



Employability of mechanical engineering graduates from Sunyani Technical University of Ghana

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Abstract

Although the Government of Ghana gives considerable attention to technical education to accelerate national development, some graduates remain unemployed for years after graduation. In this study, employability of mechanical engineering graduates from Sunyani Technical University of Ghana is presented. It assessed the employment status and duration of unemployment of the graduates, identified the factors that hinder their employability and the challenges that require attention prior to graduation of students, and made suggestions for improvement. Respondents of the study were 131 graduates from 2014-2017 graduation years, comprising 50% of graduates from each of the Program options in the department. The sampling techniques used were purposive and stratified random sampling techniques. A questionnaire was the research instrument used for data collection and it was administered using e-mails, WhatsApp and phone calls. The results revealed that the employment status of the graduates was about 84% with the duration of unemployment about 29%, 41% and 19% for one, two and three years after their national service respectively. The main factor hindering employability of the graduates was inadequate practical skills since more attention was given to theory at the expense of practical work. The main challenge which requires attention prior to graduation of students was the lack of job-seeking skills. The Department should therefore, focus more on the practical element of the Programs by increasing the practical hours and partner with industry for curriculum development, more internship opportunities and industrial tours, and organise seminars on job acquisition processes prior to graduation of students to enhance employability of the graduates.

Keywords: employability status, unemployment duration, mechanical engineering graduates, Ghana

Introduction

The past and present Governments of Ghana have given considerable attention to technical education (Afeti & Adubra, 2014) because it provides practically-oriented manpower capacity for accelerated socio-economic development of the nation (Ministry of Education, 2012). The metamorphosis of technical education in Ghana was from technical institutes in the 1950s to polytechnics in 1991 with subsequent promulgation of the Polytechnic Law, 1992 (PNDCL 321), which upgraded the polytechnics to tertiary status in 1993 (Amoa-Mensah, 2007; Boakye-Agyeman, 2006; Government of Ghana, 1992,

1991; Nsiah-Gyabaah, 2005). The polytechnics were mandated to run Programs and courses at the middle-level of technical training to promote middle-level manpower development (Government of Ghana, 1991). Thus, in 1994, the polytechnics started running Programs leading to the award of certificates in Higher National Diploma (HND) in the fields of manufacturing, commerce, science and technology, applied social science, applied art and also to provide opportunities for skills development, applied research and publication of research findings (Government of Ghana, 2007). In 2016, the Technical Universities Act, 2016 (Act 922) was enacted and amended in 2017 to convert the polytechnics to technical universities to enable them to provide high-level manpower in the fields of technical and vocational education and training (TVET), engineering, science and technology, applied arts and related disciplines for socio-economic development of the nation (Government of Ghana, 2016, 2017).

In line with the numerous reforms in the technical education in Ghana, Sunyani Technical University which started in 1967 as a technical institute to offer technical and vocational education and training to students, was also upgraded to a polytechnic status in 1997 by the Polytechnic Law, 1992 (PNDC 321). The Polytechnic Law mandated Sunyani Polytechnic to provide career-focused education in engineering, science and technology, technical and vocational, applied arts and related disciplines with hands-on experience and entrepreneurial development to meet the higher and middle level manpower needs of the country (Government of Ghana, 1992). The Sunyani Polytechnic was also converted to Sunyani Technical University in 2016 by the Technical Universities Act, 2016 (Act 922 as amended) along with other polytechnics in the country. In accordance with the Technical Universities Act, 2016, the Sunyani Technical University provides higher education and award degrees, diplomas and other certificates in engineering, science, and technology-based disciplines as well as technical and vocational education and training (TVET), applied arts and related disciplines with hands-on experience and entrepreneurial development to meet the higher and middle level manpower needs of Ghana. The university is made up of four faculties namely; Faculty of Applied Science & Technology, Faculty of Built Environment & Applied Art, Faculty of Business and Management Studies, and Faculty of Engineering. There are 15 academic departments with 19 HND Programs. The Department of Mechanical Engineering is one of the three departments under the Faculty of Engineering.

In line with the mandates of the Sunyani Technical University, the Department of Mechanical Engineering was established to produce highly qualified middle level manpower in the field of mechanical engineering through hands-on practical teaching methodologies and industrial practice in order to acquire the necessary knowledge and practical skills in mechanical engineering at the non-tertiary and tertiary levels to meet the demands of industry. In 2011/2012 academic year, the Department commenced running Programs in mechanical engineering with options in Plant, Automobile and Production leading to the award of certificates in Higher National Diploma in Mechanical Engineering. As at the end of 2018/2019 academic year, the department had graduated over 400 students into the job market.

The curricula of the Higher National Diploma Mechanical Engineering Programs were designed to equip the graduates with excellent employment potential to enable them work effectively and efficiently in industries such as manufacturing, automobile, transport, mining, energy, telecommunication, construction, health, water supply, small and medium scale enterprises (SMEs), education and research institutions, and other related industries. The graduates should also possess the best of entrepreneurial outlook to enable them establish and manage their own businesses. However, the employability of graduates produced into the job market largely depends on the quality of education provided to the students. According to Sahu, Shrivastava and Shrivastava (2008), the quality of technical education largely depends on how effective the management of the institution executes its functions and responsibilities, the availability of the required infrastructure, the quality of lecturers, students' attitude towards learning, level of partnership with industry and availability of resources for research and development. In order to ensure quality education and improve the

employability of graduates, all the major stakeholders in technical education in Ghana including the Government of Ghana, regulatory and supervisory bodies, management and staff of the Technical Universities in Ghana and students, use their quota to produce graduates who meet the expectations of employers in the country. For instance, the Government of Ghana provides financial support for infrastructure, equipment and staffing, among others, for quality technical education through the Ghana Education Trust Fund (GETFund) and the university management augment the Government's support with Internally-Generated Funds (IGF) while the regulatory and supervisory bodies ensure that quality of education is not compromised (British Council, 2016; Ministry of Education, 2012). Notwithstanding these concerted efforts to ensure quality technical education and improve the employability of graduates, UNESCO (2010), NUFFIC (2011), Kigotho (2014) and Baah-Boateng (2015) reported that there were some inadequacies in the training of graduates in engineering and technology in Ghana including inadequate supply of instructional materials, large class sizes, inadequate practical training facilities and equipment and weak linkages between the training institutions and industry. Consequently, there is a mismatch between skills possessed by graduates of tertiary education and what is needed by industries. The situation has resulted in unemployed engineering graduates in the country.

Unemployment is one of the main challenges on the job market in Ghana. The National Labour Commission revealed that there were about 700,000 unemployed graduates in Ghana (Biney, 2015; Jonah, 2011). Donkor (2014) attributed the unemployment situation in Ghana to the fact that most private universities in Ghana train people whose skills do not meet the requirement of employers. The problem of the unemployed graduates is also attributed to the inability of the graduates to apply the knowledge acquired because most tertiary institutions in Ghana only teach the theoretical aspect of courses at the expense of the practical work (Ezit, 2014; Sasa, 2018). Consequently, some university graduates remain unemployed for more than 3 years (Biney, 2015). According to Aryeetey (2011), 50% and 20% of graduates from Polytechnics (now Technical University) and Traditional Universities in Ghana remain unemployed for two years or three years respectively, after their national service. The situation has created undue tension and desperation among the graduates and parents leading to the formation of the Unemployed Graduates Association with a series of demonstrations against the Government of Ghana to provide the needed job opportunities for the graduates (Biney, 2015). Notwithstanding this, years after the Department of Mechanical Engineering had graduated students into the job market, no feedback had been sought or received from the graduates on their employment and elements that could be improved by the department to significantly increase the employability of the graduates from the department.

This study presents the employability of mechanical engineering graduates from Sunyani Technical University of Ghana. It assessed the employment status and unemployment duration of the graduates, identified the factors that hinder the employability of the graduates and the challenges that require attention prior to graduation of students, and made suggestions for improvement. The findings of the study would not benefit only the Department of Mechanical Engineering of Sunyani Technical University, but would enable those in other technical universities in the country to review and restructure the existing and future Programs to enhance the employability of the graduates especially, at this time that all the departments prepare to run four-year Programs in Bachelor of Technology in Mechanical Engineering.

Literature review

An unemployed person is one who is of working age (e.g., 15+ years in Ghana) and who is searching for work, is available for work and without work (Ghana Statistical Service, 2015). The engineering graduates' unemployment menace is an increasing problem in several countries around the world (Dalrymple & Cox, 2006) including Ghana and other developing nations. According to (Williams, 1976),

in developed countries with universal education, the educational institutions are not normally blamed for unemployment. However, in developing countries, the general belief is that inept educational delivery is a leading cause of the high graduate unemployment rates. For instance, Donkor (2014) attributed the unemployment situation in Ghana to the inability of most private universities in Ghana to train people to meet the skills requirement of employers. Ezit (2014) and Sasa (2018) attributed it to the inability of the graduates to apply the knowledge acquired because most tertiary institutions in Ghana only teach the theoretical aspect of courses at the expense of the practical work. However, Motsoeneng, Schultz and Bezuidenhout (2013) opined that the engineering work is very complex and requires several skills because of the multi-disciplinary nature of the profession. Thus, technology-based engineering work such as mechanical engineering requires theoretical knowledge and a large number of skills; some of which are technical, generic, management and social (Motsoeneng et al., 2013). Additionally, it requires integrity, self-esteem, leadership, teamwork, problem-solving and creativity (Frimpong, 2011), of which very little is taught and learned in school (Trevelyan, 2008). Spinks, Silburn and Birchall, (2007) classified these skills required by industries into technical, personal and business skills but asserted that the engineering companies mostly highlight the technical skills, probably because they form the fundamental requirement for every engineer and prerequisite for learning new technologies.

According to (Motsoeneng et al., 2013), engineering work requires both technical and social skills as such, theoretical knowledge, engineering principles, technical skills and management skills. Azami et al. (2009a) reported that some of the technical skills and attributes that employers consider before employing engineering graduates include the capability to acquire and apply knowledge of engineering fundamentals, knowledge in application and practical oriented engineering, technical skills in specific engineering disciplines, the ability to utilise a systemic approach to design and evaluate operational performance, competence in theoretical and research engineering and the ability to design and conduct experiments and analyse and interpret data. Spinks et al. (2007) and Smith and Kruger (2008) stated that in addition to technical skills, employers expected engineering graduates to possess generic skills such as communication skills and interpersonal skills. Cai (2013) contended that employers also look for knowledge, good personality attributes, ability to adjust to the culture of the company and the willingness to learn continuously. Azami et al. (2009a) stated that employers place considerable importance on the ability to communicate effectively with both engineers and non-engineers, ability to work effectively in a team and as an individual, and ability to lead. According to Spinks et al. (2007), employers look for engineering graduates who have the potential to develop business and commercial skills including developing appropriate management skills.

Azami et al. (2009c) and Lisá, Hannelová and Newman (2019), stated that the expectation of employers is that the engineering graduates should be well equipped with requisite employability skills to make them fit into their organisations and perform effectively immediately they are employed. Additionally, employers expect the engineering graduates to possess relevant skills, such as aptitude to communicate effectively, problem solving skills, interpersonal skills and other personal qualities (Azami et al., 2009b; Lee, 2003; Shahrin et al., 2004). However, according to a research conducted by the British Council (2016), employers do not expect fresh graduates to be fully trained to work as soon as they were employed but they are interested in attitudes, competencies and basic skills of the new graduates they employed. This was affirmed by Mohamad et al. (2019) who asserted that most employers recently consider the soft skills possessed by graduates more than their academic qualifications. Thus, engineering graduates should acquire the essential employability skills for effective use of their knowledge and technical skills in their organisations (Azami et al., 2009b; Kamsah, 2004; Shahrin et al., 2004). Yet fresh graduates do not meet the skills expectations of their employers (Cyphert & Lyle, 2016; Perkins & Nigel, 2015) and many engineering graduates complete their education without the essential basic skills and employers need to provide further training after employment. The situation has contributed immensely to the continuous growth of unemployment in

Ghana and the world at large (Baah-Boateng, 2015; Bhaduri, Banerjee, & Moughari, 2015; Biney, 2015; Constantinescu, 2015).

Methods

Before the study began, ethics approval was obtained from the University Research Directorate. The Head of Department of Mechanical Engineering was informed about the study and permission was sought to collect data on the graduates from the Assistant Registrar of the department. Verbal consent was obtained and assurance given to maintain the confidentiality of the data requested from the department. The data on graduates from the Department of Mechanical Engineering including number of graduates, Program options, year of graduation, phone numbers and e-mail addresses and other background information were collected from the department. The names of the graduates were exempted from the data collected from the department to ensure anonymity and protect the privacy of the graduates. A questionnaire was the research instrument used for data collection. The data collection tool was cautiously developed to ensure that all creativities were applied to gather data without compromising on accuracy. Pre-testing of the questionnaire was carried out with a sample of ten graduates in the Sunyani Municipality to structure the questions and make them clearer before the questionnaire was administered to the graduates. A copy of the questionnaire has been included as an appendix to the paper.

The purposive and stratified random sampling techniques were used to select the graduates for the study. The Department of Mechanical Engineering had graduated over 400 students into the job market from 2014 to 2019 as shown in Table 1. However, the study purposively targeted four consecutive cohorts of graduates who completed their HND Mechanical Engineering Program between 2014 and 2017. This was because the 2018 graduates had just completed their national service and were yet to be employed while the 2019 graduates had just started their National Service and were not due for employment. Thus, including these categories of graduates in the study would result in a false conclusion. Since the department runs the HND Mechanical Engineering Program with options in Plant, Automobile and Production, the graduates were stratified into these Program options and the respondents were randomly selected from the options to ensure that each of the Program options were equally represented. The stratified sampling was used to ensure that respondents were selected from each of the Program options offered at the department. In all, the respondents of the study were 131 graduates from the department who completed from 2014 to 2017. Fifty percent (50%) of the graduates from each of the Program options offered at the department were selected from each of these graduation years as the respondents for the study.

The questionnaire used for data collection was a semi-structured questionnaire consisting of structured, closed and open-ended questions. The questionnaire was grouped into employability status and unemployment duration of the graduates, the factors that hinder their employability, and suggestions from the graduates for improvement on the HND Program. In the questionnaire, a list of factors hindering employability of graduates often cited in the literature (Baah-Boateng, 2015; Kigotho, 2014; NUFFIC, 2011; UNESCO, 2010) was prepared for the respondents to choose from. Additional space was provided to enable the graduates to add to the list provided. This provided the opportunity for the challenges that require attention prior to the graduation of students to be identified. The graduates were also asked to mention the courses they were offered during their HND Program that, in their opinion, needed further attention. The selected graduates were contacted by phone to inform them of the study and seek their consent to partake in the study. The questionnaire was sent to the graduates via e-mails and WhatsApp messages to solicit the required information. Ethical considerations were satisfied by obtaining verbal consent and preserving the confidentiality of respondents. The graduates were then contacted, again by phone, to inform them about the questionnaire. The administration of the questionnaire lasted for eight weeks to allow adequate time

for the respondents to complete the questionnaire. At the end, all of the 131 questionnaires were successfully completed and the responses were returned via e-mail. The highest standard of ethics was maintained at all times during engagement with the respondents.

The data collected was entered manually, organised in relation to the objectives of the study and stored in Microsoft Excel worksheet. The worksheet was set up with the variables as columns and the respondents as rows. The data analysis was primarily quantitative and supported with qualitative analysis to present the results of the study. The processing of quantitative data obtained from the survey was done by coding, editing, classification and entered into a database developed on Microsoft Excel. The data was examined to discover any obvious input errors, and to clarify noticeable discrepancies within the data sets. Since a substantial share of the data collected was unconditional, the data were analysed using Microsoft Excel and presented in the form of percentages in tables and charts to enable comparison to determine differences between various categories. The responses from questions which were open ended were summarized and discussed.

Table 1: HND Mechanical Engineering Graduates from 2014 - 2019

| Program option/Year | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Total |
|----------------------------------|------|------|------|------|------|------|-------|
| Plant (Number of graduates) | 18 | 30 | 41 | 37 | 38 | 25 | 189 |
| Automobile (Number of graduates) | 21 | 21 | 37 | 41 | 48 | 30 | 198 |
| Production (Number of graduates) | 0 | 0 | 6 | 10 | 5 | 5 | 26 |
| Total | 39 | 51 | 84 | 88 | 91 | 60 | 413 |

Source: Department of Mechanical Engineering, Sunyani Technical University

Results and discussion

Background of graduates used for the study

The study used 131 graduates for the assessment comprising 123 graduates who were not employed before admission and eight students who were already employed before being admitted to pursue the HND Program. The graduates who were employed before admission were not included in the assessment of employment status and unemployment duration of the graduates. However, they were included in the study to tap into their rich experiences and to acquire information for the remaining parts of the study. The details of the graduates used for the study including the Program options and the years completed are shown in Table 2 while the employment status of graduates before admitted is shown in Figure 1.

The Department of Mechanical Engineering admits students from Technical Schools, Senior High Technical Schools, and Senior High Schools (SHS). In this study, students from Technical Schools and Senior High Technical Schools were classified as Technical Students since they acquired some technical knowledge and technical skills before being admitted unlike those students from Senior High Schools who neither acquired any technical knowledge nor technical skills before admission. The Department of Mechanical Engineering of Sunyani Technical University admits more students from Technical Schools than SHS. The number of students in the two categories used for the study is depicted in Figure 2.

Table 2: Number of Graduates used for the Study

| Program option/Year | 2014 | 2015 | 2016 | 2017 | Total |
|----------------------------------|------|------|------|------|-------|
| Plant (Number of graduates) | 9 | 15 | 20 | 19 | 63 |
| Automobile (Number of graduates) | 11 | 10 | 19 | 20 | 60 |
| Production (Number of graduates) | 0 | 0 | 3 | 5 | 8 |
| Total | 20 | 25 | 42 | 44 | 131 |

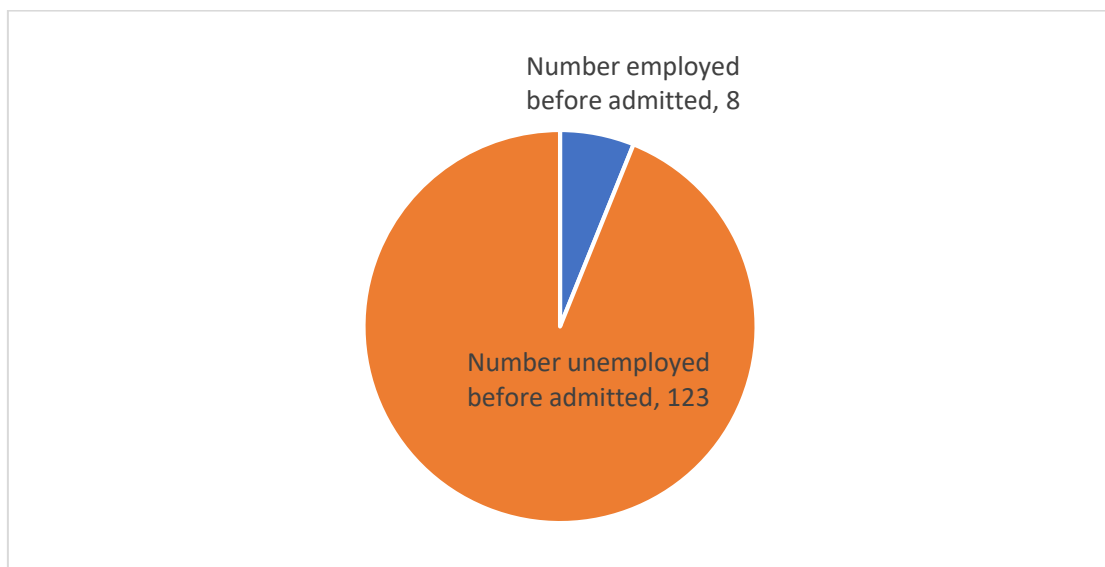


Figure 1: Employment Status of Graduates Before Admitted

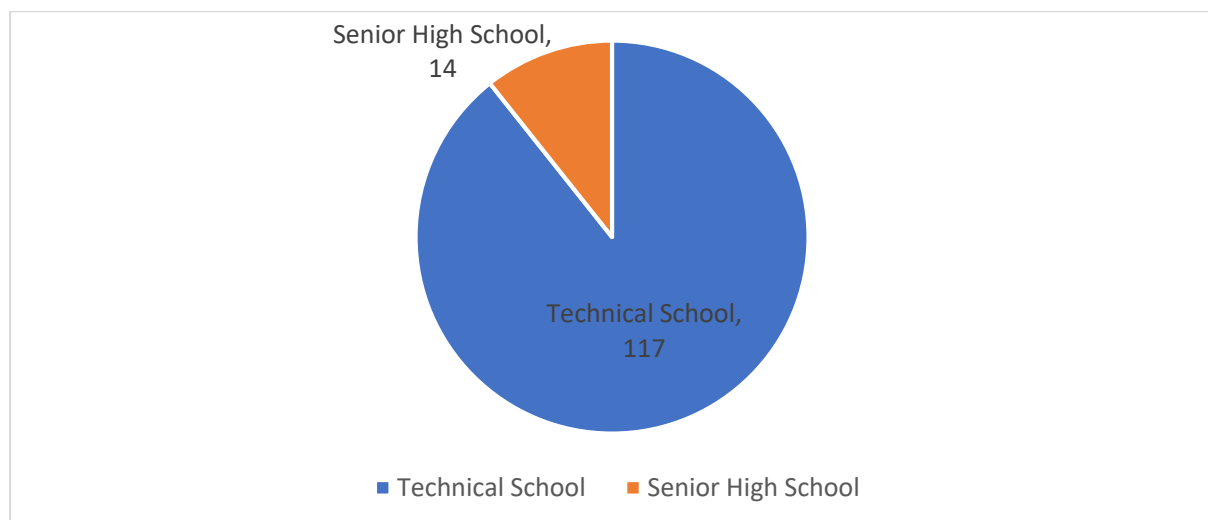


Figure 2: Previous Schools of Graduates

Employment status of graduates from the department

Overview of employment status of graduates

Many parents spend their meager resources to educate their children to improve their chances of securing good employment. However, graduate unemployment is very alarming in Ghana (Biney, 2015; Jonah, 2011). Despite the alarming graduate unemployment situation in the country, this study revealed that about 84% of the 123 graduates selected for the study were employed as shown in Figure 3.

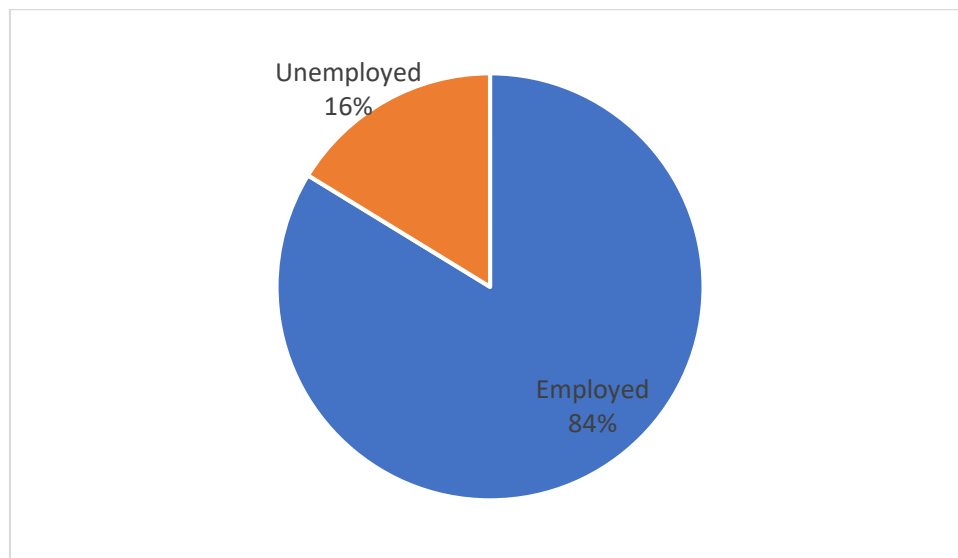


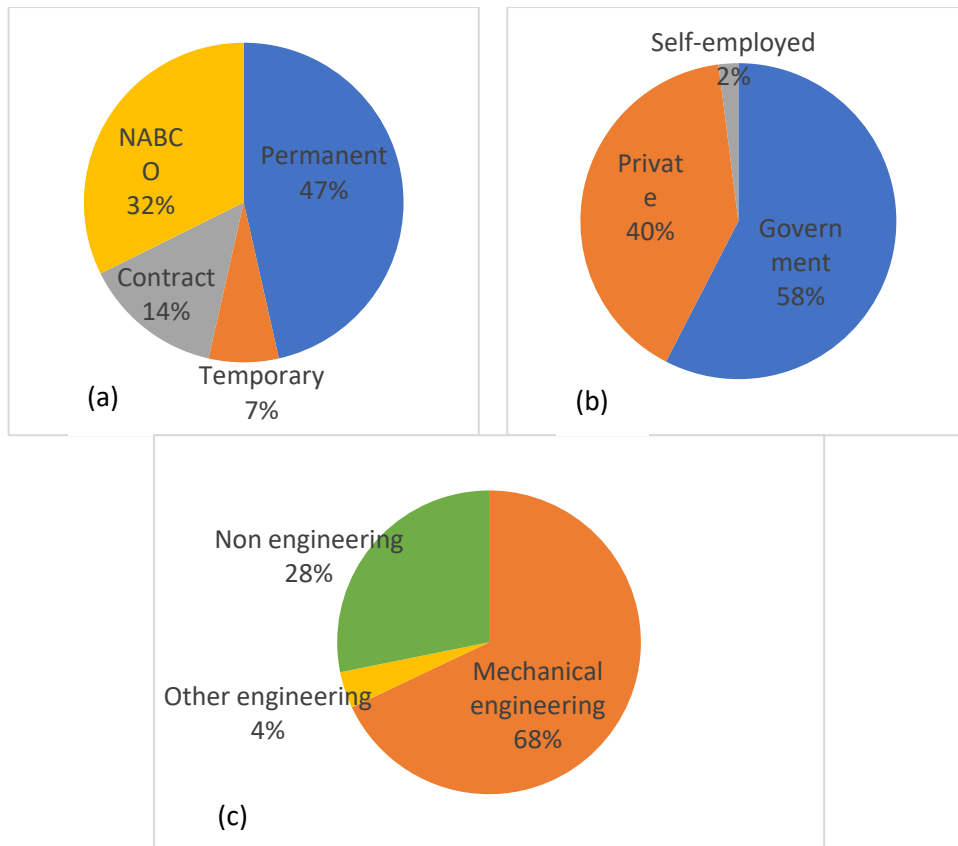
Figure 3: Employment Status of Graduates

Segmentation of the employed graduates

The employed graduates were categorized into type of employment, type of employer and field of employment. Out of the 84% of the graduates who were employed, 47% had secured permanent employment while 14% and 7% respectively, had secured contract and temporary employment. As much as 32% were employed by the 'Nation Builders Corps' (NABCO) which is a 3-year contract Program scheduled to end in September, 2021.

The Government of Ghana considers the private sector as the engine of growth and provides an enabling environment for the private sector to establish industries in the country to reduce the unemployment menace in the country. The study revealed that 40% of the graduates were employed in the private sector. The Government of Ghana employed 58% including the NABCO employees. Only 2% of the graduates have been able to establish and manage their own workshops with some apprentices under their care.

Out of the 84% of the graduates who were employed, 68% were in the mechanical engineering establishments while 4% and 28% were in other engineering fields and non-engineering fields respectively. The segregation of the employed graduates is shown in Figure 4(a-c).



(a) Type of Employment; (b) Type of Employer; (c) Field of Employment

Figure 4 (a-c): Segmentation of the Employed Graduates

Employment status of graduates from technical schools and senior high schools

According to Azami et al. (2009c) and Lisá et al. (2019) employers expect fresh engineering graduates to be well equipped with requisite employability skills to perform effectively immediately they are employed. The study investigated whether graduates who were admitted from Technical Schools and thus, had some technical skills before admitted to pursue the HND Program, had a better chance of securing jobs than those who were admitted from Senior High Schools (SHS) and had no technical skills. The study revealed that about 83% of graduates admitted from Technical Schools were employed while about 79% of those from SHS were employed as displayed in Figure 5. Although more of the graduates admitted from Technical Schools were employed than those from SHS, there was no significant difference between the two. This was attributed to the fact that employers do not only place a high premium on the practical skills and knowledge related to the fields of study, but consider other skills and attributes that are essential at the workplace (British Council, 2016). This could also mean that the department was able to provide the requisite training to those students from SHS who were admitted without technical skills and brought them to the same level as those admitted from Technical Schools to enable them to compete on level grounds for the available job opportunities.

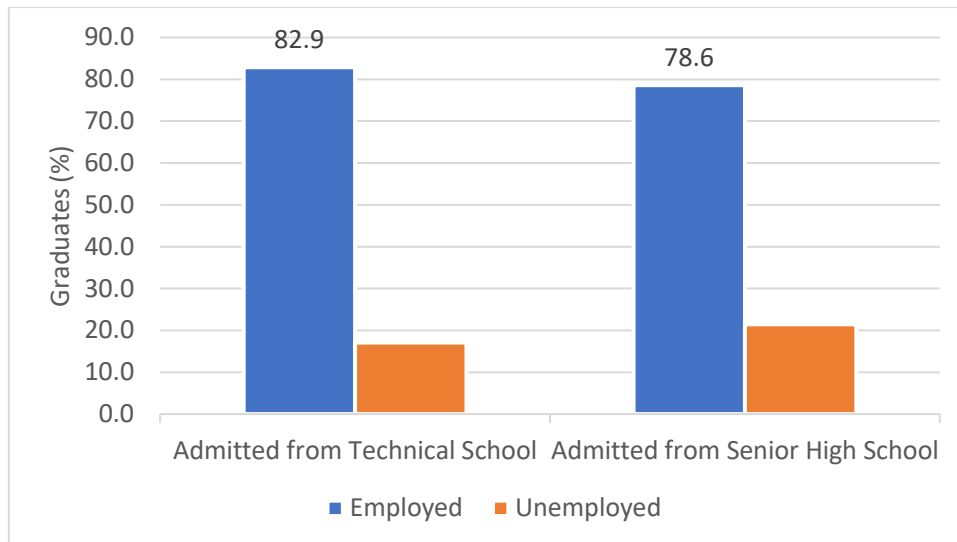


Figure 5: Employment Status of Graduates from Technical and Senior High Schools

Employment status of graduates of various program options

The Department of Mechanical Engineering runs HND Mechanical Engineering Programs with options in Plant, Automobile and Production. The study investigated which of the Program options offered by the Department of Mechanical Engineering of Sunyani Technical University had the better chance of securing jobs. It was observed that over 85% of graduates from Plant and Automobile options were employed while 57% of graduates from Production option were employed as shown in Figure 6. This means that graduates from Plant and Automobile options have better chance of securing jobs than those from Production. This is attributed to the shift from the manufacturing to other sub-sectors such as industry, mining and quarrying, construction, and electricity and water; resulting in persistent diminishing in growth of the manufacturing sub-sector in Ghana (Enu & Havi, 2014). Additionally, due to low enrolment of Production students in the Department, the number of Production graduates used for the study was far lower than that of Plant and Automobile options and this also might have contributed to the low percentage of Production graduates employed.

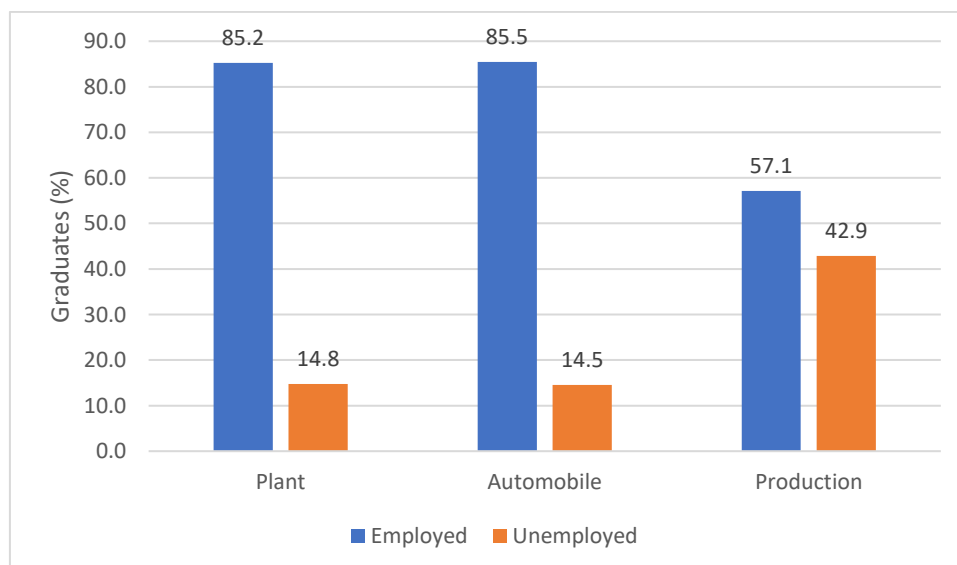


Figure 6: Employment Status of Graduates of Various Program Options

Employment status of various graduation years

The study also investigated the employment status of graduates of various graduation years. It was observed that 90% of the 2014 graduates were employed. The percentage decreased to 76% in 2015 and decreased further to about 74% in 2016 but increased to about 80% in 2017. The decline in the percentage of employed graduates in 2015 and 2016 was attributed to the embargo placed on the government sector employment, but the lifting of the embargo and the Government’s flagship Program, dubbed ‘Nation Builders Corps’ (NABCO), resulted in the rise of the employment of the 2017 graduates. The NABCO Program was rolled out just after the 2017-year group had completed their National Service and thus, they took advantage and joined the Program. Indeed, 16 out of the 35 graduates employed from the 2017-year group, constituting 45.7% were employed by the NABCO Program. The employment status of various graduating years is shown in Figure 7.

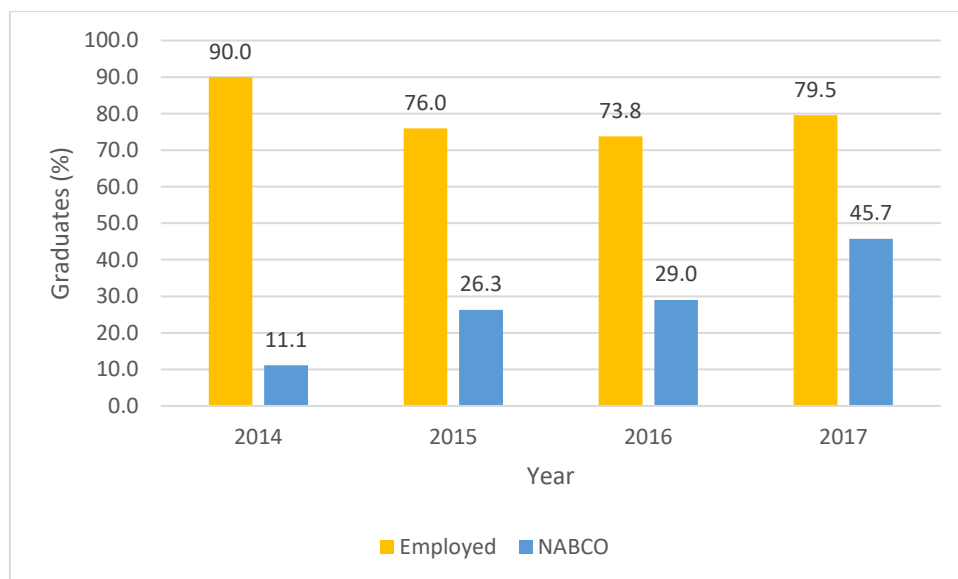


Figure 7: Employment Status of Various Graduation Years

Status of graduates who were employed before admitted

As discussed above, the eight graduates who were already employed before admission to pursue the HND Mechanical Engineering Program were exempted from the assessment of employment status of the graduates. However, the study assessed the impact of the HND Program on the status at their workplaces. The study revealed that 62% of this category of graduates were promoted after the HND Program as displayed in Figure 8. The remaining 32% claimed that they also qualify for promotion but the positions to be promoted to were occupied by their colleagues with equal qualifications. However, their salaries were increased after the HND Program and would be promoted when the appropriate positions become vacant.



Figure 8: Promotion of Graduates who were Employed before Admitted

Duration of unemployment of graduates

Although the unemployment situation in Ghana is alarming, 29.1% of the graduates from the Department secured employment within the first year, 40.8% within the second year and 19.4% within the third year after their National Service. This means that about 70% of the graduates from the Department secured employment within two years following their National Service, contrary to the assertion of Aryeetey (2011) that 50% of graduates from Polytechnics/Technical University and Traditional Universities in Ghana remain unemployed for two years. Again, over 89% of graduates from the Department secure employment within three years after their National Service with less than 11% remaining unemployed for more than three years after their National Service. This also contradicts the claim by Aryeetey (2011) that 20% of graduates from Polytechnics/Technical University and Traditional Universities in Ghana remain unemployed for three years but affirmed the position of Biney (2015) that some university graduates remain unemployed for more than three years. This indicates that the unemployment duration of graduates from the Department is shorter than previously thought. The unemployment duration of graduates is shown in Figure 9.

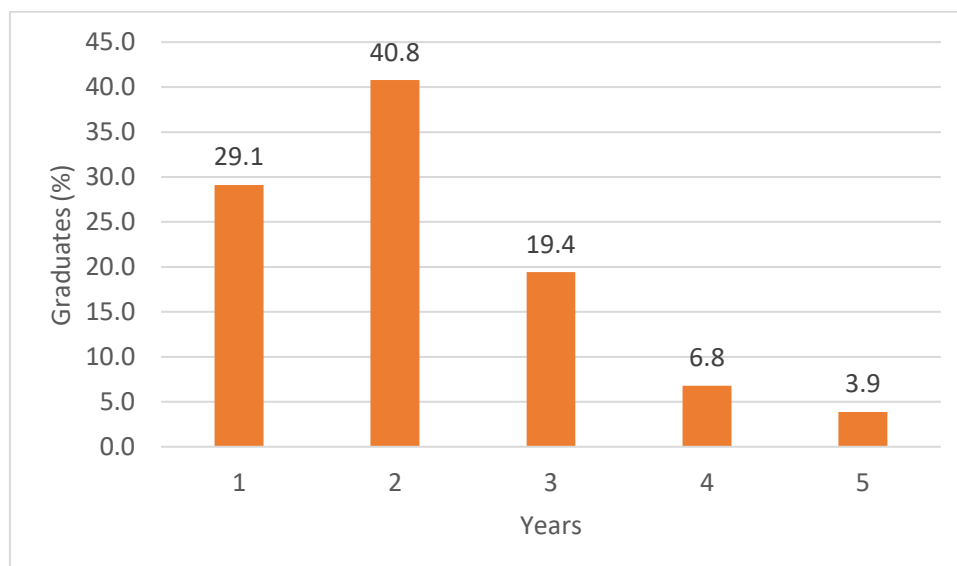


Figure 9: Unemployment Duration of Graduates

Factors hindering employability of graduates

The factors that hinder the employability of the graduates from the Department are displayed in Figure 10. Over 63% complained that they were not taken through adequate practical skills while 42% could not have an adequate internship while in school. Consequently, they lacked the necessary practical skills expected of graduates from a Technical University. This was attributed to inadequate practical training facilities and equipment, and weak linkages between the training institutions and industry (Baah-Boateng, 2015; Kigotho, 2014; NUFFIC, 2011; UNESCO, 2010). About 53% of the graduates think that lack of jobs in the country and lack of previous experience prevented them from getting employment. This contradicted the British Council (British Council, 2016) assertion that the unemployment situation in Ghana is caused by the lack of employability of the graduates and not lack of jobs in the country, but affirmed the assertion by Azami et al. (2009c) and Lisá et al. (2019) that employers expect engineering graduates to be well equipped with requisite employability skills to make them fit into their organisations and perform effectively immediately they are employed. In addition, about 56% attributed their unemployment to their inability to locate job vacancies, 39% said that some employers require a first degree instead of HND, 35% to lack of interview skills and 27.5% to lack of curriculum vitae (CV) writing skills. The introduction of the Bachelor of Technology (B-Tech) in Mechanical Engineering (Top-up) Program in the Department would solve the problem of employers requiring a first degree instead of HND and the graduates are encouraged to take advantage of the Program and upgrade themselves. The ability to locate job vacancies, CV writing skills and interview skills are part of employment seeking processes but they are not given much attention in the HND curriculum and need to be addressed to improve the employability of the graduates.

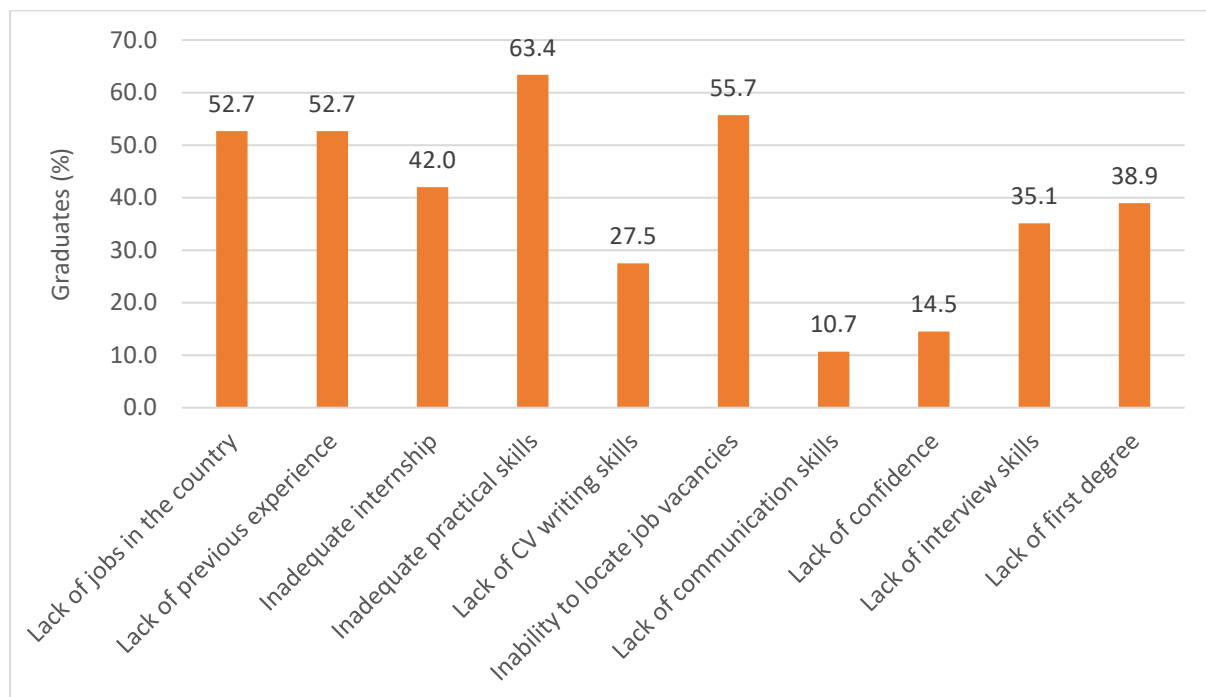


Figure 10: Factors Impeding Employability of Graduates

Impact of national service placement on employability of graduates

The National Service Secretariat of Ghana has the mandate to post graduates to organisations where the services of the graduates are needed. In this regard, mechanical engineering graduates are posted to both engineering and non-engineering related organisations for the one-year national service.

During this one year, those who are posted to mechanical engineering related organisations have the opportunity to acquire more practical skills and relevant experience to increase their chances of securing jobs after national service. Those posted to non-engineering related organisations also acquire some skills and experience but these may not be relevant to their field of study. The study investigated whether the national service placement affected the chances of the graduates in securing employment. The study revealed that at least 80% of the graduates posted to mechanical engineering related organisations, other engineering related organisations, and non-engineering related organisations had secured employment as shown in Figure 11. Thus, there was no significant effect of national service on the chances of securing a job, since there was little difference in the percentage of graduates employed from the three categories. This means that irrespective of the organisations where graduates are posted for their national service, they have an equal chance of securing jobs as those posted to mechanical engineering related organisations. This was because, in addition to the practical skills and knowledge related to the fields of study, employers place a high premium on other skills and attributes that are essential at the workplace (British Council, 2016) which could be acquired in any organisation where the graduates were placed for their national service.

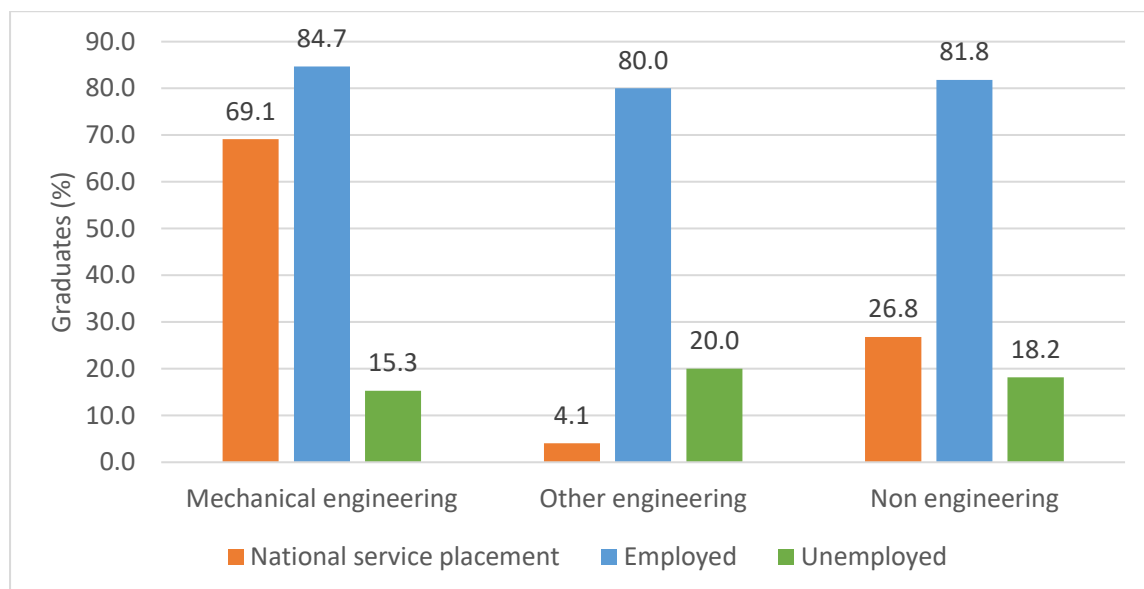


Figure 11: Impact of National Service Posting on Employability of Graduates

Courses proposed by graduates for improvement

The graduates were asked to comment on the courses they were offered during their HND Program and thought those courses needed further attention. As displayed in Figure 12, the graduates suggested that courses such as Thermodynamics, Computer Literacy, Plant Maintenance and Work Services, Workshop Processes and Practice, Refrigeration and Air-conditioning and AutoCAD should be reviewed to include more practical work. This compelled the authors to review the components of all the courses offered under the HND Programs in the department. The results indicated that the percentage ratio of Theory Hours to Practical Hours was about 60%: 40% which is inadequate for practically-oriented Programs and should possibly be increased to a ratio of Theory Hours to Practical Hours of 40%: 60%.

Surprisingly, about 32% of the graduates suggested that Plant Maintenance and Work Services should be reviewed. According to the graduates, the course was full of theory instead of the practical work they were expecting. Indeed, the majority of the graduates who wanted a review of that course claimed that they did not see any maintenance activities in the course and thus, called it: *‘Plant Theory,*

not Plant Maintenance. This course is offered to plant students only and thus, all 32% of the graduates who wanted the review were plant students. This means about 42 graduates constituting over 66% of the graduates from the Plant option wanted a review of this course. Such a high percentage necessitated a thorough review of the course content of Plant Maintenance and Work Services for adequacy of practical work. It was revealed that the students were offered the course for two years starting from semester 3 to semester 6. The course has two hours of theory and two hours of practical work per week making it a three-credit hour course. In the course outline, no practical activities were found in Semester 3 but several practical activities were found in Semesters 4, 5 and 6 as shown in Table 3. It was obvious from the review that the course had adequate practical activities to prepare the students to acquire the needed practical skills to meet the expectation of employers, contrary to the claim by the students that there were no practical activities in the course. This means that the student perception was that more attention was given to theory at the expense of practical work (Ezit, 2014; Sasa, 2018). This could be averted if the practical component of the course was dissociated from the theory and given separate credit hours as found in Automobile Workshop Practice which is a purely practical course offered by the students in the Automobile option for two years starting from semester 3 to semester 6.

The industry is a key stakeholder in engineering education and its views should be incorporated in the curricula development process. In this regard, the department could involve industrial experts in the curricula development and review, as practiced in the Competency Based Training (CBT) curricula development. This would ensure that the curricula that are relevant to industry needs were developed to ensure that the skills possessed by graduates from the department meet the needs of industry. Industry experts could also be invited to play active roles in the delivery of the curricula through practical activities, workshops and seminars.

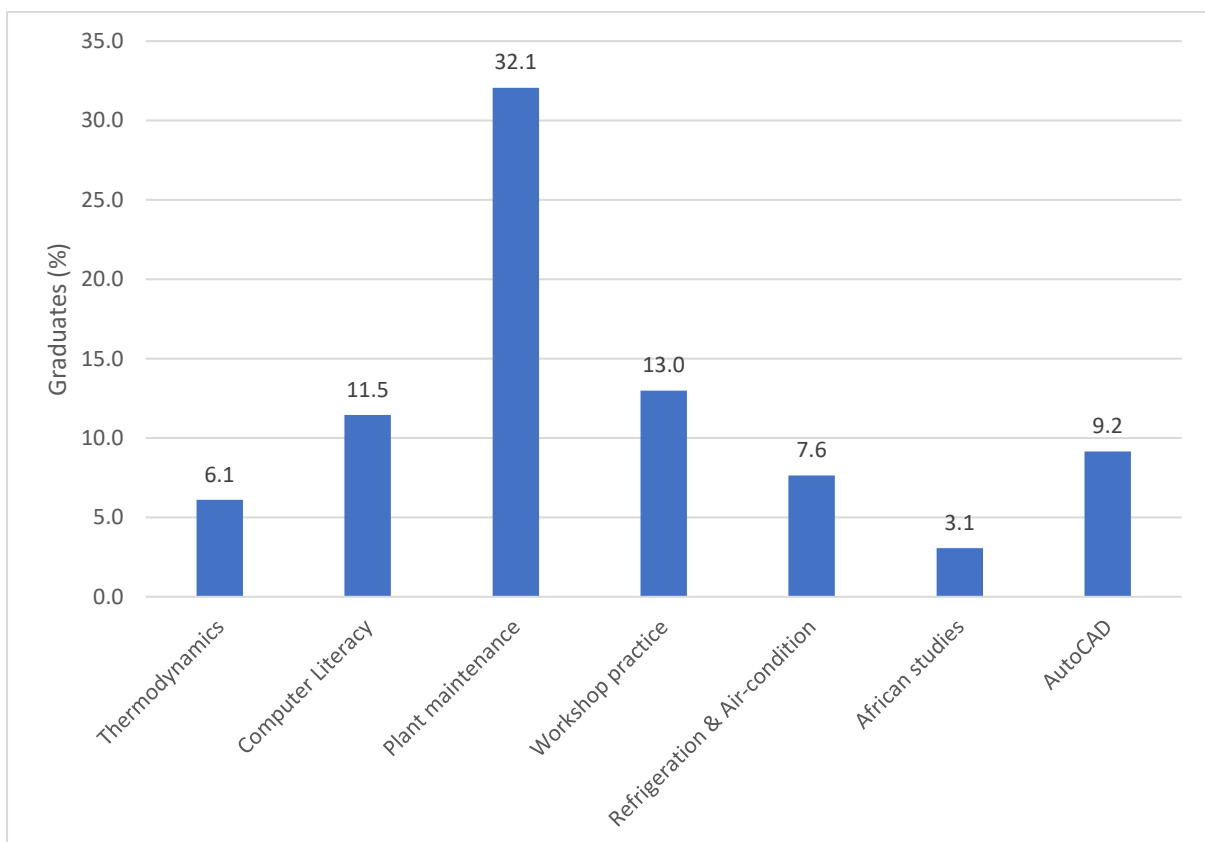


Figure 12: Proposed Courses for Review

Table 3: Identified Practical Activities in Plant Maintenance and Work Services

| Semester (Course code) | Identified practical activities |
|---------------------------|--|
| Semester 3 (MCE 205) | Nil |
| Semester 4 (MCE 206) | 2.5 Carry out planned lubrication; comment on types and effects lubrication 2.6 Assemble and dis-assemble of mechanism and machines 2.7 Participate in equipment repair and acceptance procedures 2.8 Carry out major machinery and equipment repairs – maintenance 2.9 Carry out the servicing and upkeep of plant equipment (e.g., steam boilers, machine tools, etc.) 2.10 Carry out the servicing and upkeep of Turbines, pumps, conveyors, cranes, compressors, valves, heat exchangers |
| Semester 5 (MCE 305) | 2.3 Participate in identification and location of faults 2.4 Participate in the use of flow diagrams for Algorithmic Analysis 2.5 Use Dependency Charts 2.7 Participate in multiple problem analysis 2.8 Participate in the trouble shooting and diagnosis of fault of specific and selected industrial equipment and machinery 4.6 Carry out Hydro Pressure Test |
| Semester 6 (MCE 306) | 1.7 Participate in the practical identification, installation, assembly/disassembly, maintenance/servicing, and troubleshooting of pumps and compressors 1.8 Participate in the practical identification, installation, assembly/disassembly, maintenance/servicing, and troubleshooting of heat exchangers 1.9 Participate in the practical identification, installation, assembly/disassembly, maintenance/servicing, and troubleshooting of low-pressure boilers 1.10 Participate in the practical identification, installation, assembly/disassembly, maintenance/servicing, and troubleshooting of control elements (including valves, cylinders, sensors, steam traps, and storage devices) 1.12 Recognize Pipe circuits and be able to identify installed components; carry out practical pipe fitting, inspection, maintenance and troubleshooting 1.9 Select instruments for checking alignment 2.1 Participate in maintenance procedures for current engine designs 3.1 Carry out the examination and testing of installations, motors, and switchgears 3.2 Have working knowledge of rewinding of motors and generators 3.3 Participate in Bench tests 3.4 Carry out the testing and calibration of instruments 3.5 Prepare Reports and Records 3.6 Plan and prepare layout of typical workshops and stores |

Feedback from graduates on what needed improvement

The graduates were asked to provide feedback on what the Department could implement to improve the employability of graduates. About 76% of the graduates suggested that the Department should focus more on the practical training because that is what the employers look for before offering

employment. About 34% of the graduates confessed regret that they had not taken their studies seriously, especially the practical work. They therefore, admonished the current and future students to be more serious with their studies to enhance their employability. Other suggestions include more industrial tours, a longer internship period, partnerships with industry and seminars on job acquisition processes such as curriculum vitae writing skills, how to locate job vacancies and interview skills. Another issue raised by the graduates was that, some employers expect them to carry out all mechanical engineering work in their organisations, irrespective of the Program option the graduates were offered in school. They therefore, suggested that opportunity should be given to the students to partake in all the workshop activities in the three Programs options run by the department to equip them to face the challenges presented. This feedback from the graduates affirmed the results of the British Council (2016) follow-up graduate interviews with selected graduates in Ghana. The main suggestions from the graduates are shown in Figure 13.

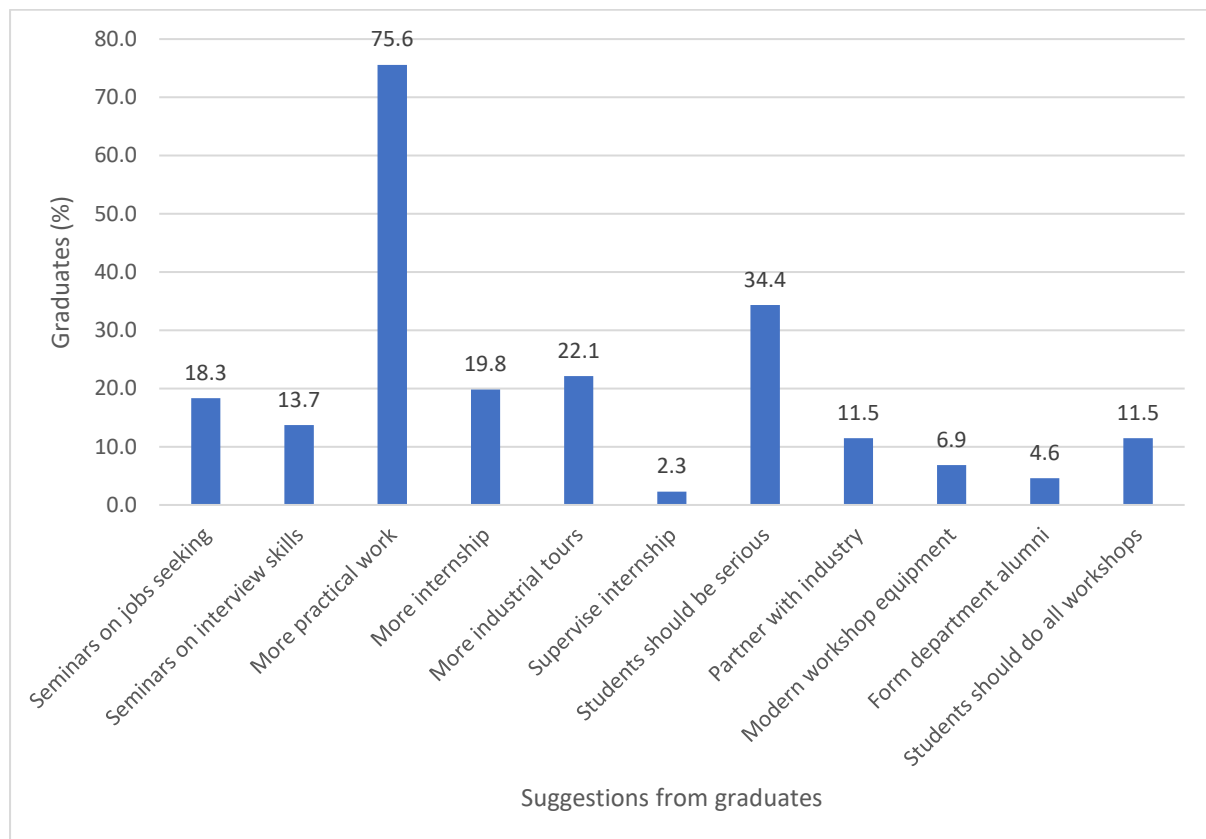


Figure 13: Suggestions from Graduates

Challenges that require attention prior to graduation of students

This study revealed that the graduates from the department were well trained and equipped with requisite employability skills to meet the satisfaction of employers. However, some challenges were identified that require attention prior to the graduation of students. These include curriculum vitae (CV) writing skills, how to locate job vacancies and interview skills as shown in Figure 10. These are part of the employment seeking processes but they are not given much attention in the HND curriculum and needed to be addressed prior to graduation of the students to improve the employability of the graduates. Offering seminars with experts from industry to inform the students prior to graduation would address these challenges and improve the employability of the graduates.

Conclusion

The study sought to assess the employment status and unemployment duration of the graduates, identified the factors that hinder the employability of the graduates and the challenges that require attention prior to graduation of students and made suggestions for improvement. The graduates have been contacted for feedback on their employment status and unemployment duration. The factors that hinder their employability and elements that could be improved by the Department to significantly increase the employability of the graduates have been identified. This study has also highlighted the key challenges that require attention prior to graduation of students and suggestions have been provided for improvement. The employment status of the graduates was about 84%, out of which about 47% have secured permanent employment, 32% were employed by the 'Nation Builders Corps' (NABCO) while 14% and 7% had secured contract and temporary employment respectively. The duration of unemployment was about 29%, 41% and 19% for one, two and three years after their national service respectively. The main factor hindering employability of the graduates was inadequate practical skills since more attention was given to theory at the expense of practical work. The main challenge which requires attention prior to graduation of students was the lack of job-seeking skills. Although the employment status and duration of unemployment of the graduates were encouraging, their employability is principally hindered by inadequate practical skills and lack of job-seeking skills. The Department should focus more on the practical aspect of the Program by increasing practical hours, advising the students to take the practical work seriously and partner with industry to pave the way for more internships opportunities and industrial tours to enable the students to acquire adequate practical skills before graduation. The ratio of Theory Hours to Practical Hours should be 40%: 60% and to avert the situation where more attention was given to the theory at the expense of the practical work, the practical component of the courses should be dissociated from the theory and given separate credit hours as in Automobile Workshop Practice which is purely practical course offered by the Automobile option for 2 years starting from semester 3 to semester 6. The department should involve industrial experts in the curricula development and review to ensure that the curricula that are relevant to industry needs were developed to ensure that the skills possessed by graduates from the Department meet the needs of industry. Industry experts should also be invited to play active roles in the delivery of the curricula through practical activities, workshops and seminars. The Department should also organise seminars on job acquisition processes such as curriculum vitae writing skills, how to locate job vacancies and interview skills prior to graduation of the students. Although entrepreneurship is a course in the HND Mechanical Engineering curriculum, its contents should be widened to include soft skills which would develop the behaviour and attitude of the graduates as well as their job-seeking skills. The findings of this study should serve as a wakeup call to the Department to review and restructure the existing and future Programs especially, as the Department prepares to run 4-year Programs in Bachelor of Technology in Mechanical Engineering. Further study should be conducted on the special skills employers in Ghana consider before employing fresh mechanical engineering graduates and the level of employers' satisfaction with the competencies possessed by these fresh graduates they employed. Also, a study should be conducted on perceptions of employers about engineering graduates from Technical Universities in Ghana and the best way that the universities can engage with industry.

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Appendix

Study on employability of mechanical engineering graduates from Sunyani Technical Universities of Ghana– Questionnaire for graduates

1. Sex: Male Female
2. Year admitted: 2011 2012 2013 2014
3. Program of study: Plant Auto Production
4. Background before being admitted: Technical Secondary
5. Year complete: 2014 2015 2016 2017
6. Employment status before being admitted: Employed Unemployed
If employed before being admitted, go to 14 else continue
7. Place of national service: Mechanical engineering Other engineering Non-engineering
8. Employment status after completion of national service: Employed Unemployed
If unemployed go to 13
9. Year of employment after national service: 2015 2016 2017 2018
10. Type of employment: Permanent Temporary Contract NABCO
11. Type of employer: Government Private Self employed
12. Field of employment: Mechanical engineering Other engineering Non-engineering
13. What challenges did you encounter when looking for job? (Tick as applicable and add more if any)

| No | Challenge |
|-----|------------------------------|
| 1. | Lack of jobs in the country |
| 2. | Lack of previous experience |
| 3. | Inadequate practical skills |
| 4. | Lack of communication skills |
| 5. | Lack of confidence |
| 6. | Lack of interview skills |
| 7. | |
| 8. | |
| 9. | |
| 10. | |

If unemployed before being admitted, go to 15

14. What change has occurred in your job position as a result of your HND Program?
 Promoted Increase salary Changed from non- mechanical engineering to mechanical engineering job.
15. If there has been no change, why?

.....

.....

16. Which courses do you think should be reviewed and why?

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17. What do you think could be done to improve the performance of our graduates on the job market?

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