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Enhancing Employability of Technical University Students: A Study of Mechanical Engineering Skill Needs and Generic Skills in Ghana

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Abstract

This study investigated the mechanical engineering skill needs and generic skills required for employability among Technical University students in Ghana. The findings revealed that technical skills such as foundry, computer-aided manufacturing, and computer-aided design are crucial for employability. Additionally, generic skills like leadership, positive attitudes, problem-solving, and communication skills are essential for students' future careers. The study's results have implications for Technical Universities, industries, and students. Recommendations include reviewing and updating curricula to include relevant technical and generic skills, promoting industry partnerships, and encouraging students to acquire a range of skills. By implementing these recommendations, Technical Universities can better prepare students for the workforce, and industries can benefit from a skilled and employable workforce.

Keywords

Practical Training, Mechanical, Engineering Students, Employability, Skills Development, Engineering Education, Hands-On Experience, Technical Skills, Soft Skills, Industry Readiness, Workplace Preparedness

1. Introduction

More professional practice abilities and experiences for graduates of mechanical engineering programs are in high demand from the industry sector and academia as well. Not only do educators and business recognize the need for increased prac-

tical training, but applicant engineers do as well. These days, the need for engineering curricula to bridge the theory-practice divide is driven by technological innovation and competitiveness [1]. In order to develop broader skills and attributes such as problem-solving, communication, teamwork, leadership, and critical thinking, students should be exposed to significant practical experiences that mimic the realities of the engineering profession for a suitable duration within this highly competitive environment. They're often referred to as employability skills [1].

Engineering curriculum must include an industrial training element in order to produce graduates that are industry-ready [2]. For students to acquire employability skills, they must have experience in industry practice. An introverted professor who is cut off from the working world will lose out on important opportunities to modify the curriculum to suit business demands [3].

Professional abilities are highly valued in today's workforce, according to both employers and graduates. The majority of employers need engineering graduates that possess both specialised professional skills and sufficient theoretical knowledge [4]. The workforce is looking for graduates with technical capabilities particular to their industry and experience working in a team [5]. However, graduates frequently lament their unemployment due to a lack of these skills [6].

Skill, in Moon's opinion, is the capacity to apply knowledge [7]. As a result, to be skilled, one must possess both some knowledge and some know-how [8]. Eraut claims that certain professional talents, in particular, call for special mixes of situational information, propositional knowledge, and professional judgement [8]. Expertise can inevitably be acquired by educational methods in addition to hands-on training and experience [8]. Generally speaking, skills can be divided into two categories: cognitive skills, which are linked to a theoretical foundation and way of thinking, and practical skills, which are linked to the actual application of techniques, materials, and equipment.

It becomes clear that prospective engineers should have a suitable undergraduate education to meet the requirements of employers and launch a successful professional career. Critical thinking, inventiveness, and communication skills are among the things that future engineers will require [9]. Furthermore, students must acquire familiarity with essential industrial equipment, project methodologies for design and development, and production processes in addition to the technical knowledge that is expected of them.

They also need to be able to understand ethical and societal issues, work in an efficient manner that boosts productivity, collaborate well in groups, manage their time effectively, solve difficulties, and overall demonstrate a range of related skills. More engineering graduates with real-world industrial experience are specifically needed by businesses. To ensure that students acquire the technical skills required in today's globally competitive industry, stronger linkages between industry and higher education are needed [10].

The literature emphasizes the importance of both technical and soft skills in

preparing mechanical engineering graduates for the workforce. Industry and academia agree that graduates need to possess a combination of specialized professional skills, theoretical knowledge, and practical experience.

Agreement and Disagreement:

- I agree with the importance of practical experience and industry partnerships in developing employability skills [1]-[3]. These experiences provide students with hands-on training and exposure to real-world industry practices.
- I partially agree that educational institutions alone can bridge the theory-practice divide. While institutions play a crucial role, industry partnerships and government support are also essential in providing students with practical experience and opportunities.
- I agree with [9] and [10] that future engineers require a range of skills, including critical thinking, problem-solving, communication, and teamwork. These skills are essential for success in today's globally competitive industry.

Implications:

- Educational institutions should prioritize incorporating practical components, industry partnerships, and soft skill development into their curricula.
- Industries should collaborate with educational institutions to provide students with opportunities for practical experience and skill development.
- Governments should support initiatives that promote industry-academia collaboration and provide resources for developing employability skills in students.

Overall, the literature highlights the need for a collaborative approach to preparing mechanical engineering graduates for the workforce, involving educational institutions, industries, and governments.

1.1. Problem Statement

The employability of mechanical engineering graduate students in Ghana is a major concern, particularly in light of the current job crisis. Employers in the construction sector state that employability is linked to three criteria: a strong degree, a range of manufacturing and technology abilities, and a set of personal qualities. But there's a worry that traditional schooling doesn't equip graduates with the common employability skills that businesses demand. During the last semester of the graduate program, a practical exercise is intended to close the knowledge gap between Ghana's technological institutes and industry. The usefulness of practical exercise hasn't, however, been thoroughly studied yet.

This article's goal is to present empirical data regarding the advantages and obstacles of practical exercise as seen from the viewpoint of the students. Furthermore, the current study aims to investigate the potential benefits of practical experiences in local industry, which are occasionally coupled with thesis research, for improving the employability and skill sets of mechanical engineering students. Students from the Mechanical Engineering Department at Akenten Appiah Menka University of Skills Training and Entrepreneurial Development (AAMUSTED),

Kumasi, Ghana, are involved in the case study that is being investigated together with artisans, technicians and engineers around AAMUSTED area (IPT and Tanoso).

Supervisors have conducted interviews and frequent industrial visits to document the process of skill development and advancement. Learning about production processes, action planning, and real-time problem-solving during manufacturing has been found to be the mechanism underlying each student's personal progress. The examination of the interview data revealed that the hands-on activity inspired students to learn more, to use their theoretical and practical knowledge to solve real-world engineering challenges, to build strong interpersonal skills, and to manage their personal obligations. By presenting statistical information about postgraduate jobless spells, employers can illustrate how working in production-oriented organisations increases a student's employability.

In order to provide evidence of skill enhancement and employability based on the perception of graduate mechanical engineers who have successfully completed a practical exercise in heavy industry, primarily in the last phase of their studies, the current research aims to investigate the perceptions of Ghanaian employers regarding the skills, knowledge, and characteristics that help undergraduates/new graduates to be employable.

The study highlights the importance of practical experience in enhancing employability skills among mechanical engineering graduates in Ghana. The findings suggest that practical exercises, industrial visits, and hands-on activities can inspire students to learn more, apply theoretical knowledge, and develop strong interpersonal skills.

Agreement and Disagreement:

- I agree that practical experience is essential for employability skills development (AAMUSTED case study). Hands-on activities and industrial visits provide students with valuable real-world experience and exposure to industry practices.
- I partially agree that the sole responsibility lies with educational institutions to provide practical experience. While institutions play a crucial role, industry partnerships and government support are also necessary to provide students with comprehensive practical experience.
- I agree that employers value graduates with a range of skills, including technical, personal, and interpersonal skills. This is evident in the emphasis on employability skills in the mechanical engineering sector.

Implications:

- Educational institutions should prioritize incorporating practical components and industry partnerships into their curricula to enhance employability skills.
- Industries should collaborate with educational institutions to provide students with opportunities for practical experience and skill development.
- Governments should support initiatives that promote industry-academia collaboration and provide resources for developing employability skills in stu-

dents.

Overall, the study emphasizes the importance of practical experience in preparing mechanical engineering graduates for the workforce, and highlights the need for collaboration between educational institutions, industries, and governments to achieve this goal.

1.2. Hypothesis

Here's a hypothesis based on the provided data:

1) **Null Hypothesis (H0):** There is no significant difference in the mean ratings of mechanical engineering skill needs for employability among Technical University students.

Alternative Hypothesis (H1): There is a significant difference in the mean ratings of mechanical engineering skill needs for employability among Technical University students.

This hypothesis can be tested using a one-way ANOVA (Analysis of Variance) statistical test to determine if there are significant differences in the mean ratings of the various mechanical engineering skills.

2) **Null Hypothesis (H0):** There is no significant difference in the mean ratings of generic skill needs for employability among Technical University students across different skill categories.

Alternative Hypothesis (H1): There is a significant difference in the mean ratings of generic skill needs for employability among Technical University students across different skill categories.

This hypothesis can be tested using statistical methods like ANOVA or t-tests, depending on the specific research design and data distribution.

2. Literature Review

Readiness for Employability in the Mechanical Engineering Industry

An important study by [11] aimed to examine supervisor- or professional entity-based competency frameworks and the systemic recommendations of vital courses of action for higher instruction level learning results. An academic subject can relate to proficient work in a variety of ways, according to this case study's evaluation of intellectual (information and understanding), practical, communication, personal, and professional skills. It also argued that the most effective way to arrange these frameworks is through ongoing discussions between the performing artists, which will help to resolve any unnecessary contrasts and empower essential differences to meet the many complexities of the real world [11].

An additional intriguing study on "the myth of job readiness" focused on employability, written communication, and the "skills gap" in higher education. Job readiness was examined by highlighting students' writing abilities and written communication skills from a variety of angles, such as the nature of writing in particular working environments, problems with academic and proficient written communication, ways to address students' writing difficulties, and methods to

better prepare graduates for communications in the professional world [11].

Engineering graduates' perceptions of their preparedness for the shift to the labour market were examined in a study by [12]. This study set out to find out how graduates of a Portuguese college studying building evaluate their master's course competencies, how these graduates studying engineering evaluate their preparedness for a move into the workforce, and finally, whether there was any correlation between higher positive recognition competencies and the preparation for a change in career. As a result, 332 senior Portuguese engineering master's degree candidates completed questionnaires. The established results indicated that practical competencies seem to be the most important indicators of labour work transition, along with communicative, methodological, and socio-emotional abilities.

These results strengthen the case for including a useful practical component in the design of educational modules as a superior means of improving employability and preparing graduates. The research recommended that in future studies, other external factors, such as the job provider conditions, be taken into account in relation to graduates' employability preparation [12].

A sample of 108 individuals was used in a study by [13] to assess the professional roles and employability of aspiring engineers. The study aimed to increase the comprehension of engineering students about the significance of industrial roles in engineering. Furthermore, to encourage pupils to consider the character, passion, strengths, and weaknesses of themselves. The third objective is to conduct pilot studies at the participating higher education institutions to examine how these creative tools may be implemented in the engineering curriculum. Analysis of the effects of innovative and entrepreneurial talents, networking and communication abilities, teamwork and ways of thinking, and lifelong learning was the main goal of the study.

According to the study's findings, engineers need to develop these soft skills in order to improve their employability. Furthermore, all members of the PREFER consortium agree that engineering colleges should support students' growing self-awareness in the first place and their ability to grow both individually and proficiently in the second [13].

In order to help engineering colleges better understand and support the competencies of industrial aspirants, a study was conducted on the relationship between the competency profile of industrial aspirants and the engineering colleges' place of residence. The goals of this study were to determine the respondents' competency profile in relation to the domicile of engineering colleges, analyse any significant relationships or differences between the respondents' competency profile and the selected variables, and, finally, recommend appropriate actions to help the respondents regain effective competency. In order to close the gap through the development of competencies and for this study, Engineering Colleges Viz. Rural, Urban, and Major cities, and understanding the Engineering Colleges' influence on technical competencies and practical and behavioural skills of Industrial Aspirants were the main factors. The study was conducted with a sample size of 149

respondents using SPSS (Statistical Package for Social Science).

In order to strengthen the hands-on technical competencies, the study suggested that engineering colleges enter into a Memorandum of Understanding with the nearby industry. Finally, industrial experts could be invited to give special lectures at engineering colleges. Special modules on the development of competencies could be included in the curriculum. Soft skills could be used as one way to develop behavioural competencies. Technical sessions should require more time and demonstration of specific mechanisms.

By comparing higher education institutions to process workplaces, [14] examined how engineering graduates in India adopted the quality management approach to attain excellence in employability and how to use the industry's adopted six sigma quality management approach to address process defects. Through an evaluation of the effects of the soft skill gap, the analytical and problem-solving skill gap, the absence of quality knowledge, the lack of domain knowledge, and the lack of industry engagement, this research examined the gap in application knowledge of theory to practice, impacts, and employability.

In order to create a conceptual model for the research, 713 working industrial professionals and 200 engineering students from 11 different universities participated in surveys and interviews. The Six Sigma methodology was used by the respondents, who also used Monte Carlo, ANOVA, regression, hypothesis testing, and correlation studies.

During the exploratory survey, 97% of employers expressed concern about the employability of mechanical engineering graduates, citing a knowledge gap in applying theory to practice as a major problem. Furthermore, 97.4% of the participants acknowledged that the lack of applied knowledge is their primary issue regarding the employability of mechanical engineering graduates. Since there isn't any domain-specific employability study that addresses the domain knowledge features and other factor interactions, it was suggested that the research be expanded to other engineering disciplines. Research is also being conducted on how well hiring individuals from the industry works to teach theory papers that are applicable to the real world and meet industry demands.

Additionally, practical relevance, practical labs, and examiners to aid in the development of bridges between industry and institution are all included in the efficacy of using industrial people as experts for lecture sessions in research. Lastly, studies on soft skills and their effects on engineering education concentrate on government policy choices, such as instruction language [14].

Many questions about students' preparedness for the workforce were brought up in an analysis study of school-to-work readiness by [15]. The readiness of school-to-work, the business skills required for success in the workforce of the twenty-first century, the current curriculum's contents for such skills, and alternative approaches that schools can investigate to ensure a successful school-to-work transition are just a few of the issues that this study looked into. Electronics checklists and interviews were used in this investigation. By examining a range of

characteristics categorised as new skills, survival skills, and soft skills, the Readiness for Employment was investigated.

The results of this survey showed that graduates require a greater number of applied skills, with critical thinking, teamwork, and communication abilities ranking as the most crucial. Additionally, the significance of critical thinking, collaboration skills, and communication abilities for their graduates to succeed in the workforce. Based on the checklist and interviews, it was determined that there is currently a "gap" between what companies require and what high schools are creating. More importantly, quantifiable results demonstrated the graduates' evolving level of preparation as they approached the workforce. Finally, the results of this study supported the necessity of keeping an eye on the curriculum to ensure that it is rigorous and incorporates higher-order thinking skills. To ensure that every student has the opportunity to be prepared for college and the workforce, the curriculum must also be current and technology must be integrated [15].

3. Methodology

The design for the study is a survey research design.

3.1. Population

Students from the Mechanical Engineering Department at Akenten Appiah Menka University of Skills Training and Entrepreneurial Development (AAMUSTED), Kumasi, Ghana, are involved in the case study that is being investigated together with artisans, technicians and engineers around AAMUSTED area (IPT and Tanoso).

3.2. Sample

Ghanaian technical universities that teach mechanical engineering craft practice and mechanical engineering-based enterprises provided the study's sample. For the study, a sample of 170 artisans, 120 technicians, and 80 mechanical engineers were taken using the purposive sampling technique.

3.3 Instrument for Data Collection

The study's questionnaire items were created by the researcher. Ten items make up the questionnaire, which addresses the practical abilities that the current Technical University mechanical engineering craft practice curriculum should incorporate. The items were rated by the respondents using the five-point rating system, as indicated below.

Highly Required (HR)—5; Required (R)—4; Moderately Required (MR)—3; Less Required (R)—2; Not Required (NR)—1. The research instrument was subjected to both face and content validation. The validated instrument was pilot tested using five engineers, seven technicians and eight craftsmen. The reliability of the instrument was established using Cronbach's Alpha. A correlation coefficient (Alpha) of 0.859 was obtained.

3.4. Method of Data Collection

The questionnaire was administered on the respondent by the researcher and with the help of research assistants. Three hundred and seventy (370) questionnaire items were distributed and collected after three days. Three hundred and fifty-seven (357) were returned, representing 96.5%.

3.5. Method of Data Analysis

Frequency counts, percentages, means, and one-way analysis of variance (ANOVA) were used to analyse the data. The study topic was addressed using mean statistics, and the single hypothesis was tested using one-way analysis of variance. The response categories were utilised to make decisions about the practical skill enhancements that technical universities' mechanical engineering craft practice curriculum needs in order to determine the true boundaries of the given values. An improvement item was deemed necessary if its weighted mean was up to 2.50 and higher, using the lower bounds of the moderately required (MR) category (2.50) as the cutoff point. Items whose mean fell below 2.50 were deemed unnecessary for inclusion in the current curriculum.

3.6. Limitations of the Study

1) **Geographical Limitation:** The study is confined to Technical Universities in Ghana, which may limit the generalizability of findings to other regions or countries.

2) **Sample Size and Representation:** The sample size might not be representative of the entire population of Technical University students in Ghana.

3) **Methodological Constraints:** The study's reliance on quantitative data may not fully capture the complexities of employability skills.

4) **Self-Reporting Bias:** The use of self-reported data may introduce biases, as respondents might overestimate or underestimate their skills.

5) **Limited Scope:** The study focuses on mechanical engineering students, which may not be generalizable to other fields of study.

6) **Cross-Sectional Design:** The study's cross-sectional design may not capture changes in skill needs over time.

These limitations provide a foundation for future research and highlight areas for further exploration.

4. Results and Discussions

Analysis of Table 1:

The table presents the mean and standard deviation of mechanical engineering skill needs for employability of students of Technical Universities. The skills are ranked based on their Relative Importance Index (RII) values.

Discussion of Results:

The results indicate that:

Table 1. Mean and Standard Deviation of mechanical engineering skill needs for employability of students of Technical Universities.

S/N	Mechanical Engineering skills	$\sum_{i=1}^{n} w_i / N$	Standard deviation	RII	Ranked
	Foundry skill	4.28	1.2	0.24	1st
	Computer aided manufacturing skill	4.21	1.04	0.23	2nd
	Computer aided design skill	4.17	1.02	0.22	3rd
	Mechanical instrumentation skill	4.12	0.98	0.21	4th
	Welding and fabrication skill	4.08	0.97	0.20	5th
	Refrigeration and air-conditioning skill	4.02	0.95	0.19	6th
	Machining skills	3.96	0.92	0.18	7th
	Plant services and maintenance skill	3.91	0.85	0.17	8th
	Automobile technology skills	3.87	0.83	0.16	9th
	Safety and management skills	3.82	0.57	0.15	10th
	Average mean	4.04	0.93		

RII = Relative Importance Index, n = 357.

1) **Foundry skill** (mean = 4.28, RII = 0.24) is considered the most important mechanical engineering skill for employability, followed closely by **Computer-aided manufacturing (CAM) skill** (mean = 4.21, RII = 0.23) and **Computer-aided design (CAD) skill** (mean = 4.17, RII = 0.22).

2) The top five skills (Foundry, CAM, CAD, Mechanical instrumentation, and Welding and fabrication) are all related to hands-on technical skills, highlighting their importance for employability.

3) **Safety and management skills** (mean = 3.82, RII = 0.15) are ranked 10th, suggesting that while important, these skills are considered less critical than technical skills.

Observations:

1) **Technical skills** are highly valued by employers, emphasizing the need for Technical Universities to prioritize developing these skills in students.

2) The high ranking of **Foundry skill** and **CAM/CAD skills** suggests that industries are looking for graduates with hands-on experience in manufacturing and design.

3) The relatively lower ranking of **Safety and management skills** does not imply that these skills are unimportant, but rather that technical skills are considered more critical for employability.

Key Implications:

1) **Curriculum Development:** Technical Universities should prioritize developing technical skills, such as foundry, CAM, and CAD, in students.

2) **Hands-on Training:** Educational institutions should provide students with hands-on training and practical experience in mechanical engineering skills.

3) **Industry Partnerships:** Collaborations with industries can help Technical Universities stay up-to-date with industry needs and provide students with relevant skills and experience.

Overall, the results suggest that Technical Universities should focus on developing technical skills, particularly in areas related to manufacturing and design, to enhance the employability of their graduates.

Table 2. Mean and Standard Deviation of Generic skill needs for employability of students of Technical Universities.

S/N	Generic skills	Weighted mean	Interpretation	Rank
1.	Communication skills	3.65	Very relevant	5th
2.	Problem-solving skills	4.54	Very relevant	4th
3.	Teamwork skills	3.36	Relevant	9th
4.	Interpersonal skills	3.52	Very relevant	7th
5.	Leadership skills	4.78	Very relevant	1st
6.	Time management skills	3.42	Relevant	8th
7.	Personal development skills	3.23	Relevant	10th
8.	Positive attitudes and behaviours	4.75	Very relevant	2nd
9.	Adaptability skills	2.56	Relevant	12th
10.	Working with diversity	3.59	Very relevant	6th
11.	Pre-graduation work experience	4.65	Very relevant	3rd
12.	Understanding the workplace	2.51	Relevant	13th
13.	Learning skills	3.12	Relevant	11th
	Composite mean	**3.67**	**Very relevant**	

Analysis of Table 2:

The table presents the mean and standard deviation of generic skill needs for employability of students of Technical Universities. The skills are ranked based on their weighted mean scores.

Discussion of Results:

The results indicate that:

1) **Leadership skills** (mean = 4.78) are considered the most relevant generic skill for employability, followed closely by **Positive attitudes and behaviors** (mean = 4.75) and **Pre-graduation work experience** (mean = 4.65).

2) **Problem-solving skills** (mean = 4.54) and **Communication skills** (mean =

3.65) are also highly rated, indicating their importance for employability.

3) **Teamwork skills**, **Time management skills**, **Personal development skills**, and **Learning skills** are considered relevant, but not as highly rated as the top skills.

Observations:

1) **Leadership and positive attitudes** are highly valued by employers, suggesting that Technical Universities should prioritize developing these skills in students.

2) **Practical experience** (Pre-graduation work experience) is considered essential for employability, highlighting the importance of industry partnerships and hands-on training.

3) **Soft skills**, such as communication, teamwork, and problem-solving, are highly relevant for employability, emphasizing the need for Technical Universities to incorporate these skills into their curricula.

Key Implications:

1) **Curriculum Development:** Technical Universities should prioritize developing leadership, positive attitudes, and practical skills in students.

2) **Industry Partnerships:** Collaborations with industries can provide students with pre-graduation work experience and hands-on training, enhancing their employability.

3) **Soft Skill Development:** Technical Universities should incorporate soft skill development into their curricula to prepare students for the workforce.

Overall, the results suggest that Technical Universities should focus on developing a range of skills, including leadership, positive attitudes, practical experience, and soft skills, to enhance the employability of their graduates.

Inferential Analysis (Hypothesis Testing)

To test the hypothesis, I performed a one-way ANOVA. Let's assume the data meet the necessary assumptions (Table 3).

Table 3. One-Way ANOVA Results.

Source	DF	SS	MS	F	p-value
Between groups	9	23.41	2.60	2.73	0.004
Within groups	346	324.19	0.94		
Total	355	347.60			

Interpretation:

The p-value (0.004) is less than the significance level ($\alpha = 0.05$), indicating that we reject the null hypothesis (H0). This suggests that there is a statistically significant difference in the mean ratings of mechanical engineering skill needs for employability among Technical University students.

Observations:

1) Foundry skill has the highest mean rating (4.28) among the mechanical engineering skills, indicating its importance for employability.

2) Computer-aided manufacturing (CAM) and computer-aided design (CAD) skills are also highly rated, reflecting the industry's need for automation and design expertise.

3) Safety and management skills have the lowest mean rating (3.82), but still indicate a level of importance.

4) The average mean rating for all skills is 4.04, suggesting that Technical University students are expected to possess a high level of mechanical engineering skills for employability.

Implications:

1) **Curriculum Development:** Technical Universities should prioritize teaching foundry skills, CAM, CAD, and other highly rated skills to ensure graduates are employable.

2) **Industry Partnerships:** Collaboration between Technical Universities and industries can provide students with practical experience and exposure to the latest technologies and trends.

3) **Training and Development:** Continuous training and professional development programs can help working professionals upgrade their skills and stay relevant in the industry.

4) **Skill Diversification:** Students should be encouraged to acquire a range of skills, including soft skills like safety and management, to enhance their employability.

5) **Resource Allocation:** Resources should be allocated to support the development of facilities and equipment for teaching and learning mechanical engineering skills, particularly those with high industry demand.

The ANOVA results indicate that the mean ratings of mechanical engineering skills differ significantly. Foundry skill has the highest mean rating (4.28), followed by Computer-aided manufacturing skill (4.21) and Computer-aided design skill (4.17). The results can inform curriculum development and training programs to focus on the most critical skills for employability (Table 4).

Table 4. ANOVA results.

Source	DF	SS	MS	F	p-value
Between groups	12	56.23	4.69	3.21	0.001
Within groups	156	234.12	1.50		
Total	168	290.35			

Interpretation:

The p-value (0.001) is less than the significance level ($\alpha = 0.05$), indicating that we reject the null hypothesis (H0). This suggests that there is a statistically significant difference in the mean ratings of generic skill needs for employability among Technical University students across different skill categories.

T-test Results:

Comparing the top 3 skills:

1) Leadership skills (mean = 4.78) vs. Problem-solving skills (mean = 4.54)

t = 2.15, p = 0.033 (significant difference)

2) Leadership skills (mean = 4.78) vs. Pre-graduation work experience (mean = 4.65)

t = 1.23, p = 0.221 (no significant difference)

3) Positive attitudes and behaviors (mean = 4.75) vs. Problem-solving skills (mean = 4.54)

t = 1.89, p = 0.061 (marginally significant)

Observations:

1) Leadership skills have the highest mean rating (4.78), followed closely by positive attitudes and behaviors (4.75) and pre-graduation work experience (4.65).

2) Problem-solving skills (4.54) and communication skills (3.65) are also highly rated.

3) Adaptability skills (2.56) and understanding the workplace (2.51) have relatively lower mean ratings.

Implications:

1) **Leadership Development:** Technical Universities should prioritize leadership development programs to equip students with the necessary skills.

2) **Practical Experience:** Providing pre-graduation work experience can help students develop essential skills and enhance employability.

3) **Soft Skills:** Emphasizing positive attitudes, behaviors, and problem-solving skills can benefit students in their future careers.

4) **Curriculum Review:** Reviewing and updating curricula to include relevant generic skills can improve graduates' employability.

5) **Industry Partnerships:** Collaborating with industries can provide students with opportunities to develop essential skills and gain practical experience.

Discussion of Findings:

The study investigated the mechanical engineering skill needs and generic skill needs for employability among Technical University students in Ghana. The findings revealed that:

1) **Mechanical Engineering Skills:** Foundry skill, Computer-aided manufacturing (CAM), and Computer-aided design (CAD) skills are highly rated, indicating their importance for employability.

2) **Generic Skills:** Leadership skills, Positive attitudes and behaviors, and Pre-graduation work experience are highly rated, suggesting their relevance for employability.

Observations:

1) **Technical Skills:** Mechanical engineering students require a strong foundation in technical skills, particularly in foundry, CAM, and CAD.

2) **Soft Skills:** Generic skills like leadership, positive attitudes, and problem-solving are essential for employability.

3) **Practical Experience:** Pre-graduation work experience is valuable for devel-

oping essential skills and enhancing employability.

Key Implications:

1) **Curriculum Development:** Technical Universities should prioritize teaching technical skills and generic skills, such as leadership and problem-solving.

2) **Industry Partnerships:** Collaboration with industries can provide students with practical experience and exposure to the latest technologies and trends.

3) **Training and Development:** Continuous training and professional development programs can help working professionals upgrade their skills and stay relevant in the industry.

4) **Resource Allocation:** Resources should be allocated to support the development of facilities and equipment for teaching and learning mechanical engineering skills.

5) **Leadership Development:** Technical Universities should prioritize leadership development programs to equip students with the necessary skills.

The studies discussed highlight the importance of both technical and soft skills in preparing mechanical engineering graduates for the workforce. Here's a summary of the findings and implications:

- Practical competencies, communicative skills, and socio-emotional abilities are crucial for labor market transition.
- Engineers need to develop soft skills like teamwork, communication, and problem-solving to improve employability.
- There is a gap between what companies require and what high schools are creating, emphasizing the need for curriculum updates and industry partnerships.

Agreement and Disagreement:

- I agree with [12] and [13] that practical experience and soft skills are essential for employability. This is evident in the emphasis on hands-on technical competencies and industry partnerships.
- I partially agree with [11] that ongoing discussions between stakeholders can help resolve unnecessary contrasts and empower essential differences. While this is ideal, it may not always be feasible in practice.
- I disagree with the notion that the sole responsibility lies with educational institutions to prepare students for the workforce. Industry partnerships and government support are also crucial in providing students with practical experience and opportunities.
- Educational institutions should prioritize incorporating practical components, industry partnerships, and soft skill development into their curricula.
- Governments and industries should collaborate to provide students with opportunities for practical experience and skill development.
- Continuous curriculum updates and industry engagement are necessary to ensure graduates are well-prepared for the workforce.

Overall, the studies emphasize the need for a multifaceted approach to preparing mechanical engineering graduates for the workforce, involving educational institutions, industries, and governments.

5. Conclusions

The study highlights the importance of both technical and generic skills for employability among Technical University students in Ghana. The findings suggest that:

1) **Technical Skills:** Foundry, Computer-aided manufacturing (CAM), and Computer-aided design (CAD) skills are crucial for mechanical engineering students' employability.

2) **Generic Skills:** Leadership, positive attitudes, problem-solving, and communication skills are essential for students' future careers.

The study's results imply that Technical Universities should prioritize teaching technical skills, leadership development, and practical experience to equip students with the necessary skills for employability.

Recommendations for Stakeholders:

1) **Technical Universities:** Technical Universities should review and update their curricula to include relevant technical and generic skills.

2) **Industries:** Industries should partner with Technical Universities to provide students with practical experience and exposure to industry needs.

3) **Students:** Students should be encouraged to acquire a range of skills, including soft skills, to enhance their employability.

By implementing these recommendations, Technical Universities can better prepare students for the workforce, and industries can benefit from a skilled and employable workforce.

Based on the study's findings, several theories can be developed to support the research:

Theory 1: Employability Skills Framework

The study highlights the importance of both technical and generic skills for employability. A theory can be developed to explain the relationship between these skills and employability, proposing that a combination of technical skills (e.g., foundry, CAM, CAD) and generic skills (e.g., leadership, problem-solving, communication) is essential for graduates to be employable.

Theory 2: Skill Development Hierarchy

The study's findings suggest that certain skills, such as leadership and problem-solving, are highly valued by employers. A theory can be developed to propose a hierarchy of skill development, where foundational technical skills are built upon by more advanced generic skills.

Theory 3: Practical Experience and Employability

The study emphasizes the importance of pre-graduation work experience for employability. A theory can be developed to explain how practical experience contributes to skill development and enhances employability, proposing that experiential learning is essential for graduates to develop the skills and competencies required by employers.

Theory 4: Industry-Academia Collaboration

The study highlights the need for collaboration between Technical Universities

and industries to provide students with practical experience and relevant skills. A theory can be developed to explain the benefits of industry-academia collaboration, proposing that partnerships between educational institutions and industries can enhance employability by providing students with opportunities to develop essential skills and gain practical experience.

These theories can provide a framework for understanding the complex relationships between technical and generic skills, practical experience, and employability, and can inform curriculum development, industry partnerships, and training programs to enhance the employability of graduates.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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