
TUNING AFRICA ACADEMY

*“THE STUDENT VOICE IN
AFRICAN HARMONISATION
PROCESS IN HIGHER
EDUCATION.”*

**COMPETENCE - ABILITY TO TRANSLATE
KNOWLEDGE INTO PRACTICE**

**KWAME NKRUMAH UNIVERSITY OF
SCIENCE AND TECHNOLOGY, KUMASI
GHANA**

(DEPARTMENT OF CIVIL ENGINEERING)

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DECEMBER 2016.

EXECUTIVE SUMMARY

At the tertiary level of education, the main focus of all students is, or more appropriately, should be, preparing themselves for the job market. In most cases, academic excellence is not always enough to secure employment. Apart from this, employers often demand one thing from graduates: “**Competence**”. There are many interpretations of the word, but they will all run along the lines of “**the quality of being physically and intellectually able to do something**”.

Studies show that different employers may favour different competences, and from a study involving over 7000 questionnaires, it can be deduced that the competence that is most highly valued by students, graduates, and employers in Africa is the “ability to translate knowledge into practice”.

However, although this competence is the most valued, it also seems to be very difficult to achieve, as the achievement of said competence among graduates leaves much to be desired. Since the university is the last place students usually go before being released into the working world, a finger can be pointed at the university educational curriculum as a reason for the low achievement rate of this competence. To solve this problem, it will take contribution from not only those in charge of the curriculum, but also from those who learn under it i.e. students. It is expected that views from both sides will help to give an accurate idea of what may be causing this deficiency and the solutions which may be implemented, if any.

This report represents the voice of students from the department of Civil Engineering of the Kwame Nkrumah University of Science and Technology in Kumasi, Ghana. The topic being discussed is the competence of translating knowledge into practice. Development of this competence has certain aspects which are developed in different ways. Being Civil Engineers, we tend to associate these aspects with certain skills unique to the Civil Engineering field, and sometimes use them interchangeably. As such one can expect to see the mention of these skills under various aspects of this competence.

Reading this report will give one some insight into our thoughts on the importance of this competence to us as students, the ways in which we develop this competence and any way in which we can improve the development of this competence.

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1.0 INTRODUCTION

In the working world, employers look for certain qualities in university graduates. One of the most common is the generic competence, “**The Ability to Translate Knowledge into Practice**”. This is valued very highly among employers, but sadly is not as common as it is sought after in graduates in Africa. Authorities have reason to believe that the current curriculum of universities in Africa is the major cause of this, and as such are looking to collect views from all parties involved to best determine how this trend can be curbed.

The purpose of this report is to give contributions on behalf of the students of Kwame Nkrumah University of Science and Technology, and more specifically the students of the Department of Civil Engineering, on the topic at hand, which is the importance of the competence and the ways in which it can be developed in students before and after they graduate. As one would expect, the views expressed in this report are mostly going to relate to the Civil Engineering field.

It contains answers to a series of questions relevant to the topic. The topics of the questions include:

- Courses which students are doing right now which help them develop this competence.
- Activities related to the mentioned courses which helped in the development of the competence
- Aspects of the competence developed through membership of clubs
- Reference to said competence in class
- Development of the competence outside the university
- Different contexts in which students have developed their competence

Students will be interviewed to get direct input on what we as a whole think of the subject, the results of which will be made available in this report as well.

2.0 COURSE WHICH HELPED ME DEVELOP THIS COMPETENCE

Over the years, I have done many courses related to the Civil Engineering profession. Every single one of them is taught with the intention of linking the knowledge we gain in school to its practical application in the field. A few examples are CE 367 (Transportation Engineering), CE 359 (Soil Mechanics), and CE 376 (Civil Engineering Quantities), among others.

Each of these courses in one way or another brought me closer to achieving this competency, but I must say that the most effective of them all has been CE 497 (Civil Engineering Design) or simply CED, as everyone at the department calls it. This course was extremely involving and almost entirely outside of class. We had very few classes compared to the other courses, and we had to rely mainly on knowledge we obtained from courses we had already done in the past.

Students are grouped into sets of six, and each set provided with the background of a construction project they are expected to design. Construction involves more than just one field however, and so each student is given one field (any one of Structures, Geotech, Highway, Drainage, Water Supply and Waste Management) on which to work and design for the construction.

Each group is expected to perform all necessary tasks required for the complete design i.e. preliminary and detailed information gathering, calculations, environmental impact assessment and costing of the construction. Expected output of each group is:

- A detailed report of the entire project, to be submitted in four stages at different stages of the semester: an inception report, a preliminary report, a draft report and a final report.
- Drawings of all designs
- Samples of any calculations the group may do
- A bill of quantities for the entire project
- An environmental impact assessment report for the project

As one can imagine, the course takes a lot of time to complete, and as such, the project is given at the beginning of the semester, and all groups are expected to submit their complete work at a specified time at the end of the semester. All groups are also expected to defend the work they have done in front of a panel of lecturers.

3.0 COURSE-RELATED ACTIVITIES

As mentioned above, the majority of the work involved in the CED course is done outside of the class. Thankfully however, they go a long way towards helping us to develop our ability to translate knowledge into practice.

3.1 Gathering of Information

To start the design of the project, the engineer (student) is required to obtain information that would be relevant to the design procedure. This involves anything from the type of soil at the construction site to the climate of the area to the kind of people who live there. Determining and obtaining the information required to make design decisions is a very important aspect of design in the civil engineering field, and taking part helps us prepare for this task in the future.

Obtaining the information involves two main activities:

- **Desk Study**, as it is commonly called in civil engineering, where the engineer looks for relevant information in books, the internet, past records of similar projects or similar areas and others. This can normally be done while sitting at one's desk, hence the name.
- **Field reconnaissance**, which is going on foot to the planned construction site, to observe features and find information from locals which may be relevant to the project. It is important because the engineer is able to notice and reconcile any observation that may differ from what was obtained from the desk study and decide accordingly.

3.2 Design Procedure and Calculations

After all necessary information has been obtained, the engineer must use them to make informed decisions about their field, and do necessary calculations to guide and support engineering decisions. Although we are basically applying knowledge we obtained in class in the past, CED forces us to use our brains to solve real life problems, compared to the ideal ones we were given in class. For example, you could be taught in class how to solve a problem whose solution is just the number "6". The solution of the real life version of the same problem may be "7.3549" or even "-75.36". These answers are typically not answers that are expected in class and not as easy to use

as just “6”. The engineer must however adapt, in that he must determine the cause of the unusual values and be able to work with them regardless of any difficulty they may cause. Making design decisions is often very difficult and normally requires research and revision before doing it.

3.3 Design Drawings

In all designs of anything ever, visual representations will always make it easier to understand and implement the design. Not everyone can understand statements such as “25-T1201” or “50mm U-drain”, which is why drawings are important. Drawings serve to bridge the gap between the understanding of the engineer and that of the layman.

Each group had to produce detailed drawings of all designs in each field, to represent the equivalent in the civil engineering field. The drawings were done using engineering drawing software such as AutoCAD.

Having to produce drawings of our own from our own designs was a big, but important change, as opposed to redrawing already presented drawings like we did in previous courses which involved engineering drawing.

3.4 Group Meetings

Teamwork is a very important part of engineering design, as there is more than one field in which to design and thus it is a very common to have multiple engineers working on the same project. If they cannot work together, there will be no progress. This is common knowledge among engineering students, because we are told this from day one. CED puts students in a position to put this into practice.

As mentioned before, students were put in sets of six, and each group expected to work on one project. The different fields are connected to one another in one way or the other, and so the students are all expected to interact and work together in order to have a successful design. To facilitate this interaction, we held regular meetings among group members, where we gave updates on our individual progress and that of the group, as well as give constructive criticism where applicable.

3.5 Costing of the Project

Just like any activity, engineering projects cost money. An integral part of the design procedure is determining how much everything will cost. Engineers have to design projects which, on top of being functional, are economical. One can design something very aesthetically impressive but impractical because of its cost, and the inverse also applies. Finding the balance between cost and functionality is the duty of the engineer. Knowing how to cost projects is also a duty of the engineer.

We have been taught this in CE 376, but again, with ideal problems. CED gave us an opportunity to apply this knowledge obtained in class to the practical aspect of civil engineering.

3.6 Sample Testing and Interpretation of Results

As part of research for any project, one must take samples from the site to test and confirm what the desk study and field reconnaissance have produced, or in the case where they do not match, adapt and decide accordingly. The engineer must know how to carry out all tests, record any data produced from the tests, and understand and interpret this data so that others can understand it. The CED course provided us with the opportunity to practice this competence.

3.7 Report Preparation

Reports are an everyday part of an engineer's job, as they serve as progress updates at various stages of design. A report, in the context of engineering design, is a general overview of the design procedure, which will serve to brief whoever is reading it on the progress of work.

It should be easy for anyone to understand. We, as Civil Engineering students, have been writing reports since the first year, but this was the first time we had to write such a comprehensive one, because of the CED course. The expectation of the report was that it should pass as a legitimate one that can be presented to a client. The lecturers ensured we followed this criterion by delivering a copy of each report to a well-known engineering consultancy firm.

3.8 Project Defense

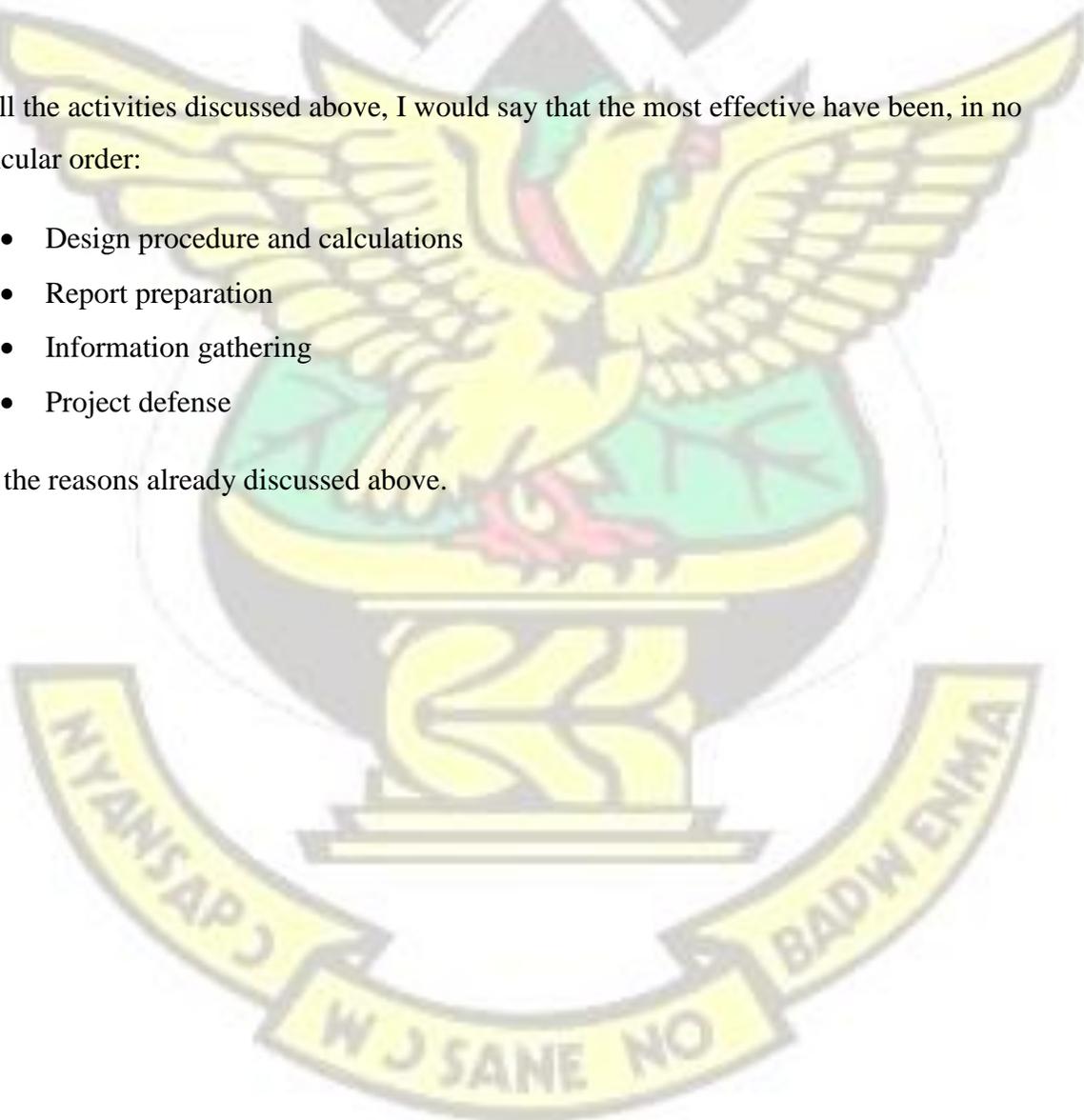
After the design is complete, the engineer must pitch it to the client, and convince them that it is a viable option to implement it. This usually involves presenting the design to either the client or a consultant, for approval. This scenario is replicated in the CED course for the students of Civil Engineering.

After the final reports have been submitted, each group is required to defend the work they have done to a panel of lecturers. This is done to confirm that the submitted work has not been plagiarized and that all members of the group took part in the design. This is important in the civil engineering field as well.

Of all the activities discussed above, I would say that the most effective have been, in no particular order:

- Design procedure and calculations
- Report preparation
- Information gathering
- Project defense

For the reasons already discussed above.



4.0 COMPETENCE GAINED AS A RESULT OF CLUB MEMBERSHIP

Apart from regular lectures and course related activities, the average civil engineering student can develop his/her competence through other means. One such means is through student clubs, most preferably clubs whose activities are related to civil engineering. From mine and other civil engineering students' experience, a few aspects of this competence which can be gained from membership of such clubs are discussed below.

4.1 Presentation and Interpretation Skills

Club in KNUST are usually student run. This gives rise to a lot of interaction between student members and leaders. A large part of partaking in club activities is sharing ideas, input and experience, for the benefit of fellow club members and to foster healthy interaction between students i.e. future engineers.

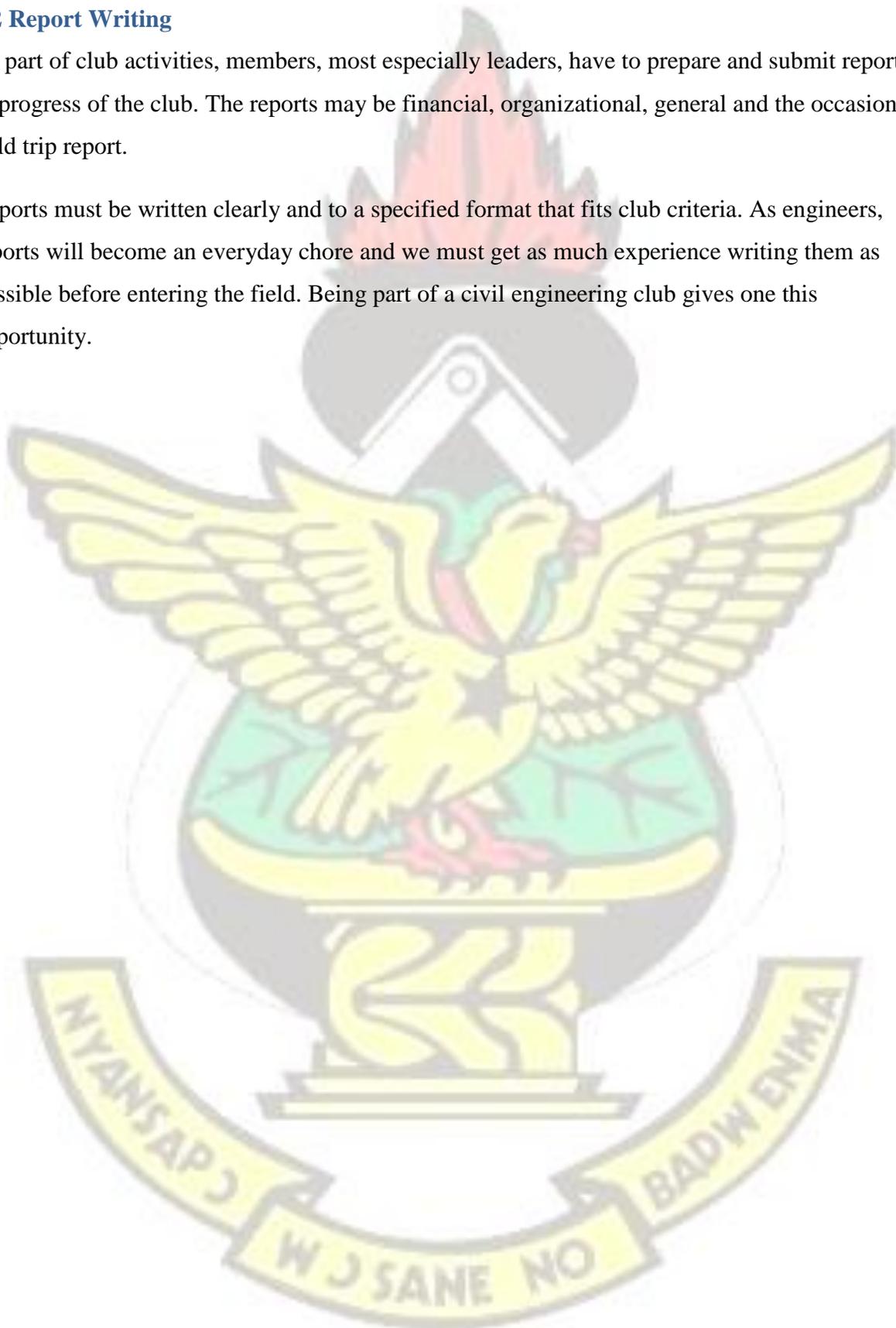
To promote the achievement of the above objective, clubs do what is called “**member presentations**”, where members are encouraged, or in some cases assigned, topics on which to do research and present. As one can imagine, the topics are mostly civil engineering-related. Presentations do not necessarily have to be verbal. There have been works submitted in the form of articles, videos, PowerPoint presentations, and of course the conventional verbal presentation. Presenters have to make sure that the language is easily understood by all listeners.

As engineers, who are encouraged to apply what they learn in class to practice, we try as much as possible to relate any knowledge in our presentations to real life comparisons in the engineering field, or sometimes examples encountered in everyday life. For example, a student could be giving a presentation on the importance of proper beam design, and point to the regular sighting of significantly deflected beams in everyday life as an example of its importance.

4.2 Report Writing

As part of club activities, members, most especially leaders, have to prepare and submit reports, of progress of the club. The reports may be financial, organizational, general and the occasional field trip report.

Reports must be written clearly and to a specified format that fits club criteria. As engineers, reports will become an everyday chore and we must get as much experience writing them as possible before entering the field. Being part of a civil engineering club gives one this opportunity.



5.0 REFERENCE TO COMPETENCE IN CLASS AND COURSE GUIDES

As has been established before, the ability to translate knowledge into practice is very important for Civil Engineers, if not all professions. Because of this, we are constantly being reminded of its importance. In course guides, class presentations and even in examinations, there are numerous references to this competence. Our lecturers never fail to mention how useless all our book knowledge becomes if we do not apply it to practice. The CED course for example, directly forces, for lack of a better word, students to apply all previously obtained knowledge to practical situations in life.

The assessment of this competence is not a one-time thing. From our first years till now, we are tested in this regard at every avenue; lecturers, in the middle of lecture sessions, pause to ask questions pertaining to the topic being taught, but require us to “think outside the box” i.e. use the knowledge and apply to real-life situations. Defense of projects is also another way that we are assessed on this competence. At least once every semester, we take part in laboratory sessions or field work, and have to produce a report. We usually have to defend the work we have submitted in front of the lecturer whose course it is. This has been going on from our first semester till now.

In terms of evidence of achievement of this competence, I have multiple references that I can provide for any employer to confirm from. These include both lecturers who have taught me and professionals under whom I have done internships.

6.0 ASPECTS OF COMPETENCE DEVELOPED OUTSIDE UNIVERSITY

Even though we spend majority of our time in the university, there are other avenues outside it that can help us develop our ability to translate knowledge into practice. Our main means of doing so is through taking part in internships, or as it is commonly called in KNUST, "Industrial Attachment", with engineering firms. We normally do this during the second semester vacations. In fact, this endeavour is so important that the college recognizes it and mandates that every civil engineering student must do at least one internship (compulsory for the third year) before he/she can graduate. Fortunately for me, I have done this thrice and have developed some aspects of this competence:

6.1 Producing and Interpreting Drawings

During my internships with ALKE Ghana Limited and Consar Limited, I was assigned to a construction site they were working on. There I learned to draw structures and details using different software, including AutoCAD, Bentley Staad, and Google Sketchup.

I was also taught how to interpret drawings, so that I could explain them to the less skilled labourers, and also so that I could check to make sure that the specifications in the drawings were being followed exactly.

6.2 Sample Testing and Interpretation of Results

During my internship with Ghana Highway Authority, I was assigned to their materials testing laboratory. That is where they send their material samples, be it soil, bitumen or others, for testing, in order to determine their suitability for a particular project. Over there I learnt how to perform many of the tests that Civil Engineers do, including all the tests that we learnt about in school. They were all performed to the standard of a senior civil engineer, and the reports followed the format set by the Ghana Highway Authority.

6.3 Design Procedure

I was taught how to go about designing structural members, both manually (i.e. by hand calculation), and by the use of modelling software such as Orion and Bentley Staad. We did calculations on similar examples in school, but they were very simple in comparison.

6.4 Report Preparation

No matter the place I did my internship, I was always required to produce reports during and after my tenure. The format for each report differed, but the purpose was the same for them all, and that is to summarize progress of works and, in the case of the end of tenure report, my entire experience there.

6.5 Costing of Projects

I was able to spend some time with the Quantity Surveyor at Consar Limited during my internship. I was able to learn how to correctly draw up a bill of quantities for different kinds of structures and activities and then cost the entire project. This was very effective, compared to the simpler version I learnt in school.

Apart from Internships, there is one other way through which I try to develop this competence. I am a firm believer in observation and inquiry. That is the whole basis of science, after all. I spend a lot of time observing things that I feel are related to Civil Engineering. It is fortunate that I live in Ghana, where one can easily find many engineering construction projects going on. They may be buildings, roads, bridges and what have you. I usually watch what goes on and see whether it aligns with what I have learnt in school, and whether or not it does, I ask questions about it, to further expand my knowledge. It is well-known that experienced tradesmen have knowledge that even some of the best engineers do not, and I try my best to get that knowledge by asking them questions.

7.0 CONTRIBUTION TO THE DEVELOPMENT OF MY COMPETENCE

Over the course of my university tenure so far, I have developed my ability to translate knowledge into practice through different avenues. Each of them has contributed to my progress in one way or the other:

7.1 In Class

Lecture sessions are the main source of preliminary knowledge for most engineering students. It is where we are introduced to whatever topic we may be interested in. In addition to dispensing knowledge in class, lecturers encourage us to be observant and think on our feet, by asking challenging questions and posing scenarios that pertain to the field aspect of the civil engineering practice, to test our understanding. Its strength over the others is that compared to them, it is the most regular source of knowledge for students. CED is done only once, and internships are done once a year, but you can almost always count on your lecturer showing up every Tuesday.

7.2 Course-Related Activities Outside Class

As illustrated with CED earlier, students are put in situations where they have replicate procedures that actually occur in the Civil Engineering practice, in order to complete a design project. Often times we encountered difficulties and ended up lost, but this is a part of the practice and we eventually found ways to make do with what we had. This is a very common occurrence in the field and it served to strengthen me mentally and improve my confidence and ability to work under pressure. I also learnt about the difficulty of producing reports under extremely harsh deadlines. Its strength over the others is that it fosters teamwork. The grades of the members of each group are linked in that they depend on one another and so everyone cooperates and does their best.

7.3 Clubs and Associations

Being a member of the CESA Global Construction Club, I have learnt how to work with other engineers, share ideas and present to people in a manner that is easy for them to understand. I have also practiced my researching report-writing skills here as well. Its strength over the others is that it is more enjoyable, as most activities we take part in are by our own choice. I am able to take part in activities with no pressure, free from any deadline.

7.4 Internships

All of my internships exposed me to the practical aspect of the Civil Engineering field. I was able to relate all the things I learnt in class to their practical applications in the field, as well as gain many skills that would make any engineer stand out among his peers. I was also given the opportunity to obtain knowledge I would otherwise never get as an engineer from the tradesmen on site. Its strength over the others is the insight into the working world that it provides. Working with the firms opened my eyes to the rigors of the working world and the values that are required to succeed as a Civil Engineer.

7.5 Everyday life

Observation and inquiry has improved my overall observational skills. I am able to notice details better. Continuously asking questions has improved my practical knowledge of Civil Engineering as well. Its strength over the others is that it is the easiest to do.

8.0 REFLECTION ON MY ACHIEVEMENT OF THE COMPETENCE

In terms of fully developing my ability to translate knowledge into practice, I feel that I am not quite there yet, and I have a long way to go before I can confidently say that I have fully developed this competence.

While I am still a student, I will continue to work hard to improve my level of competence. I plan to do more research on Civil Engineering to obtain more knowledge and to better understand how to apply it in the field.

I will make use of the human resources available to me i.e. my lecturers and teaching assistants by consulting on topics I do not fully understand.

I will also visit some construction sites in order to link what I learn from school to what I see there. The experienced tradesmen, engineers and foremen on site will surely provide me with better understanding than I approached them with.

I will also try to do one more internship, hopefully with a non-construction firm, to broaden my horizon.

When I join the workforce, I expect that I will mainly be developing my competence by doing more and diverse work, gaining experience as I do so. I believe that learning never stops, and I see proof of that every day when I see experienced engineers continue to advance in qualification, despite their advanced age and status. I aim to follow this trend and continue racking up working experience and qualifications until I am satisfied, which may be never.

9.0 INTERVIEWS

In keeping with the theme of the “Student Voice”, which is a collective contribution from a good representation of students as a whole, I conducted interviews with two of my classmates on the same topics I have spoken on above.

The questions I asked were, in the presented order, as follows:

With the preamble of the competence of translating knowledge into practice,

1. Which course was the most effective in helping you to develop this competence?
2. Which activities related to the course you mentioned have helped you to develop the competence outside the class?
3. Which of the activities mentioned were the most effective
4. Have you developed any aspects of the competence as a result of membership of a club or association? If yes, give some details.
5. Was there any reference to the competence in any of our course guides? If yes, give details.
6. Were we assessed on our development of this competence? If yes, give more details.
7. Which aspects of this competence have you developed outside the university?
8. What else have you done in your life to help yourself develop this competence?
9. In your opinion, have you fully developed this competence?
10. What can you do to improve your competence now that you are working?

As expected, the answers I received were very similar to my own. However, there a few new ideas and different perspectives I picked up, which will be touched in the next chapter.

10.0 NEW IDEAS FROM INTERVIEWS AND REFLECTIONS

From my interviews with my classmates, I was able to come to a few realizations that somewhat differ from my original ideas.

- i. The course “**Integrated Design**” was mentioned in one of the interviews as the course which helped the student develop the competence. It is shortened by us to “ID”. As a course, it is very similar to CED in the sense that both courses involve mostly the same activities, from information gathering to defense, although ID is on a much smaller scale. His reasoning was that even though ID was on a smaller scale than CED, we did it first, and thus it was the course that first exposed us to the demands of a semester-long design project.
- ii. My classmates added **consultation of professionals** as an activity outside class that helped them developed their competence. During both the CED and ID courses, we had question sessions with both lecturers and engineers working on real life projects. I did not think that this was a big enough point, but I am beginning to see the rationale behind it now.
- iii. One of those I interviewed mentioned that pursuing leadership positions was his way of improving his competence. Though one can say that this is not related to the course of Civil Engineering, but he shed some more light on his view.
Being able to take on the added responsibility of leading a group of people, who do the same thing as you, teaches you to manage large workloads, respond well to high pressure situations and balance priorities. It made me consider it as a valuable skillset which helps in the development of this competence.
- iv. A thought that occurred to me, upon some reflection, on the improvement of students’ development of the ability to translate knowledge into practice, was a new idea on adding to the curriculum. Courses such as CED and ID have shown to be very helpful towards students developing the competence, however, they did pose problems to a lot of us. The sudden change from classwork to “field” work, although helpful, was difficult and for some groups proved too much to handle. I think that introducing a course similar to CED and ID to the curriculum, but at earlier stages (i.e. first or second year) will make the

transition in the third and final year much easier for us, since we would have some experience beforehand.

- v. One of my classmates mentioned that one of the things he does outside the university to develop his competence is go on personal field trips to places that would help him learn more about Civil Engineering, such as construction sites. It got me thinking about field trips in school and I realized we rarely go on field trips, in some years not at all. An increase in the number of field trips we take part in every year would definitely help us to develop our competence.



11.0 CONCLUSION

It has been established that the ability to translate knowledge into practice is a very valuable, possibly the most valuable, competence that employers desire in graduates and job applicants in general.

It has also been established, however, that it is apparently not very easy to achieve for graduates and job applicants, so this creates a sort of demand-supply deficit, where supply is less than demand of people with this particular competence.

A conscious effort is being made, as can be seen in the curriculum of university students, to facilitate students' development of this competence before being released into the working world.

From the point of view of a Civil Engineering student, this effort seems to be working, as I have only seen positive remarks about the curriculum, although there is always room for improvement.

The current balance of classwork and practical work is quite even throughout the four years of the course. A case can be made that the number of field trips students go on should be increased. All the practical work we do, although effective, are just school-produced simulations of the real versions of the work. Field trips serve as the avenue through which students can actually assess their interpretation of the knowledge they obtain in school.

In addition to the measures taken by the university authorities in guiding students towards achieving the goal of developing the competence fully (i.e. lectures, practical work, field trips etc.), students make their own efforts geared towards achieving this goal (i.e. joining clubs, consultations, internships, observation and inquiry etc.). This tells me that the trend of graduates lacking the competences desired by employers will gradually start to go away, if we all follow this model.

Hopefully, the information in this report will go a long way in contributing to the facilitation of the development of the ability to translate knowledge into practice for university students in Africa.

With the implementation of the recommendations that myself and my classmates have made, the future will look bright for our generation of graduates, and employers should have nothing to worry about.

