ASSESSING ORAL COMMUNICATION SKILLS IN THE FINAL YEAR ENGINEERING DESIGN PROJECT

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In the name of Allah, Most Gracious, Most Merciful

For indeed, with difficulty, there is relief.
Indeed, with difficulty, there is relief.
Ash-Sharh (94:5-6)

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ABSTRACT

The ability to communicate effectively and to equip engineering students with the necessary professional skills for the workplace is one of the key outcomes required by undergraduate engineering programs in fulfilling the engineering accreditation standards set by the Engineering Accreditation Council (EAC). One method to facilitate communication skill development includes an emphasis on integrating communication into the engineering design course and implementing assessment practices to evaluate students' achievement in the communication skills outcomes. The final year project II (FYP II) design course represents an ideal context for performance assessment of students' communication skills. A mixed-methods approach was used. Quantitative data were obtained from the observation of students' FYP II seminar presentation using rubric to gain inter-rater scores, questionnaire administered to the students and FYPII supervisors; as well as the analysis of the Course Assessment Summary Report (CASR) to determine students' communication skills achievements with regard to the inter-rater scores and the achieved University's Key Performance Index (KPI). Meanwhile, the qualitative data from interviews were used to gain in-depth information from students and FYP II supervisors. Results from observation of students' FYP II seminar presentation showed different levels of competencies among the students. The inter-rater scores were compared to the results in CASR to identify any relationship between the scores and the KPI scores for the breakdown of the program outcome on the ability to communicate effectively. The inconsistency in the inter-rater scores to that of the achieved KPI suggested that the use of explicit direct assessment instrument such as the rubrics could provide further insights in the assessment of students' acquired behavioral oral skills in the FYPII design course. The finding also revealed the emphasis by faculty on communication skills in the engineering design course was prominent in the coursework, lessons carried out and consultations with students. Results related to students' and faculty's perception on the English language oral communication skill attributes revealed that students were confident and perceived themselves highly in all attributes even though the faculty supervisors' perception was only at a moderate or adequate level. In summary, all the research questions have been answered and recommendations for course improvement on the future of the oral presentation assessment tool, processes and communication skills instructions in the FYP II design course were presented.

ABSTRAK

Keupayaan untuk berkomunikasi dengan berkesan dan kemahiran profesional yang diperlukan oleh pelajar kejuruteraan di tempat kerja merupakan salah satu daripada keperluan utama yang diperlukan dalam program ijazah kejuruteraan bagi memenuhi piawaian akreditasi kejuruteraan yang telah ditetapkan oleh Majlis Akreditasi Kejuruteraan (EAC). Satu kaedah untuk memudahkan pembangunan kemahiran komunikasi adalah penekanan terhadap penyepaduan komunikasi ke dalam kursus reka bentuk kejuruteraan dan melaksanakan amalan penilaian untuk mengukur pencapaian pelajar menerusi kemahiran berkomunikasi. Projek tahun akhir II (FYP II) kursus reka bentuk mewakili konteks yang paling ideal untuk penilaian prestasi kemahiran berkomunikasi pelajar. Pendekatan kaedah gabungan telah digunakan. Data kuantitatif diperolehi daripada pemerhatian pelajar FYP II menerusi pembentangan seminar dengan menggunakan rubrik untuk mendapatkan markah *inter-rater*, soal selidik yang diberikan kepada pelajar dan penyelia FYPII serta analisis Ringkasan Laporan Penilaian Kursus (CASR) untuk menentukan pencapaian kemahiran berkomunikasi pelajar dengan mengambil kira markah *inter-rater* dan Indeks pencapaian Universiti Prestasi Utama (KPI). Sementara itu, data kualitatif daripada temu bual telah digunakan untuk mendapatkan maklumat yang mendalam daripada para pelajar dan penyelia FYP II. Hasil daripada pemerhatian, pembentangan seminar pelajar FYP II menunjukkan tahap kecekapan yang berbeza dalam kalangan pelajar. Markah *inter-rater* digunakan untuk membandingkan keputusan dalam CASR untuk mengenal pasti hubungan antara skor dan markah KPI untuk pecahan pencapaian pelajar menerusi kemahiran berkomunikasi. Markah *inter-rater* yang tidak konsisten dengan KPI yang dicapai mencadangkan bahawa penggunaan instrumen penilaian langsung yang jelas seperti rubrik boleh memberi maklumat lanjut dalam penilaian kemahiran lisan tingkah laku pelajar dalam kursus reka bentuk FYP II. Dapatan kajian juga menunjukkan bahawa penekanan oleh fakulti kepada kemahiran komunikasi dalam reka bentuk kursus kejuruteraan adalah penting dalam program yang dijalankan dan perundingan dengan pelajar. Dapatan berkaitan persepsi pelajar dan fakulti terhadap attribusi komunikasi lisan bahasa Inggeris mendedahkan bahawa pelajar merasa yakin dan keupayaan mereka untuk menguasai semua atribusi walaupun persepsi penyelia di fakulti berada pada tahap sederhana atau mencukupi. Secara ringkasnya, semua persoalan kajian telah dijawab dan cadangan untuk penambahbaikan kursus pada masa depan bagi penilaian pembentangan lisan, proses dan arahan kemahiran berkomunikasi dalam kursus reka bentuk FYP II telah dibentangkan.

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ABET	-	ABET Engineering Criteria 2000 also referred to as "EC 2000"
BEM	-	Board of Engineers Malaysia
BM	-	Bahasa Malaysia
CASR	-	Course Assessment Summary Report
CO	-	Leaning outcome, similar to certain constructs such as educational objectives, competencies, skills or achievement
CSD	-	Communication Skills Development, one of the non-technical learning outcomes or professional attributes expected by engineering students by the time they graduate
EAC	-	Engineering Accreditation Council
FKA	-	Faculty of Civil Engineering
FKE	-	Faculty of Electrical Engineering, responsible for teaching and learning activities in the programme leading to the award of a Bachelor in Engineering (Electrical)
FPPSM	-	Faculty of Management and Human Resources
FYP	-	The final year project. In the United States it is referred to as capstone design or senior design
ESP	-	English for Specific Purposes
IEEE	-	Institute of Electrical and Electronics Engineers
IEM	-	The Institution of Engineers, Malaysia
IHL	-	Institution of Higher Learning – which includes public or private universities, and other institutions authorised legislation (either directly or indirectly) to award engineering degrees.
MOHE	-	The Ministry of Higher Education

MQA	-	Malaysian Qualification Agency
OCAR	-	Oral Communication Assessment Rubrics
PeO	-	Program Educational Objective in attaining university's vision and mission
PO	-	Program Outcomes are statements that describe what students are expected to know or able to do by the time of graduation
SEF	-	Seminar Evaluation Form
UTM	-	The Malaysia University of Technology or locally known locally as *Universiti Teknologi Malaysia*

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In Malaysia, English serves as the global language where multinational firms use English as the prime means of communication in the office (MICCI and UM, 2005). These corporations indirectly influence the educational policies through the global economic power. The increase of global economy in Malaysia requires the education system to produce graduates who can communicate effectively in English and possess high potentials in developing their career path. Otherwise, Malaysia would lose out to foreign investors (Muhammad Rashid Rajuddin, 2006; Riemer, 2002). This signals the need to transform the engineering pedagogy in order to respond to the increasingly complex nature of work in the twenty-first century. Pursuant to this, the 2013-2025 Education Development Plan (MOE, 2012) was introduced to facilitate the use of language in the teaching and learning process in schools and Institution of Higher Learning (IHL) in an effort to highlight the talent for Malaysian graduates at the workplace. The Malaysian higher education system also emphasizes the importance of communication skills in producing flexible, adaptable workforce as prescribed in the standards set by in the National Graduate Employability Blueprint 2012 – 2017 (MOHE, 2012). Many studies have shown that one of the main reasons for unemployability among Malaysian graduates is failure to communicate in English (Nik Azmi *et al.*, 2012). Thus, the Malaysian government feels that there is a need for educational transformation in language policy and planning which can assist efforts in

the economic growth and development of a country to help change a state and society in radical ways.

One reason for the lack of graduates' English language communicative ability is because students still lack the required English competencies upon entry into the university for a preparatory or first year diploma or degree course despite having spent an average of 11 years of English language studies in the primary and secondary school system. This limited use of English throughout the engineering program could have an unfavourable effect when students leave the university to start work. Thus, the shortage of skilled workforce with effective English language communication skills is repeatedly identified (Poon, 1991). Many blamed on the alienation of the English Language courses which are conducted in the first year of the undergraduate study (Munby, 1978), while another blame is on the school curriculum which did not give due emphasis on students' communication skills development (Poon, 1991). Jennings and Ferguson (1995) believed that communication skills should be the leading concern of engineering academics in the higher learning institutions. Similarly, Pappas and Lesko (2001) feel that communication skill is one of the professional attributes essential to facilitate and prepare future engineers for the 21st century. Engineering graduates require an ever-increasing range of skills to maintain relevance with the global environment of the new millennium and the global trend among employers today is to look for graduates who are proficient in the professional skills, a vital characteristic for an engineering careers.

As one of the educational institutions that offer engineering programs, Universiti Teknologi Malaysia (UTM) recognizes the importance of communication skills as a key graduate attribute. There are a variety of ways to teach engineering students about communication and one method is to offer formal semester long courses on English communication courses. These types of courses were run by the Department of Modern Languages in the Faculty of Management and Human Resources (FPPSM). The English language courses are offered to all the faculties including the engineering faculties, for a period of at least three semesters throughout the students' eight semesters of undergraduate studies. The two compulsory English courses are English for Academic Communication and Advance English for Academic Communication. Students are then allowed to choose one elective English course from

five offered by the FPPSM. They are English for Career Search, English for Workplace Communication, Reading for Specific Purposes, Writing for Specific Purposes, and Effective Oral Communications Skills. A lot of emphasis is given by FPPSM to ensure that communication skills are developed holistically into the undergraduate students' learning experience, but because communication skills are introduced early on in the first years of the engineering experience, the question is are they reinforced and integrated in the later stage of their studies.

Fortunately, with respect to oral communication skills, it was found that the electrical engineering faculty does reinforce it throughout the curriculum through a variety of experiences to develop students' ability. The faculty provides varied speaking opportunity to speak in class and these start from the first year and continue through the final year. A number of formal and informal oral presentations are required as part of a course. These presentations tend to be short and focused in the first year and they become more open ended and of longer duration by the final year especially in design courses where they present as a member of a team or individually. Students also give longer 15 minutes technically oriented group presentation when presenting the results of a laboratory experiment to the lecturers and the class. Finally, oral design presentations are used in the two final year projects senior design courses – Final Year Project I (FYP I) and Final Year Project II (FYP II). At the end of each semester in the final year, students make a 10-15 minute individual oral presentation on the project to the department faculty and students. As such, oral communication skills is sufficiently incorporated and integrated into the electrical engineering curriculum (Shahrum Shah, 2008). To encourage the use of communication skills in the engineering curriculum, the FYP stresses on both the technical skills learning outcomes as well as the non-technical aspect – CO3, which requires students to "communicate effectively either orally or in written form". Likewise, all engineering faculties share common program outcomes on communication skills (PO6) which is the ability to communicate effectively (Shahrum Shah, 2008, pp. 9-10). Efforts have been made by faculty to give high priorities on both technical and communication skills even though there is no specific policy on the integration and assessment of communication skills in its engineering programs.

Nonetheless, in the engineering context, the requirements for communication skills are prescribed in the local accreditation bodies set by the Engineering Accreditation Council (EAC) (BEM, 2007), and the international engineering accreditation standards of the Washington Accord (IEEE, 2004). With these accreditation standards, among the implications for engineering students is learning how to function collaboratively and how to acquire particular sets of competencies and how to communicate effectively to fulfil common design objectives. A common practice in engineering curriculum at most higher education institutions is the use of the capstone design course or locally referred to as the senior design project or the Final Year Project II (FYP II) which is administered to the final year students to give students hands-on and real-world experience with the objective of not only teaching the application of engineering principles, but also acquiring the behavioral skills of communication (Duff and Schildgen, 2005). The experience in the FYP was feasible because it provides a smooth transition from academic to professional life.

Since the FYP II is the cornerstone of an engineering program, communication skills should have been fully developed by the students by the time they implement their FYP II. This is because the focus in FYP II is on consolidating all the experiences catered towards "research" and learning something new. It requires students working individually, designing, building and testing mechanical components, devices or systems and working closely with a faculty member. Incorporating tasks on communications alongside the design project tasks is beneficial in achieving congruency in the expected students' learning outcome. As such, in meeting the requirements of this study, the researcher looked into the assessment of oral communication skills in English by the engineering students, focusing on how much the oral communication skills have been implemented and emphasized in the Final Year Project II (FYP II) design course, in doing activities such as giving oral presentation and product demonstration.

The selection of the FYP was further strengthened by studies made by Scales *et al.* (1998), who identified seven types of indicators or instruments that could be used in assessing programs outcomes - Alumni survey, Capstone design courses, Employer survey, Exit interviews, Fundamentals of Engineering (FE) Examination, Nationally Standardized Tests, and Industrial Advisory Boards. Simultaneously,

ABET provides engineering programs the opportunity to define themselves, their students, and their methods of data collection,

> "Evidence must be given that the results (of program assessment) are applied to the further development and improvement of the program. The assessment process must demonstrate that the outcomes important to the mission of the institution and the objectives of the program…, are being measured. Evidence that may be used includes, but is not limited to the following: student's design projects; nationally-normed subject content examinations; alumni surveys that document professional accomplishments and career development activities; employer surveys; and placement data of graduates."
>
> (ABET, 2000, p. 3)

Scales *et al.*(1998) proposed the use of capstone design courses as a means of enhancing communication skills as it integrates the knowledge gained from the previous courses and it requires students to perform professionally through demonstration of technical expertise and communication skills. The design course provides a unique milestone where the combined skills and conceptual attributes of the undergraduate engineering experience can be measured, and besides, an assessment of student's communicative competence and their ability to solve design problems can be made. These final year design projects give students hands-on and real-world experience in meeting the demands of the workforce. As such, the faculty needs to identify generic employability skills which are embedded within the FYP II design course and to conduct and assess related graduate employability outcomes from it. At the same time, the faculty needs to develop a monitoring and reporting tool that is able to evaluate and provide reliable information on the effectiveness of the measures taken and to provide informed decisions regarding the improvement of curricula, instructional practices, and the instruments used. Based on the factors highlighted earlier, the researcher has decided to use the FYP II as the indicator in the assessment of student's oral communicative competence in the seminar presentation of the design course.

1.2 Background of the Problem

A university and industry collaboration between the Malaysian International Chamber of Commerce and Industry, and University Malaya was held to identify the communication problem among graduates (Fitterling, 2005; MICCI and UM, 2005). Fitterling (2005) identified reasons for the lack of language and communication skills amongst new graduates which included their inability to communicate and articulate their thoughts very clearly; lack of communicative ability among students and graduates; less exposure to use the language; and too heavy curriculum – reduces communication opportunity. Employers also concurred that local university graduates generally demonstrate low English language proficiency. This was further endorsed by lecturers who participated in the study conducted by the National Higher Education Research Institute (IPPTN, 2006). Opinions from employers, graduates, undergraduates, lecturers and Universiti Sains Malaysia's administrative units were gathered and it was found that employers rated personal qualities and English communicative abilities in speaking and writing as crucial for employment purposes. These abilities are also vital characteristics for employees to communicate with clients from abroad. They also claimed that undergraduates' language performance and abilities have gradually decreased over the years and students' communication skills were extremely limited. This was worsened by the lack of confidence when communicating and reluctance to engage in classroom communicative activities, thus resulting in students' difficulties to improve their communicative skills in speaking and writing. Universities have realized that in major engineering courses, students' communicative inability especially in oral presentation skills were very low (IPPTN, 2006).

The industry and the government have repeatedly highlighted the importance of strong communication skills for engineers entering the workplace (ABET, 2007; BEM, 2007; IEA, 2005; IEM, 2008; McKenzie *et al.*, 2004; Paretti, 2008; Sageev and Romanowski, 2001). Industries require a greater number of communication and interpersonal skills for entry-level engineers (Azami, 2008), yet, graduate engineers still lack the required standard of communication skills (Forbes, 2005). Therefore, the challenges faced by graduates are to focus on the development of the professional skills in the undergraduate engineering program to meet the demands from industries.

Reimer (2007) contends that communication skills are a regular feature of an engineer's job. Fresh graduates employed in the industries have identified that communication skills instruction needs to be improved given the industrial demands. The industries expect engineering graduates to have strong acquisition of the English language besides being able to communicate effectively.

In line with the concern of universities and industries on the limited ability of students' communicative competency, the capstone course or the final year project is seen as an opportunity for learning to take place in a student-centered and student-directed manner that requires the command, analysis, and synthesis of knowledge and skills. The capstone course fosters interdisciplinary partnerships among university departments and helps cultivate industry alliances and cooperation (Moore, 1994). By doing so, it should result in a positive and successful learning experience as well as generating self-confidence and strong communicative abilities among students. The Carnegie Report (Boyer, 1987) states that the capstone also integrates coursework, knowledge, skills, and experiential learning to enable the student to demonstrate a broad mastery of learning across the curriculum for a promise of initial employability and further learning and career advancement. The Carnegie Report recommends three instruments for measuring the outcomes in a capstone course – the senior thesis, an oral presentation and preparation of portfolio. The oral presentation is the integration of the thesis and the senior design project. It is a presentation of the research study; it allows for a summarization of the literature review, discussion of its procedures, data, and recommendations. It also reviews the project, exhibits the production or performance, and discusses its results applicable as a solution to the problem. It was also identified that with stand-alone technical communication courses and laboratory courses, design courses have long been a key site for helping students develop these skills (Brinkman and Van der Geest, 2003; Dannels *et al.*, 2003; Miller and Olds, 1994; Norback *et al.*, 2008; Pappas *et al.*, 2004; Pappas and Lesko, 2001; Tompkins *et al.*, 2007; Tooley and Hall, 1999; Wilk and Anderson, 2002). In fact, in their 2004 national survey on capstone design, McKenzie *et al*. (2004), claimed that the ability to communicate effectively was critical in design courses.

In assessing oral communication skills in the seminar presentation of a capstone course, it not only enhances students' previous cognitive learning in the

course, but also provides a forum that allows the faculty to assess the student's overall academic learning experience. Evaluation of affective learning, is characterized by expression of feelings, values, and attitudes. Finally, psychomotor learning is evaluated by the application and performance of skills. Ideally, a student's competency in the FYP will be demonstrated in all three learning modalities. With regard to communications, the overall students' communicative abilities could be evaluated in the FYP using instruments such as observation, questionnaire and interviews to obtain information on the overall communication competency demonstrated in the attainment of the FYP course outcome. Nevertheless, when assessing the students' oral communication during the observation of the FYP seminar presentation, the assessment is mainly on psychomotor learning whereby it encompasses verbal and nonverbal communication, besides the others such as gross bodily movements, and finely coordinated movements. While in getting students responses on their attitudes, feelings and students' communication skills and ability in the FYP course, assessment using questionnaire and interviews would most likely capture their cognitive and affective learnings respectively (Moore, 1994). The terminology cognitive, affective and psychomotor learning described above, was given a somewhat similar term by Nichols (1991) who acknowledges the need to establish consistent terminology among educators. To Nichols, "…intended educational (student) outcomes are descriptions of what academic departments (faculty) want students to know (cognitive), think (attitudinal), or do (behavioral) when they have completed their course or programs" (Nichols, 1991, p. 18). The definitions may help to expose some of the problems, we as educators, are having with the construct of learning outcomes.

The learning expectations as well as the oral communication skills outcomes that is achieved through the use of capstone course are shown in the Table 1.1 below. As can be seen, the capstone course prepares graduates to be experts in their disciplines and core courses besides being competent in the communication skills. It prepares students with good communication skills as well as the other outcomes necessary for the engineering discipline (Dannels, 2002). Thus, there is a growing need for undergraduate engineering programs to include assessment on effective communication skills because communication is one of the key competencies that engineering graduates are expected to possess (Nguyen and Pudlowski, 2003). While

EAC recognizes the critical component of communication skills, however, it does not specify the form of assessment that should be conducted to assess such skills. It only states that the curriculum content shall cover skills in oral and written communication in its program structure, course contents, and the need to have a balanced curriculum. In terms of assessment and evaluation methods, EAC only states that the assessment to evaluate the students' achievement of the program outcomes shall be done both at the program as well as at course levels (BEM, 2007).

Table 1.1: Learning expectations in a capstone course and the communication skills achieved

Cognitive Learning	**Course Expectations**	**Oral Communication Achieved (Gathered through Questionnaire)**
Knowledge Comprehension Application Analysis Synthesis Evaluation	Students are presented with a problem and draw on their knowledge and research to weigh and select various data leading to a solution of the problem that is workable and intellectually defensible.	Understanding of the communication /presentation process; Use of supporting strategies and information; nonverbal communication - visual support; Questioning; Understanding the audience, Shaping of ideas appropriately
Affective Learning / Attitudinal	**Course Expectations**	**Oral Communication Achieved (Gathered through Interview)**
Receiving Responding Valuing Organization Value complex	The approach and decisions made reflect attitudes, values, feelings, and beliefs characteristics of the discipline and the profession.	Display an attitude for performance that indicates mastery of verbal techniques: clarity, relevance, and effectiveness; Create planning and presentation of thesis or project
Psychomotor Learning/ Behavioral	**Course Expectations**	**Oral Communication Achieved (Gathered through Observation)**
Gross bodily movements Finely coordinated movements Nonverbal communication, Speech behaviors	The production of project solution to a problem and the oral and visual presentation of it, reflects a degree of skill competency as a communicator.	Performance skills: oral communication, nonverbal communication,; Presentation skills and organization.

The Engineering Accreditation Council of Malaysia (EAC) recognizes these needs and ten technical and non-technical learning outcomes are outlined in its Engineering Program Accreditation Manual and the one relevant to communication skill outcome is item (vii) which emphasizes the students' – the ability to communicate effectively, not only with engineers but also with the community at large (BEM, 2007, p. 3). Azami (2008) added that attribute (vii), and attribute (iii) - the ability to undertake problem identification, formulation and solution, are the top two attributes applied by six industrial sectors in soliciting new engineering workforce. This is evident that the design course plays a significant roles in developing communication skills and at the same time meeting the expectations of the industries and stakeholders. Thus, communication skills attributes of graduating undergraduate engineers are best evaluated using performance assessment where students are judged on their ability to complete a real task compared to the traditional objective tests which focus on non-contextual recall of facts and closed-ended problem-solving (Miller and Olds, 1999). A variety of innovative and rigorous methods have been developed by engineering programs in the international context to develop and assess communication skills to be in line with the ABET Engineering Criteria 2000 (Felder and Brent, 2003; Lang and Gurocak, 2008; McGourty *et al.*, 1999a; McGourty *et al.*, 2002; Mickelson *et al.*, 2001; Shuman *et al.*, 2005; Tooley and Hall, 1999; Williams, 2000). Thus, assessing students' performance to demonstrate accountability has become a necessity in academia. This view supports ABET Criterion 3 which states that:

> "…each accredited engineering program must have an assessment program with documented results. The assessment process must demonstrate that outcomes are important to the mission of the institution and the objectives of the program are being measured" (ABET, 2000, p. 3)

Accordingly, Shahrir *et al.*, (2008) stressed that Malaysian higher learning institutions offering engineering programs have to adopt the outcome based education (OBE) as part of the requirement for BEM to be a full member of the Washington Accord. This transformation requires the engineering programs to ensure that the program educational objectives (PEO) and program outcomes (PO) are continually reviewed and the achievement measured within a certain time frame as part of quality assurance process.

As such, this study is timely as it evaluates the effectiveness of the oral communication skills learning outcomes used in the design course of an engineering program. No research has been carried out on the needs and assessment of communication skills learning outcomes in any of its courses in the engineering faculty. A related study was conducted by Azami (2008) on Universiti Kebangsaan Malaysia (UKM) students' generic skills attributes and its proponents as stipulated in the engineering accreditation standards. It only rated the learning outcomes as outlined in the EAC manual from the highest to the lowest. In another UKM study, Riza Atiq, Khalim, Zamri, and Wan Hamidon (2005) proposed a capstone design project to develop students ability in many of the EAC criteria to introduce the learning outcomes. Therefore, the present challenge is to utilize assessment instruments that adequately address observable evidence of learning outcomes. Measures are needed for engineering educators to develop effective assessment tools for course and program evaluation (McGourty, 1999b). These measures will provide a better understanding of the active learning process, and the means for students to take a proactive role in their learning. Similarly, documenting learning outcomes could provide evidence of continuous improvement for the department.

1.3 Statement of the Problem

This research aims to fulfil the research gap through an in-depth study of the communication skills learning outcomes in an engineering course by implementing an assessment method that is in response to the standards set by the Engineering Accreditation Council of Malaysia (EAC). In seeking to introduce performance skills, EAC only highlights the role of the stakeholders in designing, planning and incorporating the assessment to enable students to effectively develop the intellectual and practical skills, as well as the positive attitudes as required in the program outcomes. As such this study justifies the reasons in the selection of the instruments and methods used to assess the perceived effectiveness of oral communication skills learning outcomes in the Final Year Project II (FYP II) design course, as well as describing the perception and behavior of students and faculty members on the communication skills attributes. These views would provide answers on the

effectiveness of an engineering course in meeting the communication outcome stipulated in the engineering program.

Bearing this in mind, the researcher realizes the importance of assessment and frequently asks the question; "Does what we assess matter?" While the professional skill of communications is now a critical concern to the assessment of student learning in engineering fields, "there is no… approach to implement and assess the … outcomes-based criteria. Each program must interpret the criteria as they see fit for them" (Brumm *et al.*, 2005, p. 1). Allen (2004) further justifies that the focus of program assessment is on the learning that occurs as a result of a curricular experience of the students. This approach to assessment can improve the overall quality of the field, program test or enhance its effectiveness. Assessment is important to communications faculty for two reasons; firstly, the faculty needs to provide evidence of students' learning and abilities. Failure to do so may threaten institutional accreditation and signal that communication courses in engineering programs lack legitimacy as a true program with meaningful outcomes. Secondly, communication courses integrate the knowledge and ability, a natural showcase for accountability and evidence of impact on knowledge /attitudes and skills/behavior (Allen, 2004)

Scales *et al.* (1998) acknowledge that outcome indicators are the measuring instruments used in assessment, and the means by which achievements of outcomes is confirmed. In general, assessment begins when a program faculty establishes intended program outcomes and then identifies the outcome indicators that will be used to measure the outcomes. The move towards more integrated and university-wide processes for evaluation suggests that assessment should take place from a multi-methodological position. In the all too familiar testing culture, outcomes are based on ranking. An assessment culture using an integrative approach can focus on a wider range of student outcomes – both quantitative and qualitative, that include core engineering courses integrated along with demonstrated proficiency in communication skills (Ferrone, 2003). In this research, the FYP II is a core engineering course and various types of assessments are carried out by the engineering faculty. As can be seen in Table 1.2 below, a large percentage of the FYP II course assessment went to Progress Evaluations 1, 2 and 3 which is 40 percent. Thesis writing takes up 30 percent, while the component that involves oral presentation is the Seminar and Project

Demonstration which takes 30 percent. This 30 percent from Seminar and Project Demonstration is further sub-divided into three types of assessments - PO4 (ability to work with modern instrumentation, software and hardware) at 12 percent; PO5 (ability

Table 1.2: Assessment of FYP II

No.	Items	Week	Marks Allocation
1.	Progress Evaluation 1-3	4 - 14	40 percent
2.	Thesis		30 percent
3.	Seminar and Project Demonstration:	16	30 percent
3a.	PO4		(12)
3b.	PO5		(10)
3c.	PO6		(8)

to design a system, component or process to fulfil certain specifications) at 10 percent; and PO6 – (ability to communicate effectively) only carries 8 percent. This shows that out of 100 percent for the assessment of the FYP II, only 8 percent goes to the assessment of the oral communication skills. This distribution of marks is seen as quite contradictory to the policy set by the faculty which stresses that it gives strong emphasis on the assessment of the oral communication skills in its presentation.

From the table in Appendix A which shows the 'Mapping of CO to PO1-PO5, emphasis and assessment method', it can be seen that oral communication is at level '1' and 'c' which means that oral communications should be given major emphasis in the assessment which is through seminar presentation, besides the assessment of the thesis. Nevertheless, as can be seen in Table 1.2 above, the assessment for oral communication during the Seminar and Project Demonstration is only give a small percentage of 8 percent and as such this triggers the need for investigation on the inconsistency on the emphasis and the assessment. As justified by Nichols's (1991), "…intended educational (student) outcomes are descriptions of what academic departments (faculty) want students to know (cognitive), think (affective/attitudinal), or do (psychomotor/behavioral) when they have completed their course or programs." Therefore, besides the FYP II course outcome CO3 - Communicate effectively in the oral form, the faculty's program outcome for communication - PO6 on the ability to

communicate effectively will both be the focus of this study (see Appendix B for FKE 10 Program Outcomes). As such, this study will investigate from both the perspective of the students and faculty supervisors in the FYP II design course.

As shown in Table 1.2 above, the 8 percent allocated for the assessment of communication skills in the Seminar and Project Demonstration is obtained from the use of the Seminar Evaluation Form (SEF) (See Appendix C). Further analysis of the SEF showed that the range of marks is questionable. Firstly, as can be seen in Table 1.3 below, the four levels of items being assessed in SEF were not consistent in terms of the range of scores. The first level had a single range of '0', whereas the next level covered two ranges '1 – 2'. The third and fourth level had three ranges each from '3 – 5' and '6 – 8'. This showed that the range of scores was not consistent. Next, the traits to be assessed were also questionable. Two or three traits or criteria were being assessed in one item or so called "double-barreled item". All the items showed either two or three traits were being assessed together under one level such as 'Presentation Slides', 'Explanation' and 'Answering Questions'. When two or more traits are looked at under one range of score, it may lead to a non-response or a response that is hard to interpret (Tomei, 2015). Table 1.3 identified the short falls of the SEF as explained above.

Table 1.3: Range of scores and the traits assessed in SEF

Range of Scores	Traits	Comments on Range of Scores and Traits to be assessed
0	- Presentation - Plagiarism	Two different variables are assessed under one range of score – Presentation and Plagiarism. However, plagiarism is not an item to be assessed in an oral presentation but instead in a written form.
1 to 2	- Presentation - Answering questions	Two different variables are assessed under two range of scores – Presentation and Answering Questions.
3 to 5	- Presentation Slides - Explanation - Answering questions	Three different variables are assessed under three range of scores – Presentation Slides, Explanation and Answering Questions.
6 to 8	- Presentation Slides - Explanation - Answering questions	Three different variables are assessed under three range of scores – Presentation Slides, Explanation and Answering Questions.

Besides, the review of the SEF, interviews were carried out with members of the engineering faculty to find out their opinion from the use of SEF. Some of their comments were:

> "The present SEF was created according to the PO and later improved by the FYP coordinator. Initially, it was very general, it had not gone through any validation process to ensure that the items to assess communication skills is reliable"; (Respondent FS2)

> "But it (SEF) is also very subjective because the points are very close to each other, so we have difficulty to put either a 4 or a 5, a 5 or a 6, etc… and sometime you just have to give the overall performance of the students to in order to give a mark. 0-2 is very rare though no matter how poor they are in the communication skills abilities." (Respondent FS4)

> "Now mark using impression method… We are not looking at every item one by one skills of the students, just on a whole…" (Respondent FS5)

As a result of the poorly constructed rubric like the SEF, data collected from the assessment process cannot be analyzed and applied to diagnose students' learning needs and inform instruction based on those needs. There would also be a failure to drive the learning process in a manner that documents acceptable performance (Tomei, 2015). As such, there is no continuity of assessment of the competencies seen in the SEF scoring rubrics.

From the above analysis of SEF, this research aims to justify that it is necessary to introduce a better rubric which is an authentic assessment tool to measure students' oral communicative ability in a seminar presentation. As such, the rubric used to assess student performance should be trait-analytic and through observation of students, the traits of the communication skills abilities could be examined and the language production and language learning behaviors assessed (Dunbar *et al.*, 2006). Trait-analytic rubrics have been shown to improve validity and reliability, and gives quality of the feedback to the participants (Racicot and Pezeshki, 2007). It is a scoring guide

that seeks to evaluate a student's performance based on the sum of a full range of communicative criteria rather than a single numerical score.

Communication skills are multifaceted and incorporates various elements, such as oral, written, listening, visual, intercultural and interdisciplinary skills (Riemer, 2007). Oral communication is laden with contextual motivations, purposes, audiences, and strategies specific to each field of inquiry. As graduating students have had vast experience in oral communication throughout their engineering experiences, it is not uncommon to see students who had shown improvements from their earlier presentations in the first years of their undergraduate studies to presentation that are obtained during the design course experience where students bring together all the skills they practiced during the course (Palmer and Salvin, 2003; Shahrum Shah, 2008). Palmer and Salvin (2003) further reiterated that in an oral presentation students are encouraged to work on these skills:

1. Maintaining lingering eye contact with all members of the audience;
2. Using appropriate facial expressions and body gestures, actions, and mannerisms;
3. Using appropriate volume and speed;
4. Using correct articulation and pronunciation;
5. Using correct grammar and style;
6. Achieving vocal variety;
7. Avoiding the use of fillers *(er's, oh* 's, and *um* s);
8. Handling the laser pointer effectively;
9. Not blocking the audience's view of the screen; and
10. Appearing enthusiastic

Besides these delivery components, Palmer and Salvin also stressed that the content of the presentation should be effectively organized; the purpose clearly stated in the Introduction of the presentation, the details effectively arranged and transitions clearly provide in the Body; the main points summarize in the Conclusion, and finally, questions politely invited and answered. As such, the rubric for the direct assessment of oral observation should be unique and stress on information about communication which is related directly to the students experience as graduating seniors, and which is collected directly from people in the workforce, practicing industrial engineers,

managers, and senior executives of organizations employing many industrial engineers (Norback and Hardin, 2005). It should include items to be assessed on what is expected of the graduating engineering students in order for them to be professional. This is because oral communication is vital to contemporary industrial relations, where in these times of rapid change and adjustment aimed at maintaining productivity and competitive position, listening and speaking skills are vital tools in developing employees' ability to learn and consequently to acquire new skills, and ultimately this facilitates the development of solutions to problems (Crosling and Ward, 1999). Therefore, constructs to assess excellent oral communication outcomes such as presentation of content, delivery of the speaker, ability to use non-verbal communication such as the use of slides, and keeping the audience attention through the use of eye contact and body gestures are crucial constructs in a rubric for oral presentation.

Accordingly, Dunbar, Brooks, and Kubicka-Miller (2006) use the term Criterion-Referenced to describe the evaluation when student performance is rated according to standards set by the discipline or department. In addition, all components of the rubric must measure accurately the objective of that particular component. When communication assignments such as an oral presentation are given to the students, rubrics are often utilized in the grading of students' oral presentations (Dunbar *et al.*, 2006). Rubrics used in the engineering programs has a set of expected outcome or standards to be assessed. In addition, all components of the rubric must measure accurately the objective of that particular component (Tomei, 2015). A sample of a Criterion-referenced rubrics is shown in Table 1.4 below.

Table 1.4: Common Rubric Template: 5-Level or 5 point Likert scale

Criteria / Likert Scale	Poor 1	Limited 2	Satisfactory 3	Good 4	Excellent 5
Criterion #1 (Standard)					
Criterion #2 (Standard)					
Criterion #3 (Standard)					
Criterion #4 (Standard)					

Source: Tomei (2015)

When communication assignments are given in a course, such as a speech or presentation, rubrics are often utilized in grading student oral presentations. For each competency on a rubric, evaluators must always understand the conditions and terms for each competency, and they must make inferences and approximations of those standards. Thus, rubrics can be an influential tool in faculty development efforts in terms of developing and maintaining consistency among teachers. The oral presentation assignment is designed to measure students' abilities regarding clear and supported content; logical organization; professional style; and effective visual aids design. Students are observed in terms of their understanding in the ways they describe characteristics of the FYP II research design within an engineering research environmental setting as well as their communicative abilities (Shahrum Shah, 2008). The students are expected to focus largely on the conclusions drawn from their results and reasons for any obvious discrepancies from expected trends. Once again, faculty use questioning to probe for evidence of analysis, synthesis, and evaluation by the student (Miller and Olds, 1999).

As the communication rubrics only measures the communicative aspects of PO6 and none of the technical aspects of PO4 and PO5 needed in the FYP II Seminar and Project Demonstration Assessment, a mechanism has to be looked into such as having a collaborative efforts between engineering departments and the communications department to work together in assessing the technical and communicative components using separate rubrics. This would incorporate the multidisciplinary experience in the engineering program and at the same time advocates a natural evolution synthesizing the non-technical skills with other attributes necessary for students to become competent engineering professionals (Rosca, 2003). This would create a comprehensive approach to engineering education that require students to demonstrate a greater understanding of oneself and society. Thus, each discipline must be able to assess communication to ensure appropriate skills are being developed. Communication-based competencies are not only the focus of educators in communication departments, it has also become increasingly important for other disciplines and its role has been considered in curricular change (Dannels, 2002; Dunbar *et al.*, 2006). Dannels (2001) further endorsed that assessment practices that evaluate the extent to which students achieve the communication outcomes by specific disciplines must be developed. This will provide a unique opportunity for research

into meaningful assessment practices, leading to greater understanding of the active learning process (Besterfield-Sacre *et al.*, 2000b).

Accordingly, besides using rubrics in the observation of students oral presentation, engineering education researchers, Rogers (2006), proposed that engineering programs "use a multi-method/multi-source approach to maximize validity and reduce the bias of any one approach. It is also important to have at least one direct method that provides for the direct examination or observation of student knowledge or skills and one indirect method". McMartin, McKenna & Youssefi (1999) pointed out that although faculty and administrators have always relied on student surveys or multiple-choice tests as measures of student learning, however, these measures do not always show a student's actual ability in order to fulfil a particular outcome. Unlike these measures, performance assessments are designed to get at the more difficult aspects of higher learning by solving realistic or authentic problems. Student performance can best be measured by observation". Besides observation, there is a need to implement an indirect approach in this study to identify the emphasis the faculty has put on the assessment of oral communication skills in the FYP II course.

Therefore, besides the use of rubrics to directly assess students' psychomotor/behavioral performance in the oral presentation; there is also a need to understand students' cognitive abilities when carrying out the FYP II course which is investigated though questionnaire; and their affective and attitudinal learning as they reflect on their values and feelings obtained from interviews. While this kind of study has never been applied in the Malaysian context, nevertheless, the researcher aims to adopt the multi-methodological approach both quantitatively and qualitatively, in the assessment of the oral communication skills learning outcome in a design course of an engineering program. With this initiative, it is hoped that it will be a start to meet the standards set by EAC in providing a mechanism to assess students' achievement of the program outcomes which are done both at the program as well as at course level.

1.4 Conceptual Framework

The conceptual framework for an outcome based assessment was adapted from Felder and Brent (2003). In order to ensure that communication skills ability in FYP II could be further examined and the language production and language learning behaviors could be assessed easily and reliably to be descriptive of students' performance, an assessment tool that assess actual oral communication needed in the workforce based on outcome based evaluation (OBE) was strongly justified. From Figure 1.1 below, Felder's original framework is confined in the box which constitutes three broad areas: (i) identifying course content and defining measurable learning objectives for it; (ii) assessment - selecting and implementing the methods that will be

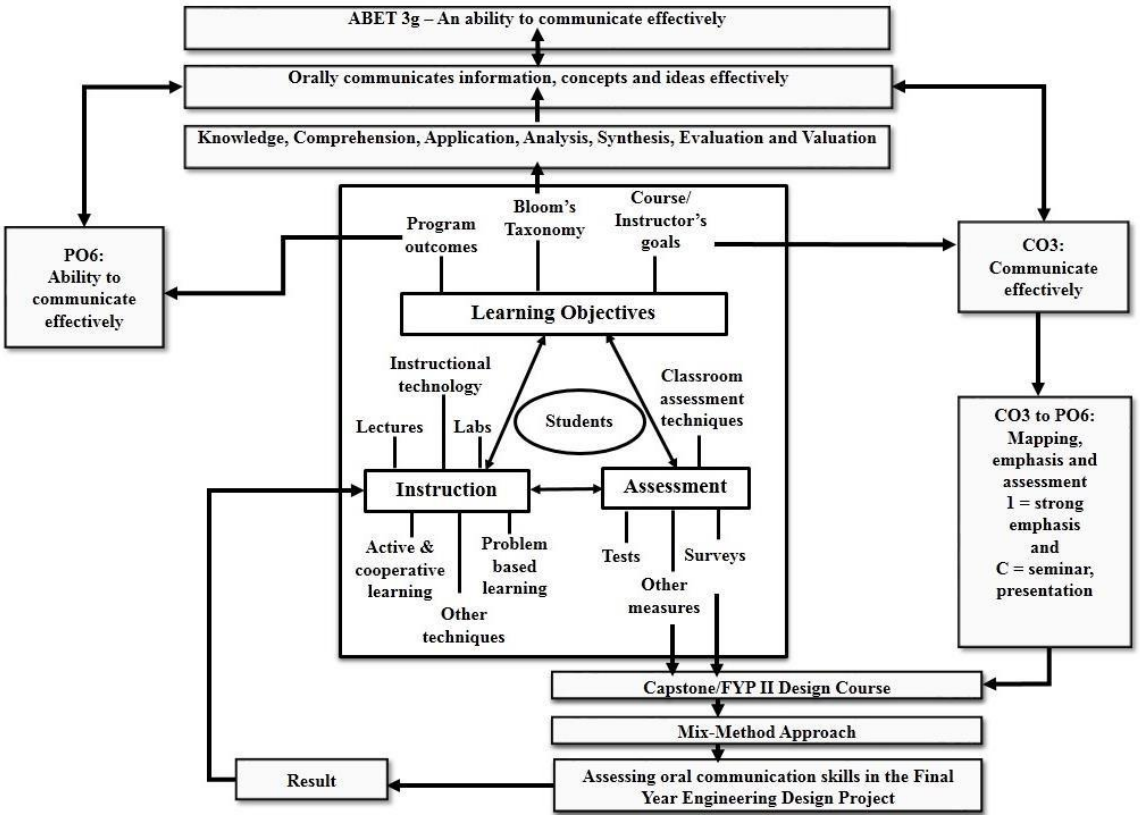

Figure 1.1: Conceptual framework of the Study

used to determine how well the objectives have been achieved and interpreting the results; and (iii) instruction - selecting and implementing the methods that will be used to deliver the specified content and facilitate student achievement of the objectives.

Shaeiwitz (1996) had earlier proposed a similar kind of framework which emphasized on an assessment plan with these components; the educational goals, multiple measures of achievement of the goals, and the use of the information in improving the learning process. In another study by Williams (2002) who viewed the first component of the framework i.e. the learning objectives and highlighted that it is the responsibility of the faculty in defining engineering communication. Williams also contended that each learning outcome must first be defined because it is the crucial step in revising a curriculum, developing courses, and creating useful assessment plans. The next component includes the assessment and evaluation. This includes selecting and implementing the methods that will be used to determine the extent to which the objectives and the results have been implemented. Felder's framework was then extended and the arrows point out to what are needed to achieve engineering students' oral communication competency, and directs what should be assessed at the student, course, and program levels in the FYP II design course.

Thus, the conceptual framework which starts with the understanding of the learning objective would be the crucial stage, since the purpose of this study was to assess the oral communication skills learning outcomes achieved by graduating engineering students. A description of the Engineering Accreditation Body Criteria e.g. ABET as well as the identification of the communication skills course outcomes (CO) and program outcomes (PO) are investigated. In identifying course content and defining measurable learning outcome for communications, the PO6 and CO3 specifically on communication skills outcomes are set by stakeholders, including the accreditation body and faculty to define the desired outcomes to be measured and which must also include statements of where and how the outcomes are addressed in the program curriculum.

This was followed by the implementation of the assessment processes. How the level of attainment of the program and course outcomes are to be assessed, and how the assessment applied the methods and processes involved in the assessment of the outcomes in the FYP II design course has to be clearly identified. Here, this research employed a mixed method design that required an in-depth evaluation of the oral communication skills learning outcome in the design course.

The next step was the triangulation of the assessment results from the mixed method approach to apply the information gathered to support the future improvements and academic decisions of various kinds in individual courses and in the assessment instruments previously used. If the outcomes are assessed continuously and the results are used to improve instruction in the courses that address them, the degree to which the program meets its self-selected goals must inevitably improve. Thus, in the development and integration of communication skills in a design course, instructions is improved by selecting and implementing the methods that will be used to deliver the specified content and facilitate student achievement of the objectives specifically pertaining to engineering and professional communication (Brinkman and Van der Geest, 2003; Cook, 2002). .

Appropriate individual faculty members and faculty groups implement the improvements, thus completing the assessment-evaluation-improvement loop or the continuous quality improvement (CQI) loop. In a way, the assessment served as a model of continuous improvement in the implementation of assessment at the course and program level. Accordingly, as the quality of the instructional program improves, new objectives may be formulated to encompass higher levels of achievement and the course instruction and assessment modified

The findings generated by this study could provide engineering departments the opportunity to reflect, refine, and develop their programs. Thus, in the assessment and instruction stage, the instruments used could help inform decisions to stakeholders to reinforce developmental communication skills knowledge and practice which will later improve the instructional practices. The three stages are not purely sequential—the information collected in each component feeds back to the others in a cycle that leads to continuous improvement. For instance, if assessment reveals that a learning objective has not been satisfactorily achieved, reframing the objective or modifying the instruction may be performed. Similarly, if the quality of the instructional program improves, new objectives need to be formulated and the assessment modified accordingly (Felder and Brent, 2003).

1.5 Purpose of the Study

The purposes of this study are twofold. Firstly, the study aimed to measure the oral communication abilities of the engineering students in the FYP II design course. Secondly, it was to enhance the use of appropriate assessment tools to assess communication skills in the course.

1.6 Objectives of the Study

The following are the objectives of this study:

1. To investigate the degree to which the assessment tools accurately measure the engineering students' communicative ability;
2. To identify the extent to which the FYP II design course outcomes (CO1 to CO5) integrate the oral communication skills outcome (PO6);
3. To identify improvements in enhancing students' oral communication skills ability in a design course

1.7 Research Questions

The research sought answers to the following research questions:

1. How does the assessment tools accurately measure engineering students' communicative ability?
2. To what extent do the FYP II design course outcomes (CO1 to CO5) integrate the oral communication skills outcome (PO6)?
3. What improvements could be made in enhancing students' oral communication skills ability in a design course?

1.8 Significance of the Study

Multidisciplinary research on the assessment of professional skills alongside core engineering courses is relatively new in the Malaysian context and has not received wide exposure. This study should be useful to engineering departments, the industry, and faculty interested in engineering education. The awareness also offers engineering departments involved in assessment activity the chance to improve and to reflect on their program as it continues.

The assessment process accurately assessed the oral communication skills of the students deemed necessary for the workplace. Students' achievement of communication skills learning outcomes demonstrate whether they have achieved the competency standards required by the university, the accreditation standards, and ultimately the industry.

The importance placed on oral communication skills by employers has been echoed internationally for many years and across disciplines. Technical knowledge are clearly important, but these must be presented with and excellent standard of communication skills, particularly oral. Furthermore, oral communication and presentation skills are considered one of the best career enhancers and to be the single biggest factor in determining a student's career success or failure. This study could close the gap between communication skills needed in the workplace and those taught in universities as employers are constantly looking for additional abilities in addition to technical engineering knowledge in order to meet the standards expected of future engineers.

By using a suitable oral communication assessment rubric, it is possible to minimize the often subjective means of evaluating communication skills and move towards more objective evaluations. As such, if faculty have strong agreement to have quality of student presentations, they need to arrive at a complete consensus to have a completely reliable and objective tool in assessing oral communication skills. On a similar note, McGourty states that there is no single existing instrument that would be valid, appropriate, or relevant for a particular learning experience since no particular method is more privileged over the other. In order to take the opportunity to develop

a comprehensive and robust picture of student learning and competency in communication skills, and to contribute to the development of new educational experiences or policies related to senior research design experiences, the justification in the use of the mixed method approach in this study was based on comparing advantages and disadvantages on the kind of information each method provided and the ease in facilitating cross validation with other methods (Adams *et al.*, 2002). It is also to determine if the instruments used would be an effective means for future assessment of student learning within an engineering learning environment.

The integration of the FYP II design course outcomes (CO1 to CO5) to the oral communication skills outcome (PO6) is deemed necessary for engineering students to equip themselves with the necessary attributes to meet the needs of today's technical workplace. In order for students to view communication as crucial to engineering education, both engineering and communication educators must be committed to include communication instruction in the thinking, planning and classroom. As in the present practice, communication skills are introduced early on in the first two years of the engineering experience in UTM and this would not adequately serve students' needs. Therefore, the integration, reinforcement and continuous input of communication instruction from the design course faculty through a variety of experiences is deemed necessary within the within the engineering curriculum and later for work placement. This is important to provide students with the opportunities to practice oral communication prior to the FYP II design course; provide opportunities for students to present to peers while studying for exams, and utilize study groups and introduce more teamwork experience before the final year design course. This would also ensure that the curriculum instils student's self-development and self-directed learning. As such, instilling new instructional practices by senior design faculty encourages effective communication for engineering students which is one of the core professional skills that they should possess at the end of the engineering program.

From the improvements made in the engineering pedagogy and curriculum, this would eventually enhance the credibility of the program and its accreditation. Racicot and Pezeshki (2007) stated that the current educational reform seen worldwide is in the move towards a common framework in achieving international accreditation through assessment goals and practices. Therefore, without large-scale assessments at

the program level, deficiencies will not be recognized or addressed; and academic departments may continue with the status quo which may or may not be instructionally effective. Though UTM recognizes the importance of communication skills and effective communication skills is seen as a key attribute of its graduates for success in employment, efforts must be made by UTM and its engineering departments to ensure continuous evaluation of communication skills in the engineering curriculum, and to place a higher priority on the teaching and strong usage of communication skills alongside the technical skills. This is to ensure that the programme meets the expectation from the stakeholder as well as keep intact with the vision and mission statements of the faculty and the university.

Finally, in line with this mission, all academic faculty are expected to demonstrate scholarship in their fields of specialization, and to demonstrate professionalism and competence in their ability to teach. Students learn to the maximum of their ability when the individual and collective faculty's personal characteristics are such as to utilize the learning environment to inspire the students to do their very best (Glower, 1999). The quality of the faculty determines the integrity of a university. Even with excellent students and state-of-the art laboratory equipment, it is the faculty who establish the curriculum and the academic standards that students must adhere to. It is also the faculty who provides the instruction and directs the research of students. Because of this, it is important for any institution to pay the greatest attention to the quality of the faculty to meet local and international standards (Smith Jr., 1999). Thus, engineering faculty members face a significant challenge in adopting the significant learning outcomes into the engineering curriculum.

1.9 Scope

The study involves only the undergraduate engineering students and the faculty members from the Faculty of Electrical Engineering (FKE) in the Universiti Teknologi Malaysia (UTM) Skudai, Johor. There are several justifications of this selection. Firstly, the researcher has had prior experience of teaching English and communication skills course for the first year undergraduate students in FKE. Secondly, the electrical

and electronics engineering industry is a growing and leading sector in Malaysia's manufacturing sector which is contributing significantly to the country's economy and employment. This means that more competent electrical engineering graduates are needed in order to meet the growing demand for skilled manpower. (FKE, 2008; MIDA, 2008). The selection of FKE students is timely as their technical and communicative competence will be highly needed for the country's economic transformation. In addition, the choice to include FKE faculty members was because the FYP design course encourages reflection and critical thinking, and helps the faculty member draw clear relations between classroom practice and engineering applications (Williams, 2002). This type of teaching pedagogy promotes the outcome-based education approach advocated by UTM. Examining the interactions and processes of the communication skills involved in the completion of the FYP was an attempt to analyse the level of communication competencies demonstrated in the FKE design course.

The scope of the study features only the communication skills learning outcomes - CO3, which requires students to "communicate effectively either orally or in written form". Likewise, all engineering faculties share one common program outcomes PO6 - "Ability to communicate effectively"(Shahrum Shah, 2008, pp. 9-10). Based on this justification, the learning outcomes are correlated within the activities executed in the FYP through the direct and indirect assessment of the engineering faculty's program outcomes. The direct assessment includes the observation of the oral communication skills during the FYP II seminar presentation using the Rubrics. The indirect assessment, on the contrary includes the use of questionnaires and interviews to provided further information about student learning.

1.10 Definition of Terms

Ability - The ability or skills needed by an individual to be a flexible and an adaptable workforce to suit the constantly developing and changing requirements of the workplace.

Accreditation - A concept used in the implementation of policy on the accreditation of engineering programs practiced by the international and local accreditation board to evaluate programs leading to the award of engineering degrees and accredits engineering degree programs offered in the Institutions of Higher Learning

Assessment - A process that identifies, collects, analyzes, and reports data that can be used to evaluate achievement. Within the context of this study, assessment is interchangeably referred to as evaluation and measurement.

Attribute - Used interchangeably with 'Outcome' in statements which describe what students are expected to know and be able to do by the time of graduation. Interchangeably referred to as objectives, standards, goals (Rogers, 2009). They are also actions that explicitly demonstrate mastery of the abilities specified in an outcome or outcome element. The main thrust of the work of Besterfield-Sacre *et al.* (2000b) is to define attributes at the six levels of Bloom's taxonomy of cognitive objectives and at the valuation level of Krathwohl's taxonomy of affective objectives.

Capstone Design Course – Known as the final year project design course (FYP) in the Malaysian context. It is a subject that must be completed by final year students in an engineering program as a requirement to be awarded the bachelor of engineering degree. Students have two semesters to work on a task that is related to a student's field of interest. Students are expected to document their work in a thesis and present their work in a seminar presentation and project demonstration.

Course outcome – knowledge, skills, and attitudes that the students who complete a course are expected to acquire. Some of the outcomes in program core courses should map onto or be identical with one or more program outcomes.

Faculty - refers to the faculty in a University and at the same time it could also be referred to the academic faculty or academic teaching staff in the engineering faculty.

Mixed-Method – Also known as Multi-source or Multiple Methods assessment that uses different sources and methods

Objectives - Statements that describe the expected accomplishments of graduates during the first few years after graduation. The other terms used are goals, outcomes and standards.

1.11 Conclusion

Communication skill is one of the professional attributes needed by graduating engineers for their future careers. It has long been recognized by academia and industry as part of the non-technical professional attribute, critical for the success of engineers to interact with all stakeholders in an organization as well as to be knowledgeable of societal and contemporary issues in the global perspective. This skill needs to be firmly placed within the engineering program to allow engineering students to use and practice the skill in the most appropriate context. Assessment of a program allows the faculty to work toward continuous improvement based on the articulation of learning and behavioral goals and outcomes for their graduates. Assessment of student learning is carried out in response to the accreditation standards set by the EAC. It allows the faculty to identify if the communication skill outcome represent curricular problems, overcome any perceived weaknesses of the outcome, and then develop a plan for improvement.

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