

GRIT, SELF-EFFICACY AND GOAL ORIENTATION: A CORRELATION TO ACHIEVEMENT IN STATISTICS

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ABSTRACT

The study aims to investigate or determine if non-cognitive factors and skills such as grit, self-efficacy, and goal orientation has relationship with achievement in statistics. This study used descriptive-correlational research design. Survey-questionnaire and Achievement test served as the primary tools of data gathering. Frequency count, percentage, weighted mean, standard deviation, t-test, ANOVA, Pearson r, and Stepwise multiple regression analysis were utilized to statistically analyze the data. Results revealed that profile of the students has no substantial influence in the difference of academic performance. Achievement in statistics is positively correlated to grit, self-efficacy, and mastery goals while negatively correlated to performance avoidance goals. Furthermore, students with high extent of self-efficacy and low pursuit of performance-avoidance goals have higher probability to perform well academically and have greater achievement in statistics.

Keywords: *Grit, Self-Efficacy, Goal Orientation, and Achievement in Statistics*

I. INTRODUCTION

The relationship between Mathematics and economy cannot be underestimated. Mathematics has been a key instrument in national development and has driven the economic growth of a nation. In the research study of Organization for Economic Co-operation and Development (OECD) in 2010, data revealed a direct positive relationship between mathematical skills and Gross Domestic Product (GDP) growth. This finding underscores the vital role that mathematics plays in the micro and even in the macro levels of human progress. Moreover, in 2011, Mathematics was recognized by the Department of Science and Technology (DOST) and Philippine Council of Mathematics Teacher Educators (MATHTED) as the gatekeeper of success in country's economic progress. Advancement heavily relies on development in science and engineering, which eventually demands a strong foundation of mathematics. Therefore, it is essential to have a high quality of mathematics education and to determine the factors that influence the mathematical achievement and performance of the students.

For the past decades, teachers and educational psychologists have tried to identify and understand the underlying factors that contribute to the success and failure of students. As such, they have confirmed that these cannot be attributed to a single factor, but to a myriad of factors. Among these factors are cognitive factors such as *intelligence* and *academic aptitudes*, which were identified as core aspects that influence students' academic success based on the variety of scientific studies. Ormrod (2010) highlighted that students with a high Intelligence Quotient (IQ) have a great

probability to perform well in school. However, it does not necessarily convert to academic success. Intelligence probably plays an important role in academic achievement but many other factors such as motivation, quality of instruction, family resources, parental support, and peer group expectations may also account for this.

Grit is defined as perseverance and passion for long-term goals. This also means as having consistent interest and effort through time that despite challenges and repeated failure, a gritty person continuously strives to achievement his/her goal. It is about not giving up despite setbacks and failure experience, pushing oneself to accomplish goals without losing determination in a long run. Research of Duckworth (2007) showed that *Grit* emerged as a significant predictor of success, better than cognitive predictors such as IQ, high school GPA (Grade Point Average) and SAT (Scholastic Aptitude Test) scores. Moreover, grit was found to have a direct positive association with GPA, and gritty students outperformed their peers with lower grit scores. Additionally, it was also found to be associated with age, educational attainment, and career changes, conscientiousness. Similarly, results of Chang's (2014) examination exposed that gender, SAT scores, race, and the perseverance sub-scale score of grit were found to be significant in predicting the first-year GPA. He then suggested that higher education administrators and faculty should foster perseverance in students in an effort to increase academic performance. Also, Tovar-Garcia (2017) explored the importance of grit in migrant students in Russia, the regression analysis showed that grit was a key variable in explaining educational outcome and has a positive impact on the achievement of migrant students. In addition, Miller (2015) investigation revealed that grit has a positive relationship to task persistence while having a negative relationship to perceived stress. On the other hand, Ivcevic and Brackett (2014) did not support the incremental validity of grit over conscientiousness. Based on the findings of their study, school outcomes were significantly predicted by conscientiousness and ERA (Emotion Regulation Ability), but not Grit. Hence, one recommendation of their study was that instead of giving emphasis on grit which is a lower level of self-regulation trait, educational programs should focus on conscientiousness and emotion-regulation studies to address school challenges. Ironically, there are conflicting results on how grit affects the grades and school success. Hence, it is evident that further investigation on this matter is still needed.

Self-efficacy is also considered to be a notable non-cognitive factor, rooted from the social cognitive theory from a well-known psychologist of the 20th century - Albert Bandura. Self-Efficacy Theory has had considerable influence on research, education, and clinical practice (Carey & Forsyth, 2017). In education, academic self-efficacy was identified as factors that predict school success and GPA (Cooper, 2014). According to Shams et al. (2011), self-efficacy exists in diverse branches, applying this concept in a specific domain like mathematics will be beneficial. Altun and Erden (2013) research revealed that self-regulation strategies, time, environment, and self-efficacy predict mathematics achievement. In addition, the analyses showed that self-efficacy perception has the biggest role in predicting mathematics achievement. It was further reinforced by the outcome of two independent studies; Shams et al. (2011) and Jaafar and Ayubb (2010), both studies concluded that self-efficacy has a positive relationship to mathematics performance. These findings again demonstrate that self-efficacy is an important factor in mathematics achievement. Thus, the present study attempted to validate the importance of self-efficacy in learning statistics.

Achievement goals is conceptualized as the competence-relevant purposes or aims that individuals strive for in achievement settings, and these different purposes or aims are posited to lead to differential performance outcomes (Elliot, Shell, Henry & Maeier, 2005). Achievement goals refer to the purposes for which a person engages in achievement behavior (Pahljina-Reinić & Kolić-Vehovec, 2017). Achievement goals provide a framework to conceptualize motivation.

Individuals were hypothesized to have different purpose or reason for engaging activity which probably influences their performance attainment. In the trichotomous achievement goal framework also known as the three-factor model, the goals are categorized as *mastery goals*, *performance-approach goals*, and *performance-avoidance goals*. Investigation of Stan and Oprea in 2015 disclosed that students with mastery goals seek to gain new knowledge and further develop their skills which leads to lower level of test anxiety. Siecol (2016) suggested that mastery-approach goal is a significant predictor of academic resilient. Also, paper of Elliot, Shell, and Maeier in 2005 found that performance-approach goals have a more positive effect on students' performance than mastery goals. Similarly, Jowkar, Kojuri, Kohoulat, and Hayat (2013) said the performance-approach goal is a significant predictor of academic resilient. Likewise, study of Costello (2011) revealed that performance-approach goals predict academic achievement while being unrelated to course interest and enjoyment. Performance-approach has more positive effects on the performance as compared to another dimension of achievement goals. In contrast, study of Mattern (2005) indicated that performance-approach goals have no significant relationship to course grades. However, Rastegar et al. (2010) stressed that performance-avoidance goals are grounded also from fear of failure. Students with performance-avoidance goals have a higher level of test anxiety (Stan & Oprea, 2015). Hiding one's incompetence might probably lead to poor academic performance since they prevent possible help from peers and classmates. The teacher might assume that students learned but the reality is that they struggle with learning (Wirthwein, 2013). Elliot, McGregor, and Shelly (1999) said that performance-avoidance goals were determined as positive predictors of surface processing and disorganization, and it is also a negative predictor of deep processing and exam performance.

In sum, the aforesaid researches provided inconsistencies and conflicting findings. Hence, the researcher seeks to conduct further investigation relevant to the topic. The researcher believes that the noted inconsistencies could be solved through another study. Most importantly, few research has been conducted to examine the effects of grit, self-efficacy and goal orientations in statistics achievement. Thus, results of this study would provide additional data that would be significant to mathematics academicians and future researchers. Also, this study would also like to ascertain how confident students are in learning statistics, and what their prevailing purposes are when studying statistics. The researcher believes that taking into account the motivational construct of learning will be advantageous to gain better insight. Hence, this study specifically seeks to focus on the following, to wit:

1. Describe the respondents' level of grit, extent of self-efficacy in Statistics, goal orientation in learning Statistics and achievement in Statistics;
2. Analyze whether respondents' achievement in Statistics differs in terms of age, socio-economic status, and work status; and
3. Determine if there is a significant relationship among students' grit, self-efficacy, goal orientation, and achievement in Statistics.

Hypotheses:

1. There is no significant difference on students' achievement in Statistics when grouped in terms of age, socioeconomic status and work status; and
2. There is no significant relationship among grit, self-efficacy, and goal-orientation, and achievement in Statistics.

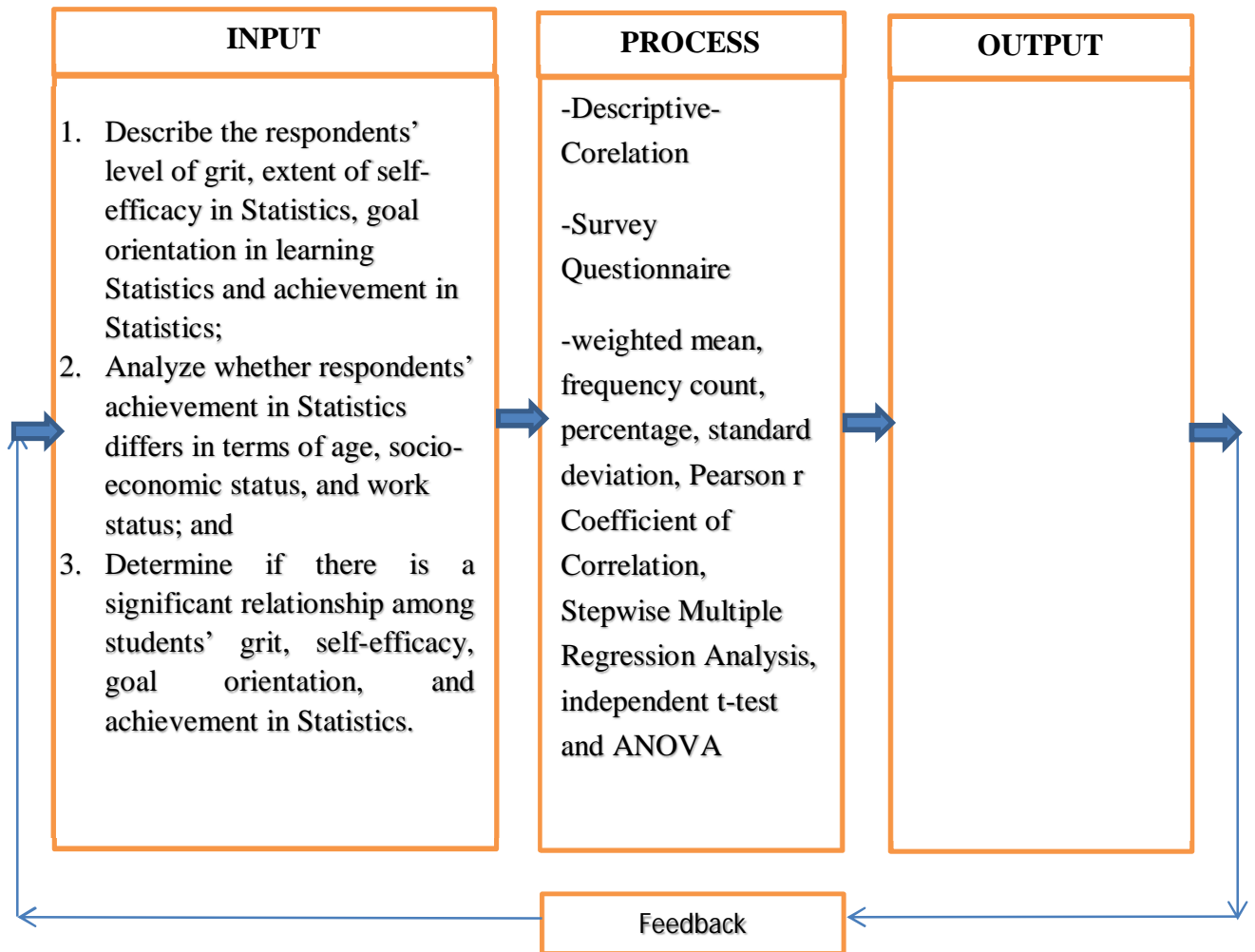


Figure 1. Paradigm of the Study

II. RESEARCH METHODOLOGY

This study used a descriptive-correlational research method. Descriptive research provides a snapshot of the current state of affairs. It also provides a relatively complete picture of what is occurring at a given time. Also, as cited by Eduardo (2018), descriptive method is a purposive process of gathering, analyzing, classifying, and tabulating data about prevailing conditions, practices, beliefs, processes, trends and cause-effect relationships and then making adequate and accurate interpretation about such data with or without the aid of the statistical methods. On another hand, correlational research is designed to discover relationships among variables and to allow the

prediction of future events from present knowledge. It also allows testing of expected relationships between and among variables and the making of predictions (Stangor, 2011). Considering that this study sought to determine and describe the current level of students' statistics achievement, grit, self-efficacy and adopted achievement goal orientation, descriptive method of research was used. Furthermore, correlational research was also used in determining the relationship and predictive power of non-cognitive factors over statistics achievement. The respondents were composed of first-year students from Nueva Ecija University of Science and Technology-College of Management and Business Administration Technology (one hundred fifty-one [151] first-year students enrolled in Statistics during the second semester of the Academic Year 2017-2018) It utilized survey questionnaire and achievement test as the primary tools for data gathering composed of two: The Revised Students' Grit, Self-Efficacy and Goal Orientation Questionnaire, and Statistics Achievement Test. Grit scale was adapted from the study of Duckworth et al. (2007) which was designed to measure the students' grit toward success. For the Self-Efficacy Scale, the questions were patterned from Ling (2016) who used the instrument in determining the extent of the respondents' mathematics self-efficacy. For the Achievement Goal Orientation Questionnaire, it was taken from Young (2012) composed of three components, mastery goals, performance-approach goals, and performance-avoidance goals. However, questionnaires were revised, modified and adapted to specific content that suits the learning of the student' respondents. The final survey questionnaire was revised after validation by experts and was found reliable through *Cronbach's Alpha*. Also, the Statistics Achievement Test was prepared by the researcher; it is a Multiple Choice Test composed of 40 items constructed based on the lessons covered in the midterm. The topics included were basic statistical concepts, collection and representation of data, measures of central tendency, and measures of variation. The Table of Specification was used by the researcher as a basis for test construction to increase the quality content validity of the test items. In addition, *Face and Content Validity Testing* was conducted as part of validity testing. Moreover, the *Statistics Achievement Test* was also submitted to experts in the field for content validation. Furthermore, it was also subjected to pilot testing to determine the difficulty and reliability index of the achievement test. The item analysis revealed that majority of the questions constructed were moderately difficult and discriminating. All computations were carried out using Microsoft Excel 2013 and Statistical Package for Social Science version 21 (SPSS 21), stored in the computer.

Table 1. Levels of Grit Descriptors

Mean Score	Interpretation
4.20 – 5.00	Extremely Gritty
3.40 – 4.19	Very Gritty
2.60 – 3.39	Somewhat Gritty
1.80 – 2.59	Slightly Gritty
1.00 – 1.79	Not at all Gritty

Table 2. Statistics Self-Efficacy Descriptors

Mean Score	Interpretation
4.20 – 5.00	Very High
3.40 – 4.19	Very High
2.60 – 3.39	Average
1.80 – 2.59	Low
1.00 – 1.79	Very Low

Table 3. Statistics Achievement Test Descriptors

Mean Score	Interpretation
32.00 – 40.00	Outstanding
24.00 – 31.99	Very Satisfactory
16.00 – 23.99	Satisfactory
8.00 – 15.99	Unsatisfactory
0.00 - 7.99	Poor

III. RESULTS AND DISCUSSIONS

3.1. Respondents' Level of Grit, Extent of Self-efficacy in Statistics, Goal Orientation in Learning Statistics and Achievement in Statistics

a. Levels of Grit

Table 4 displays that out of 151 student respondents, 122 or 80.79% are described as “somewhat gritty” in learning statistics while only 23 or 15.23% are described as “very gritty” to learn statistics. Meanwhile, five (5) or 3.31 % of the students are “slightly gritty” while only one (1) student-respondent is identified to be “extremely gritty”. It can be noted, however, that no respondent is identified to be “not gritty at all.” As a result, the level of students’ grit in learning statistics ranged from “slightly gritty” to “extremely gritty”. The table further shows the computed general weighted mean of students’ level of grit in learning statistics, which is 3.14 with a standard deviation of 0.29.

Table 4. Frequency and Percentage Distribution of the Student' Level of Grit in Statistics

	Levels of Grit		Mean	SD
	f	%		
Extremely Gritty	1	0.66%	3.14	0.29
Very Gritty	23	15.23%		
Somewhat Gritty	122	80.79%		
Slightly Gritty	5	3.31%		
TOTAL	272	100%		

This indicates that the responses of the respondents were less dispersed around the mean score. In general, students are described as “somewhat gritty” to learn statistics. Also, the data revealed that the majority of the student-respondents were fairly gritty to learn statistics. It only means that to some extent, students put effort and work hard to study their lesson in statistics so they can accumulate knowledge about the subject matter to perform well. They are more likely to moderately engage themselves in practicing solving problems in statistics and review their notes. Findings also signify that most of the students had only mild interest in learning the subject, and a typical desire to study and learn statistics. This may be attributed to the nature of the subject which requires analysis and extensive computation. Several students can be considered as very gritty in terms of learning statistics. Thus, they are more likely to work harder and to preserve to learn and to study their lessons as compared to less gritty students. Moreover, very gritty students have a greater desire and interest to learn about the concepts of statistics. Miller (2015) emphasized that students who are high in grit persist due to an internal drive to accomplish their long-term goals, and not in pursuit of

external rewards. Furthermore, his study also found that grit was positively correlated to task persistence while negatively correlated to perceived stress. Hence, gritty students have a higher percentage to perform well in school.

b. Extent of Self-Efficacy

Table 5 displays that the extent of statistical self-efficacy had a general weighted mean of 3.78 with a standard deviation of 0.52. It indicates that students can generally be described to have a high extent of statistics self-efficacy. It can be noted that majority of the respondents, 88 out of 151 or 58.28% had a “high extent” of statistics self-efficacy, while 33 or 21.85% had “very high extent” of statistics self-efficacy. On the other hand, 28 or 18.54% had “average extent” of self-efficacy, while only 2 or 1.32% respondents had a “low extent” of self-efficacy. Meanwhile, none of the student-respondents was identified to have very low extent of statistics self-efficacy. Thus, the extent of statistics self-efficacy of the students ranged from low to very high self-efficacy. Azar et al. (2010) stated that perceived self-efficacy is the main construct in Bandura's social- cognitive theory, which refers to one's beliefs and judgments regarding their ability to accomplish specific tasks such as mathematics. Self-efficacy beliefs determine how people feel, think, motivate themselves and behave. It is hypothesized to have positive effects on personal well-being, job satisfaction, stress management, and academic performance. It can be said that generally, students have a high degree of confidence and self-esteem in their abilities to solve problems in statistics. In addition, they also have positive beliefs about their capabilities and skills to successfully perform or accomplish a specific academic task in learning statistics. Students with higher levels of self-efficacy set higher goals, apply more effort, persist longer in the face of difficulty and are more likely to use self-regulated learning strategies (Kvedere, 2014). Overall, these results indicate that students with high extent of self-efficacy are more likely to work hard to study their lessons and assignments in order to achieve their objectives in learning statistics. Furthermore, the students with high extent of self-efficacy have a high level of commitment to finish the task in statistics successfully and even when they experience failure, they have the ability to get back and continue to work hard in achieving goals. Similarly, students with very high extent of self-efficacy have similar characteristics, but in a higher degree and sophistication.

Table 5. Frequency and Percentage Distribution of the Students' Extent of Statistics Self-Efficacy

	Extent of Self-Efficacy		Mean	SD
	f	%		
Very High	33	21.85%	3.78	0.52
High	88	58.28%		
Average	28	18.54%		
Low	2	1.32%		
TOTAL	272	100%		

Meanwhile, only a few of the student-respondents had a low extent of self-efficacy. This is a positive result since it only indicates that only a few students have low confidence regarding their abilities to learn and perform well in statistics. Students with a lower level of self-efficacy often doubt their capabilities, are reluctant in engaging oneself in a difficult task and have low aspiration and are weak commitment to pursue their respective goal.

c. Goal Orientation

Table 6 shows that students' mastery goals had an overall weighted of 4.16 with a standard deviation of 0.5416; performance-approach goals with an overall weighted mean of 3.77 and a standard deviation of 0.6831; and performance-avoidance goals with an overall weighted mean of 2.98 and a standard deviation of 0.8498. It is apparent that mastery goals had the highest general weighted mean and also with the lowest dispersion. Thus, the data implies that majority of the students practice mastery goals in learning statistics. Also, students strive to develop their skills to become competent in statistics. They usually engage in learning statistics because they want to acquire new knowledge and learn as much possible. Stan and Oprea (2015) stressed that students with mastery goal oriented exhibit adaptive pattern of behavior in which they strive to complete a task despite setbacks and treat failure as learning opportunities. It can be said that students are generally characterized as highly motivated to learn statistics and to improve their current statistical skills, seek challenges where they can maximize their full potential, work hard, and do not give up easily in case of failure or setbacks.

Table 6. Weighted Mean and Standard Deviation of Students' Goal Orientation in Learning Statistics

Goal Orientation		
	Mean	SD
Mastery Goals	4.16	0.54
Performance-approach Goals	3.77	0.68
Performance-avoidance Goals	2.98	0.85
TOTAL		

On the other hand, the data also revealed that student-respondents were using performance-approach goals since their general weighted mean was also high. Taken together, these results suggest that several students strive to demonstrate that they have superior competence in statistics as compared to their classmates. Hence, some of the students were very competitive to gain public recognition. As observed by the researcher of this study, there are many cases where the mean scores of students' mastery goals and performance-approach goals were identical. This signifies the possibility some students are practicing multiple goal orientations towards learning statistics. Dela Rosa and Bernardo (2013) stressed that in multiple goals perspective, individuals can adapt both mastery and performance-approach goals simultaneously that lead to positive learning outcomes.

Lastly, performance-avoidance had the lowest weighted mean which indicates the only few of the students adapt this orientation. It can be said that only small portion of the students studied their lessons in statistics since they do not want to create an impression of incompetence for themselves.

d. Achievement in Statistics

Table 7 displays that students' achievement in statistics has a general weighted mean of 21.89 with a standard deviation of 6.49. This indicates that students had "satisfactory" performance in the achievement test. Students' achievement in statistics ranged from "unsatisfactory" to "outstanding". It can be observed that out of 151 student-respondents, 63 or 41.72% performed "satisfactory" on the achievement test in statistics, while 44 or 29.14% performed "very satisfactory". Meanwhile, 31 or 20.53% of the students scored "unsatisfactorily". It must be noted

that only a few students performed “outstanding” in the achievement test which was about 8.61 percent of the distribution.

Table 7. Frequency and Percentage Distribution of the Students' Achievement in Statistics

Achievement in Statistics				
	f	%	Mean	SD
Outstanding	13	8.61%		
Very Satisfactory	44	29.14%		
Satisfactory	63	41.72%	21.89	6.49
Unsatisfactory	31	20.53%		
Poor	0	0.00%		
TOTAL	272	100%		

Also, majority of the students performed “satisfactory” on the achievement test. It means, generally, that students have an approaching proficiency in statistics. It further means that students at this level have developed fundamental knowledge, skills and a core understanding of statistics. Yet, students needed a little assistance from the teacher and some assistance from peers, but have already met the minimum requirements or standard on the subject matter. Meanwhile, a large portion of the students performs “very satisfactory”. This indicates that they were proficient in statistics. The students at this level demonstrate proficiency in the knowledge and skills necessary in statistics. They develop a higher level of core understandings. In addition, students need no or little assistance in learning statistics. However, some of the students performed “unsatisfactory” in the achievement test and only small portion of the students performed “outstanding” in the statistics achievement test. These denote that only a few of the student-respondents achieved very well in the examination. Students who achieved “unsatisfactory” possess minimum knowledge, skills, and core understanding of statistics. These students need substantial academic support in learning statistics. In contrast, students who performed “outstanding” exceed the core requirements in terms of knowledge, skills, and understanding in statistics.

3. 2. Difference in Achievement in Statistics of Student-Respondents according to Profile

a. Age

Table 8 shows that there is no significant difference in students' achievement since the p-value is greater than 0.05 or $p = 0.796$. This leads to the nonrejection of the null hypothesis that there is no significant difference in students' achievement in statistics when grouped according to age. Based on the results, it can be inferred that the age group of the students does not influence differences achievement in statistics. Regardless of the age, students have the potential capabilities to perform proficiently in statistics.

Table 8. Difference in Students' Achievement in Statistics According to Age

Age	N	Mean	SD	Computed F	p- value	Verbal Interpretation
18-20	89	21.27	5.95			
21-23	40	21.83	7.01			
24-26	15	23.00	8.32	0.340	0.796	Not Significant
27 and above	7	21.00	6.73			
Total	151	21.58	6.49			

It supports the findings of the study of Josiah (2014) which showed that differences in achievement across gender, age and mathematics anxiety groupings were all not significant. Contrary thereto, study of Eze et al. (2015) revealed that there is a significant difference in the students' academic achievement in Mathematics, Science, and ICT when clustered according to age and gender. Moreover, Nordin et al. (2011) revealed in their study that younger group of students had higher GPA scores in mathematics as compared to older students. They also emphasized that when the student becomes older, their academic performance declines and that they are more likely to drop out.

Likewise, the researcher observed that older students (returnees) take a longer time to catch up with the lessons. Nevertheless, they exert more effort and determination in studying statistics. Conversely, some younger students have the ability to learn faster. However, they do not exert enough effort.

b. Socioeconomic Status

Table 9 shows that the computed F-value was 2.423 with the p-value greater than 0.05 ($p = 0.51$). Hence, the null hypothesis is accepted; there is no significant difference in students' achievement in statistics when grouped according to socioeconomic status. This indicates that the socioeconomic status of the students does not influence or affects students' academic performance.

Table 9. Difference in Students' Achievement in Statistics According to Socioeconomic Status

Socioeconomic Status	N	Mean	SD	Computed F	p-value	Verbal Interpretation
₱7890 and below	61	19.66	5.55			
₱7891-₱15780	60	22.90	7.15			
₱15781-₱31560	27	23.29	6.23	2.423	.051	Not Significant
₱31561-₱78900	7	22.00	6.51			
₱78901 and above	2	21.00	6.66			
Total	151	21.58	6.49			

The results negate the findings of Singh and Choudhary (2015) which revealed that achievement was influenced by socioeconomic status and students with high and middle socioeconomic status performed better than students with low economic status. In contrast, study of Ford (2013) revealed that there is no significant relationship existed between the socioeconomic status and the academic achievement. It only signifies that socioeconomic status is not a factor in the variability of students' achievement in statistics.

However, this study suggests that students with high economic status may have an advantage to other students since they can easily avail learning resources like books, internet access,

and tutorials sessions, but it does not necessarily mean that they have the higher academic achievement. Alos, economically disadvantaged students have also the capacity to perform well in statistics and poverty do not much hinder their determination to learn and eventually performed well academically.

c. Work Status

Table 10 shows that there is no significant difference in achievement in statistics since the p-value was greater than 0.05 or $p = .372$. Therefore, the null hypothesis that there is no significant difference in students' achievement in statistics when grouped according to work status is accepted.

Table 10. Difference in Achievement in Statistics when Grouped According to Work Status

Work Status	N	Mean	SD	Computed t	p-value	Verbal Interpretation
Working Students	31	20.65	5.91	-.895	.372	Not Significant
Non-working Students	120	21.82	6.63			
Total	151	21.58	6.49			

In contrast to the study of Tessema et al. (2015), a significant difference is found in the academic performance of working students and non-working students, non-working students were also found to have a higher GPA as compared to working students. Furthermore, their study revealed that students' employment had a significant negative effect on GPA, although the effect is practically very small. However, Rokicka (2014) pointed out that being a working student may provide some benefits since they will be able to improve or develop particular personal characteristics, including a sense of responsibility, work organization and time management, which could in return enhance school achievements. Consequently, she also argued that the employment may have an adverse effect on the academic performance of students since it reduces the time available for educational activity and therefore could lead to lower educational achievements, possibly resulting school withdrawal.

Data analysis indicates that working students and non-working students have a similar level of achievement in statistics and work status was not a factor that contributes to the variation of students' achievement. It implies that working students may be able to manage their time efficiently in studying and working. But still, working students must be given proper support by the teachers and counselors to avoid or reduce dropouts of working students and so that they will be able to support themselves financially and also to perform well academically.

3.3. Relationship of Achievement in Statistics and Non-cognitive Factors and Skills

a. Between Achievement in Statistics and Grit

Table 11 shows that there is a significant relationship between achievement in statistics and grit since the p-value was less than .01 or $p = .000$. It is also shown that there is a moderately weak positive correlation between achievement in statistics and grit with $r = .315$. Therefore, the null hypothesis which states that there is no significant relationship between achievement in statistics and grit is rejected. This means that students with higher level of grit have greater achievement in statistics.

Table 11. Correlations between Achievement in Statistics and Non-cognitive Factors and Skills

Achievement in Statistics			
Non-cognitive Factors and Skills	r	p-value	Verbal Interpretation
Grit	.315**	.000	Significant
Self-efficacy	.390**	.000	Significant
Mastery Goals	.296**	.000	Significant
Performance-approach Goals	.018	.823	Not Significant
Performance-avoidance Goals	-.287**	.000	Significant

***. Correlation is significant at the 0.01 level (2-tailed)*

The results agree with the study of Garcia, Cheung, and Loreda in 2015 where the direct positive correlation was found between levels of grit and academic performance of college students. Similarly, study of Duckworth et al. (2007) revealed that high grit scores were associated with higher GPA and concluded that gritty students tend to outperform less gritty students.

b. Between Achievement in Statistics and Extent of Self-Efficacy

It can be gleaned in Table 11 that statistics and self-efficacy have a significant relationship to achievement in statistics since the p-value was less than .01 or $p = .000$. In addition, the analysis shows that there was moderately weak positive correlation since $r = .390$. Therefore, reject the null hypothesis that there is no significant relationship between achievement in statistics and self-efficacy. The results indicate that students with high self-efficacy have superior achievement in statistics. Positive correlation denotes that changes in the extent of students' self-efficacy have the same direction as the achievement in statistics. Students with high extent of self-efficacy have greater achievement in statistics while students with a low sense of self-efficacy have lower achievement in statistics. Similarly, research conducted by Ayotola and Adedeji in 2009 revealed that there is a strong positive relationship between mathematics self-efficacy and achievement in mathematics. Also, Rastegar et al. (2010) reported that mathematics self-efficacy have a direct positive effect on mathematics academic performance as students with high extent of self-efficacy used metacognitive strategies in learning.

The findings of the current study provide additional evidence regarding the positive impact of high extent self-efficacy in the academic achievement of the students. Hence, self-efficacy can be concluded as a factor that determines academic achievement. Strong sense of self-efficacy is the absence of self-doubt in own capability to perform and accomplish task. Students with high extent of self-efficacy strive for learning and achievement. They have a high level of commitment, aspiration, and persistence in undertaking difficult task consequently converts into higher levels of achievement.

c. Between Achievement in Statistics and Goal Orientation (Mastery, Performance-Approach and Performance-Avoidance)

As shown in Table 11, the correlation analysis indicates that there is a significant relationship between achievement in statistics and mastery goals with a $p\text{-value} = .000$ at 1% level of significance. There is a moderately weak positive correlation between two variables since $r = .296$. The results indicate that mastery goal orientation is a factor that contributes to higher achievement in statistics. As students tend to have high mastery goals, the achievement in statistics increases. Hence, the null hypothesis that there is no significant relationship between achievement in statistics

and mastery goals is rejected. In support to the findings, study of Mattern (2005) revealed that college students' endorsement of mastery goals to be positively correlated with academic performance. She also stated that students with high mastery goals tend to have greater understanding and interest. Therefore, students with mastery goal orientation have a high percentage to perform well academically in statistics. Contrary thereto, study of Costello (2011) emphasized that mastery goals were not significantly related to final course grade, and an indirect path was found through deep processing study strategies.

On the other hand, Table 11 reveals that there is no significant relationship between achievement in statistics and performance-approach goals the p -value = .823 which is greater than .01 and degree of correlation was positively weak ($r = .018$). Hence, the null hypothesis that there is no significant relationship between achievement in statistics and performance-approach goals is accepted. The analysis only indicates that students' adaptation of performance-approach goals has no relevant influence over academic achievement in statistics. However, the result negates the findings of Elliot, Shell, Henry, Kelly, and Maeier (2005) who observed that performance-approach goals were found to have a more positive effect on students' academic performance than mastery goals. Likewise, study of Niepel, Brunner, and Preckel (2014) showed that performance-based goals may provide beneficial indirect effects on achievement via academic self-concept. It implies that performance-approach goals are not factors that contribute to higher achievement in statistics.

Lastly, Table 11 reveals that there is a significant relationship between achievements in statistics and performance-avoidance goals, with moderately weak negative correlation since the p -value = .000 and $r = -.287$. A negative correlation indicates that as students pursue performance-avoidance goals, achievement in statistics decreases. Hence, the null hypothesis that there is no significant relationship between achievement in statistics and performance-avoidance goals is rejected. Results were consistent with the findings of Soric, Penezić, and Burić, (2017) which revealed that students with a lower level of performance-avoidance goals tend to accomplish better academic achievement. The findings were reasonable since performance-avoidance goals were grounded from fear of failure and hypothesize to have a negative impact on students' achievement. Therefore, it is concluded that performance-avoidance goals are a factor that contributes to poor achievement in statistics.

IV. CONCLUSION

Based on the findings, it can be concluded that in terms of Grit, few of the respondent-students are able to practice and develop their ability in terms of analysis through statistics. Reciprocally, most of the respondents could finish their course with modest ability in terms of analyzing problems; in terms of Self-efficacy, the students could acquire better analytical skills due to their high self-efficacy; and in terms of Goal Orientation, students are unique in style considering that they use various goal orientation which is also beneficial for them to cope-up in the subject. On the achievement in statistics, students could perform or develop their knowledge in analyzing and understanding their statistics subject regardless of their profile. Hence, statistics students need not to be categorized by teachers just to get a promising academic result. Lastly, Grit, Self-efficacy, Goal Orientation play a very important role to students of statistics towards their attainment of better academic result.

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