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# Exposing Students to Engineering in Society

Emmanuel Asuming Frimpong[1*], Daniel Opoku, Francis Boafo Effah[1], Gideon Adom-Bamfi[1]

[1]Kwame Nkurmah University of Science and Technology, Ghana
E-mail: eafrimpong.soe@knust.edu.gh

**Abstract** - *Engineering and for that matter engineering training is pivotal in solving problems that confront societies. This paper introduces academia to a course named Engineering in Society run at the College of Engineering of the Kwame Nkrumah University of Science and Technology, Kumasi, Ghana. The paper also reports on an assessment of the course content, mode of delivery and impacts, and recommends improvements to enhance its learning outcomes. The impact assessment was done through the administration of questionnaires to four hundred and thirty-seven current and immediate past students of the College's Department of Electrical and Electronic Engineering. The respondents were students in the second, third and fourth years of the BSc Electrical and Electronic Engineering programme as well as its immediate past alumni. The results of the impact assessment show that over 85% of the respondents from the various categories consider the course to be essential for their career development. Between 56.76% and 79.38% of respondents from the various groups are satisfied with the mode of delivery of the course. Not less than 69% of the responds agree to the attainment of at least one of the learning outcomes of the course. The respondents consider the community project component of the course as the most impactful. The study has revealed an increasing trend of students contracting others to do their community projects for them as well as an increasing trend in plagiarism of submitted reports. Among others, the study recommends some revision of the course content and mode of delivery to maximize the impact of the course. Additionally, the university should do away with the submission of reports in printed copy and rather migrate to online submission of reports, with plagiarism checks. The course, with the suggestions made, is recommended for adoption by engineering training institutions.*

***Keywords*** *– Community projects, Curriculum, Engineering education, Societal development.*
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## 1. Introduction

Engineering is unquestionably critical in societal development. Hence, engineering training is essential. To enhance the training of students, engineering curricula should go beyond regular classroom lectures to incorporate real world experiences to enable students develop the needed insights, critical thinking, and problem-solving skills [1]. Enriching the educational experiences of students, including their exposure to real life issues, is one of the benchmarks of engineering training [2]. Introducing engineering students to practical issues help them to develop their practical competencies, interpersonal relationships, and cognitive skills [1]. In other words, the exposure of engineering students to societal problems in the early stages of their training enhances their learning experiences and enable them to develop the skills set needed to address the many challenges that confront humanity.

Traditionally, engineering students are exposed to real world issues through laboratory works, field trips, industrial presentations, industrial visits, seminars, internships (vacation training) and project works [3-6]. These approaches have been demonstrated to positively impact engineering training. Notwithstanding the benefits of the above highlighted approaches, there is still room to introduce new methods to maximize the benefits of exposing students to real life issues. For example, not much has been done by way of introducing students to the many challenges that plague societies and whose solutions hinge on engineering. This is particularly important for universities in developing and underdeveloped countries where societies have a myriad of problems that can easily be solved with the application of basic engineering principles. It is uncommon to find, incorporated in the curricula of engineering training institutions, content that deliberately cause students to identify societal problems and attempt to solve them.

To enable students to better pick-up challenges facing their communities and develop the skill of applying engineering knowledge to address such challenges, the College of Engineering of the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, developed a course called Engineering in Society. The course is run in three phases. The administration of the course starts towards the end of the second semester of the first year, continues during the vacation and is completed in the first

semester of the second year. The course has been running since the 2014/2015 academic year.

This paper presents to academia, the Engineering in Society course, including lessons learnt in administering it as well as an assessment of its impact over the years. Suggestions to improve the delivery of the course to achieve the desired outcomes are also offered. The impact of the course was assessed by administering questionnaires. The questionnaires were administered to current and immediate past students of the BSc. Electrical and Electronic Engineering programme of the College's Department of Electrical and Electronic Engineering. It is expected that the details presented in this work will provide the necessary feedback to help improve the administration of the course and enable other engineering training institutions to adopt the course as well as the recommendations, to improve students' training.

The rest of the paper is organized as follows. Section 2 provides details regarding the objectives, learning outcomes, content, and mode of delivery of the Engineering in Society course. Section 3 explains the methodology used to assess the impact of the course. Section 4 presents and discusses the results of the impact assessment. Conclusions drawn are highlighted in Section 5 alongside recommendations for improvements.

## 2. Details of the Engineering in Society Course

The Engineering in Society course at the College of Engineering of the Kwame Nkrumah University of Science and Technology, Kumasi, is administered to students in all programmes of the College. It has been running since 2014. The course seeks to enable students to identify challenges facing their communities and propose engineering-based solutions to address the challenges. The specific objectives of the course are as follows. Firstly, the course seeks to inculcate in students an appreciation of how engineering can be used to solve societal problems. Secondly, an object of the course is to encourage students early in their programmes of study to draw a link between their chosen fields of engineering and their application to the issues that confront the day to day lives of people. Thirdly, the course targets to develop an appreciation of the aspects of life that their fields of study can be applied to, and to deepen their interest in and appreciation of their disciplines of engineering. Fourthly, the course focuses to improve students' sense of innovation and application of engineering to development. Lastly, the course intents to improve their communication and interpersonal skills through community interaction. The expected outcomes are improved students' learning experience, early exposure to engineering research and improved technical report writing skills. Further learning outcomes are enhanced communication and interpersonal skills, and production of engineering solutions to societal problems.

Although, major components of the course work are done before students enter the second year of their programmes, the assessment of all the activities/components culminates in the first semester of the second year. Consequently, the course is registered in the first semester of the second year. The course code is CENG 291.

The course is administered in three phases which broadly consists of engineering clinic, community based project work, and a taught component. The first phase which is the engineering clinic is designed to introduce the course to the students and bring their minds to the importance of engineering, in solving societal problems. It is organized immediately after the end of examinations for the second semester of the first year of study, before students depart for the long vacation. It is usually organized over a three-day period. The clinic gives an overview of the Engineering in Society course, to enable students appreciate what it offers. Activities during the clinic include seminar presentations, workshops, and small group discussions. The presentations cover the following topics: the structure of the economy of Ghana, the millennium development goals (MDGs), poverty in Africa and its indicators, and development challenges of Ghana. The rest are ethics in engineering practice, the history of the College of Engineering and of KNUST, the core values of KNUST, basic engineering research methods, and current issues in engineering industries.

A major challenge associated with the clinic relates to dealing with the large number of students that must be taken through the clinic within a limited three-day period. This challenge is principally encountered when students must be split in several smaller groups during breakout sessions. Lecturers get overwhelmed by the high numbers. The Engineering programmes at KNUST are highly competitive, attracting many applicants. Consequently, the departments are compelled to admit a lot of students into their programmes. For example, for the case study department, the number of students admitted each year has risen from 103 in the year 2014 to 307 in the year 2021. To deal with this challenge, Teaching Assistants are now assigned to each breakout group to help reduce the numbers per group and to facilitate the sessions. Teaching Assistants are usually immediate past graduates from the various programmes who do compulsory one-year national service at the various Departments of the College. Ghana has a policy that mandates all persons who complete tertiary education programmes, to undertake a one-year compulsory national service. The Teaching Assistants work directly with supervising lecturers to facilitate the breakout sessions.

The second phase activity (i.e. community based project work) is done during the long vacation. There is no direct lecturer supervision for the projects. The project work consists of field work, report preparation and submission, and oral presentation. In the field work, each student is required to identify a development challenge within his/her community, investigate the nature, characteristics and scope of the challenge and come up with a solution using knowledge from his/her chosen field of study. A website/webapp has been developed with a link for students to submit their project topics. This enables course coordinators to conveniently vet the topics and provide

timely feedback to the students. Each department has assigned one lecturer to the course as a coordinator, to facilitate the activities of the course. A feedback can be in the form of acceptance, rejection, or suggestions for improving the topic. Through the same channel, the students can submit their draft reports for feedback. WhatsApp platforms have also been created for the students, by the coordinators, to facilitate interaction with students to address whatever concerns they may have. Students can post their concerns or ask questions on the platforms and receive responses from their colleagues and coordinators. These platforms are also used to provide a kind of virtual support for the field works. Students are required to write and submit printed technical report on the projects they undertake. The reports are submitted to the various departments when school reopens for the first semester of the second year of study. Each report covers an introduction (including literature review), methodology for addressing the identified challenge, results and discussion, conclusion, and recommendations. The submitted reports are received by the Course Coordinator for the Department who then distributes the reports among the lecturers of the Department for grading. Students are also required to do oral presentations of the reports, via power points. Students make the presentations to the lecturers who receive their reports. The power point presentations afford students the opportunity to defend their identified community challenge, proposed solutions, conclusions, and recommendations. After each presentation, lecturers engage the student in question-and-answer sessions before eventually grading the student. The question-and-answer sessions enable lecturers to elicit additional information from students. The individual lecturers prepare their own timetables for the oral presentations, in consultation with the assigned students.

In the third phase, students are engaged in a two-hour weekly taught component. This component involves classroom lectures, individual/group assignments, debates/group discussions and a summative assessment. The topics covered include engineering ethics and its importance, the scope of engineering ethics and the overview of ethical themes, engineering as a social experiment, dimensions of engineering project, professions, ethical dilemmas and their resolution, ethical frameworks, and theories, engineering professional societies, safety and risk, academic and research integrity, shared responsibility, and control of technology. Towards the end of the semester, students write a 2-hour examination on the content covered.

## 3. Methodology for Impact Assessment of Course

The impact of the Engineering in Society course was assessed through the administration of questionnaires to past and current students of the BSc. Electrical and Electronic Engineering programme. The past students were the most recent graduates of the programme while the current students were those in the second, third and fourth years of study. Students in the first year were not considered since the course is yet to be administered to them. The questionnaires were developed using Google forms. The links to the forms were then shared on the WhatsApp platforms of the respondents. The questionnaire had six sections. The sections covered demographics, course rationale and content, content delivery, project execution, attainment of learning outcomes, and recommendations. In the demographics section, the gender and level of study of students were sought. Details of issues that views were obtained on are presented below.

### a) Course content and rationale

The following were determined:

1. The extent to which they remember the aim and objectives of the course.
2. How well they remember the content of the course.
3. How well they remember the learning outcomes of the course.
4. How relevant the content is/was to their career development.
5. The component of the course that was most impactful to them.

### b) Content delivery

The section on content delivery considered the following:

1. Whether the content was delivered to their expectation.
2. The component of the content they most enjoyed.

### c) Projection execution

The section on project execution assessed the following:

1. How well they understood what was expected of them.
2. Whether they did the project themselves.
3. Whether they submitted a previous work as their project.
4. Whether their CENG project design/findings can be implemented to solve community problems.
5. Whether attempts have been made to implement the designs/findings of their projects.
6. Whether when given the needed funding, they would like to implement their project.

### d) Learning outcomes

On the attainment of learning outcomes, the following were determined:

1. Whether their participation in the CENG project has made them gain a good appreciation of challenges that confront their communities, from the viewpoint of an engineer.
2. Whether the course improved their exposure to real life engineering issues.
3. Whether it gave them good exposure to engineering research.
4. Whether it improved their technical report writing skills.
5. Whether it enhanced their communication and interpersonal skills.

**e) Recommendations**

Views were obtained on the following:

1. Whether the course should continue to run.
2. Whether the content should remain unchanged.

## 4. Results analysis and discussion

### 4.1 Respondents

In all, 437 current and former students responded to the questionnaires. Of this number, 88.1% were males and 11.9% were females. One hundred and ninety-four (194) students out of the 231 registered Year 2 students completed the questionnaire. Thus, the response rate for this year is approximately 84%, which is remarkably high. For those in Year 3, 80 out of 179 registered students gave responses. The response rate is therefore approximately 45%. Albeit this rate is below the average rate, it is sufficient to produce analysis that reflects the thinking of the year group. The response rate of those in Year 4 is approximately 58% which is good. Here 74 out of 128 registered students gave responses. For the immediate past graduates of the programme, 92 out of 125 graduates, representing almost 74% completed the questionnaire. Here too, the response rate is high. Figure 1 provides details of the gender variations for the various year groups. The figure reflects the nature of the enrollment into the programme. The programme, over the years, has dominantly higher percentages of males than females.

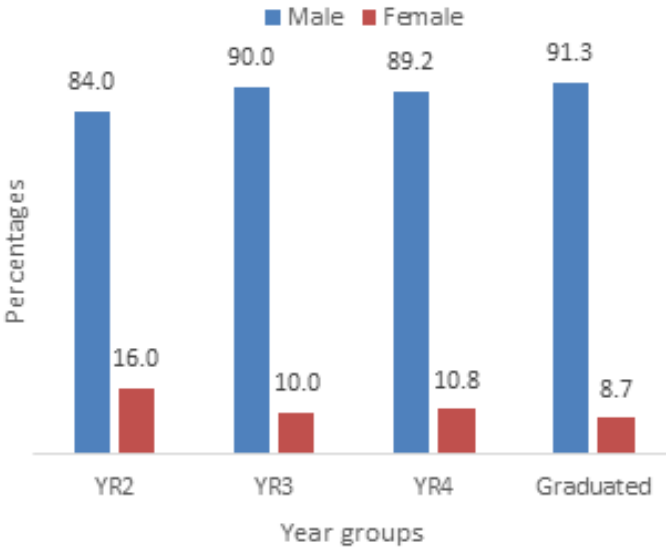


Figure 1. Percentages of male and female respondents

The rest of the results are presented and discussed under the sub-headings that follow:

### 4.2 Course Content and Rationale

Figure 2 shows the extent to which present and past students know or remember the aim and objectives of the course. It is noted from the figure 2 that, at all levels, over 73% of the respondents remember the aim and objectives of the course either very well or well. The striking result is the fact that none of those who have graduated has completely forgotten about the aim and objectives of the course while some of those in the second year (1%), third year (2.5%) and fourth year (1.35%) who should have the course fresh in their minds have completely forgotten about its aim and objectives. This could be attributed to some lapses in the delivery in the course of time. However, considering the fact the fewer second year students have completely forgotten about the aim and objectives of the course, it can be said that these lapses are being corrected. This is more so since the Year 2s reported the least percentage of those that have little remembrance of the course. These percentages are however likely to go up as the years go by and may attain levels like those of the higher year groups. As expected, respondents in Year 2 have the highest percentage of those that either remember the aim and objectives very well or well. Again, this high percentage is likely to wane with time. It gives cause for concern noting that students in Year 3 have the least percentage remembrance (i.e. very well or well) of 73.8% and the highest percentage of forgetfulness of 2.50%.

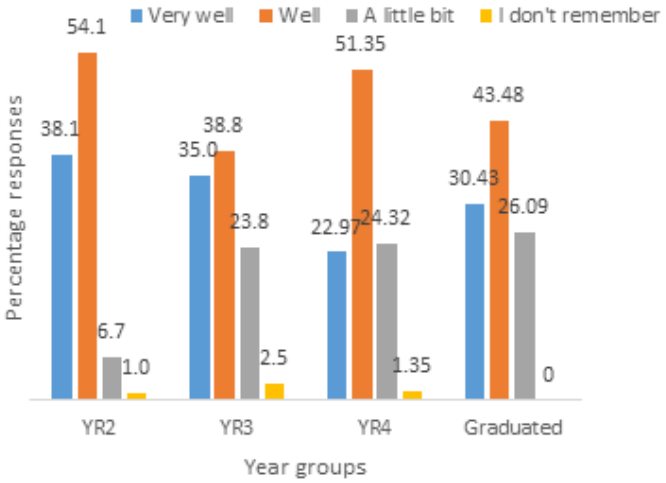


Figure 2. Percentage responses to the extent to which respondents know/remember the aim and objectives of the course

Figure 3 shows a measure of the extent to which respondents remember the content of the course. Generally, majority of the respondents showed noticeable (either well or very well) remembrance of the course content, which is encouraging. The figure also shows an increasing level of forgetfulness of course content as students' progress in the programme, which is expected. The striking result is that 7.61% of the immediate paste graduates do not remember the course content although none of them has completely forgotten the aim and objectives of the course as previously reported in figure 2. This 7.61% of immediate past graduates who do not remember the content of the course is likely to have come from the percentage that had earlier (from Figure 2) indicated little remembrance of the course aim and objectives.

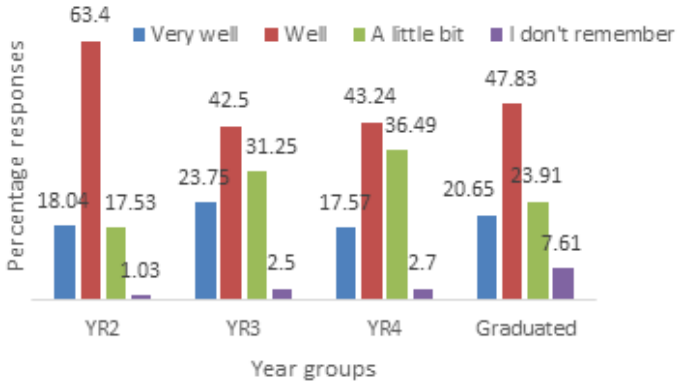


Figure 3. Measure of the extent to which respondents remember the content of the course

Figure 4 depicts the level of remembrance of course learning outcomes. Majority of students in each group (88.25 of Year 2, 60.0% of Year 3, 66.75% of Year 4 and 61.96% of immediate past graduates) remember either very well or well, the learning outcomes of the course. However, a significant percentage of Year 3 and Year 4 students as well of those who have graduated from the programme, have completely forgotten about the learning outcomes. It is worrying that nearly 22% (i.e. 20.10+1.55) of those in Year 2, who as at the time of preparing the manuscript are doing the phase 3 component (i.e. lectures phase) of the course have either completely forgotten about the learning outcomes or only have a little bit remembrance of the outcomes. The percentages (exceeding 35%) for the higher years and those who have graduated is equally troubling. Innovative ways must be found to get students to substantially remember the course learning outcomes as they progress in the programme and graduate.

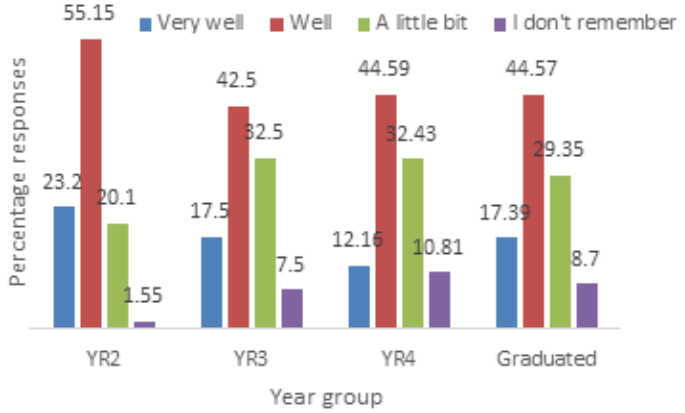


Figure 4. Level of remeberance of the learning outcomes of the course

Figure 5 shows how the respondents perceive the relevance of the course content. Over 85% of the respondents at all levels consider the content of the course to be essential for their career development. The percentages that consider the course to be relevant are however much higher than those who deem it to be very relevant. Refreshingly, the highest percentage of those who consider the content of the course to be relevant are those who have graduated and are doing their national service at various institutions and contributing to national development. The percentages that do not consider the course to be relevant, though much lower, cannot be ignored. Efforts should therefore be made by coordinators and lecturers to get all to appreciate the usefulness of the course.

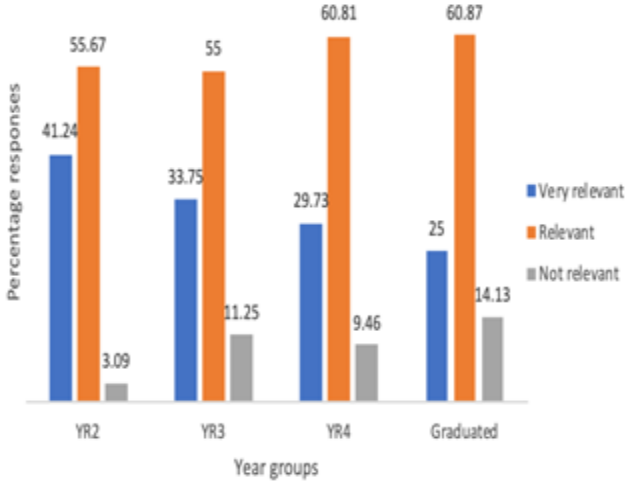


Figure 5. Measure of relevance of course content to career development

Figure 6 provides information on the component of the course that respondents consider most impactful. For all year groups, the field work or community project was considered most impactful. This is refreshing since this is pivotal in the aim of the course. The percentage of Year 2 students who consider the field work to be most impactful is the lowest amongst the respondent groups. The reduced percentage of impact can be attributed to the restrictions imposed by the Covid-19 pandemic which might have adversely affected their field experience. The high impact realized by the community project suggests that a lot more attention must be paid to this and possibly find ways of integrating the clinics and lectures in the field work to realize outmost impact of the course. This could be done considering the wide range of virtual learning platforms that now exist due to the Covid-19 pandemic.

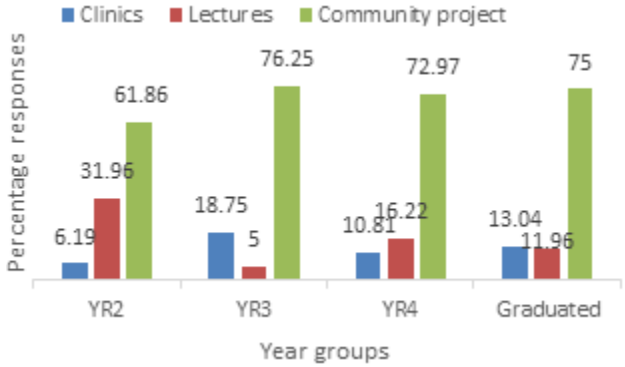


Figure 6. Component of the course that was most impactful

### 4.3 Content Delivery

Figure 7 presents the extent to which the mode of delivery of the course met the expectations of students. Almost 57% of students in Year 4 indicated that the course was delivered to their expectation either very well or well. The percentages for the other year groups are higher. However, a significant percentage (over 30%) of those who have completed the course (i.e. Yr 3, Yr 4 and the graduated group) stated that their expectations were barely met. An appreciable percentage of Year 4 students (12.16%) and students who have just graduated from the programme (7.61%) were disappointed about the mode of delivery. Thus, a significant percentage of students were not satisfied with the mode of delivery of the course. Hence, improvements must be made in the mode of delivery of the course. Particularly, improvements are needed in the clinics and lectures which earlier were reported not to be components that had made the most impact on students.

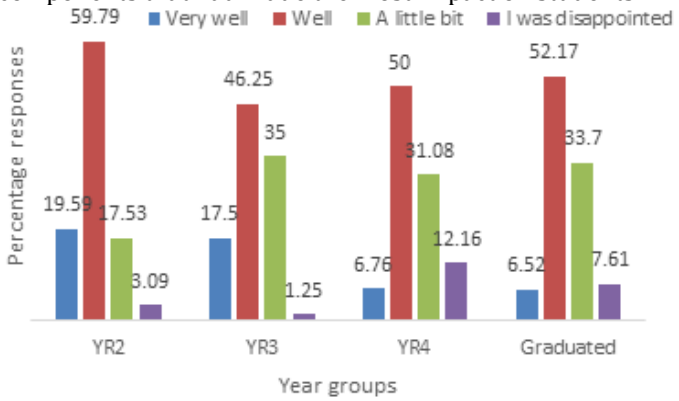


Figure 7. Extent to which the course was delivered to expectation

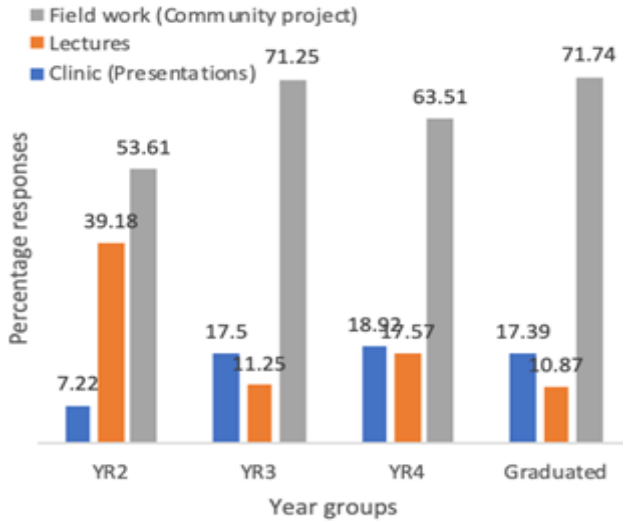


Figure 8. Component of the course that was most enjoyed by students

Figure 8 provides details regarding the component of the course that was most enjoyed by the students. The results show that the field work was most enjoyed by the students. This ties in well with the fact that, as earlier presented, the field work made the most impact on students. The rather low percentage of Year 2 students, compared to the other groups, that most enjoyed the community project could be, as previously stated, attributed to the restrictions brought about by the Covid-19 pandemic which had limited society interactions and impeded community projects.

### 4.4 Project Execution

Table 1 shows the percentage responses to questions on project execution. From Table 1, a high majority of respondents in the various categories either strongly agreed or agreed to having understood what was expected of them in the execution of community projects. The specific percentages are 81.9% of students in Year 2, 68.8% of those in Year 3, 77.0% of Year 4 students, and 82.4% of those who have graduated. Though the percentage for Year 3 is markedly low, compared to the other groups, not many of them (only 5.1%) indicated a complete lack of understanding of what was expected of them, rather, 26.3% were neutral. This percentage that expressed neutrality gives a cause of concern and suggests a need to deepen engagement with students to help them to know what is expected of them, so that they may be able to satisfactorily execute the projects. A huge percentage of at least 94.3% of respondents in the various categories asserted that they executed the projects themselves. Though this is encouraging, the remaining percentage of at most 5.7% who did not concur to this (either expressing neutrality, disagreement, or strong disagreement) gives a cause for concern since in academia, plagiarism of any magnitude is unacceptable and should be completely wiped away. In can be inferred from this finding that some contract others to do their project for them or present other students work as their own. This revelation is even more worrying since the results show an increasing trend of plagiarism or false ownership of reports. The increasing percentages are 1.1% of the recent graduates, 2.8% of those in Year 4, 5.1% of those in Year 3 and 5.6% of those in Year 2. An alarming percentage of students either strongly agreed, agreed, or expressed neutrality (those that expressed neutrality to this question are likely to have concealed the truth) to the assertion that they submitted a previous work as their own project. The percentages are 19.3% for Year 2, 20.5% for

Year 3, 14.9% for Year 4 and 17.6% for those who have graduated. These percentages of respondents are deemed to have submitted either wholly or substantially plagiarized works. This statistic contradicts the gigantically high percentage of students who previously asserted that they executed their projects themselves. The authors are inclined to go with this latter revelation than the former. This reinforces the need to completely overhaul the approach for project execution and reporting.

On the potential implementation of project design/findings to solve community problems, a desirably high percentage of respondents either strongly agreed or agreed to this. The percentages are 94.3% of Year 2, 89.9% of Year 3, 81.1% of Year 4 and 83.7% of immediate past graduates. These pleasantly high percentages are in synch

with the goals of the course. A significant percentage of respondents (32.8% of Year 2, 34.6% or Year 3, 31.1% of Year 4 and 25.0% of immediate past graduates) declared (strongly agreed or agreed) that they attempted to implement their project designs or findings. Much higher percentages (72.0% of Year 2, 62.0% of Year 3, 55.4% of Year 4 and 57.6% of immediate past graduates) of respondents are willing to implement their projects, given the needed funding.

### 4.5 Attainment of Learning Outcomes

Table 2 shows the responses to questions relating to the attainment of learning outcomes. Most of the respondents (above 80% in all groups) affirmed that the course made them gain a good appreciation of challenges that confront their communities from the viewpoint of an engineer. It is even more encouraging that this percentage has an increasing trend over the year groups, with the percentage responses from Year 2 being the highest (93.8%). More than 80% of respondents in each category either strongly agreed or agreed that the course has improved their learning experience. It is worth noting that 91.7% of those in Year 2 have this understanding. This will help them to better appreciate the programme and provide them the needed motivation to pursue it. Similarly, more than 90% of the continuing students affirmed that the course gave them good exposure to engineering research. A rather reduced percentage of 77.2% of the immediate past graduates hold this view. The fact that this percentage has significantly increased over the years suggest some improvements in the exposure given and should continue. Such early exposures to engineering research will nurture students to grow to become societal problem-solving researchers for the good of societies. Over 80% of students in Year 2 and Year 3 as well as the immediate past graduates declared that the course helped improved their technical report writing skills. A rather reduced percentage of 74.0% of students in Year 4 made the same assertion. For this group, 24.7% of them expressed neutrality, which to a high degree suggests that this learning outcome was not realized in them. However, since the endorsement is higher by the more current year group (i.e. Year 2 and Year 3), one can conclude that whatever shortfalls that accounted for the reduced percentage in the later year group (Year 4) has been corrected, resulting in the improved percentage. On the enhancement of communication and interpersonal skills, the percentage approvals were 77.1% for Year 2, 84.0% for Year 3, 75.3% for Year 4 and 69.6% for the immediate past graduates. Albeit the percentage endorsements are relatively reduced, the percentages that outrightly disapproved this were low (between 1.3% and 10.9%). An appreciable percentage of 14.1% to 20.8% expressed neutrality. Thus, some revisions are needed in the syllabus to enhance the attainment of this learning outcome.

Table 1. Percentage responses relating to questions on project execution

| Respondents and Likert scale | | I understood what was expected of me. | I did the project myself. | I submitted a previous work as my project. | My CENG project design/findings can be implemented to solve a community problem. | I attempted to implement the design/findings of my project. | Given the needed funding, I would like to implement my project. |
|---|---|---|---|---|---|---|---|
| | | Percentage responses | | | | | |
| YR 2 | SA | 20.2 | 60.8 | 6.3 | 50.3 | 9.4 | 26.4 |
| | A | 61.7 | 33.5 | 5.7 | 44.0 | 23.4 | 45.6 |
| | N | 16.6 | 4.6 | 7.3 | 5.2 | 47.9 | 24.9 |
| | D | 1.0 | 0.5 | 29.7 | 0.0 | 16.1 | 1.6 |
| | SD | 0.5 | 0.5 | 51.0 | 0.5 | 3.1 | 1.6 |
| YR 3 | SA | 31.3 | 65.8 | 11.5 | 41.8 | 6.4 | 26.6 |
| | A | 37.5 | 29.1 | 2.6 | 48.1 | 28.2 | 35.4 |
| | N | 26.3 | 3.8 | 6.4 | 7.6 | 26.9 | 27.8 |
| | D | 3.8 | 0.0 | 20.5 | 1.3 | 25.6 | 5.1 |
| | SD | 1.3 | 1.3 | 59.0 | 1.3 | 12.8 | 5.1 |
| YR 4 | SA | 18.9 | 77.0 | 5.4 | 40.5 | 4.1 | 21.6 |
| | A | 58.1 | 20.3 | 6.8 | 40.5 | 27.0 | 33.8 |
| | N | 20.3 | 1.4 | 2.7 | 16.2 | 29.7 | 29.7 |
| | D | 2.7 | 0.0 | 9.5 | 1.4 | 31.1 | 14.9 |
| | SD | 0.0 | 1.4 | 75.7 | 1.4 | 8.1 | 0.0 |
| G | SA | 24.2 | 67.4 | 7.7 | 44.6 | 9.8 | 23.9 |
| | A | 58.2 | 31.5 | 6.6 | 39.1 | 15.2 | 33.7 |
| | N | 14.3 | 0.0 | 3.3 | 15.2 | 30.4 | 30.4 |
| | D | 2.2 | 0.0 | 25.3 | 1.1 | 25.0 | 8.7 |
| | SD | 1.1 | 1.1 | 57.1 | 0.0 | 19.6 | 3.3 |

Table 2. Percentage responses to learning outcomes related questions

| Respondents and Likert scale | | It made me gain a good appreciation of challenges that confront my community from the viewpoint of an engineer. | It improved my learning experience (exposed me to real life engineering issues). | It gave me a good exposure to engineering research. | It improved my technical report writing skills. | It enhanced my communication and interpersonal skills. |
|---|---|---|---|---|---|---|
| | | Percentage responses | | | | |
| YR 2 | SA | 47.9 | 50.0 | 45.8 | 40.6 | 32.3 |
| | A | 45.8 | 41.7 | 46.4 | 44.3 | 44.8 |
| | N | 5.7 | 7.8 | 7.3 | 13.5 | 20.8 |
| | D | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 |
| | SD | 0.5 | 0.5 | 0.5 | 0.5 | 1.0 |
| YR 3 | SA | 43.6 | 40.3 | 51.9 | 32.5 | 33.3 |
| | A | 46.2 | 45.5 | 40.3 | 54.5 | 50.7 |
| | N | 7.7 | 10.4 | 6.5 | 11.7 | 14.7 |
| | D | 1.3 | 2.6 | 0.0 | 0.0 | 0.0 |
| | SD | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 |
| YR 4 | SA | 31.5 | 27.0 | 26.0 | 30.1 | 23.3 |
| | A | 49.3 | 55.4 | 64.4 | 43.8 | 52.1 |
| | N | 16.4 | 12.2 | 4.1 | 24.7 | 19.2 |
| | D | 2.7 | 4.1 | 5.5 | 1.4 | 5.5 |
| | SD | 0.0 | 1.4 | 0.0 | 0.0 | 0.0 |
| G | SA | 37.0 | 39.1 | 32.6 | 30.4 | 22.8 |
| | A | 43.5 | 41.3 | 44.6 | 51.1 | 46.7 |
| | N | 13.0 | 14.1 | 9.8 | 13.0 | 19.6 |
| | D | 2.2 | 2.2 | 7.6 | 3.3 | 3.3 |
| | SD | 4.3 | 3.3 | 5.4 | 2.2 | 7.6 |

### 4.6 Students' Recommendations

Figure 9 portrays the recommendations of the respondents regarding the continued mounting of the course. It is noted from the figure that more than 78% of respondents in each group have endorsed the continued running of the course. A significant percentage (14.13% to 19.18%) were however neutral, with only a few (3.74% to 6.52%) wishing its termination. Thus, chiefly, the respondents consider the course to be critical for their career development and support its continued running.

Regarding the course content, the percentage endorsement or otherwise is present in figure 10. From the figure, the percentage approval of the existing content is low (35.9% to 62.8%). This percentage approval is the lowest in relation to all the other questions asked in this research. It is also worth noting that the disapproval rate increases with years in programme. This suggests that as students advance in the programme, more and more of them begin to realize deficiencies in the content. Amongst the immediate past graduates, the percentage rejection of the current content is 42.4% which is higher than their percentage acceptance of 35.9%. Since this group is the group that is out there in societies practicing and are therefore in the best position to advice on course content, their disapproval of the content should be taken with all the seriousness.

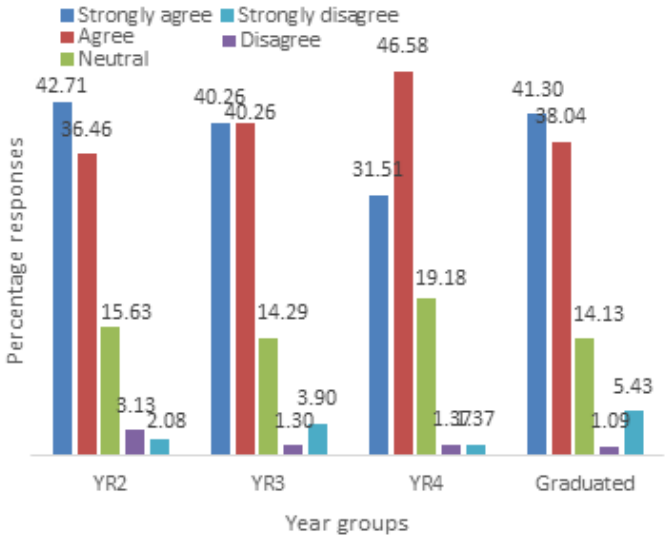


Figure 9. Views as to whether the course should continue to run

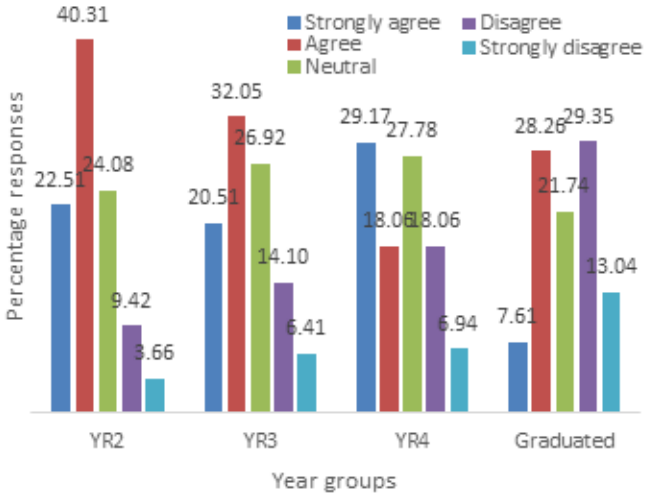


Figure 10. The content should remain unchanged

## 5. Conclusion

A course named Engineering in Society has been introduced to academia, and its administration and impact assessed through questionnaires. The respondents to the questionnaires were Year 2, Year 3, Year 4 and the immediate past students of KNUST's BSc. Electrical and Electronic Engineering programme. Between 61.86% and 76.25% of respondents in the various groups consider the field work or community project as the most impactful component of the course. The study found that between 1.1% and 5.6% of respondents in the various categories either contracted others to do their community projects for them or submitted the reports of others. Again, this detested act of plagiarism or false ownership of reports is on the ascendancy. Most of the respondents (above 80% in all groups) affirmed that the course made them gain a good appreciation of challenges that confront their communities from the viewpoint of an engineer. More than 78% of respondents in each group have endorsed the continued running of the course. However, the content of the course has low approval ratings of 35.9% to 62.8%. Consequently, revisions are required in the course content. The revisions should mainly focus on the clinics and lectures since these have low approval ratings. It is further recommended that the mode of submission of reports be changed. The current submission of reports in printed (hard) copy only, which is not amenable to plagiarism checks should be replaced by electronic (soft) submission with an interface for plagiarism check. Again, during the oral presentations, lecturers should probe students to ascertain if the submitted/presented projects were executed by themselves. Considering the increasing number of students, the College should consider incorporating group/teamwork in the community project phase of the course. This will reduce the number of students' reports to be graded and oral presentations to be made to enhance the assessments. Additionally, it will build their teamwork skills and improve the quality of work done.

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