

Figure 3. Mentor function model. Source: [69].

Mentoring can be used as a supportive and assistive tool to help minority students overcome various personal, sociocultural, and contextual challenges [60,72–74]. In addition to women, minority students classified as individuals from ethnic populations, social service groups, and those with medical conditions (health problems and physical and mental disabilities) can benefit from mentoring tailored to their specific needs [75]. While building self-confidence, mentors offer minority students encouragement and serve as their role models [76]. Despite the many benefits, shortage of faculty mentors (Thomas et al., 2007) [73] along with lack of mentoring opportunities [77] and dysfunctional mentoring relationships [78] are amongst the limitations minority students face. According to McGuire [79], when minority students do receive some mentoring, it will primarily be psychosocial support and less career guidance. Even so, successful mentoring programs can help curtail drop-out rates of minority students and at-risk students [80].

According to scholars such as Higgins and Kram (2001) [22], the current career environment is changing, requiring mentoring relationships to evolve and adapt to current conditions. They identify four types of change to the context that can impact careers and career development, namely changes to employment contracts, changes in technology, changes to organizational structures, and changes to organizational diversity [17] (p. 266,267). Mentoring relationships and career guidance initiatives at higher education institutions should be cognizant of these ongoing phenomena. This requires faculty mentors to have current information on job market trends and career environment such that they can provide appropriate career guidance to future graduates [10]. Mentoring in the current career context, therefore, should focus not only on students' academic accomplishments but also on helping them to smoothly transition from school to work and empowering them with job-specific technical and soft skills.

Reciprocal benefits to mentors are also discussed by scholars [81,82]; a theoretical review found a sense of satisfaction and fulfillment as a fundamental benefit. Other benefits discussed in the literature are generativity [83], satisfaction of sharing skills, and wisdom and self-rejuvenation [44]. Mentees' feedback can be used constructively to improve mentors' performance [81]. New technologies and curriculum could empower mentees with up-to-date insights on best practices, tools, and techniques, which can also benefit the mentors if they are openminded and willing to relax perceived hierarchies to yield mutual benefits from a mentoring session. As with teaching evaluations, professors can use students' constructive criticisms positively to improve themselves and develop characteristics favored by students. The guidance and advice mentors provide to their students to

inculcate personal qualities and professional skills are a way of reminding themselves the importance of these attributes and upholding intellectual and professional standards [84]. Teaching of professional skills further reinforces a deeper understanding of such skills. The findings of Eby and Lockwood [85] concur that mentoring can serve as a process for mutual learning, and mentors used the experience to reflect on their own professional- and career-based strengths and weaknesses.

The extant literature and experiences from around the world demonstrate that career guidance can play an important role in career enhancement through an array of interventions that facilitate job-specific knowledge and training, increase awareness on the career context and organizational culture, and facilitate upward mobility, especially for women [35,36,40,68,80,86]. Nevertheless, there is a dearth in the literature focusing on the quality of mentoring in academic settings and specific outcomes on student career development. In particular, in the context of the higher education system in Egypt, hardly any literature is available investigating issues related to mentoring focusing on career development of university students, such as quality of career advice, effectiveness of career guidance, and presence of any gender-based differences, amongst others. This paper attempts to fill this gap in the literature and examine if there are any difference in the substantive value of career guidance based on the gender of mentor.

This study aligns well the social cognitive career theory (SCCT) evolved after Bandura's (1986) [87] social cognition theory. As discussed in NASEM (2019) [13], the SCCT has the core premise that individuals' behaviors are socially constructed and influenced, and it is used to explain individuals' motivation, goal setting, and persistence in achieving a desired academic outcome and career path. Even though it directs mentees to constantly examine their contexts, their efficacy, and outcome expectations, it is the responsibility of mentors as well to understand their contexts, understand their mentees' expectations and career path, and help them prepare for that.

As part of the Center of Excellence for Agriculture (COEA) project funded by the United States Agency for International Development (USAID), a needs assessment for human resource development was conducted in 2019 involving five universities in Egypt, namely Ain Shams University, Assuit University, Benha University, Cairo University, and Suez Canal University. The COEA project was initiated to address one of the growing concerns identified by the Egyptian government in the Egypt's Vision 2030 report [88]. The report points to the alarming unemployment rates among graduates, suggesting that nearly one in every three unemployed individuals is a university graduate. One major contributory factor is the mismatches between university learning outcomes and labor market needs. Education and training is one of the ten strategic pillars identified by the government to foster sustainable development, and it specifically identifies the need for non-discriminatory, high-quality education and the provision of "necessary skills to students and trainees to think creatively and empower them technically and technologically" [88] (p. 13). However, in today's career context, bridging the skill gap in graduates cannot be achieved by merely addressing pedagogical and curricular constraints. The COEA project aims to co-create multidimensional interventions backed by data. The goal is to create the next generation of workforce-ready university graduates empowered with skills and competencies who can make direct immediate impacts on Egypt's agricultural economy. Appraising the current technical and non-technical skills in students and knowing their sources of career guidance are key foci of the needs assessment. As demonstrated by the critical analysis of various empirical studies in the previous section, it is evident that effective career preparation and guidance are crucial steps towards students' career success.

2. Methodology

2.1. Research Questions

Q 1: Do students' subjective self-evaluation of technical and employability skills differ by gender?

Q 2: Do various sources of career mentoring change the students' subjective self-evaluation of technical and employability skills?

Q 3: Do various frequencies in using career mentoring change the students' subjective self-evaluation of technical and employability skills?

Q 4: Is there a difference amongst students', professors', and employers' perception of the level of technical and employability skills in students?

Q 5: Do professors' value of technical and employability skills have an impact on students' perception of level and relative importance of those skills?

Q 6: Is there a gendered difference in the faculty's perceptions of the importance of technical and employability skills?

2.2. Research Locations

The selection of research sites was performed within the confinements of the project. Ain Shams University (AS), Assuit University (AU), Benha University (BU), Cairo University (CU), and Suez Canal University (SC) collaborated for the study. AS had the largest student population of 191,086, followed by CU (184,000), BU (89,471), AU (82,736), and SC (28,685) [6]. All five universities had a Faculty of Agriculture with a similar composition of the academic departments. All protocols and questionnaires were reviewed and approved by the Purdue University Institutional Review Board (#1906022352). In addition, with assistance from the local partners, potential private-sector agri-business employers were also contacted and invited to participate in the study.

2.3. Population

The target population for the study included three categories of key stakeholders, namely agriculture students, faculty, and potential private sector agri-business employers. The population of students was limited to undergraduate students currently enrolled in the Faculties of Agriculture at the five universities. The faculty population included assistant, associate, and full professors from the faculties. While the results may be applicable to other graduate students and other faculties and universities, this research presents the perspectives of these three groups. Employers were recruited from those industries where university professors were collaborating with or providing consultancy services. Leads of some commodity organizations who were managing their agribusinesses were also invited.

2.4. Questionnaires

Three similar yet somewhat distinct instruments were used for data collection: one for each stakeholder group. The survey was designed to gather both qualitative data through a mix of demographic, multiple choice, Likert scale, and matrix-type questions. The questions in the student questionnaire were structured to gather information on student demographics, degree program, year of enrolment, completed level of education, field of study, factors that motivated them to choose their field of study, sources of career advice, post-graduation aspiration, as well as frequency of seeking advice and participation in career-preparation activities. The questionnaire for professors was structured to gather information on the professor's academic background and demographic information along with their expectations of fields with growing job opportunities, degrees that are most demanded, and fields with the most job prospects. Professor appraisal of student ability to practice the 16 skill-building activities was also collected. The employer questionnaire included questions that helped to draw information on the type of agri-business the respondent was involved in, and like the professors' questionnaire, it contained questions to determine employers' forecast of areas with the highest growth within the agriculture sector and academic qualifications needed to fulfill these future opportunities.

Defining valuable skills for the evolving workplace is not an easy process [89]. For all three groups, a matrix question was crafted to assess their perception of 35 competencies (Table 2). The students were asked to self-assess the level of each competency they possess and give their perception on the value prospective employers place on those same

competencies. The professors were asked to gauge the value of the 35 competencies to employers and provide their opinions on the level of those competencies in new university graduates. Similarly, the employers were requested to select the value they place on the 35 competencies in new employees and the level they observe in new university graduates. These competencies measured in this study are broadly divided into technical skills and non-technical skills based on the definitions provided by Sherer and Eadie [90]. Together, these skills help students swiftly transition to a job and thrive in it after graduation. Technical skills are those skills that are subject or discipline-oriented and are used to perform specific job-related functions. Non-technical skills, also referred to as employability skills, are a set of skills and personal attributes that are transferable vertically within an organization and horizontally between organizations. The employability skills are grouped into nine dimensions: communication, ethics and values, teamwork, problem solving and critical thinking, initiative, and enterprise, planning and organizing, managerial and leadership, learning, and digital literacy. Records with missing values were not included when calculating the ten composite skill variables.

Table 2. Measured skills and competencies.

I. Technical skills		
1. Knowledge of subject matter		
2. Ability to apply academic knowledge to real scenarios		
3. Applied math		
4. Knowledge of and ability to apply technical skills specific to a job		
5. Knowledge of and ability to apply technologies specific to a job		
6. Familiarity with the latest technologies		
Non-technical/Employability skills		
II. Communication	**III. Ethics and values**	**IV. Teamwork**
7. Oral communication		
8. Written communication	11. Knowledge of ethics and best practices in field	13. Ability to function as part of a team
9. Proficiency in English	12. Ability to make ethical decisions	14. Working with others from diverse backgrounds
10. Proficiency in other languages other than Arabic and English		
V. Problem solving and critical thinking	**VI. Initiative and enterprise**	**VII. Planning and organizing**
15. Analytical		
16. Problem identification and solving	21. Creativity	24. Ability to plan and organize
17. Ability to interpret data and make inferences	22. Ability to work independently	25. Time management
18. Ability to work across disciplines	23. Knowledge of industry or potential employer	26. Proactivity to tasks
19. Customer service		
20. Ability to manage complex tasks/projects		
VIII. Managerial and leadership	**IX. Learning**	**X. Digital literacy**
27. Financial management	31. Self-motivation to learn new things and work	33. Use of MS word, MS excel, email, the Internet
28. Organizational management	32. Adaptability to changes in the field or workplace	34. Advanced computer programing
29. Human resource management		35. Ability to access different resources for information
30. Conflict management		

The technical skills include skills that reflect foundational academic learnings, theoretical knowledge, and disciplinary competence [91]. Under employability skills, communication skills entail verbal, written, and language skills needed to effectively exchange information [92]. Ethics and values represent commitment to work, independence, equality, efficient time management, delayed gratification, etc. [93]. Teamwork involves building

relationships, working cooperatively with others, and having respect for diverse opinions and preferences [94]. Critical thinking is an important attribute for any employee, which refers to "the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action" [95] (p. 1). Problem solving is the ability to use knowledge, facts, and data to analyze outstanding issues [94]. Initiative and enterprise skills promote creativity, conversion of ideas into action, adaption to new situations, and contribution to innovative outcomes [96]. Setting goals, objectives, and targets; budgeting and resource allocation; and taking initiative to manage and coordinating tasks constitute planning and organizing skills. Management skills combine capacities in planning, organizing, staffing, directing, and controlling functions to enable an organization to accomplish its goals and mission [97]. Learning is defined as an agility to learn new things and keeping oneself informed and increasing, adaptability to the changing contexts. Digital literacy includes a mix of advanced information technology (IT) skills that helps with data entry, storage and retrieval and facilitates desktop publishing, use of spreadsheets, and Internet skills [98]. The composite scores for each sub-categories were derived by taking the mean of the equally weighted scores of skills listed under those categories.

The three questionnaires were first developed in English and were subsequently translated to Egyptian Arabic. With the support of native Arabic scholar, the translated versions of the questionaries were validated for linguistic and cultural integrity. After incorporating the recommended revision, the questionaries were once again translated to English to confirm the original structure and that the essence of the question was maintained. All three questionnaires were then subjected to Institutional Review Board evaluation and approval. Using Qualtrics XM software (Seattle, WA, USA), digital versions of the questionnaires were also created. The three questionnaires in both digital and paper formats were tested in Egypt for validity and reliability. The Cronbach's alpha for "value to employers or value in new employees" and "skills levels in recent graduates" for 35 statements were 0.954 and 0.961 for the student survey; 0.969 and 0.976 for the faculty survey; and 0.978 and 0.976 for the employer survey. Necessary revisions were made to the English and Arabic versions. The three questionnaires in both digital and paper formats were tested in Egypt for validity and reliability. After completing these steps, the three surveys in both English and Arabic were subjected to Purdue University's Institutional Review Board review and approval. Once approved, the questionnaires were circulated among students, professors, and employers affiliated with the agriculture faculties at the five universities and agribusinesses through social media and stakeholder gatherings.

2.5. Data Analysis

Data gathered through the Qualtrics survey were transferred to Statistical Package for the Social Sciences (SPSS) (Version 24.0, IBM, Armonk, NY, USA) for statistical analysis. Data analysis was conducted using descriptive statistics, independent sample *t*-tests (subjected to Bonferroni correction), one-way ANOVA with Games–Howell post hoc tests, and two-way ANOVA with Hochberg's GT2 test. Intercorrelation matrix was computed to understand how perception of the value of skills is related by respondent group. An alpha level of 0.05 was used for all statistical tests.

2.6. Limitations

There are two key limitations to this survey. There is a sampling bias resulting from limiting the participation to those affiliated with agriculture education and business. Therefore, the results do not necessarily represent the views and perceptions of the entire student, professor, and employer populations. The methods used to distribute the surveys were only partially effective in reaching the entire sampling frame and could result in a selection bias. Missing data due to incomplete responses posed a challenge. This issue was tackled by adopting either complete case analysis or available case analysis depending on

the approach needed to generate results. The omission of missing data could lead to biased estimates and could reduce the representativeness of the findings.

3. Results

3.1. Respondents' Characteristics

Altogether, usable surveys from 779 students, 371 faculty, and 81 employers were received for the study. About two-thirds (62%) of the student respondents represented Cairo University (CU), one-third (31%) came from Assuit University (AU), a few from Benha University (BU) and Suez Canal University (SU), and none from Ain Shams University. Male student respondents outnumbered female respondents; however, they both have the same average age of 20 years. (Table 3). Almost all the students were unmarried undergraduate students, and many of them were either in their second or third year at the university.

Table 3. Student characteristics.

		Gender			
		Male		Female	
		N	Percent	*N*	Percent
Nationality	Egyptian	178	35	335	65
	Not Egyptian	8	73	3	27
Social status	Unmarried	185	36	334	64
	Married	1	25	3	75
	Absolute/separate or otherwise	0	-	1	100
Academic degree program pursued	B.A.	160	36	280	64
	M.A.	0	-	0	-
	Ph.D.	0	-	0	-
	Others	27	31	59	69
Completed level of education	Level 1	25	43	33	57
	Level 2	52	34	101	66
	Level 3	78	41	114	59
	Level 4	30	25	88	75
University represented	Benha University (BU)	11	44	14	56
	Cairo University (CU)	99	31	223	69
	Assiut University (AU)	71	44	89	56
	Suez Canal University (SCU)	4	25	12	75
	Ain Shams University (ASU)	0	-	0	-

The majority (N = 202) of the faculty respondents were male. Faculty undergraduate teaching experience varied greatly, from 0 to 59 years (average of 22 years), and graduate teaching ranged from 0 to 51 years (average of 17 years). Female faculty were younger (42 years) than male faculty (52 years). In addition, male faculty (M = 24) had more teaching experience that female faculty (M = 17.6). Professors (hereafter used to refer collectively to assistant, associate, and full professors) represented 18 departments, with the majority coming from animal production (N = 55), followed by agricultural microbiology (N = 44), economic entomology and pesticides (N = 30), soil science (N = 28), food science (N = 27), and agronomy (N = 21), among others (Table 4). Of the 81 employers recruited for the survey, males (95%) outnumbered the female employers, and they represented agricultural exports (N = 33), agriculture sales and marketing (N = 26), agronomy (N = 26), poultry (N = 24), horticulture (fruit) (N = 22), and food processing (N = 20).

Table 4. Professor characteristics.

Demographics		Male		Female	
		N	Percent	*N*	Percent
University	Benha University	8	100	0	-
	Cairo University	43	66	22	34
	Assiut University	46	75	15	25
	Suez Canal University	62	75	21	25
	Ain Shams University	42	52	39	48
Position	Assistant and Associate Professor	63	63	37	37
	Professor	123	80	30	20

3.2. Subjective Perceptions on Technical and Employability Skills

Male and female students' subjective self-evaluation of technical and employability skills is presented in Table 5. Students perceived their competency in all ten skills to be between average and high, with ethics skills, teamwork skills, learning skills, and planning and organizing skills close to a high level. Students assessed themselves to be less proficient in communication skills and management and leadership skills. However, there were no significant differences ($p < 0.05$) between male and female students in their self-evaluation of the level of the various skills in them.

Table 5. Students' subjective self-evaluation technical and employability skills.

	Skill	Male			Female			*t*-Value
		Mean	SD	*N*	Mean	SD	*N*	
1.	Student level of technical skills	3.33a	0.49	161	3.25a	0.48	292	1.543
2.	Student level of communication skills	3.09a	0.53	162	3.10a	0.46	295	−0.234
3.	Student level of ethics skills	3.73a	0.43	152	3.79a	0.38	275	−1.408
4.	Student level of teamwork skills	3.59a	0.55	154	3.58a	0.53	275	0.298
5.	Student level of problem solving and critical thinking skills	3.37a	0.45	157	3.31a	0.45	284	1.322
6.	Student level of initiative and enterprise skills	3.33a	0.50	160	3.30a	0.49	288	0.545
7.	Student level of planning and organizing skills	3.54a	0.48	151	3.56a	0.48	278	−0.379
8.	Student level of management and leadership skills	3.20a	0.56	155	3.11a	0.53	277	1.741
9.	Student level of learning skills	3.61a	0.47	151	3.60a	0.48	274	0.224
10.	Student level of digital literacy skills	3.37a	0.54	161	3.30a	0.52	290	1.329

Scale: 1—very low, 2—low, 3—average, 4—high. Values on the same row with same subscript are significantly different ($p < 0.05$).

Both male and female students relied on their professors ($N = 175$, 30%), followed by graduate students ($N = 127$, 22%) and parents and family ($N = 103$, 18%), for career guidance. About 12% reported employment forum and 7% as other students. University professional service advisors was the least common source of career guidance. Factorial ANOVA results show the main effects of gender (G) and source of career guidance (S) (Table 6), which also included their interaction effects on student-reported technical and employability skills. Except for initiative and enterprise skills, where the source of career guidance was statistically significant at $p < 0.05$, the gender, source of career guidance, or the interaction effect did not show significant results, indicating that students' subjective self-evaluation of skill level did not differ by gender or source of guidance or their combined effect.

Table 6. Student's sources of career mentoring.

Source	*N*	Percent
Professors	175	29.9%
Graduates	127	21.7%
Parents or family	103	17.6%
Employment forum	71	12.1%
Other students	43	7.3%
Professional service advisors at the university	38	6.5%
Other (specify)	29	4.9%

Majority of the student respondents (44%) stated that they seek career mentoring four or more times per year (Table 7). Of the rest, 21% seek once per year, 19% twice per year, and 16% seek thrice per year. Second- and third-year students constitute the majority that seeks career mentoring three to four times a year. The factorial ANOVA results of both the main and combined effects of gender (G), frequency of obtaining career mentoring (F) were calculated. There was no statistically significant difference at $p < 0.05$, indicating that gender, frequency of mentoring, or their combined effect did not influence students' subjective self-evaluation of skill level.

Table 7. Student's subjective self-evaluation of skill level by frequency of seeking career mentoring.

Academic Year	Once per Year	Two Times per Year	Three Times per Year	Four or More Times per Year
1st year	12	7	13	21
2nd year	28	32	25	62
3rd year	46	29	28	82
4th year	22	26	12	54
Total	108	94	78	219

Table 8 showcases a comparison of the perceived level of technical and employability skills reported by students to professors' and employers' assessment of those skills. Across all skills, students' self-assessment of those skills was higher than professors and employers. For technical skills, communication skills, and digital literacy skills, professors' perception of skill level aligned with students'. Employers' perception of various skills in students always ranged between very low and average levels, with management and leadership and initiative and enterprise skills at the lowest level. Students and professors ranked communication as the weakest skill, and all three respondent groups ranked ethical skills as the strongest skill in students.

Table 8. Comparison of students' subjective self-evaluation to professors' and employers' assessment of technical and employability skills in students.

Skills	Student			Professor			Employer			F-Value
	Mean	SD	*N*	Mean	SD	*N*	Mean	SD	*N*	
1.	3.27_{a}	0.48	458	3.27_{a}	0.59	264	2.38_{b}	0.74	72	50.35 *
2.	3.09_{a}	0.49	462	3.10_{a}	0.62	265	2.36_{b}	0.74	72	33.86 *
3.	3.77_{a}	0.40	428	3.50_{b}	0.70	257	2.73_{c}	0.89	62	52.01 *
4.	3.58_{a}	0.53	432	3.35_{b}	0.74	255	2.55_{c}	0.89	63	46.22 *
5.	3.33_{a}	0.45	445	3.15_{b}	0.67	259	2.31_{c}	0.77	72	63.20 *

Table 8. *Cont.*

Skills	Student			Professor			Employer			F-Value
	Mean	SD	*N*	Mean	SD	*N*	Mean	SD	*N*	
6.	3.31 $_{a}$	0.49	453	3.18 $_{b}$	0.67	263	2.25 $_{c}$	0.79	72	61.79 *
7.	3.55 $_{a}$	0.48	430	3.27 $_{b}$	0.73	257	2.29 $_{c}$	0.77	63	87.84 *
8.	3.14 $_{a}$	0.54	436	2.98 $_{b}$	0.76	256	2.11 $_{c}$	0.70	63	64.30 *
9.	3.60 $_{a}$	0.47	426	3.34 $_{b}$	0.67	253	2.57 $_{c}$	0.84	63	55.29 *
10.	3.32 $_{a}$	0.53	456	3.40 $_{a}$	0.61	264	2.46 $_{b}$	0.77	72	46.14 *

Scale: 1—very low, 2—low, 3—average, 4—high. Values on the same row with same subscript are significantly different at * $p < 0.001$ level.

For each of the skills, a significant correlation was found between students' perception of value and students' perceived level of those skills (Table 9). A significant positive correlation was found between professors' value of technical skills and the student-perceived level of technical skills. The results did not reveal a significant relationship between professors' perceptions of the value of skills and students' level or perception.

Table 9. Correlation between students' and professors' perceptions of the importance of technical and employability skills.

	Technical skill	**1a**	**1b**	**1c**	**1d**	**Mean**	**SD**	***N***
1a	Student's level	1				3.27	0.48	458
1b	Student's perception of value	0.42 **	1			3.54	0.46	485
1c	Professor's perception of student level	−0.1	0.03	1		3.21	0.63	174
1d	Professor's perception of value	0.15 *	0.05	−0.14	1	3.08	0.62	327
	Communication skill	**2a**	**2b**	**2c**	**2d**	**Mean**	**SD**	***N***
2a	Student's level	1				3.09	0.49	462
2b	Student's perception of value	0.39 **	1			3.38	0.47	493
2c	Professor's perception of student level	−0.22 *	−0.11	1		3.06	0.63	174
2d	Professor's perception of value	−0.09	0.03	−0.02	1	2.97	0.63	330
	Ethics skills	**3a**	**3b**	**3c**	**3d**	**Mean**	**SD**	***N***
3a	Student's level	1				3.77	0.4	428
3b	Student's perception of value	0.43 **	1			3.72	0.52	456
3c	Professor's perception of student level	0.03	−0.08	1		3.45	0.74	174
3d	Professor's perception of value	0.02	−0.05	0.02	1	3.38	0.7	319
	Teamwork skills	**4a**	**4b**	**4c**	**4d**	**Mean**	**SD**	***N***
4a	Student's level	1				3.58	0.53	432
4b	Student's perception of value	0.45 **	1			3.62	0.55	458
4c	Professor's perception of student level	−0.02	−0.12	1		3.32	0.75	174
4d	Professor's perception of value	0.01	0.1	0.01	1	3.24	0.71	318
	Problem-solving and critical thinking skills	**5a**	**5b**	**5c**	**5d**	**Mean**	**SD**	***N***
5a	Student's level	1				3.33	0.45	445
5b	Student's perception of value	0.52 **	1			3.52	0.48	476
5c	Professor's perception of student level	−0.14	−0.01	1		3.1	0.7	174
5d	Professor's perception of value	−0.01	0.04	0.01	1	3.02	0.69	322
	Initiative and enterprise skills	**6a**	**6b**	**6c**	**6d**	**Mean**	**SD**	***N***
6a	Student's level	1				3.31	0.49	453
6b	Student's perception of value	0.48 **	1			3.43	0.53	486
6c	Professor's perception of student level	−0.07	−0.11	1		3.12	0.69	174
6d	Professor's perception of value	0	−0.03	0.04	1	3.01	0.65	329

Table 9. *Cont.*

	Planning and organizing skills	**7a**	**7b**	**7c**	**7d**	**Mean**	**SD**	***N***
7a	Student's level	1				3.55	0.48	430
7b	Student's perception of value	0.48 **	1			3.67	0.49	458
7c	Professor's perception of student level	−0.11	−0.08	1		3.23	0.75	174
7d	Professor's perception of value	0.04	0.04	0.01	1	3.12	0.75	320
	Management and leadership skills	**8a**	**8b**	**8c**	**8d**	**Mean**	**SD**	***N***
8a	Student's level	1				3.14	0.54	436
8b	Student's perception of value	0.42 **	1			3.44	0.58	466
8c	Professor's perception of student level	0.02	−0.02	1		2.91	0.8	174
8d	Professor's perception of value	−0.05	0.02	−0.04	1	2.87	0.75	318
	Learning skills	**9a**	**9b**	**9c**	**9d**	**Mean**	**SD**	***N***
9a	Student's level	1				3.6	0.47	426
9b	Student's perception of value	0.45 **	1			3.64	0.53	453
9c	Professor's perception of student level	−0.17	−0.03	1		3.3	0.71	174
9d	Professor's perception of value	0.05	−0.05	−0.08	1	3.2	0.89	318
	Digital literacy skills	**10a**	**10b**	**10c**	**10d**	**Mean**	**SD**	***N***
10a	Student's level	1				3.32	0.53	456
10b	Student's perception of value	0.38 **	1			3.64	0.48	489
10c	Professor's perception of student level	−0.06	0.01	1		3.42	0.61	174
10d	Professor's perception of value	−0.04	0.05	−.19*	1	3.23	0.69	330

Significant at the 0.01 ** and 0.05 * level (2-tailed).

The students, professors, and employers gave feedback on the importance of technical and employability skills to employers (Tables 10 and 11). Both male and female students' rating of all ten skills was higher than that of professors. No differences were found in the ratings of students by gender. However, ratings for students were significantly different from professors ($p < 0.01$). Female and male professors had similar perceptions on the value of the nine skills to employers except for communication skills. When gender-aggregated skills ratings were compared to the employers' input on the value they place on these skills, it was found that professors and employers held a similar perception on the value of most skills except for planning and organizing and learning skills.

Table 10. Comparison of stakeholder perceptions value of technical and employability skills.

Skill	**Student**			**Professor**			**Employer**			**F-Value**
	N	**Mean**	**SD**	***N***	**Mean**	**SD**	***N***	**Mean**	**SD**	
1.	485	3.54 $_{a}$	0.46	327	3.08 $_{b}$	0.62	75	3.22 $_{b}$	0.65	69.817 **
2.	493	3.38 $_{a}$	0.47	330	2.97 $_{b}$	0.63	76	3.02 $_{b}$	0.71	53.793 **
3.	456	3.72 $_{a}$	0.52	319	3.38 $_{b}$	0.70	65	3.42 $_{b}$	0.78	29.205 **
4.	458	3.62 $_{a}$	0.55	318	3.24 $_{b}$	0.71	67	3.40 $_{b}$	0.71	32.867 *
5.	476	3.52 $_{a}$	0.48	322	3.02 $_{b}$	0.69	76	3.18 $_{b}$	0.75	67.744 **
6.	486	3.43 $_{a}$	0.53	329	3.01 $_{b}$	0.65	75	3.12 $_{b}$	0.78	49.850 **
7.	458	3.67 $_{a}$	0.49	320	3.12 $_{b}$	0.75	67	3.35 $_{c}$	0.66	68.975 *
8.	466	3.44 $_{a}$	0.58	318	2.87 $_{b}$	0.75	67	2.99 $_{b}$	0.72	69.839 **
9.	453	3.64 $_{a}$	0.53	318	3.20 $_{b}$	0.89	67	3.46 $_{a}$	0.63	32.043 *
10.	489	3.64 $_{a}$	0.48	330	3.23 $_{b}$	0.69	76	3.19 $_{b}$	0.91	47.732 **

Scale: 1—very low, 2—low, 3—average, 4—high. Values on the same row with same subscript are significantly different at * $p < 0.05$ and ** $p < 0.001$ levels.

Table 11. The ratings on the importance of technical and employability skills to employers by gender and their differences.

Employer value of technical skills	***N***	**Mean**	**SD**	**MS vs. FS**	**MS vs. MP**	**MS vs. FP**	**FS vs. MP**	**FS vs. FP**	**MP vs. FP**
Male students (MS)	172	3.55	0.48	−0.018	8.417 **	6.267 **	9.404 **	6.745 **	−0.614
Female students (FS)	307	3.55	0.45						
Male professors (MP)	197	3.05	0.65						
Female professors (FP)	96	3.10	0.60						
Employer value of communication	***N***	**Mean**	**SD**	**MS vs. FS**	**MS vs. MP**	**MS vs. FP**	**FS vs. MP**	**FS vs. FP**	**MP vs. FP**
Male students (MS)	174	3.35	0.51	−1.085	7.786 **	3.799 **	10.01 **	4.876 **	−2.259 *
Female students (FS)	313	3.40	0.45						
Male professors (MP)	198	2.89	0.62						
Female professors (FP)	96	3.06	0.63						
Employer value of ethics	***N***	**Mean**	**SD**	**MS vs. FS**	**MS vs. MP**	**MS vs. FP**	**FS vs. MP**	**FS vs. FP**	**MP vs. FP**
Male students (MS)	164	3.68	0.54	−1.479	4.724 **	2.923 **	6.644 **	4.052 **	−0.645
Female students (FS)	291	3.75	0.50						
Male professors (MP)	194	3.37	0.69						
Female professors (FP)	94	3.43	0.73						
Employer value of teamwork	***N***	**Mean**	**SD**	**MS vs. FS**	**MS vs. MP**	**MS vs. FP**	**FS vs. MP**	**FS vs. FP**	**MP vs. FP**
Male students (MS)	165	3.58	0.56	−1.109	5.684 **	3.533 **	7.278 **	4.485 **	−0.882
Female students (FS)	290	3.64	0.54						
Male professors (MP)	192	3.19	0.73						
Female professors (FP)	95	3.27	0.74						
Employer value of problem solving and critical thinking	***N***	**Mean**	**SD**	**MS vs. FS**	**MS vs. MP**	**MS vs. FP**	**FS vs. MP**	**FS vs. FP**	**MP vs. FP**
Male students (MS)	170	3.50	0.51	−0.777	8.231 **	5.348 **	9.928 **	6.148 **	−0.751
Female students (FS)	302	3.54	0.46						
Male professors (MP)	197	2.98	0.69						
Female professors (FP)	197	2.98	0.69						

Table 11. *Cont.*

Employer value of initiative and enterprise	***N***	**Mean**	**SD**	**MS vs. FS**	**MS vs. MP**	**MS vs. FP**	**FS vs. MP**	**FS vs. FP**	**MP vs. FP**
Male students (MS)	172	3.38	0.59	−1.469	6.498 **	3.994 **	9.370 **	5.317 **	−1.253
Female students (FS)	308	3.46	0.48						
Male professors (MP)	198	2.96	0.64						
Female professors (FP)	96	3.06	0.68						
Employer value of planning and organizing	***N***	**Mean**	**SD**	**MS vs. FS**	**MS vs. MP**	**MS vs. FP**	**FS vs. MP**	**FS vs. FP**	**MP vs. FP**
Male students (MS)	164	3.64	0.49	−1.209	8.056 **	5.892 **	9.970 **	6.871 **	−0.506
Female students (FS)	292	3.70	0.48						
Male professors (MP)	193	3.08	0.77						
Female professors (FP)	95	3.12	0.76						
Employer value of management and leadership	***N***	**Mean**	**SD**	**MS vs. FS**	**MS vs. MP**	**MS vs. FP**	**FS vs. MP**	**FS vs. FP**	**MP vs. FP**
Male students (MS)	167	3.42	0.59	−0.723	7.976 **	5.956 **	9.816 **	6.739 **	0.333
Female students (FS)	295	3.46	0.56						
Male professors (MP)	193	2.87	0.70						
Female professors (FP)	94	2.83	0.84						
Employer value of learning	***N***	**Mean**	**SD**	**MS vs. FS**	**MS vs. MP**	**MS vs. FP**	**FS vs. MP**	**FS vs. FP**	**MP vs. FP**
Male students (MS)	163	3.67	0.54	0.762	5.971 **	5.457 **	5.867 **	5.305 **	−0.085
Female students (FS)	289	3.63	0.52						
Male professors (MP)	193	3.17	0.99						
Female professors (FP)	94	3.18	0.76						
Employer value of digital literacy	***N***	**Mean**	**SD**	**MS vs. FS**	**MS vs. MP**	**MS vs. FP**	**FS vs. MP**	**FS vs. FP**	**MP vs. FP**
Male students (MS)	173	3.59	0.50	−1.726	6.229 **	4.564 **	8.246 **	5.871 **	−0.279
Female students (FS)	310	3.67	0.48						
Male professors (MP)	198	3.20	0.71						
Female professors (FP)	96	3.22	0.70						

Scale: 1—very low, 2—low, 3—average, 4—high. Significant at the 0.01 ** and 0.05 * level (2-tailed).

4. Discussion

A primary goal of this investigation was to determine if formal and informal sources of career mentoring are preparing agriculture students for future employment and demands of the workplace, considering professors as a key source of career guidance. These findings help identify if there are any differences skill levels based on gender as well as how well students and their mentors are aligned with the skills employers seek.

Q 1. Do students' subjective self-evaluation of technical and employability skills differ by gender?

Literature on gender-based differences in skills in university students provide mixed results. Some studies conclude that skill differences exist [99,100], while others conclude the contrary [101–103]. The results of this study concur with the latter, as no significant differences were observed for all ten skills. Several factors likely contribute to this result. The common curriculum and environment at the university exposes male and female students to a comparable learning and skill-building experience that cultivates and nurtures technical and employability skills. Blasco (2009) [104] found cultural sensitization and social interaction as possible contributory factors. Studies by [105,106] found that, compared to male students, females have a higher level of employability skills. This study cannot verify this finding, as the study relied on self-reported scores. However, the higher graduation rates amongst female students [107] are indicative of their academic success compared to their counterparts.

The Ministry of Education has taken steps to improve the quality of education at public universities, but given the prevailing unemployment rates, there is still a need for innovative curriculum and adoption of contemporary pedagogic approaches that align with today's job market. In addition, students must be encouraged to take up field-based experiential learning opportunities to compliment course work to strengthen their technical as well as employability skills. Where possible, the university should partner with alumni and industry stakeholders to share experience and build practical skills to prepare them for the workplace. The academic advisors and mentors must be trained to identify knowledge and skill gaps and direct students to appropriate avenues for capacity building. Moreover, career fairs and workshops can be used to build awareness amongst students and to provide networking opportunities, particularly for students in third- and fourth-year levels. While no notable differences were observed between genders, there could be differences within resulting from other attributes, such as economic status, rural/urban origin, institution, etc. It is important to further investigate the effects of these factors on the perceived and actual level of skills and address challenges that limit skill-development.

Q 2. Do various sources of career mentoring change the students' subjective self-evaluation of technical and employability skills?

As discussed earlier, mentoring relationships are of various forms. From the data, it is evident that students' primary source of career mentoring is with their professors, followed by graduates. This result is not unusual given the traditional roles these groups play in a student's life. However, none of these mentoring sources seem to particularly impact students' perceived level of skills. Whether there are gender-based preferences in the selection of mentors was not addressed in the questionnaire.

As noted earlier, same gender dyads may be preferred due to a combination of personal, social, and cultural reasons [30,32,33]. As in the case of Egypt, in more traditional societies with a growing number of female students in higher education, female faculty mentors can play a significant role in influencing and advancing the academic and career paths of female students. However, Neumark and Gardecki [108] estimated a marginally significant negative effect on female students working with female faculty, and there is minimal evidence to support that female students majoring in traditionally masculine fields preferred female professors. Thus, students and professors do not necessarily have to be of the same gender for a mentoring relationship to succeed. Hilmer and Hilmer (2007) [109] found no difference between female students working with female faculty relative to female students working with male faculty in their success in receiving research-oriented first jobs. As such, empirical evidence with regard to the value of pairing students with mentors

of similar demographic background is contradictory. Jacobi (1991) [43] and Crisp et al. (2017) [60] found that divergence in race and other personal characteristics is not always a limiting factor for achieving positive outcomes from mentoring relationships.

De Janasz and Sullivan (2004) [110] argued that with the changing labor market, mentees consider mentoring models and relationships beyond the traditional ones, and learning demands can be effectively achieved by forming multiple mentoring relationships. Further, they claimed that mentoring relationships will be more effective when there is clear conveyance of identity (knowing why), performance (knowing how), and social capital (knowing whom) from the parties. In addition, new forms of mentoring arrangements may prove to be successful. E-mentoring, for instance, is gaining momentum. It is a useful approach and tool especially for female students to obtain career mentoring [111]. Neely et al. (2017) [112] hypothesized that women and minority groups are more apt to adopting e-mentoring because it creates a safer environment for atypical mentoring relationships involving interfacing with individuals of different socio-cultural backgrounds and keeps personal attributes obscure [38]. It also controls for and mitigates negative consequences faced by disadvantaged groups arising from biases and stereotypes [113].

Q 3. Do various frequencies in using career mentoring change the students' subjective self-evaluation of technical and employability skills?

Mentoring signifies a mentor-mentee dyad where there is regular interaction. Several studies have shown that frequency is a key factor that helps establish a fruitful mentoring dyad [114–116]. In contrast, the results of this study showed that students' frequency of participation in career mentoring had no significant impact on their perceived skill level. Similarly, Weidman and Stein (2003) [117] did not find a significant correlation between frequency of mentee-mentor mentoring interactions and the student's research and scholarly activities. Pascarella, Terenzini and Hibel (1978) [118] indicated that the real impact of mentoring interactions towards a student's academic progress occurs during the initial interaction, implying that the benefits of mentoring may reduce over time.

These results support the premise that the quantity of mentoring alone will not lead to the development of job skills. Formal and informal career mentoring sessions cannot be random encounters. To effectively develop skills in students, they must have a mutually agreed format that stimulates quality and frequency. The parties may be better served if they adopt a system that establishes tenable objectives and key results (OKRs). This could ignite in mentors a deeper sense of purpose, belonging, and commitment to their institutions and overall institutional missions, potentially leading to career success for the mentors [119]. Mentoring helps develop leadership skills and confidence, which may be transferable to the mentor's own professional life [120,121]. Therefore, in universities where professors play a critical role in career development, it is important for them to recognize the reciprocal benefits of mentoring for their own curricular and professional development.

Q 4. Is there a difference amongst students', professors', and employers' perception of the level of technical and employability skills in students?

Across all skill types, Egyptian employers rated lower skills in recent graduates compared to students and professors. This finding is consistent with other studies from across the world [122,123]. Employers are not quite satisfied with the quality of academic programs and their abilities to inculcate relevant skills in graduates [124]. According to Jackson (2016) [125] (p.14), this could be due to "graduate inability to successfully transfer their acquired skills to the workplace, despite mastery in the classroom setting". Employers found managerial and leadership skills to be the weakest in university students completing degrees. In addition, technical and other relevant skills for the workplace for planning and organizing, communication, problem solving and critical thinking, and entrepreneurship were all low. This indeed a serious problem in Egypt that contributed to the high unemployment rates among university graduates.

Lack of coordination between the supply side and the demand side can be a potential driver of skill gaps [126]. Employers may not be adequately communicating and signaling to institutions of higher education (IHE) their human capital needs. Conventional demand

for credentials by students and their parents instead of focusing on skill development may also be driving an education system that is not adequately tailored to meet the needs of the labor market. Tomilnson (2008) [127] contended that students are increasingly seeking avenues for capacity building in addition to academic credentials. While the university curriculum may cultivate technical and non-technical skills in students, they may not be aware of how to apply those skills in the workplace.

Q 5. Do professors' value of technical and employability skills have an impact on students' perception of level and relative importance of those skills?

The professors' duty is to develop high-quality and relevant curricula and impart knowledge and training to students to prepare them for their lives and careers [128]. As indicated in Table 10, students' perception of their level of skills and their perception of the value of those skills seems to have a notable positive relationship especially with regard to problem solving and critical thinking, initiative and enterprise, and planning and organizing skills. The data do not substantiate the premise that professors' value of technical and employability skills have an impact on students' perception of level and relative importance of those skills. This is rather concerning, and it is difficult to discern the reasoning behind this result using the data set.

There seems to be a mutual perception of the value of technical skills and various employability skills amongst female and male students. Similarly, female, and male faculty seem to converge on their opinions on the value of those same skills with the exception of communication skills. However, when comparing gender-disaggregated student data to professor data on perceived value of those skills, there are significant differences across all categories of skills. Students generally placed a higher importance on the skills compared to professors.

Q 6. Is there a gendered difference in the faculty's perceptions of the importance of technical and employability skills?

Except for communication skills, no differences were found between perceptions of the importance of technical and employability skills of the male and female faculty. However, as explained above, the perceptions of students differ from that of faculty for all technical and employability skills irrespective of their gender, with students valuing their skills higher than did the faculty.

5. Conclusions

Graduate unemployment is a growing economic and social problem for Egypt. In today's competitive job market, employers expect students to possess skills above and beyond their degree and continue to develop in their profession. Through various interaction, mentees seek guidance from their mentors for academic, research, and career advancement and to develop pertinent technical skills and indispensable professional development [129,130]. Jacobi (1991) [60] offered a critical review of empirical research covering mentoring and undergraduate education and theorized four possible areas for student academic success: increased involvement in learning, facilitating academic and social integration, extending social support, and promoting development support. In addition, [131] found that mentoring relationships can result in leadership development in college students. The mentoring function associated with professional development is directly related to career advancement. Through this function, students can enhance technical competency, develop job-related and transferable skills, obtain networking opportunities, and better prepare for academic and professional aspirations beyond graduation. Ramaswami and Dreher (2007) [81] pointed out that career outcomes for protégés will be impacted by mentors' human capital, movement capital, social/political capital and signaling, path-goal clarity, and values clarity as well as the quality of the relationship and protégés' cognitive, affective, and behavioral responses. This study serves as a step towards gaining relevant insights on the existing level of skills amongst male and female students in the Faculties of Agriculture in five universities in Egypt, their perceptions on the value of technical and employability skills, their access to various sources of career mentoring,

their persistence in using these sources, and their understanding of skills that are valued by prospective employers. As professors are a key source of career guidance, the study also attempts to gauge the utility and quality of mentoring by understanding the professor's perspective of where the students stand with regard to the various skills and their view on the value of those skills to employers.

The results reassure that both male and female students, in study, have similar perceptions of their levels of the ten skills. This could be due to sampling biases because the majority of the sample for this study came from Cairo University, and they may not be the true representatives of the students from other universities operating in rural Egypt. Alternatively, further research employing qualitative tools is required to better understand the perceptions.

According to scholars such as Higgins and Kram (2001) [22], the current career environment is changing, requiring mentoring relationships to evolve and adapt to current conditions. They identified four types of change within the context that can impact careers and career development, namely changes to employment contracts, changes in technology, changes to organizational structures, and changes to organizational diversity. Mentoring relationships and career guidance initiatives at higher education institutions should be cognizant of these ongoing phenomena. This requires faculty mentors to have current information on job market trends and career environment such that they can provide appropriate career guidance to future graduates. Mentoring in the current career context, therefore, should focus not only on students' academic accomplishments but also on helping them to smoothly transition from school to work and empowering them with job-specific technical and soft skills.

The employability challenges require focus on the updating of curricula, orienting course content towards employer needs, providing opportunities for experiential learning and work placement, as well as mentoring programs involving students and alumni or industry coaches. The government of Egypt has made strides towards enhancing the quality of education, but it must continue to support the development of its higher education infrastructure and implement policies and reforms to increase equity and quality.

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