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## RESEARCH ARTICLE

### FACTORS AFFECTING THE PERFORMANCE IN THE BOARD EXAMINATION OF ELECTRONICS ENGINEERING – UNIVERSITY OF SOUTHERN MINDANAO GRADUATES

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#### ABSTRACT

License is a standard mark of a professional recognized by the government and public to introduce excellence, rules of behavior, guidelines of recruitment and measures of member protection, assuring a high sense of dedication, responsibility, skills and quality towards one's profession. The BSECE – USM graduates who took the ECE Licensure Examination from October 2011 – October 2016 assessed the following factors: faculty/teaching strategy, curriculum, instructional materials, facilities/laboratory equipment/laboratory activities, admission and retention policy, review preparation and mental/study behavior through survey. Using the data of the respondents among passers and non-passers and their assessment of the factors, the result shows that faculty and instructional materials favorably affect the performance of the ECE – USM Examinees from October 2011 – October 2016. Passers also attribute their success to curriculum, admission/retention policy and their own study behavior. Meanwhile, poor performance of the examinees was largely attributed to the lack of laboratory facilities/equipment.

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## INTRODUCTION

License is a standard mark of a professional recognized by the government and public to introduce excellence, rules of behavior, guidelines of recruitment and measures of member protection, assuring a high sense of dedication, responsibility, skills and quality towards one's profession. (Merced et al 2015). The Licensure Examination for Engineers is a tool that measures and ensures the quality of engineers who would join the workforce of various manufacturing industries in the Philippines and abroad (Laguador *et al.*, 2013). The Professional Regulation Commission (PRC) mandated to administers, implements and enforces the regulatory laws and policies of the country with respect to the regulation and licensing of the various professional and occupations under its jurisdiction including the enhancement and maintenance of professional and occupational standards and ethics and the enforcement to the rules and regulations relative thereto (R.A 8981). Asian countries like Singapore, Taiwan, China and India have also been producing quality and competitive engineers. In the Philippines, generally the national passing percentage of the Electronics Engineering board exam does not

even close to 50% as stated in Philippines Regulatory Commission since 2013, it's an apparently a poor performance rating among examinees. The University of Southern Mindanao (USM), Kabacan, North Cotabato, a level 4 university faced with the current status that there is a necessity to maintain the growing need for excellence in the programs offered by the school especially those with board examinations. Currently, the College of Engineering and Computing offers BS Electronics Engineering (BSECE) which requires board examination for its graduates to be called an Electronics Engineers. In the area of Electronics Engineering board examination, the school is always aiming for a high performance in the board examination. As strategies, the department conducted board examination reviews and adopted the subject Competency Enhancement Program (CEP). The reviews for the takers provide enhancement on the fundamental principles and theories on Mathematics, Electronics, Communications and General Engineering and legal aspects of the profession to prepare the students on their actual licensure examination. Thus, the researcher conducted this study to investigate the factors affecting the performance in the ECE board examination. In detail, this study aimed to determine the factors that affect the performance in the Licensure Examination of the Electronics Engineering USM graduates from October 2011 to October 2016 with respect to the assessment of the respondents to the following factors:

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curriculum, faculty or teaching strategy, instructional materials, facilities/laboratories and equipment or laboratory activities, review preparation or review materials, admission and retention policy and mental preparation and study behavior. It also seeks to determine the licensure examination performance rating of Electronics Engineering graduates from October 2011 – October 2016. In doing so, the result of the study will be a benchmark and of great help to the department, the college and the university as well to give more importance, revise and emphasize to the factors that improve the performance in the board exam of the ECE-USM graduates.

## REVIEW OF LITERATURE

**Electronics Engineering:** Electronics Engineering is a branch of engineering that integrates available and emerging technologies with knowledge of mathematics, natural, social and applied sciences to conceptualize, design, and implement new, improved, or innovative electronic, computer and communication systems, devices, goods, services and processes. An Electronics Engineer is endowed with spiritual, moral, and ethical values, mindful of safety concerns and guided with responsibility to society and environment in the discharge of his functions (CHED Memorandum Order, CMO No. 24, series of 2008). In order for Electronics Engineering graduates to become licensed engineers, they must follow to the policies and guidelines set by the Professional Regulation Commission for taking the Licensure Examination.

The Professional Regulation Commission (PRC) mandated to administers, implements and enforces the regulatory laws and policies of the country with respect to the regulation and licensing of the various professional and occupations under its jurisdiction including the enhancement and maintenance of professional and occupational standards and ethics and the enforcement to the rules and regulations relative thereto (R.A 8981). Republic Act 5734 regulates the practice of the Electronics and Communications Engineering in the Philippines. In order to be admitted to the electronics and communications engineering examination, an applicant must, at time of the filing of his application therefore, establish to the satisfaction of the Board that he is at least twenty-one years of age; a citizen of the Philippines or of a foreign country qualified to take the examination under Section twenty-three of this Act; with good moral character; and a holder of the degree of Bachelor of Science in Electronics and Communications Engineering, or such equivalent engineering course from any school, institute, college, or university recognized by the Government or the State (RA 5734). Furthermore, the RA 9292 An act providing for a more responsive and comprehensive regulation for the registration and practice of Professional Electronics Engineers, Electronics Engineers and Electronics Technician repealing RA 5734, otherwise known as the Electronics and Communications Engineering Act of the Philippines, to pass the licensure examination, a candidate for Electronics Engineer or Electronics Technician must obtain a passing rating of seventy percent (70%) in each subject given during the examination: Provided, however, That a candidate who obtains a passing rating in the majority of the subjects but obtains a rating in the other subject/s below seventy percent (70%) but not lower than sixty percent (60%), shall be allowed to take one removal examination on the subject/s where he/she failed to obtain the passing rating. Provided, finally, that should the examinee fail to obtain a passing rating in the removal examination, he/she shall be considered as having

failed the entire licensure examination (RA 9292). To pass these licensure examinations, engineering students have to undergo five years of baccalaureate studies through educating and cultivating their knowledge, skills and values with the application of different concepts and theories of learning.

**Factors affecting the performance in the board exam:** There are several factors that affect the performance of the examinee in the board examination, however in this study, the following literature are focused on the factors presented by the researcher. Curriculum is viewed as listing of subjects to be taught in school. But in a broader sense, it refers to the total learning experience of an individual not only in school but in society as well. Javier and Bilbao (2008) present some curricular issues and concerns regarding curriculum innovation like implementation of the curriculum in universities and teachers. Other issues include insufficient books and other resources, overcrowded classrooms that do not provide good learning environment, lack of full understanding of the changes or modification done in the curriculum and Unclear goals. Thus Teachers/faculty members were hesitant in the implementation as well as evaluation of the curriculum. Moreover, little support from the stakeholders, sometimes from the administration, has placed a burden among classroom teachers. There is also a lack of regular monitoring and evaluation. In fact, the present curriculum was left unattended since the time it was installed and very little means is provided to find out if the implementation is running smoothly or not. Needed revisions are not communicated to all. According to CMO number 101, series of 2017, the Electronics Engineering curriculum contains mandated general education and elective sources as connected to the desired program outcomes. This is also to ensure that the Electronics engineering graduates can understand and articulate the nature of the special roles in society and the impact of their work on the environment. The curriculum is designed to guarantee a certain breadth of knowledge of Electronics Engineering disciplines through a set of a core courses. Teaching, according to Oladipo and Ayeni (2000), involves bringing about or at least facilitating desirable changes in learners.

However, effective teaching requires the teacher to step out of the realm of personal experience and step into the world of the learners. Looking for the best way to teach students is to be simple and plain. Teaching is used to achieve a variety of educational objectives. It will help the students to acquire knowledge and skills in a different subject matter at different level of intellectual maturity. According to Alimi (2004), Schools are established for the purpose of teaching and learning. It is most important that the teachers and learners are properly accomodated to facilitate the teaching and learning process. Bandele (2003), said that the importance of physical facilities cannot be relegated. Facilities like modern laboratories, libraries, classrooms are to be put in place in all our schools. Agboola, *et al.*, (2014) cited that admission process into universities is critical. Like any other nation, admission information has historically been used as predictors of academic success by most institutions and when evaluated, it may likely help identify students that may be at risk of low academic performance, as well as revolve the factors that may likely predict quality but may not be factors that predict low performance. Student quality on its part is a measure of the forces that shape students' attributes such as: their performance in academic works, study and coping skills satisfaction with

course of study and ability to persist in the educational system. It is one of the major indicators of institution efficiency.

## MATERIALS AND METHODS

The survey technique was used to gather facts about the respondents' profile and assessment of the respondents to determine the factors that affect the performance in the Licensure Examination of the BS Electronics Engineering of University of Southern Mindanao (BSECE-USM) Examinees from October 2011 to October 2016 with respect to the assessment of the respondents to the following factors: curriculum, faculty or teaching strategy, instructional materials, facilities/laboratories and equipment or laboratory activities, review preparation or review materials, admission and retention policy and mental preparation and study behavior. The ECE – USM licensure examination rating from 2011 – 2016 was taken from the website of Professional Regulatory Commission to determine the performance rating of the graduates of BS ECE-USM in the board examination. The respondents of the study were the graduates from 2011 – 2016. A survey questionnaire was developed, checked and validated by the experts. Their comments and suggestions were considered formulating the instrument. Two form of survey questionnaire was made one in hard-copy form personal interviews and the other as a web-based survey for those who are in located at far distance. The developed questionnaire was distributed to the respondents through email and personal interviews or used the web-based survey for easy access. The developed web-based survey automatically tabulates data and generates report. The data gathered were tabulated and analyzed using the frequency and weighted mean. The Likert chart scale was used for the assessment rating given by the respondents for the different factors.

### ScaleDescription

- 5- Strongly Agree
- 4- Agree
- 3- No Impact
- 2- Disagree
- 1- Strongly Disagree

There were a total of 80 graduates, however, only 74 who answered the survey and those who did not take the board exam were not considered in the tabulation. Hence, 68 respondents were considered.

## RESULTS

For the demographic profile of the respondents, it shows that majority are single, and male, Catholic and belonging to the age group between 24 – 26 years old. They can also speak in English, Tagalog, Bisaya and other languages (Table 1). For the highest educational attainment of the respondents, very few advancing themselves for further study and majority engage in technical work (all Electronics Engineering job). Majority of the respondents have salaries that fall between 10,000.00 – 20,000.00 (Table 2). For the number of years the respondents took the BSECE program, majority of them have been enrolled in request subjects and graduated within five years. Majority of examinees passed the EcE Board exam upon the first take (Table 3). For the University of Southern Mindanao – College Entrance Examination (USMCEE), it shows in Table 4 that majority of the passer got high score in the USMCEE. It can be observed that those who got scores higher than 700 definitely passed the board exam and none did fail. Non-passers meanwhile have USMCEE scores of 700 and below shows a marginal difference in the board exam performance based on admission results. For the distribution among takers (passers and non-passers). according to gender, using the dichotomous data depicted in Table 5, it shows that male has a greater number of passers compared to female by percentage. For the result of the study, table 6 shows the performance in ECE Licensure Examination Rating of USM from October 2011 to October 2016. The first three years the ECE-USM got the highest performance rating. The average passing percentage of ECE-USM is 55.42% higher than the national average passing percentage of 39.34%. However, the trend shows a deteriorating performance. For the relationship between gender and takers, there are more male who passed in the first take of the exam compared to the female, shown in Table 7.

**Table 1. Demographic profile of the respondents**

Demographic data	Frequency ( n = 68 )	Percentage ( % )
Civil Status		
a.Single	64	94.11
b.Married	4	5.880
Gender		
a.Male	45	66.17
b.Female	23	33.82
Age		
a.21 – 23	12	17.64
b.24 - 26	38	55.88
c.27 – 29	18	26.47
Religion		
a.Catholic	46	67.64
b.Protestant	13	19.11
c.Born Again	4	5.88
d.No response	3	4.410
e.Islam	1	1.470
f.Iglesiani Cristo	1	1.470
Language Spoken		
a.All (English, Tagalog, Bisaya & other Dialect)	27	39.13
b.Others ( Bisaya, Ilonggo, Ilocano)	17	23.18
c.Tagalog	16	24.63
d.English	4	5.790
e.No response	4	5.790

**Table 2. For the Highest Educational Attainment, Occupation and Salary of the respondents**

Statement	Frequency (n = 68)	Percentage (%)
<b>Highest Educational Attainment</b>		
a.BSEcE	65	95.50
b.MS / MEP	3	4.400
c.PhD / DEng'g	0	0.000
<b>Occupation</b>		
a.Technical (design, manufacturing, etc) ( all electronics engineering job)	45	66.17
b.Professional ( instructor &Etc)	11	16.17
c.Clerical	3	4.410
d.Managerial ( consultation)	0	0.000
e.Other (No response/ Self-employed)	9	13.23
<b>Salary / Occupation</b>		
a.10,000 – 20,000	25	36.76
b.20,001 – 30,000	18	26.47
c.30,001 – 40,000	5	7.350
d.40,001 – 50,000	0	0.000
e.50,001 – 60,000	1	1.470
f.60,001 – up	2	2.940
g.No response	17	25.00

**Table 3. The academic year and performance of the respondents**

Statement	Frequency (n = 68)	Percentage (%)
<b>Number of years of the respondents in taking the BSEcE</b>		
a.Five years	50	73.52
b.Six years	13	19.11
c.No response	5	7.350
<b>The respondents took requested subjects</b>		
a.Yes	40	58.82
b.No	21	30.88
c.No response	7	10.29
<b>Number of times the respondents took the EcE Board Exam</b>		
a.First time	45	66.17
b.Second time	23	33.82

**Table 4. USMCEE Score of the respondents**

USMCEE SCORE	TAKERS	
	PASSER	NON-PASSERS
500 - 550		1
551 - 600	4	3
601 - 650	13	13
651 - 700	18	6
701 - 750	3	
751 - 799	7	
Total	45	23

**Table 5. Relationship between the gender and the takers (passers and non-passers)**

Gender	Takers	
	Passers (%)	Non-Passers (%)
Male	71	29
Female	57	43

**Table 6. Licensure Examination Rating of ECE-USM from October 2011 to October 2016**

Year	Month	# of Takers	# who Passed	USM Passing %	National Passing %	Difference %
2011	October	5	2	40.00	36.87	3.130
2012	April	2	2	100.0	53.55	46.45
	October	10	9	90.00	51.57	38.43
2013	April	1	1	100.0	37.21	62.79
	December	26	13	50.00	34.50	15.50
2014	March	9	6	66.67	35.23	31.44
	September	19	5	26.32	31.58	-5.260
2015	April	13	9	46.15	34.95	11.20
	September	12	4	33.33	39.94	-6.610
2016	April	7	1	14.29	36.95	-22.66
	October	14	6	42.86	40.36	2.500

**Table 7. Distribution among the first takers and repeaters according to gender**

Gender	Takers	
	First takers	Repeaters
	Male	26
Female	9	4

**Table 8. Assessment of the respondents (passers and non-passers) on factors affecting the board examination**

Factors affecting the board exam	Takers	RATING				
		1	2	3	4	5
Curriculum	Passers	1	1	14	29	0
	Non-passers	0	2	8	12	1
Faculty	Passers	1	1	12	29	2
	Non-passers	0	1	2	19	1
Instructional materials	Passers	0	1	11	29	4
	Non-passers	0	1	1	20	1
Facility / Laboratory	Passers	3	10	16	15	1
	Non-passers	1	4	13	5	0
Admission / Retention	Passers	0	1	3	29	12
	Non-passers	0	1	2	15	5
Review Preparation	Passers	0	0	1	22	22
	Non-passers	0	0	3	15	5
Mental/Study Behavior	Passers	0	1	13	29	2
	Non-passers	0	0	7	16	0

For the assessment of the respondents for the factors affecting the performance in the board examination of the ECE-USM examinees from October 2011 – October 2016, using the dichotomous data between passers and non-passers, the result shows that they both agree together that the Curriculum, Faculty, instruction materials, admission and retention, review preparation and mental/study behavior, while facility/laboratory equipment got the lowest rating between passers and non-passers depicts in table 8.

## DISCUSSION

The socio-demographic profile of the respondents shows that 64 (94.11%) are single and 4(5.880%) are married. There are 45 (66.17%) male and 23 (33.82%) female. The age group between 24 – 26 years old got 38 (55.88%), followed by the 27 – 29 years old got 18 (26.47%) and the last group between 21 – 23 got 12 (17.64%). Most of the respondents were Catholic numbering 46 (67.64%), followed by the Protestant with 13 (19.11%), then the Born Again with 4 (5.88%). The remaining either belongs to Iglesiasni Cristo, Islam, other religions and those with no response. 27 (39.11%) can speak two or more dialect, while 27 (24.63%) can speak Bisaya, Ilocano and Ilocano, the (23.18%) respondents can speak Tagalog, while those who speak English and no response got the same result of 4 (5.79%). The highest educational attainment of the respondents is Master of Science (MS) or Master of Engineering (ME) with 3 respondents (4.41%) and the rest of them with Bachelors level numbering 65 (95.58%). Regarding their occupation, 45 (66.17%) are engaged in Technical work which includes manufacturing, design, telecom, and etc, followed by the professional work that includes instructor numbering 11 (16.17%) and for the clerical work or office work with 3 (4.41%). Those who are self-employed or have no response comprise the smallest percentage and zero for managerial work. 25 (36.76%) of the respondents earns the highest salary which falls between 10,000.00 – 20,000.00, followed by 18 (26.47%) with salaries of 20,001.00 – 30,000.00. Only 2 (2.94%) has the salary of 60,001.00 – 70,000.00, one (1.47%) for the 50,001 – 60,000.00, five (7.35%) for the salary of 30,001 – 40,000.00.

The rest of the respondents have no response. With regarding to the number of years of taking the program, there are 50(73.52%) who graduated on time or exactly five years, 13 (19.11%) graduated in more than five years, the rest has no response. For the respondents who took requested subject during college years, there are 40 (58.82%) who said yes while 21 (30.88%) never requested a subject which means that they had no failing grades. There are 7 (10. 29%) who has no response. With regard to the number of times that the respondents took the EcE Board Exam, there are 45 (66.17%) who took it once and passed while 23 (33.82%) repeated the exam. The entrance examination results of the respondents reveals that students who yield highest scores (>700) were able to pass the licensure examination definitely compared to those who got lower score. It agrees with Agboola *et al.*, 2014 that admission process into universities is critical. It will likely help identify students that perhaps at risk of performing low in future board exams. For the relationship between gender and takers (passers and non-passers), using the dichotomous data between passers and non-passers, there are 71% of male and 57% of female who passed while 29% of male and 43% of female failed. The performance of the BSECE – USM in ECE licensure examination from October 2011 - October 2016, shows that there are two exams that the USM got 100% (April 2012 and April 2013), October 2012 the ECE-USM got 9 out 10 or 90% passing. On April 2016, the ECE-USM got the lowest passing rate of 14.29%, along with the September 2014 and September 2015 exams which also got the lower passing rate. The rest of the performance of ECE-USM is just above national passing percentage. It was observed that the first two batches who used the same curriculum before it was revised performed remarkable higher compared to succeeding graduates who were under the revised curriculum. In the current curriculum, important subjects were significantly removed particularly Electronics 3 which requires in depth analysis in designing circuits. This subject supposedly will help the students prepare for more advanced subjects in their higher years. For the distribution of the takers according to gender using the dichotomous data, there are 26 male first takers while 6 are repeaters, and 9 female first takers while 4 repeaters.

For the assessment of the respondents with respects to the factors which includes Curriculum, Faculty, Instructional materials, Facility/laboratory, Admission/Retention policy, review preparation and mental/study behavior affecting the board examination, there are 29 of passers that rated Curriculum, faculty, Instructional materials and admission/retention policy 4 or agree. Both passers and non-passers agree on the usage and implementation of the curriculum. It has a strong foundation in Engineering Mathematics, Science and other core subjects that requires in the licensure exam. Respondents agree that faculty/teaching strategy was good. The teacher was able to transfer the knowledge and skills to the students. Review preparation got 4 from 22 passers and also got 5 from 22 passers. It indicates agrees and emphasizes the importance of the review preparations. Examinees should be prepared before taking the board examination So they can acquire mastery of the topics and lessen the anxiety. Admission/retention policy and review preparation both got 4 for the 15 non-passers. The admission/retention policy of the department may undergo revision and make a clear guidelines and policy. Facility/laboratory equipment got the lowest rating between the passers and non-passers. 10 passers rated 2 for the facility

and laboratory, only 5 non-passers rated 4. According to Alimini (2004), schools were established for the reason of teaching and learning. It is important that the teachers and students are properly accommodated to facilitate the teaching and learning process. Bandele (2003) stated the importance of physical facilities which cannot be relegated. Facilities like modern laboratories, libraries, classrooms are to be in place in all our schools. The respondents agree that lack of facilities explain to poor performance in the board exam. It is implied that adequate and quality facility/equipment are perceived to be important factors in determining the performance of ECE graduates in future licensure examinations.

### Conclusion

Among the seven factors that were given to be evaluated, the facility and laboratory facility/equipment is the factor that rated poorly with regard to its effect on the performance of the ECE-USM Examinee in the board exam with respect to the assessment of the respondents (passers and non-passers). USMCEE score of the respondents revealed that the higher the USMCEE score the greater the possibility in passing the licensure examination. Faculty and instructional materials favorably affect the board examination of the passers. Curriculum, admission/retention policy, review preparation and mental /study behavior has less significant effects on the performance of the ECE-USM from October 2011 to October 2016.

### Recommendations

In view of this, the following recommendations are encouraged:

- The department must scrutinize, revise and update the current curriculum for the BSECE program. It is advisable that important subject that requires higher analytical thinking/designing be retained.
- Regular purchase and maintenance of laboratory equipment and facility for the program is highly recommended.
- There should an established and regularly updated admission/retention policy of the department.
- The faculty of the Department of Electronics Engineering should develop motivational skills to encourage students to pursue effective study habits and carefully monitor their improvement of performance to ensure quality learning.

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### Abbreviations

BSEcE – Bachelor of Science in Electronics Engineering  
 CEP – Competency Enhancement Program  
 CMO – CHED Memorandum Order  
 PRC – Professional Regulation Commission  
 USMCEE – University of Southern Mindanao College Entrance Examination  
 USM –University of Southern Mindanao

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