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MODELLING TEACHERS GRIT & LICENSURE EXAMINATION PERFORMANCE OF TEACHER EDUCATION INSTITUTIONS

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Abstract

The study ventured on producing a mathematical model between teachers' grit of tertiary education teachers and licensure examination performance of teacher education institutions. Using the descriptive correlational design, the study sought the following variables: grit scales of the faculty; and the September 2017 Licensure Examination for Teachers results. Using the binary logistic regression, it was found out that teachers grit is a high predictor for the licensure performance of institution. A high grit scale will mean a great likelihood and high probability that the institution will perform above the national passing rate in the Licensure Examination for Teachers.

Keywords: Grit, Licensure Examination, Mathematical Modelling

INTRODUCTION

Over the last two decades, quality assurance in higher education has gained significant momentum worldwide (www.UNESCO.org). Major drivers for this momentum include increased public demand for better performance of higher education institutions, widening of access and a clear call from stakeholders for greater efficiency and accountability, the need for better quality graduates to drive national economies, better use of public resources for higher education and increasing cross-border provisions. Of these quality assurance initiative challenges has been felt that include: a mismatch between higher education graduate skills and those demanded by the labour market and industry, an imbalance between the number of students studying sciences and those in arts-based courses, and the proliferation of private providers.

In response to UNESCO's Agenda 21, the Philippine initiative to assimilate Education for Sustainable Development (ESD) in tertiary education is enunciated in the Commission on Higher Education's Strategic Plan for 2011–2016, which contains the roadmap to reform higher education institutions (HEIs) to respond well to the academic pursuits of sustainable development.(https://www.researchgate.net/publication/303 3704483_Teaching_Education_for_Sustainable_Development_at_University_Level_A_ Case_Study_from_the_Philippines,accessed Nov 14 2018)

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Projects based on assured qualtiy is one of the major concerns and goal of CHED. The included things in the projects are the enforcement and the positioning of Policies, Excellence and Guidelines (PSGs) for academic programs, compliance observation and phase out/closure of non-compliant programs, Institutional Quality Assurance Monitoring and Evaluation (IQuAME), and authorization. Note that in order for state universities to cope up with these goals, certain standards must be obtained and sustained. One of these is the higher education institutions performance in licensure examinations.

Licensure examinations are considered important by teacher education students in their professional development (Riney et al, 2006). Thus, graduates of teacher education programs all aim to pass the Licensure Examination for Teachers to make them eligible to teach either in the public or private educational institution. Moreover, passing the board examination will not only give them honor and prestige but a competitive edge over those who are non-LET passers. Passing the Licensure Examination for Teachers is not a simple matter. It requires adequate preparation and readiness.

In Philippines, the Teacher Education Institutions (TEIs) have exercised their all efforts to assure excellent performance of graduates in the Licensure Examination for prospective teachers (LET) by the Philippine Regulations Commission (PRC) two times a year. This examination fulfills the government's qualification for teacher education graduates which is specified in Republic Act No. 7835 or else the Philippine Teachers' Professionalization Act of 1994. According to this any teach cann't practice teaching profession without having a teaching license from the PRC.

Both elementary and secondary levels are not at all satisfactory in LET's national performance result. The percentage of passing rate in national performance is under 50%. The PRC report and the Board for Professional Teachers (BPT) support this. During the March 2017 LET, 5,600 elementary teachers out of 53,915 examinees (10.39%) and 18,482 secondary teachers out of 72,584 examinees (25.46%) successfully passed.(http://www.prcboard.com/2017/09/Results-September-2017-LET-Teachers-Board-Exam-Elementary-Secondary-List-of-Passers.html). The conclusiong drawn here is, the performance of the teacher education institutions need investigantion as most are not producing quality graduates who are responsible for the youth education of the country.

Grit is a term used to describe a trait in people who have the diligence and endurance to keep working for a goal in spite of various setbacks, such as extended lengths of time to reach the goal, changing interests, or other problems encountered along the way (Duckworth et al. 2007). According to these researchers, accomplished and successful people throughout history have had this grit trait that has set them apart from other people.

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Many researches using grit as an indicator of student performance and success has been studied since the term was introduced. However, grit has not been sufficiently studied in licensure examinations. Therefore, understanding the role of grit will offer a new lens for higher education administrators when looking at student performance in their licensure examination.

Grit has been used in many aspects including education. As Paul Tough (2012) notes, many educators have begun to believe that improvements in instruction, curriculum, and school environments are simply not enough to raise the achievement of all learners, especially disadvantaged ones. He also said that using applicable stories from children and innovative educators to illustrate how important it is for parents and schools to teach children character qualities that include grit. The quality called grit, loosely defined as persistence over time to overcome challenges and accomplish big goals (Duckworth, 2013; Shechtman, DeBarger, Dornsife, Rosier, & Yarnall, 2013). Grit comprises a suite of traits and behaviors, including (1) goal-directedness (knowing where to go and how to get there), (2) motivation (having a strong will to achieve identified goals), (3) Self-control (avoiding distractions and focusing on the task at hand), (4) positive mind-set (embracing challenge and viewing failure as a learning opportunity).

While many countries are openly researching on the impact on grit on performance and success since 2007, very little literature can be sited about grit here in the Philippines. Grit has also been yet to determine success in licensure examinations. Further, the term grit was only introduced by an English Language Fellow from Iowa State named Kelly Keegan in one of her talks in 2016. This gave the researcher the decision to venture on grit as an indicator of performance and success.

Statement of the Problem

This study determined whether grit is a performance indicator in the Licensure Examination for Teachers. Specifically, it aimed to answer the following problems.

1. What is the institutional profile of the different teacher education institutions as to:

- age
- years of teaching in the institution
- academic rank
- employment status
- highest educational attainment

2. What is the grit scale of the faculty in the different TEIs?
3. What is the performance in the licensure examination for teachers of the TEIs?

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4. What model could show the relationship of the faculty grit scale and the LET performance of the TEIs?

METHODOLOGY

Research Design

A descriptive correlation design was employed in this study to describe the respondents' profile and the TEI's LET performance in the recent licensure examination and also examined the relationship between those variables.

Sample of the Study

The study was conducted in Region I, Philippines. Specifically the population of the study will be the Teacher Education Institutions of the said region.

Total enumeration was used in the study. A total of 64 TEI's in Region I with 744 faculty members offering Secondary Education Courses were the main respondents of the study.

Analysis of Data / Statistical tools

The grit scale of the faculty respondents in each TEI were entered in the site https://angeladuckworth.com/grit-scale/ and were presented in tables for better interpretation of results.

The licensure examination performance rating which were taken from the PRC website were presented in tables showing the national performance of the TEI in the recent September 2017 examination.

The binary logistic regression/ logit was used to test the correlation between the profile of the respondents and the LET Performance. The likelihood of performing above the national passing rate was determined through the unstandardized beta coefficient (B) while the the exponent of the coefficient (Exp(B)) or the odds ratio was used to interpret the likelihood the variable of interest is predicted. The logistic regression model/logistic link function was used to determine the model/ equation to predict the performance of the TEI during the LET given the grit scale.

To obtain a model for grit scale of faculty and the LET performance of the TEI, binary logistic regression was used. In order to produce the logistic regression model, the log odds or the logit link function which estimates the unknown *P* (logit) for any given linear combination of the independent variables was used. We simply take the inverse of the logit(p) or $ln\left(\frac{p}{1-p}\right)$ to obtain the probability from 0 – 1 in the range of the function which will be the model for $Ln\left(\frac{P}{1-P}\right)=\beta_0+\beta_1X_1+\beta_2X_2+\ldots+\beta_kX_k$ the two variables of

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interest.

To get the final equation, the formula $\mathbf{log(odds) = constant + grit\ B}$ will be used and will be converted to odds (Probability):

since: $log(odds) = \ln\left(\frac{p}{1-p}\right)$, letting $log(odds) = y^*$

then its antilog will be $\mathrm{p} = \left(\frac{e^{y^*}}{e^{y^*}+1}\right)$.

Therefore the equation (Model) will be:

$$p = \left(\frac{e^{(\text{constant}+\text{grit B})}}{e^{(\text{constant}+\text{grit B})}+1}\right)$$

RESULTS

Respondents' Profile

Table 1. Distribution of the Institutions as to Faculty Profile

n=64

Profile	Modal Category	Frequency	Percentage
Age	21-30	39	61
	31-40	10	16
	41-50	5	8
	51-60	4	6
	61-70	6	9
Years of Teaching in the Institution	0-5	51	80
	6-10	10	15
	11 and above	3	5
Academic Rank	Instructor	48	75
	Asst. Professor to Professor	16	25
Employment Status	Contractual	23	36
	Permanent	41	64

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Highest Educational Attainment	Bachelor	41	64
	Masters	19	30
	Doctoral	4	6

Table 1 shows the institutional faculty profile of the teacher education institutions of region I. Specifically, it shows the age, years of teaching in the institution, academic rank, employment status and highest educational attainment of the faculty of the TEIs. Although individual profiles of the respondents were taken from the questionnaire floated in each institution, the institutional profile of the TEIs is presented using the mode of each profile. The mean was not used to describe the institutional profile since it will be affected by outliers. The profiles age and years of teaching in the institution will be affected by those who are new in the institution e.g. say 22 years old and those who are about to retire e.g. 60 or even those who are retired but are still teaching in private institutions. Since data will be skewed by extreme values, the mode was used to determine the institutional profile. While it is true that the median is less affected by outliers and skewed data, the rest of the profiles of the faculty of the TEI's are categorical data and therefore requires that the mode will be the best measure to be used. The table also contains the frequency distribution count in each of the profile stated and percentage of each modal category.

- **Age**

It can be gleaned in table 1 that faculty between 21-30 years of age comprises 61% of the whole population of the study. Sixteen percent of the population are between 31-40 years of age, 41-50 years of age comprise 8% of the population, 6% are from 51-60 and 9 % from 61-70. Based from these results, it can be concluded that teachers in the TEIs of region I are young. Further, it can also be concluded that most of the faculty are new in the teaching profession ad have just recently graduated from their degree.

To further support the claim above, an actual look at the age of the faculty of the TEIs in region I may be seen in figure 1. Figure 1 shows the individual age of all the faculty respondents in the TEIs of region I with age on the y-axis and individual faculty on the x-axis. Each dot in the figure represents a faculty and his/her age. It can be seen that faculty ages 21-30 really dominate the TEI's of region I as seen in the congestion of points in the said age. It can also be seen that there are still quite a handful of faculty teaching beyond 60 which normally would be the retiring age. These faculties are teaching in the private institutions of the region. Perhaps the most interesting and intriguing part of the scatter graph is the fact that there are still teachers teaching above 80 years of age. That is, 82 to be exact.

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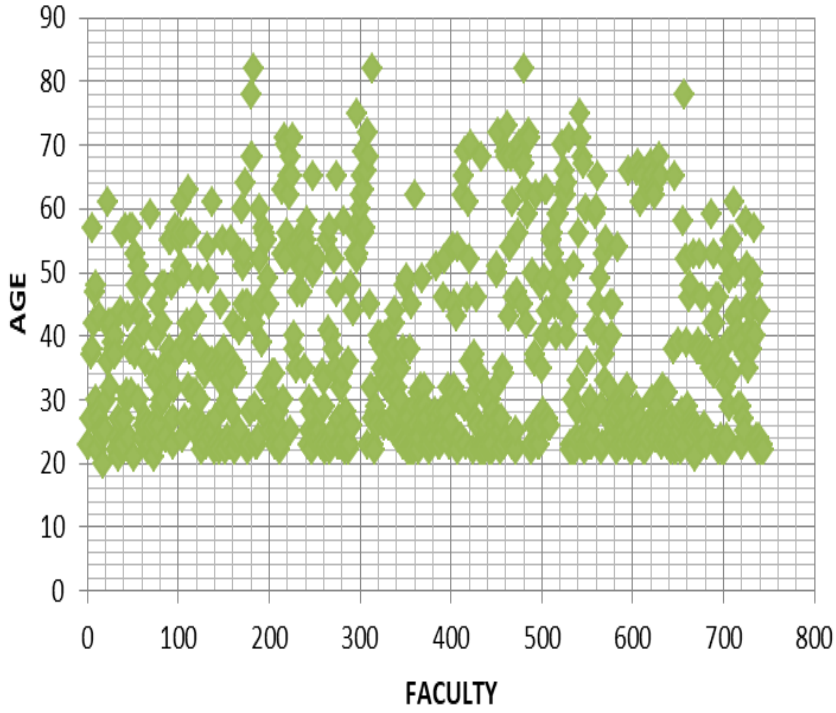

Figure 1. Age of individual faculty of TEIs in Region I

- **Years of Teaching in the Institution**

Table 1 also shows that most of the faculty of the TEI's in region I are new in the institution they are teaching. It can be gleaned that 80% of the population have rendered service in their respective institutions for 0-5 years while 16% from 6 to 10 years. Further, 0nly 2% have rendered service for 16-20 years and 21-25 years. This may be attributed to the fact that majority of the faculty of TEIs in the region are between 21-30 years old. This result may suggest that a closer look at the situation of TEI's in region I be taken by CHED since studies have shown that inexperienced teachers tend to be less productive and underperforming. Studies confirm findings from existing research that, on average, brand new teachers are less effective than those with some experience under their belts (Clotfelter, Ladd, and Vigdor 2007). These results were confirmed in the study of Rice in her study "The Impact of Teacher Experience: Examining the Evidence and Policy Implications" concluding that less experienced teachers tend to be less effective than more experienced teachers as a whole.

Once again to have a better view of the actual years of teaching of the faculty in the TEI's in the region, figure 2 is shown on the next page. The figure shows the years of

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teaching of the faculty in their respective TEI. It can be gleaned in the figure that dots which represent each faculty congest on the lower portion of the graph suggesting that most of the teachers have served their institution for at most 5 years.

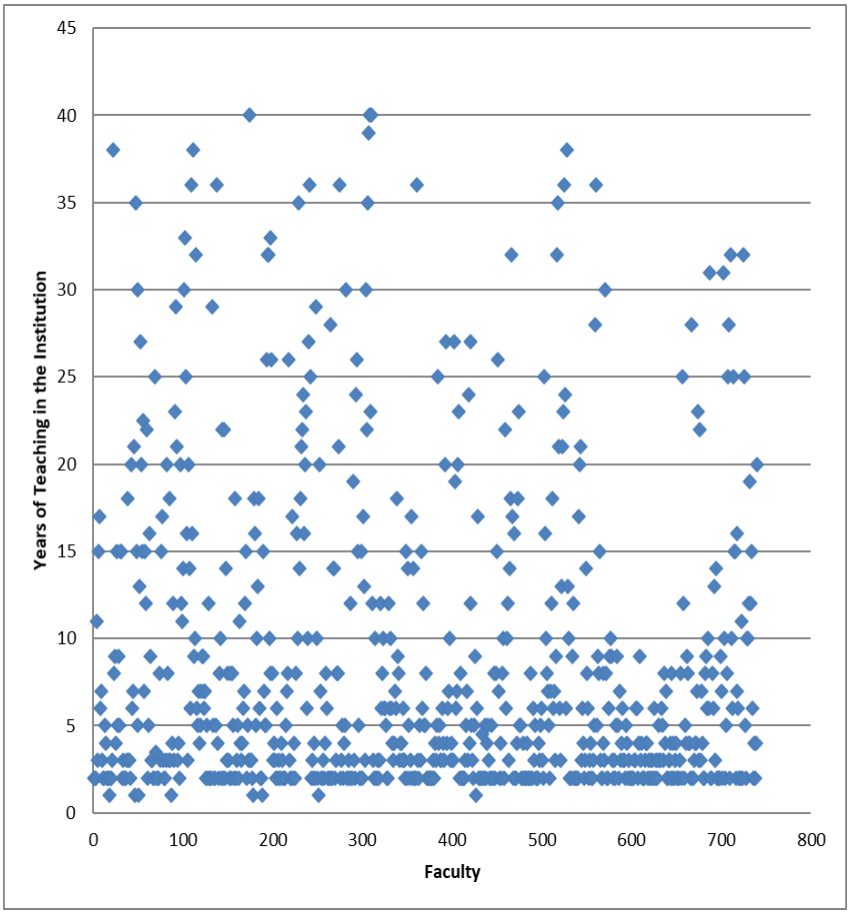

Figure 2. Age of individual faculty

- **Academic Rank**

Faculties in the TEI's of the region are 75% instructors. This data may be attributed to the fact that faculty in TEIs in Region I are young and are new in their respective institutions. Further, having a young faculty would likely mean that most are instructors since it is the entry rank for TEIs. This implication may post the need for TEIs to have a closer monitoring and training for these young professionals at the said rank. Although it may seem that having young instructors could affect the TEI's performance, determining if it will have a positive or negative effect is yet to be determined. Studies have shown that academic rank does not affect student performance. Hoffmann and Oreopoulos

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(2014) found out that no significant relationship exist between academic rank and student outcomes (performance) while Jacob and Lefgren (2005) who found out that rank and other teacher profile such as experience, education status and salary affect their students' scores.

- **Employment Status**

With the growing number of institutions of higher education, retaining faculty has become a challenge (Rantung 2014). Many factors are identified as indicators of job satisfaction and performance and among these factors is security. Philippines is among those countries, experiencing teachers' turnover consistently because of heavy work load, low salary, long working hours, personal circumstances, and lack of challenge as per Briones Philippine Institute of Development Studies in 2014. Flores (1991) cited in Rantung (2014) in the study Factors Contributing to Faculty Satisfaction and Its Relationship, concluded that security is one of the major factors affecting faculty retention. Perhaps this concern is foreseen and addressed by the TEI's in region I as can be seen in the data in the table below. While instructors dominate the TEIs in region I, most of them are of permanent status posting 64% of the total population while contractual faculty comprise of 34% of the population and part time faculty only at 2%. This is a good implication of handling faculty turn-over. Thus, the data shows a good sign of faculty in the Region would likely stay in their respective institutions.

- **Highest Educational Attainment**

Finally, majority of the faculty respondents of the TEIs in the region are bachelor's degree holder. This data may be attributed to the result that majority of the faculty of the TEIs in region I are young. It may be seen in Appendix F that faculty are improving their education level and taking up higher degrees. Still this result post a critical concern for the TEIs in Region I since ideally, faculty of higher education institutions should be a Master's Degree holders. Zhang (2008) found out that an advanced degree of teachers increased student achievement. Goldhaber and Brewer also found out that the certified teachers in mathematics having BA and MA degrees in mathematics are accompanied with higher student mathematics test scores. Similary, BA degrees in science teachers are accompanied with higher science student test scores while Zuzovsky (2008) found out that an advanced degree was found to be positively associated to student performance. Further, Visco (2015) in her study Determinants of Performance in The Licensure Examination for Teachers (LET) of Abra State Institute of Sciences And Technology found out that a moderate correlation between faculty related variable which includes highest educational attainment of teacher and LET performance. Cadiz (2010), found out that there is a significant relationship between performance in instruction with age, civil status, educational attainment, trainings attended, and

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academic rank, number of preparations and length of service in selected universities and colleges in Cordillera Administrative Region.

Clearly, the need to improve on this profile of the respondents of region I should be addressed.

GRIT SCALE OF THE FACULTY OF THE TEI's

Table 2 shows the frequencies of actual response of the respondents on the grit scale. Exact statements from the grit scale questionnaire were placed on the first column followed by the actual frequency count for each item. Out of the TEIs in Region I, 744 faculty members of the different TEIs answered the grit questionnaire. As seen in the table, items 1,3,5,7 and 9 which are statements pertaining to keeping a certain goal and not being distracted by other factors have higher frequencies on the "somewhat like me", "not much like me" and "not like me at all", although in general, most of the frequencies in these items are on the "not much like me". This shows some indecisiveness of the respondents to statements that pertains to attention to keep a goal. While items 2,4,6,8,and 10 pertaining to perseverance and doing everything to finish a goal have frequencies on the "very much like me", "mostly like me" and "somewhat like me". Although these are positive responses to items pertaining to diligence and finishing tasks, answers generally lie only on "mostly like me" which means the eagerness is still not that much.

Table 2. Frequency of Individual Responses on the Grit Scale

n = 744

Statement	Frequency				
	Very much like me	Mostly like me	Somewhat like me	Not much like me	Not like me at all
1. Sometime getting distracted from previous one after seeing the new ideas and projects sometimes distract me from previous ones.	0	32	89	340	283
2. Difficulties don't discourage me. I don't surrender easily.	123	506	88	27	0
3. I often set a goal but later choose to chase after different one.	0	0	155	473	116
4. I am a diligent worker.	90	589	65	0	0

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5. It is difficult for me to focus on projects that take more than a few months to	0	0	496	197	51
6. I complete whatever I start.	97	631	16	0	0
7. I change my interest from year to year.	0	37	513	113	81
8. As a hardworker I never give up.	159	503	78	3	1
9. Any idea or project can obsess me for short time only, later lost interest.	0	23	521	112	88
10. I got the better of all difficulties to conquer an important challenge.	134	41	192	0	0

The table on the next page shows the grit scale of the institutions of Region I. Out of the 64 TEI's, 44% have a grit scale of 2.1-3 . Nineteen 0r 30 percent posted 3.1-4 grit scales followed by 19% at 1.1-2 and only 8 percent had 4.1-5 grit scales. This shows that majority of the faculty are moderately gritty. This result may be attributed to the fact that grit grows with age Duckworth (2007). Since the faculty of TEIs in region I are young, majority of the respondents having a grit scale of 1.1-3.0. The high results of grit scale may be attributed to the fact that the respondents are professionals and are either studying higher education (graduate studies) courses supporting the claim of Duckworth that educated adults have high grit scales.

Table 3. Institutional Grit Scale of Respondents

n=64

	Grit	**Frequency**	**Percentage**	**cf**
Scale	Description			
4.1-5.0	Very Highly Gritty	5	8	8
3.1-4.0	Highly Gritty	19	30	38
2.1-3.0	Moderately Gritty	28	44	82
1.1-2.0	Fairly Gritty	12	19	100
0-1.0	Not at all Gritty	0	0	100
Total		64	100	100

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Figure 3 shows the scatter plot graph of individual age and grit of faculty of the TEIs in region I. It can be gleaned in the graph that for faculty ages 21-30, grit is congested on the moderately gritty descriptive rating, faculty ages 31-50 shows congestion on the highly gritty descriptive rating and congested on very highly gritty for ages 51-70. This trend then goes down after the age 70 as per seen on the drop of grit scale for the faculty in this age bracket. This shows that grit grows at certain age level then drops off after that certain age, in this case after 70.

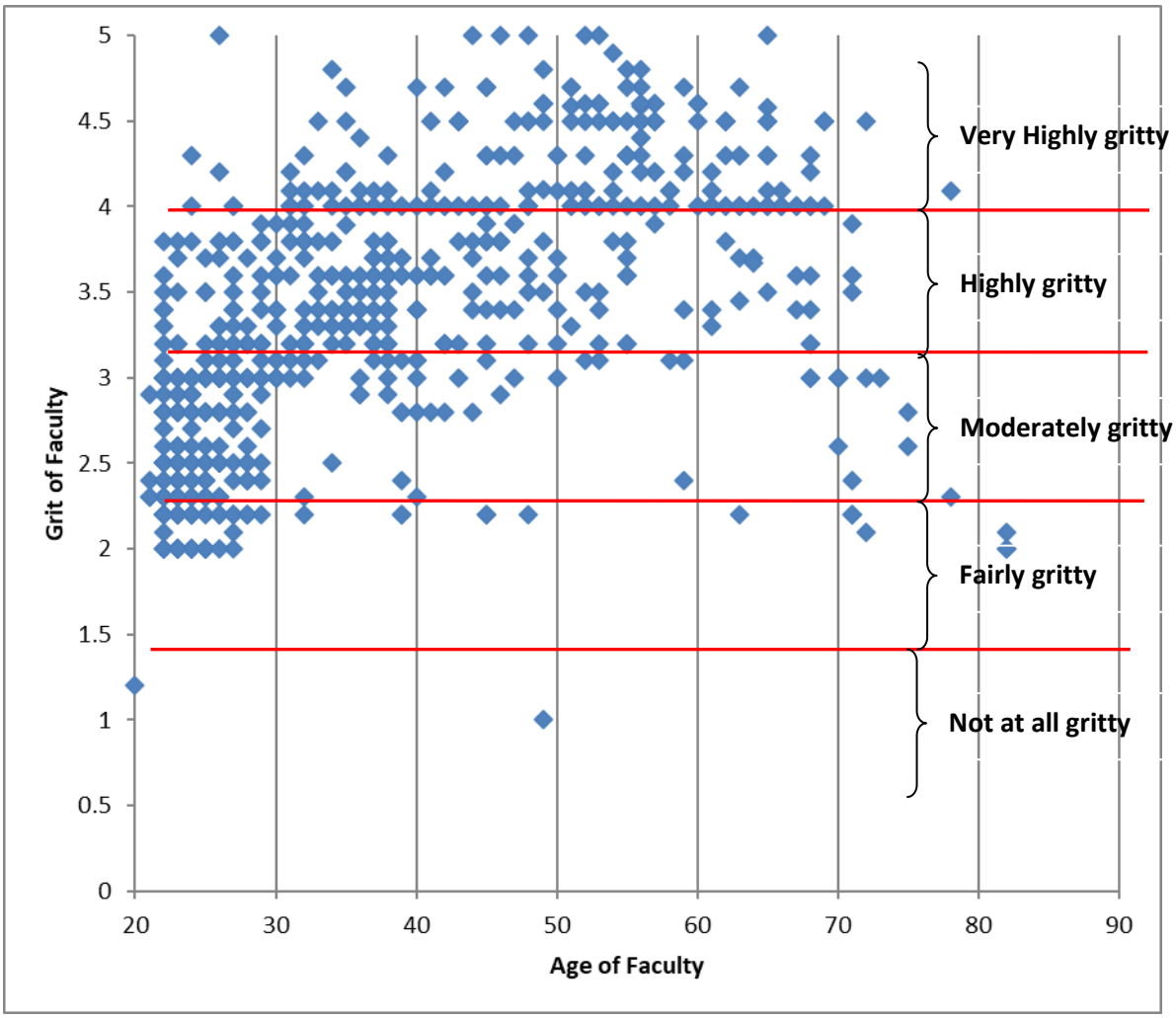

Figure 3. Age of Faculty and Grit

A careful look at the grit scale on table 4 also shows that the grit of teachers increases as they grow older as per seen from age bracket 21-30 which posted an average of

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2.67 and increases until the age 51-60. This further show the claim above that as a faculty gets older his or her grit scale increases Duckworth (2007).

However, a decrease on the grit scale of the faculty may be seen in the 61-70 brackets posting only 3.21 and getting lower the next age bracket at 3.11 and 3.17. This result supports the study of Vakil (2014) that a person grows grittier at some age. Although in his study, individuals ages 21-69 grow grittier and this drops off after 70.

Table 4. Grit Scale of Faculty with Respect to Age

Age Group	f	Average Grit Scale
21-30	318	2.67
31-40	138	3.37
41-50	93	3.59
51-60	85	3.64
61-70	68	3.21
71-80	15	3.11
81-90	3	3.17

PERFORMANCE OF THE TEACHER EDUCATION INSTITUTIONS IN THE LICENSURE EXAMINATION FOR TEACHERS

The Professional Regulation Commission (PRC) and the Board for Professional Teachers (BPT) announced that 21,198 elementary teachers out of 80,509 examinees (26.33%) and 49,626 secondary teachers out of 107,020 examinees (46.37%) successfully passed the Licensure Examination for Teachers (L.E.T.) given last September 24, 2017 in 27 testing centers all over the Philippines, Hong Kong and Thailand. It is further announced that of the 21,198 elementary teacher passers, 19,581 are first timers and 1,617 are repeaters. For the secondary teachers, 41,180passers are first timers and 8,446 are repeaters.

This study looked into the LET results of the TEI's in Region I and could be described and looked into in table 5. The table performance shown here is the TEI's in terms of the first timers, repeaters and overall performance of takers. The mean of the said category shows that first timers has a mean of 53.68, repeaters has a mean of 22.09 and overall performance a mean of 43.85. Since the overall performance is simply the average of first timer and repeater, it could be concluded that the repeaters percentage pulled the overall performance of TEI. Although the mean suggest that the performance

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is not high. Variance and standard deviation shows that performance rating of TEI are more spread for first timers suggested by its larger value although the results for repeater is not that far. Range of scores in the LET examination shows a rating from 0-100 given by the lowest and highest scores. This means that there are TEI who obtained a 100% passing rate and also sadly, 0%. This is quite alarming since obtaining a 0% in the LET is a very poor indicator of performance. A careful look at the data shows that TEI's who posted a score of 0% are private institutions whose number of takers is only 1. This fact could somehow explain the reason why the institutions posted a 0% ranking. However, this post another reason of concern on why they only have a single student taking the LET. Reasons as to enrolment and student retention may be looked into to diagnose the said concern.

Skewness and Kurtosis on the other hand have values -0.67 and -0.36 for first timers, 1.86 and 4.55 for repeaters and -0.02 and -0.18 for the overall performance respectively. This shows that the data for first timers are more normally distributed than that of repeaters as suggested by the closeness of the two values. Further, the table shows rates of skewness and kurtosis of first timers are not too large compared to the standard error (SE) which is the expectation for normally distributed data. This may be further supported by computing the z-value of the statistics which is given by Rate/SE. For data to be normally distributed, z-values should lie between -1.96 to 1.96. Computing for the z value of first timers shows that it is within range. Although the data for first timers are negatively skewed, it is considered moderately skewed suggested by its value -0.67 (Bulmer 1979). Therefore, data for first timers suggest a moderately high performance overall. Meanwhile, the data for repeaters show a positively skewed distribution as described by the positive values for skewness and kurtosis. The value further shows that the data is highly skewed (Bulmer 1979). This means that the repeaters performed very low during the examination and is not normally distributed. Further, higher kurtosis means more of the variance is the result of infrequent extreme deviations, as opposed to frequent modestly sized deviations. The overall performance shows an approximately symmetric distribution since it is affected by the result for first times and repeaters. Therefore, the TEI's in the region had an average performance in the licensure examination for teachers.

Table 5. Descriptive Performance of the TEI's in Region I in the LET

	First Timer		Repeater		Overall	
Statistic	**Rate**	**SE**	**Rate**	**SE**	**Rate**	**SE**
Mean	53.68	3.46	22.09	2.84	43.85	2.73

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95% Confidence Interval for Mean	Lower Bound	46.75		16.41		38.40	
	Upper Bound	60.60		27.76		49.30	
5% Trimmed Mean		54.23		19.14		43.76	
Median		57.74		20.00		45.94	
Variance		767.74		516.88		476.09	
Std. Deviation		27.71		22.73		21.82	
Lowest		0.00		0.00		0.00	
Highest		100.00		100.00		100.00	
Skewness		-0.67	0.30	1.86	0.30	-0.02	0.30
Kurtosis		-0.36	0.59	4.55	0.59	-0.18	0.59

For simplicity of comparison, the box plot or box and whisker plot for the descriptive statistic for first timers, repeaters and overall performance is shown below. Figure 4 shows that first timers had scores ranging 40-60, the median lies almost at 60 and it position suggest a normal distribution since the first (area below the median) and third quartile (area below the median) are almost of the same area. Meanwhile, the box plot for repeaters shows a very poor performance in the LET. Outliers can also be seen in the data which is located above the whisker on top. This mean that only a very few TEI's performed near the half mark of the licensure examination which is a negative indication of performance. Further, the whisker below the box suggest that the scores are concerted on the lowest possible mark or rating in the LET which is zero. Further, the median being located on the upper portion of the box indicates that scores are more congested in the first quartile. This shows that repeaters have performed very poorly in the licensure examination.

The overall performance of the TEI's in the region shows its average performance having a normally distributed set of scores and median set at the half mark of the ratings. This is post a concern for the region since CHED in its quality assurance programs suggest that performing high in licensure examination is expected for higher education institutions.

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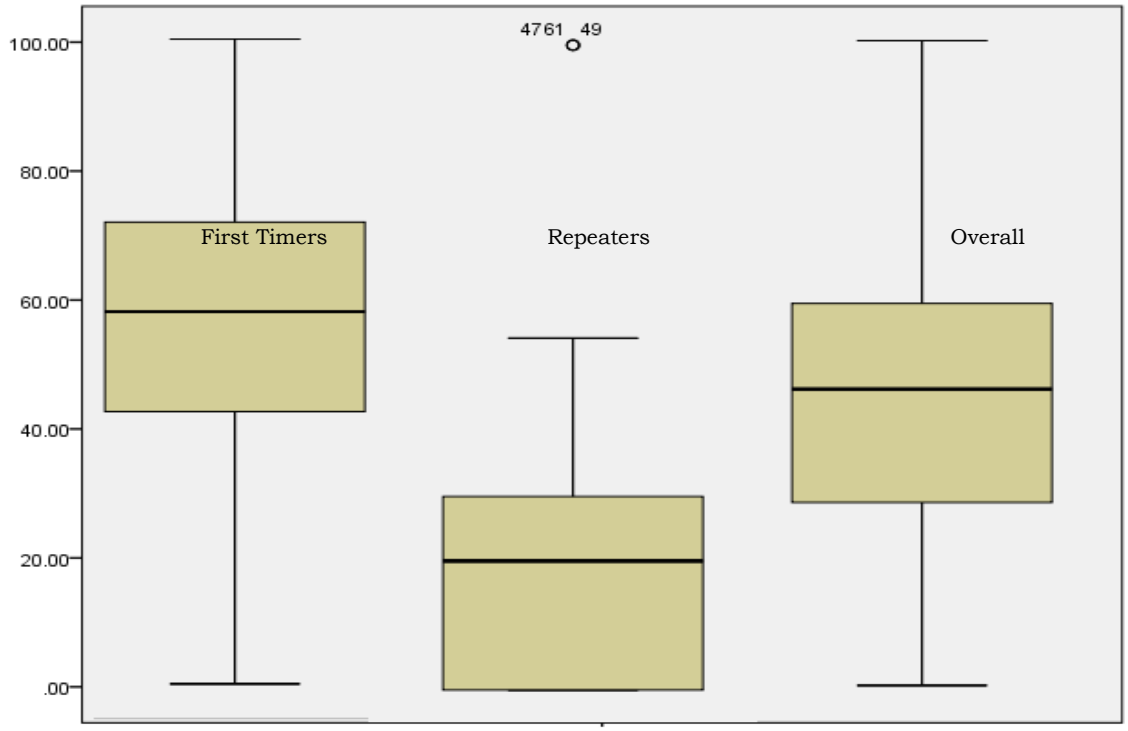

Figure 4. Box plot for First Timers, Repeaters and Overall in the LET

Table 6, further gives an idea of how the TEI's in the region faired in the LET based on the national passing rate. It can be seen that half of the teacher education institutions in region I performed below and above the national passing rate as per the count suggest. The mean further suggest the very low performance of those who performed below the passing rate which is only 26.48. The kurtosis being moderately skewed does not help alleviate these results since it means that the scores are normally distributed.

Meanwhile, 50% or 32 institutions performed above the national passing rate. It may seem as a positive reinforcement to lift the low performance of the other 32 but data shows it may not be enough. Having a mean of 56.70 shows that the TEI's in the region performed slightly above the national passing rate. Skewness and Kurtosis values further suggest that the group data are positively skewed and is highly skewed (Bulmer 1979). This means that more scores are located at the lower quartile (1st Quartile) and are nearer the national passing rate.

This is a problematic result and calls for concern since this data mirrors the national trend for LET performance for the past eight years with at least half of all TEI's in the Philippines performing below the national passing rate (https://www.pbed.ph/single-

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post/2017/10/02/Teacher-Quality-in-the-PH-Needs-Intervention). This shows that while PBED and CHED are looking for ways to improve such results, Region I is yet to perform and achieve beyond these expectations.

Table 6. Descriptive Performance of the TEI's Below and Above the National Passing Rate

Statistic		Below National Passing Rate		Above National Passing Rate	
		Rate	SE	Rate	SE
Mean		26.48	2.43	61.21	2.21
95% Confidence Interval for Mean	Lower Bound	21.54		56.70	
	Upper Bound	31.44		65.72	
5% Trimmed Mean		26.96		60.11	
Median		28.36		59.25	
Variance		188.69		156.36	
Std. Deviation		13.736		12.50	
Minimum		0.00		46.51	
Maximum		45.37		100.00	
Range		45.37		53.49	
Interquartile Range		24.10		16.56	
Skewness		-0.50	.41	1.322	.41
Kurtosis		-0.80	.81	1.935	.81
Count		32		32	

*National Passing Rate = 46.37

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The descriptive statistics in table 6 may further be visualized in the box plots below. Figure 5 shows the box plots for TEI's who performed below and above the national passing rate. The box plot of the overall performance of the TEI's who performed below the national passing rate shows that the scores are normally distributed. It can also be seen that the scores are moderately and negatively skewed. Whiskers further show that there are institutions that performed very near the national passing rate and the lowest possible rate, while majority of scores range from approximately 16% to 40%. This shows that majority of the TEI's who performed below the national passing rate posted rating not near the national passing rate. Teacher education institutions who performed above the national passing rate shows that performance is not very high. This may be suggested by the location of the box not even reaching 70%. Further the skewness discussed in the previous paragraph that scores are positively skewed and highly skewed may be confirmed by the area of the below the median line being larger that the upper area on the box and whisker plot of the data of TEI's who performed above the national passing rate.

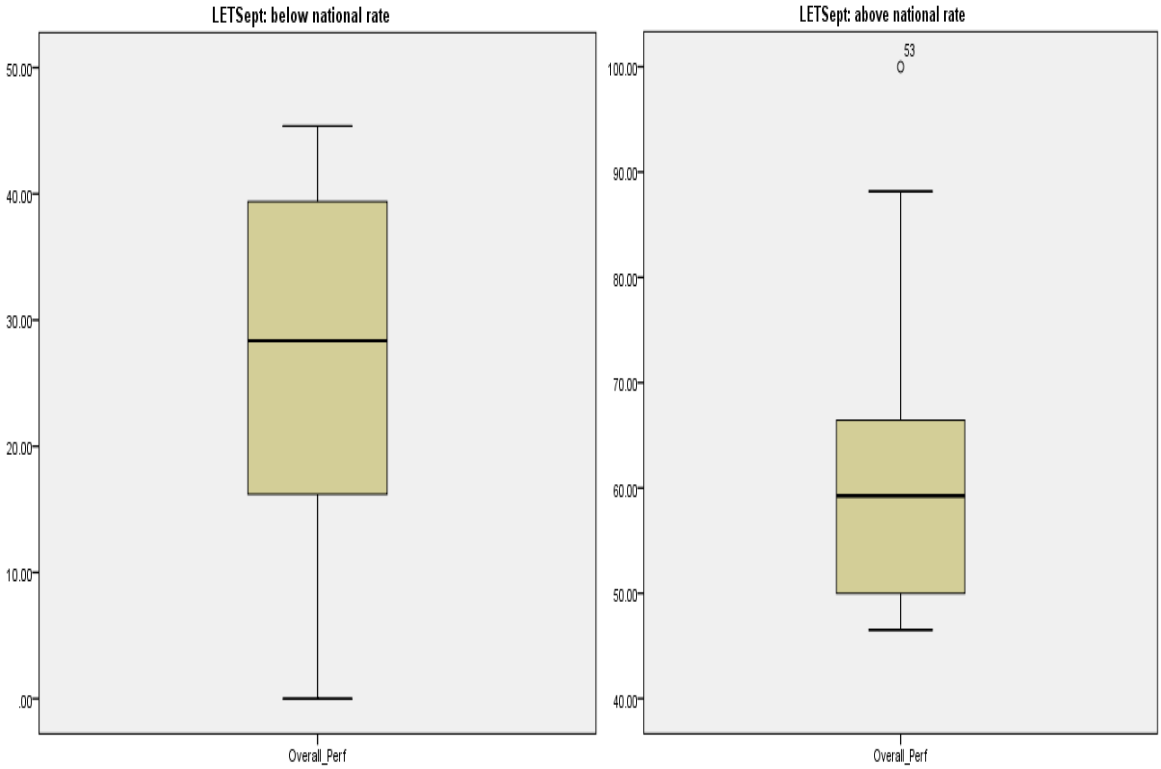

Figure 5. Box plot for overall performance of TEIs below and above the national passing rate

To give a picture of this results, Figure 6 shows the scatter plot of the TEI's in the region which contains the individual performance of TEIs during the September 2017

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Licensure Examination for Teachers. The blue dots indicate the TEI and the y-axis shows the rating of each institution. The line marked the national passing rate 46.37 to better see the actual performance of the teacher education institutions.

With all these results, the dire need to increase performance in the Teachers Licensure Examination should be prioritized by Teacher Education Institutions in Region I.

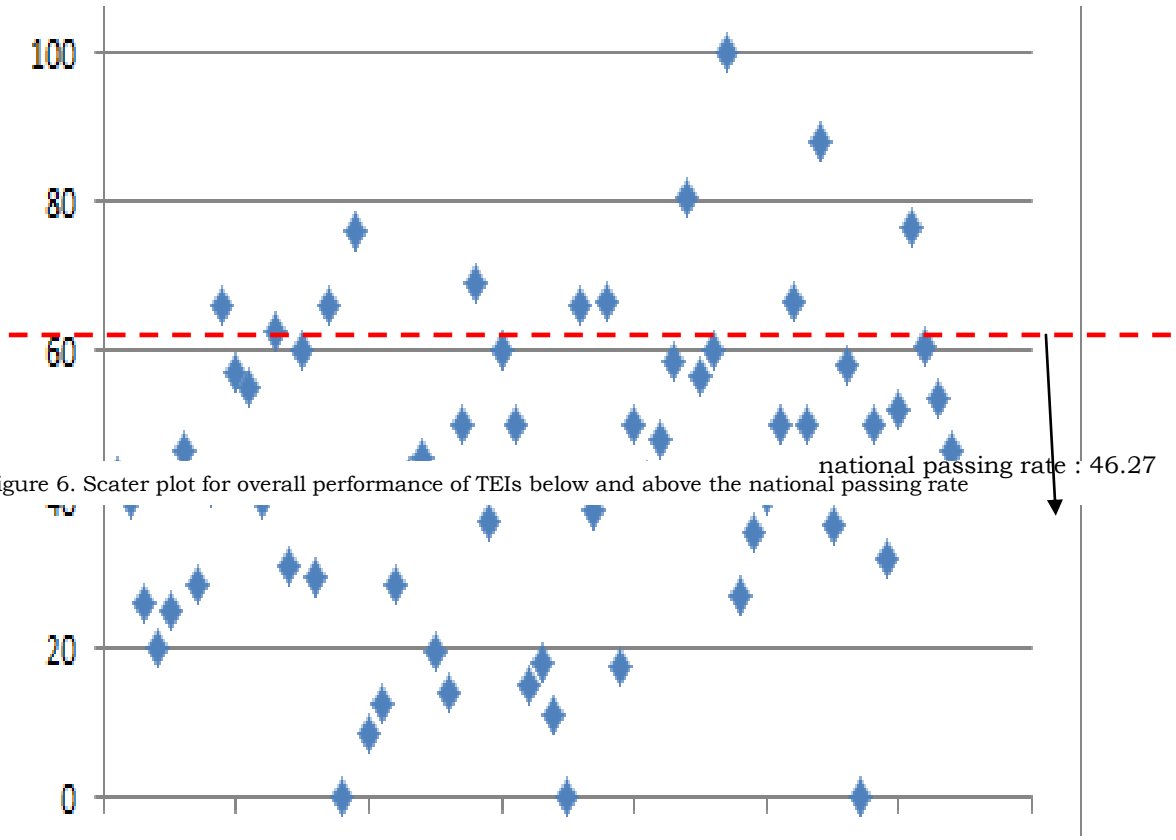

Figure 6. Scater plot for overall performance of TEIs below and above the national passing rate

LOGISTIC REGRESSION MODEL OF LICENSURE EXAINATION AS A FUNCTION OF GRIT MODEL

Table 7 shows the Binary Logistic Regression Result for Grit and September 2017 LET Results. The value of *B (odds Beta)* in the table shows the odds (logit) value of the grit scale and the correlation between LET performance. Meanwhile, the *Exp(B)* value indicates the number of times more likely the TEI will perform above the national

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passing rate of LET. Finally, the p-value may be seen in the significance value at 0.05 confidence interval.

The table shows that grit is highly significant (0.000) to the September 2017 LET results. A positive correlation is suggested by value of B (odds Beta). This means that in every unit increased in grit, there is 4.425 times more likely that the TEI perform above the national passing rate for LET. While the profile of the respondents were used in the statistics, the results shown in the table is only the Grit since it is the main variable of interest and is significant among all the profiles of the respondents. Results between profile and LET may be seen in Appendix K. Although the statistical test suggested that grit is the only significant independent variable in the model, this does not necessarily mean that other variables are not to be considered or are not predictors in terms of LET performance. In statistics, multicollinearty is an occurence where one predictor variable can be directly predicted from others with a significant precision degree. Simply saying, there is a high correlation between two or more predictor variables or one predictor variable can be used to predict the other.

Table 7. Binary Logistic Regression Result for Grit and September 2017 LET Results.

	B	Significance	Exp(B)
Grit	**1.487**	**0.000**	**4.425**
Constant	**-4.834**	**0.001**	**0.008**

Using the formula to compute the log(odds) of a given independent variable (grit scale) given by:

$$\log(odds) = constant + xB$$

And substituting values of the constant and the B we get:

$$log(odds) = -4.834 + x(1.487)$$

Using the process discussed earlier, then the equation (Model) will be:

$$p = \left(\frac{e^{(-4.834 + x(1.487))}}{e^{(-4.834 + x(1.487))} + 1}\right)$$

which gives the probability *(p)* of performing above the national passing rate of the licensure examination for teachers given the grit scale value (x).

This formula gives the probability of an institution of performing above the national passing rate given a grit value (x). This means that if a certain TEI in region 1 has a grit scale of 3.0, a TEI with a grit scale of 4.0 will have a higher chance of

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performing above the national passing rate in the LET. Therefore, the higher the grit scale of the institution is, the higher is the probability of the TEI performing above the national passing rate of the licensure examination for teachers.

To further support the claim, a cross tabulation using spss between grit and LET result was run in and the results are as follows:

Table 6. Cross Tabulation between Grit and LET Performance of TEI's

	GRIT		LET RESULTS Below national passing rate	Above national passing rate	Total
	Not at all gritty	0	0	0	0
	Fairly gritty	count	11	1	12
		% within grit	91.7%	8.3%	100%
		% within LET	34.4%	3.1%	18.8%
	Moderately	count	15	13	28
		% within grit	53.6%	46.4%	100%
		% within LET	46.95	40.6%	43.8%
	Highly gritty	count	6	13	19
		% within grit	31.6%	68.4%	100%
		% within LET	18.8%	40.6%	29.7%
	Very highly	count	0	5	5
		% within grit	0.0%	100.0%	100%
		% within LET	0.0%	15.6%	7.8%
Total		Count	32	32	64
		% within grit	50%	50%	100%
		% within LET	100%	100%	100%

The table shows grit scale description and the percentage of performing above and below the national passing rate. It can be gleaned that a fairy gritty rating has a higher percentage of below performing the national passing rate. Further, a moderately gritty rating has a 46% chance performing above the national passing rate and this

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percentage grows higher to 68.4% and 100% when the grit description is highly gritty and very highly gritty respectively.

Conclusions

On the basis of this study findings, the following drawn conclusions were:

1. The education institutions of region teachers, I have a low faculty profile. This can be backed up by the result of the survey-questionnaire showing that the TEIs of the region have a young core faculty. Further, the faculty of the TEIs of the region are dominated by instructors and are still new in the teaching profession. This may also be the reason why most TEIs are dominated by teachers who are only Bachelor's degree holder although many are working with their educational qualification. One good light in the profile of the faculty of the TEIs will be the dominant number of faculty members who are with permanent status.

2. Most of the TEI's in the region have faculty who are ranging from fairly gritty and moderately gritty. This result is credited to the age of faculty since grit level increases with age (Duckworth 2007). The data also shows that grit scale of faculty in TEI's in region I increases from ages 21-60 and declines after the age 60.

3. Only half of the TEI's in region I performed above the national passing rate suggesting that the region is only at par with the national performance of TEIs. This is an indication that the region is performing poorly in the LET and thus actions to alleviate this finding should be addressed

4. It can be concluded that based on the results of the study that grit scale of faculty is a predictor of the performance of an institution in the licensure examination for teachers for region I. As the result suggests, the higher the grit scale of the faculty, the higher is the probability that the institution perform above the national passing rate for the licensure examination for teachers.

Recommendations

Based on the results of this study and the conclusions formulated, the following recommendations are hereby suggested:

1. Teacher Education Institutions need to elevate their faculty profile. Although there is nothing wrong with the fact that their faculty are young, training and retaining the faculty should be the priority. Quality of teachers of TEI's should be the major concern as suggested by the Philippine Business for Education (PBED) in order to produce quality graduates to perform well in the LET. Teacher education institutions may have rigorous selection and hiring process to come up with a competent teaching force.

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2. More activities related to the licensure examination for teachers may be institutionalized like the conduct of qualifying exams, pre-board exams and mock examinations to further augment the regions' LET results.

3. It is recommended that TEI's also develop grit of their faculty. While it is true that grit increases with age, holding seminars and workshop to develop grit will be beneficial to the overall being and success of their teachers, students and institution as well. Further, providing opportunities for teachers to improve skills will lead them to endure the world of teaching

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