

# Web-Based ECE DHVTSU Licensure Examination: Data Analysis Tool

Jun P. Flores, May Layson, and Anna Liza C. Nacion

**Abstract:** Performance of graduates of an Institution in the Licensure Examination (LE) usually reflects the quality of its education. It provides the effectiveness of the curriculum that contributes to their esteem and reputation if their graduates successfully pass the LE. The factors considered in the study were the Academic Performances, Pre-board Exam performance, and the High School Profile of the students. The study considered the LE takers from October 2012 to September 2014 and determined which of the said variables best contributes to the performance of the graduate when taking the LE. Results show that the Academic Performance has the most significant relation to the LE with a 25.68 percent factor rate. The study develops a system that determines the key success factor areas in the performances of the graduates in the LE. It also serves as storage for files of the individual performance of the examinees which are needed during accreditation. Among all the factors used in this study, the academic performance best predicts the LE. Hence, it should be taken into consideration that the curriculum of the University's Electronics Engineering program should be in-line with the syllabi used for the LE. The study recommends the Electronics Engineering program to provide a more sound general and professional foundation for the practice of Electronics Engineering.

**Keywords:** Licensure Examination, Graduates, Academic Performance, Pre-board Performance, ECE, DHVTSU

## I. INTRODUCTION

Nowadays, higher education institutions are giving much attention to graduates' licensure examination performance. One of the critical success factors of an institution is the quality of the graduates it produced which is often determined by their performance in board examination (Ballado-Tan, 2015). The graduates' performance in the licensing tests often reflects, in general, the 'performance' of the school. The results of the licensure exam are also used to measure the effectiveness of the curriculum. This contributes to the esteem and reputation of the institution if their graduates successfully passed these examinations.

To practice a certain profession, a license is earned by taking board examinations. In the Philippines, the Professional Regulation Commission (PRC) serves as the agency authorized and responsible in enforcement, implementation, and administration of policies on licensing different professions. The PRC as the duly constituted body created for this function has been consistent in its task of screening among the graduates from all board courses will be granted the professional licenses based on the board exam results. The goal of licensure is to identify those

individuals who can be processed to possess minimum competencies related to a specific vocation (Castle, 2004).

The LE 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 and Dizon, 2013).

The Bachelor of Science in Electronics Engineering (BSECE), formerly known as Bachelor of Science in Electronics and Communications Engineering, focuses on the design and development of electronic devices, communication products, network services, and processes. Electronics Engineering also focuses on design and development of different electronic devices and equipment such as integrated circuits, semiconductors, and receivers and transmitters that will be used in different electronic and communications systems (ECE Philippines, 2009).

A good curriculum prepares students to succeed in society (Howell and Nolet, 2009). The BSECE Curriculum provides strong basic knowledge in the areas of mathematics, physics and engineering and also provides teaching and training activities in the classroom together with laboratory exercises. Subjects included in the curriculum provide basic knowledge about different communication systems, communication devices and equipment, digital processing, TV and Radio broadcasting, instrumentation and control systems, network analysis, computers, microprocessors, design of integrated circuits, robotics, and more (National Career Services, 2016).

Electronics Engineering is a difficult course since it requires a focused, innovative, and logical mindset. Since technology vastly improves and is continuously innovated, an electronics engineering student must possess the ability to learn and apply new concepts and technologies. Several subjects in BSECE Curriculum also deal with scientific computations and analysis, which could be quite difficult for an average student.

Don Honorio Ventura Technological State University (DHVTSU) presently offers BSECE wherein the graduates of the program will undergo a LE in order for them to legally practice their profession as Electronics Engineers.

The examination is conducted by the Board of Electronics Engineering under the supervision of PRC. The LE is conducted twice a year, on the months of April and October, wherein graduates of irregular time frame usually opts to take the licensure exam on the month of April.

With the broad scope of the Electronics LE, it is evident how difficult it is to perform successfully in it. While the

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change of board of examiners before the December 2013 exam has affected since then the national performance to fall below the passing rate (PRC, 2017).

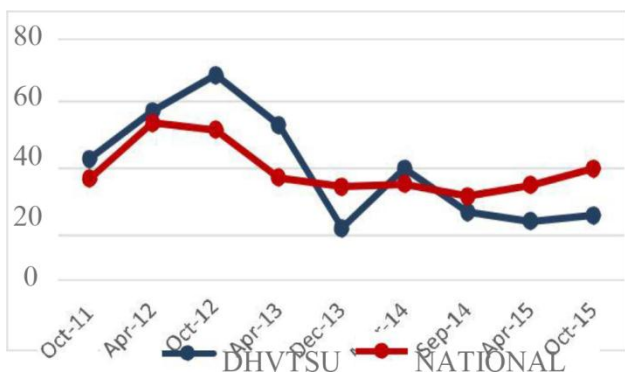


Figure 1. Passing rate results, National vs. DHVTSU; October 2011 – October 2015.

A good examination preparation gives examinees a sense of control and mastery, and prevents test anxiety from overwhelming them (Feldman, 2000). The fatal effect in taking the LE is lack of intensive preparation before taking the test itself that may cause failure (Merced and Canang, 2014).

Examinees' foundation in their college years could be considered to be the most significant factor for the preparation for the LE, but due to the outdated curriculum of the Department of Electronics Engineering there are few topics that were encountered for the first time during the review days. If only the examinees did well in their College Academic Years, adjustments in the Review Centers would not be difficult for them most importantly in encountering topics they didn't take up in their studying years. Review centers are great help for the examinees. Through this the examinees could easily recall what they have learned and the review centers can assist them to the new topics that they still need to study. Focus, determination and time management, these are some of the keys that can help the examinee to perform successfully in the LE. There were cases when an examinee didn't excel much during their college years but prepared well in their review days and passed the LE. The declined trend of the National Passing Rate has shown that new set of Board of Examiners had affected the LE. Unlike from the previous years, Review Centers are having difficult time in predicting what will be the possible topics and questions would be given during the exam by the Board of the Examiners.

In the study conducted in the Accountancy Department of University of Eastern Philippines, academic performance, aspirations, attitudes, and study habits were used as factors that can affect the examinees in accountancy LE. Relationship of the academic performance, aspirations, attitudes towards accounting and study habits and the performance in the LE was determined as well. The students of the program have high hopes of becoming successful in the future. This could be implicated that the Accountancy program is viewed as a stepping stone for them to achieve the desires they want to attain. The achievement of the CPA license is generally dependent on persistence in working towards that goal, specifically through studying hard while in college, coupled with positive attitude and behavior

towards accounting. The positive attitude towards accounting paired with effective study habits might lead to higher academic performance and therefore higher chance of passing the board exam (Ballado-Tan, 2015).

Student-related factors, faculty-related factors, administrative and supervisory factors were used as determinant for the performance in the Licensure Examination for Teachers (LET) (Visco, 2015).

Review classes offered by the University are beneficial factor that affect a student's performance in the board exams. In-House reviews to LET performance are significantly correlated (Arce and Belen, 2011). Meanwhile, mental and psychological boost helps in high level of perseverance, motivation, determination and influence by the institution to pass the LE (Pascua and Navalta, 2011). However, majority of the institutions conducting the review focus less on the result of the mock board examination, there were no feedback and support given to the reviewees after taking the exam (Tarun, Gerardo, and Tanguilig, 2014).

A study was conducted by the College of Engineering and Research and Publication Center of the University of Mindanao to identify the readiness of the engineering students for LE – Civil Engineering, for period 2009 to 2011. The variables that were used to determine the probability outcome of the civil engineering board exam were the student's academic preparation and LE performance. The findings has shown that for the year 2009 to 2011, the average percentage was merely 27.85%; it was in May 2009 when the institute had it highest passing percentage with was 37.50% while the lowest was in November 2011 with 23.33%. With all the statistics done with the study the variables predicts in passing the LE for civil engineers were: grade point average; mathematics subject; hydraulics and survey subjects; design and construction subjects. The design and construction subjects have the relatively strongest influence to pass followed by mathematics, and then the least to show influence was hydraulics and survey. It was found that the intervention subject known as the correlation course did not had predictive ability to determine in passing the LE (Tamayo, 2015).

The usual passers of the Nursing LE are those who performed well in the academics, clinical studies, and in their review after the graduation. These became their variables in the prediction of the graduates' LE performance (Neri, 2009). Academic performance is the biggest factor which also shows the quality of education of the school attended by the students who took the exam (Navarro, Vitamog, Tierra, and Gonzales, 2011). The students' acquired attitude, knowledge and skills are also important. Considering the factors, if the students performed well there is a 55% chance of passing the examination (Neri, 2009).

Furthermore, another relevant study was undertaken by Hafalla and Calub in 2011. The study attempted to profile board passers and non-passers of the Electronics Engineering LE and develop a discriminant function model using derived factor constructs from the pre-determined



variables, such as student’s academic demographics, student’s exam demographics, and interval between graduation and exam. According to the result of the study, much broader set of predictor variables in the re-estimation of discriminant function must be included.

This research was conducted to analyze the performance of graduates in LE for Engineers with the use of selected variables considered in the study. These variables include the examinees’; high school profile; academic performances; and pre-board course as an intervention program offered by the university where the students need to pass and complete.

Developing this study has revealed problems not only the factors that can affect the examinees’ in the LE, but in the department itself. There are examinees that performed well in the LE but not in academics and pre-board subject and vice-versa. The Department of Electronics Engineering in DHVTSU doesn’t have any means to assess the graduates who will likely perform successfully in the LE. The files received from the PRC regarding the school and individual performance of the examinees are just being filed and kept by the college secretary in the office. In some cases, files are misplaced or worst missing.

Each factor is as relevant like the others, but the main aim of this study is to determine which of the mentioned variables will be the significant predictor for the LE. It aims to develop web-based data analysis tool to be used for the determination of the key success factor areas that affects the board examination performance of the BSECE graduates from 2012 - 2014. Furthermore, to design a system that will help the ECE Department and the University in storing files regarding the school and individual performance of the examinees which are needed during accreditation.

The research was done to determine how prepared an ECE student is in taking the ECE LE based on the given variables. This Web Based Data Analysis Tool shall make use of the student profile from High School, College Academic performance, and College Preboard Exam as factors to be analyzed. Profile of students who graduated during A.Y. 2012-2014 are used as subjects of this study. Since the project is Web-based, it is accessible to anyone who wishes to determine what could be possibly the result when they take the board exam as long as they are connected to the Internet.

The study only covers examinees who graduated from A.Y. 2012 – 2014, and those who took the board exam twice. Examinees who have taken the board exam more than twice are not included since there could be more factors to be considered other than those used in this study. Also, only BSECE graduates could possibly use this program since the Academic subjects used in this study are those relevant to the ECE curriculum.

## II. METHODOLOGY

The system is a Web – Based Analysis Tool which allows any graduates of BSECE in DHVTSU to evaluate their performance in the upcoming ECE LE.

The user will enter their grades at the box corresponding to the subject required. After filling out the tool, a result will be displayed on the screen, stating the possibility of passing the LE. The administrator of the system have the authority

to save student profiles and their record as a reference for the school accreditations and other purposes it may usefully serve.

For the prototype of the project, version 2 of Raspberry Pi is utilized. It has a 900MHz quad-core ARM cortex-A7 CPU and 1GB of RAM. It also has 4 USB port and a Full HDMI support, suitable for viewing an interactive and responsive web based analysis tool.

A Raspberry Pi 2 micro-PC is enough for a responsive kind of website developed for this study compared with its previous version (Raspberry Pi 1) because of its unique specifications. The Raspberry Pi 2 includes three basic, powerful upgrades. It replaces the single-core, 700MHz ARM11 processor of the original in favor of a far more powerful quad-core, 900MHz ARM Cortex-A7 chip; it doubles the available RAM from 512MB to a full 1GB; and it packs four full USB ports, twice the amount of the original Model B.

Beyond the upgrades, the micro-PC uses the same VideoCore IV 3D graphics processor as its forefathers, but that was already a (relatively) powerful processor that punches above its weight class with full 1080p video output capabilities. The Raspberry Pi 2 also features an Ethernet port, a full HDMI port, a jack for combined 3.5mm audio and composite video, and a micro-SD card slot.

Collectively, the upgrades add up to dramatically improve the Pi’s performance.

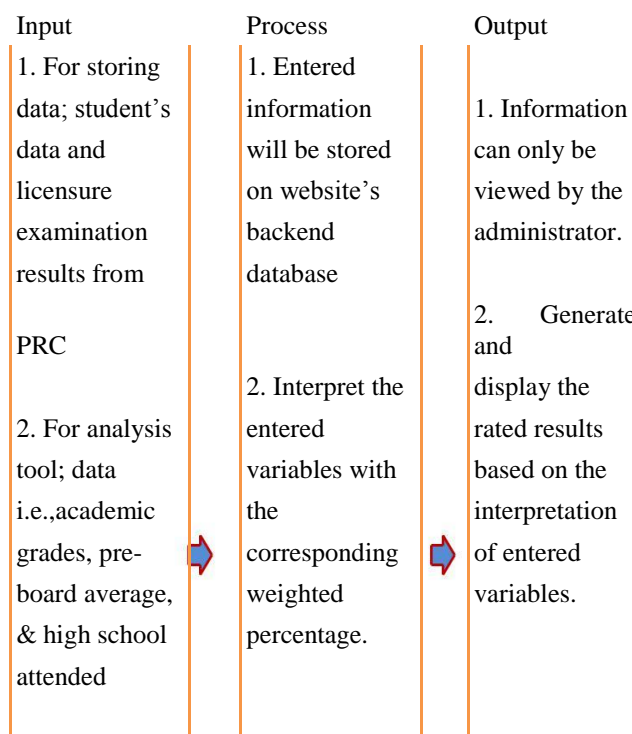


Figure 2. Paradigm of the study

The grades of graduates, pre-board average, and high school attended are the required data and will be encoded at appropriate boxes in the analysis tool. After which, the system will generate result. Another function of the system



is storing of student's profile, this also requires information to be encoded in the system. Once this information is encoded, it will be saved in the system. However, only the system administrators can view the student's profile.

The variables that were used to determine the probability outcome for the performance of the graduates in the ECE LE were: academic performance; pre-board examination grade; and high school profiles. The ratings and performance of all board examinees for ECE were also used in this study.

The academic performance and examination grade were gathered from the University's Registrar. Whereas, the high school profiles that were supposedly be gathered from the University's Management Information System (MIS) were unavailable.

With that unfortunate reason, high school profiles were only obtained via online interviews through social networking sites. Personal messages were also sent to all the examinees.

While the results from the LE were sent by the PRC and these were obtained through the office of the University's College of Engineering and Architecture Office.

This study employed the descriptive-correlational method of research. Documentary analysis was utilized in gathering the needed data. Data gathered were analyzed through Frequency Distribution, Percentage, Arithmetic Mean and Regression analysis. Frequency Distribution was used in categorizing each graduate according to the level of their performances in the LE and Pre-board Examination and after getting the number of examinees for every performance level, they are converted to percentage ratings (Math is Fun, 2014). Arithmetic mean was used to get the average of each graduate in every subject area in the LE for ECE and their average in every subject areas in Pre-board Examination. It was also used to get their average academic performance in subject areas correlated to LE. These averages were then used for regression analysis in correlating the student's performances in Pre-board and Academic ratings (Math Goodies, 2015). After determining the average ratings of the graduates in every subject areas in LE and Pre-board Examination, as well as the average in their Academic ratings, regression analysis was used to determine the significant relation of these average ratings with each other. Linear Regression is the most basic type of regression analysis and is commonly used as a predictive analysis which is very significant with this study.

### III. RESULTS AND DISCUSSIONS

Generally, the majority of the graduates of DHVTSU in ECE program performed well in the subject area 01, an indication that the graduate has a strong foundation in the concepts and principles of Mathematics. The results also show that there were more graduates that excel "good" in the academics than in the LE as well as in the "passing" level. Nonetheless, there were more examinees that performed at a "very good" level in the LE than in the academics. Moreover, the figure shows that the graduate's performance in their academics does not match with their performance in the LE.

The same as the results on the subject area 01 (Mathematics), there were more graduates that perform

better in the academics than in the LE in subject area 02 (Electronics Engineering). Moreover, the performance of the examinees in the subject area 02 is almost the same as their performance in the subject area 01, were there were more examinees that failed in the LE than in the academics.

In the Subject area 03 (General Engineering and Applied Sciences), the overall performance of the examinees is the same also with their performance in subject area 01 and 02 were most of them performed at "failure" level. Nevertheless, almost a quarter (45 or 24.73%) of them performed at "passing" level and the 41 or 22.53% performance is at "Good" level. The figure further reveals that the percentage of those in the "passing" level in both academics and licensure examination are almost equal. Furthermore, there were more examinees that failed in the LE, this subject area as compare with their performance in the academics.

In the subject area 04 (Electronics Systems and Technologies), the results show that there were more graduates that performed better in the academics than in the LE. Though, there are examinees that perform at the "superior" level in the LE, there were more examinees that scores below the passing rate in the LE in this subject area.

A 1.23% of the variation in the LE is explained by the variability in the pre-board examination for ECE graduates for the period of 2012 – 2014. A P-Value of 0.0145952 which is greater than 0.05 with this, the pre-board examinations offered by the university is not significantly related to the LE performance

A 1.05% of the variation in the LE is explained by the variability in the type of school attended during high school of ECE graduates for the period of 2012 – 2014. A P-Value of 0.311742 which is less than 0.05 with this, the type of school attended during high school is not significantly related to the licensure examination performance. With the data presented, the type of high school attended is the least predictor for the LE. The results show a 26.16% of the variation in the LE is explained by the variability in the academic performance of ECE graduates for the period of 2012 – 2014. A P-Value of 2.98E-13 which is less than 0.05 with this, it has identified that the academic performance is significantly related to the LE performance. The academic performance is the best predictor for the LE.

### IV. SYSTEM EVALUATION

The assessment questions were based on the testing of the system performed by the users. The respondents rated the system based on Functionality, Reliability, Usability, Efficiency, Maintainability and Portability.

For the functionality as to suitability, very satisfactory; accurateness, very satisfactory; Interoperability, very satisfactory; Security, very satisfactory.

For the reliability as to fault tolerance and recoverability both are rated very satisfactory.

For usability as to understandability, learnability, operability and attractiveness, all are rated very satisfactory.

For efficiency as to time behavior and resource behavior, both are very satisfactory.



For maintainability as to changeability stability and testability, all are very satisfactory.

And for portability as to adaptability is very satisfactory while as to conformance is excellent.

## V. CONCLUSIONS

Earning a professional license card is a goal for any engineering graduate. For ECE, despite having such difficult courses in different subject areas, students still thrive to pass all of them. The Electronics LE is certainly difficult, the graduates need to have a thorough preparation for it, and doing well while they are in college could lead in having a favorable licensure examination performance.

Pre-board Examination offered by the University is another way of preparing the students for the much more difficult LE. Although the Pre-board Performance is somehow correlates in the LE, it has only a minimal effect since it is just a preparatory exam.

The pre-board course is a part of the curriculum of a graduating student in the first semester of that academic year but there are other subject courses that still need to work on. Students do not give much focus on the pre-board because it is only considered as a single unit subject. Their attention is divided from different school works such as; projects, assessments and examinations from all other subjects. Therefore, students could not give their whole attention for the pre-board subject.

The type of school attended by the graduates during high school could be considered as the foundation of the students before entering college. The knowledge gained during high school is undoubtedly important, for it can become a big contribution for the students to perform well all throughout his/her collegiate years.

Academic performance is the measure of how a much a graduate learned during his/her collegiate years, considering the results of the analysis, we can say among all the factors used in this study, the academic performance best predicts the LE. Therefore a student must exert much effort in studying well, because all the basic information and knowledge they need for the preparation for the LE are all gained during their collegiate years. Hence, it should be taken into consideration that the curriculum of the University's Electronics Engineering program should be in-line with the syllabi used for the LE.

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