Regulating Electronics Engineering Education in the Digital Age

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Abstract**—**The underlying principle behind the harmonization in international education does not solely aim for the comparability but also the compatibility of outputs produced. The international standard in the different professions particularly in engineering defines the required graduate attributes to attain suitable qualifications and recognitions. This study described the language practices of the Electronics Engineering students of Bulacan State University, Philippines who will be deployed for their internship program. The purpose of the study was achieved by determining the language proficiency of the students in terms of speaking, listening, reading, and writing, and checking the adherence of the University to the commitment of intensifying community building for the Association of Southeast Asian Nation Vision 2020. The analysis of variance of the variables defined the significance between the causal variables and dependent variables. Thus, this study identified the mechanism that would regulate language practices in the Electronics Engineering program.

Keywords**—**Communicative competence, descriptive design, language practices, mechanisms, outcomes-based education.

I. INTRODUCTION

THE twenty-first century education presents a consistently disagreeing pattern in the causality of its demands and outcomes - the competitiveness and interdependence [12] promoted by globalization, the paradoxical theory of building human capital [4] towards the promotion of the economy, and the promotion of the innovation capacity of the people [6] demand to harmonize education policies and standards. Likewise, this global agenda in education mandate the standardization of graduate attributes, regulation of professional competencies, and the comparability of credentials necessary in acquiring international recognition.

The members of the Association of Southeast Asian Nations (ASEAN) Community are expected to adhere to the regulation standard to qualify for the international register. As signatories, they have to be responsive to the mandates of the agreement. The ASEAN community prepares itself by intensifying community building through enhanced regional cooperation and integration to achieve Global recognitions. [1] The recognition of professional qualifications for instance as stated in educational accords – Washington Accord 1989, Sydney Accord 2001, Dublin Accord 2002- serves as the driving force of the ASEAN Community to achieve comparability of its professionals. This is envisioned to be achieved by providing programs that facilitate the mobility of engineers, education that acquire suitable qualifications, and trainings that exhibit good practice in the engineering education. With these identified processes and criteria of graduate attributes, education practices need a standardized mechanism, which would ensure the regulation in processes and harmonization of outcomes.

The defined expected competencies of a professional engineer that are divided in eight individual elements describe a knowledge profile in the hierarchical order based on Washington Accord Standard. This program builds the type of knowledge and develops the attributes that are typically achieved in 4 to 5 years of study. The eight elements require the knowledge of the theory, engineering practice, and engineering application in the society which are expressed in terms of competence in a systematic, theory-based understanding of the natural science applicable to the discipline; conceptually-based mathematics, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modeling applicable to the discipline. [10] Significantly, the order of competencies [9] is arranged from a structure-based-conceptbased-outcomes-based approach. These elements require the communicative competence that is achieved through a systematic, methodical, careful training in the language in the profession for engineers to carry out complex problems. [9] Hence, future engineers need the functionally native proficiency of experts who discuss in the technical or esoteric language to conform to the standard.

With the presumption that the relationship of causal variables affects the communicative competence of the electronics engineering students, the collected data were subjected to a regression analysis. Thus, the results formulate the mechanism that would regulate language practices in electronics engineering - in the language in the profession and in the outcomes-based education for international recognition.

II. CONCEPTUAL FRAMEWORK

This framework illustrates the relationship of the independent and dependent variables. The line that connects to the variables shows its correlation to the intervening variable.

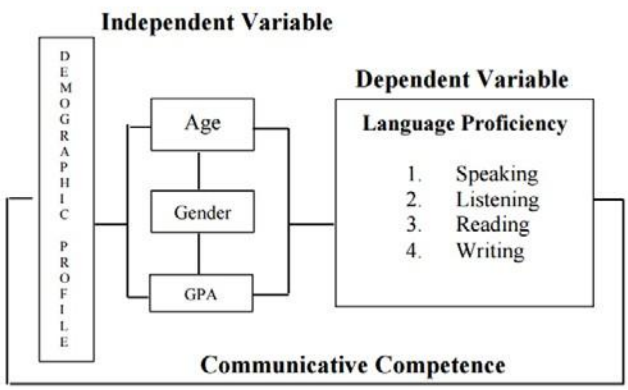

Fig. 1 Conceptual Model of the Study

This study theorized that the predictor variables – Demographic Profile – has significant relationship with the language proficiency of the students which is categorized as speaking, listening, reading, and writing. Significantly, the data were subjected to a regression analysis to determine if significant relationship between demographic profile and language proficiency of the students exist. Thus, the effect of the demographic profile on language proficiency was described.

III. Methodology

The descriptive and inferential analysis design was used to describe the language proficiency of the 103 randomly picked electronics engineering third year students in Bulacan State University Philippines who will be deployed for their on-thejob training in the different companies. This research design was used to define the relationship of the predictor variables to the language proficiency of the students in terms of speaking, listening, reading, and writing. The adopted Foreign Language Test Battery [3] was used to assess the language proficiency of the respondents with their corresponding scale and description where 0- is No Proficiency, 0+ Memorized Proficiency, 1Elementary Proficiency, 1+ Elementary Proficiency Plus, 2Limited Working Proficiency, 2+ Limited Working Proficiency Plus, 3- General Professional Proficiency, 3+ General Professional Proficiency Plus, 4- Advanced Professional Proficiency, 4+ Advanced Professional Proficiency Plus, and 5- Functionally Native Proficiency. Lastly, the causal effect of the predictor variables to the language proficiency of the electronics engineering students was described using a regression analysis.

IV. Results and Discussion

Fig. 2 presents that majority of the Electronics Engineering third year students were 19 years old. Some were 18 years old. Few students were 20 years old. Very few students were age 21 & above.

Fig. 3 shows that although there is a very little difference in the number of the respondents according to their gender, still, the illustration presents that majority of the respondents were male.

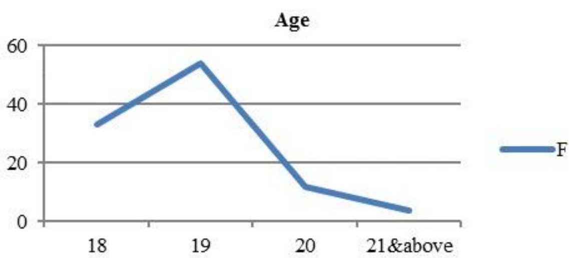

Fig. 2 Frequency Distribution in terms of Age

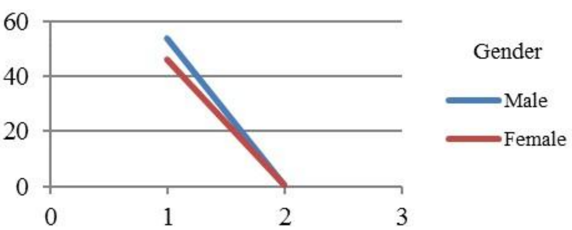

Fig. 3 Frequency Distribution in terms of Gender

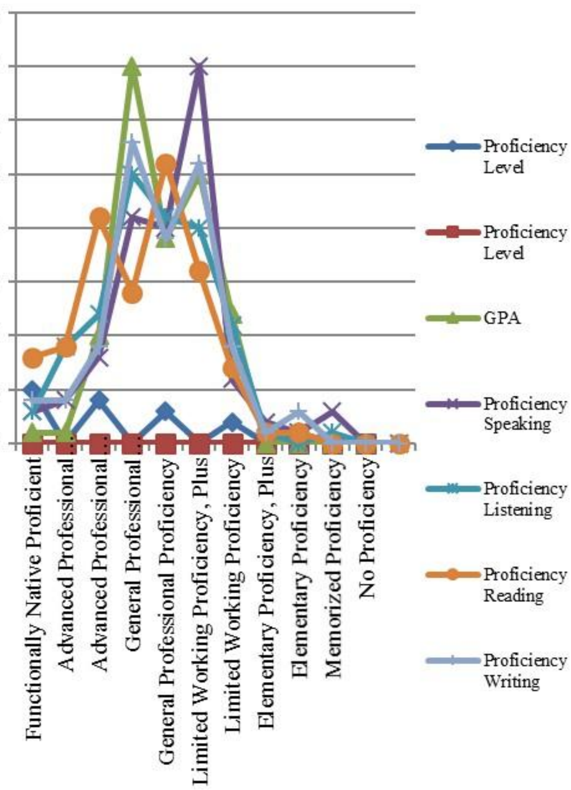

Fig. 4 Frequency Distribution in terms of GPA, Level of Proficiency in Speaking, Listening, Reading, and Writing

From the data in Fig. 4, it could clearly be gleaned that nearly 35% of the respondents exhibit a Grade Point Average of General Professional Proficiency, Plus, while only 1 student exhibit a functionally native proficiency. Conversely, almost 35% of the respondents were recorded to have Limited Working Proficiency, Plus in terms of speaking; nearly 25% have the General Professional Proficiency, Plus in terms of listening; 25% acquire the General Professional Proficiency in terms of reading; and 27% exhibit the General Professional Proficiency, Plus in writing. This means that the students have the ability to satisfy most work requirements with language usage that often, but not always, acceptable and effective; ability to comprehend most of the content and intent of a variety of forms and styles of speech pertinent to professional needs, as well as general topics and social conversations; ability to read within a normal range of speed and with almost complete comprehension a variety of authentic prose material on unfamiliar subjects; ability to write the language in a few prose styles pertinent to professional/educational needs in terms of speaking, listening, reading, and writing respectively. Conversely, this means that nearly 25% of the students have acquired the elements in engineering in a general proficiency level, but 35% in the general proficiency plus as revealed in the GPA. When the language proficiency is combined with the elements in the discipline, the competency of the students is most likely to increase.

The process of the evolution of language education views on the nature of language, language learning, and the role of the learner within the learning process also change language philosophies and affect classroom settings; listening classrooms

down listening skills in learners. Strategies-based approach is also important to the teaching of listening; particularly important in classrooms where students are exposed to substantial amounts of authentic data because they will not (and should not expect to) understand every word; reading in an interactive process may involve the exploitation of linguistic knowledge (sound/symbol correspondences, grammatical knowledge), and real world (content) knowledge. Skilled readers should have a range of strategies at their disposal, and select those strategies that match the purpose for which they are reading; product-oriented and process-oriented approaches are complementary. Writing program should incorporate elements of both approaches. Writing classrooms should look into the adoption of functional, discourse-based perspective on writing, and program-based. [5]

TABLE I
CORRELATION OF AGE, GENDER, AND GPA ON LANGUAGE PROFICIENCY
ANOVA

Variable	Speaking		Listening		Reading		Writing	
	F	Sig.	F	Sig.	F	Sig.	F	Sig.
Age								
Gender	2.1	$.10^b$	2.6	$.05^b$	.27	$.84^b$	2.6	$.05^b$
GPA								

of today need to develop both bottom-up and top-

Test Statistics recorded t = $.10^b$; $t$$.05^b$; t = $.84^b$; t = $.05^b$ mean "do not reject hypothesis". The analysis of variance showed that the combined effects of the causal variables do not have significant relationship upon the language proficiency of students in terms of speaking, listening, reading, and writing. This means that there are extraneous factors other than age, gender, and GPA that influence the language proficiency of students. However, even though the recorded data revealed no significant relations of the demographic profile of the students on language proficiency, with a careful scrutiny of the data, it can be subsumed that with a very slight difference of .003 in listening and .006 in writing, and a recorded computed F value .276 which is lower than the critical F value .842 in reading; the causal variables may have a slight significant effect on the language proficiency of the students in terms of listening and writing; and a significant effect on reading. This means that with the recorded data it can be said that other than age, gender, and GPA as well as the existing language practices in the electronics engineering, there should be a more careful consideration as to the other factors that could contribute to the language proficiency of the students.

The results proved that the design of the Electronics Engineering language curriculum should have a special consideration to the structure of the language contents and practices, the amount of time spent in learning the concept of the language, and the identification of the compatible outcome to define the quality of learning. The training should be systematic, methodical, and outcomes-based.

Language education in its entirety promotes the enhancement of abilities and skills of the students, and that the relationship of language and reality is realized. Failure to learn the language needed in their field of specialization and acquire the skills necessary to put learning into practice is more likely to affect the performance of the future Electronics engineers in the global market. The trends in the language education propose that students discuss in the esoteric technical language and jargon, communicate like experts, and think and explore in the language similar in the workplace. From this perspective, the use of Functionalism and Communicative Approaches has to be considered. The communicative Language Teaching (CLT) is committed to meaning- language teaching as oriented to real world communicative goals and practice, rather than form. [5] CLT helps learners communicate in the target language; it is fitted to the needs of electronics engineers who are expected to communicate in the technical and esoteric language like experts. Since, communication is possible only upon a common language between sender and receiver [8] future engineers need to have the communicative competence to apply grammatical discourse and cultural knowledge to communicate effectively in particular contexts for particular purpose. [7]

V. CONCLUSION

The investigation on the relationship of the demographic profile and language proficiency revealed that there are other extraneous factors in developing functionally native proficient experts among electronics engineers. The existing language practices in electronics engineering in BSU, produce students who exhibit the general professional proficiency in the English language. These are students who can speak in the language but are not always acceptable and effective; can comprehend most of the content and intent of speech pertinent to professional needs, as well as general topics and social conversations; can read in a normal range of speed on unfamiliar subjects; can write in a few prose styles pertinent to professional needs. The current scenario in the language setting in BSU proved that there is the need to consider the adoption of a new language system for the desired effect.

Significantly, it can be substantiated that to be able to produce functionally native proficient experts, the right and suitable language education and training need to be identified.

VI. Recommendations

Communication is a regulated process that allows the subject to negotiate. [2] The professional discourse of second language curriculum is emphasized with key terms like CLT, learner-centeredness, and learner outcomes. The generic standard is set in the Accords which identified the attributes that describe the needs and fitness of each type of engineering for their respective purposes; therefore, there should be a standard specialized language curriculum in a continuum process for the Electronics Engineering course to regulate language practices. Similarly, it can be noted that the adoption of the community of practice as a social learning system [11] might enhance the competency of the students. Allowing the students to visualize the practices in the workplace and communicate like experts through simulations would allow them to engage in collective learning, and would later on develop concern and passion to the field that they are doing. The community of learning significantly presents a perspective that locates learning in the relationship between the person and the world. The participant's experiences will allow him to develop his identity in a community, realize the need to belong, develop commitment, and accountability to its regime of competence. Hence, the language practices should include the *domain*, collective competence; the *community*, interaction and learning together; and the *practice*, shared repertoire to create a community of practice [11]. Ultimately, since the impact of engineering in the community as well as their engagement in research defines the kind of electronics engineers an institution produce; therefore, the specialized language practices in an outcomes-based education anchored in community of practice would be the best mechanism to achieve the international qualifications for the electronics engineers.

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