



## RESEARCH ARTICLE

### DRIFT OF IT STUDENT PERFORMANCE IN STEM COURSES USING MACHINE LEARNING

**\*Jeffrey C. Cinco, Lowell A. Quisumbing, Devine Grace D. Funcion, Las Johansen B. Caluza, Rommel L. Verecio and Micehline A. Gotardo**

Paterno St. Tacloban City, Leyte, Philippines

#### ARTICLE INFO

##### Article History:

Received 18<sup>th</sup> December, 2017  
Received in revised form  
26<sup>th</sup> January, 2018  
Accepted 02<sup>nd</sup> February, 2018  
Published online 30<sup>th</sup> March, 2018

##### Keywords:

Correlation, STEM Subjects, Academic Performance, Information, Technology, Cognitive Skills.

*Copyright ©2018, Jeffrey C. Cinco et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.*

#### ABSTRACT

This experiment aimed to this paper examines the relationship between the IT subjects and the STEM subjects which can affect the academic performance of the IT students at the tertiary level. It was found out that IT students should have a strong foundation in there in the STEM subjects. To develop their cognitive skills to solve and analyze complex problems in Math and Science. And be able to understand and construct the correct syntax and grammar in making system. It was found out that STEM subjects are highly correlated to the IT subjects.

## INTRODUCTION

Over decades higher educational institutions have invested heavily in the development of its human labor in different fields of specializations. A puzzling question is the impact of STEM Courses (Science, Technology, English, and Mathematics) towards its academic performance and on the returns of education. Many educational researchers have tried to answer this question at the theoretical and empirical levels. On the one hand, student performance is hard to observe, and there is still confusion about its definition. Hence, there is no standard definition of student performance. The conventional approach focuses on achievement and curricula, how students understand the courses and obtain their degrees or their marks. However, a more extensive definition deals with competencies, skills and attitudes learned through the educational experience. The narrow definition allows the observation of the outcomes of any change in higher education, while the more extensive description needs a more complex strategy of view and a focus on the labor market. The results of learning are mainly validated in the labor market. The field of Information Technology (IT) has been ever dynamic; its advancement and development had been rapid, and its involvement is a continuous process. To face the challenges of promotion, the Commission recognizes the need to be responsive according to the current needs of the country.

Hence, it is essential and essential that the country's IT capability should be continuously developed and strengthened to be at par globally (CHED Memorandum Order 53, s. 2006). The Leyte Normal University, Tacloban City, offered BS Information Technology (BSIT) program as one of its many undergraduate programs. The curriculum is patterned after the Rules and Standards for the Undergraduate Information Technology Education (CHED Memo Order No.53, s.2006). Such rules and standards is a result of the series of workshops initiated by the professional organization in Information Technology education, PSITE (Philippine Society of IT Educators). Where IT educators, practitioners, students and stakeholders in the IT industry are invited as participants to the workshop with the presence of a technical panel from CHED (Verecio, 2013). The curriculum includes courses that will facilitate the development of the students in the different disciplines of Information Technology especially the development of knowledge, skills, and attitude that were embedded in the curriculum. The university is committed to meet the demand of the employers and accountable to its student's performance. As part of the on-going efforts to measure the effectiveness of the program and to be continually responsive to the needs of the student, it is on this premise that this study is conducted to survey the student performance on how STEM Courses affects or contributed in their Information Technology field of specialization.

#### Statement of the Problem

- What is the status of the performance of the IT Students in the STEM subjects between:

\*Corresponding author: Jeffrey C. Cinco,  
Paterno St. Tacloban City, Leyte, Philippines.

- IT and Math subjects;
- IT and Science subjects; and
- IT and English subjects?
- Is there a significant relationship between IT subjects and Science, Math and English topics?
- What input can be derived from the results to improve the performance of the IT Students?

**METHODOLOGY**

The methodology provides the discussion about the research method that will be utilized in this study. This chapter also includes the research design, respondents of the research and the research locale.

**Research Design**

This study employed quantitative research approach using descriptive-correlation design. The descriptive research design was used to measure the student performance of the BSIT students. This type of model is used to describe the current status of phenomena to describe what exists about the conditions in a situation (Key, 1997).

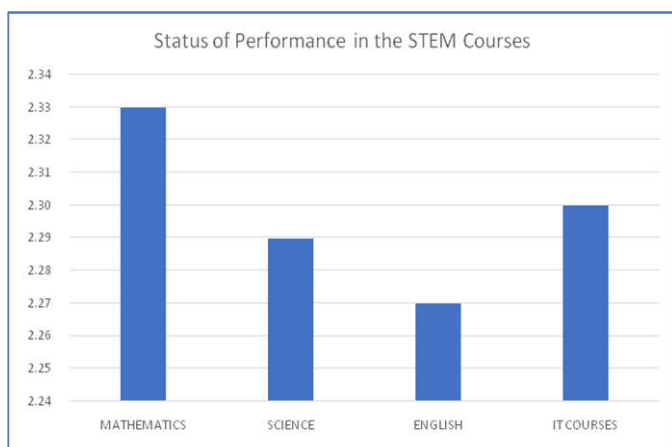
**Research Method**

The researchers collected data from the student’s record of third-year BSIT students from the first year to third-year grades. Students were removed from the list with no degrees in either of the subjects. The average of the IT subjects was computed and interpreted using One-Way ANOVA. The strength and directions of the variables were measured using correlations. The pooled standard deviation was used to calculate the intervals between the STEM courses.

**Respondents and the Research Locale of the Study**

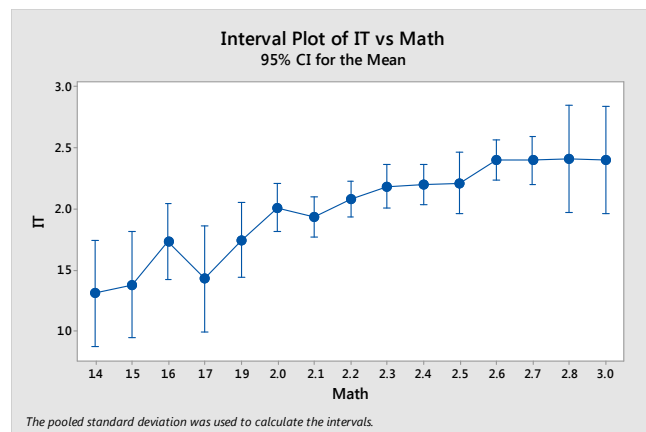
The selected third-year BSIT students of the Leyte Normal University as the respondents of the study. The chosen 58 out of 96 students or 60 percent of the respondents of the survey. These are the students who have completed grades in the STEM subjects. Students with no classes to either one of the STEM subjects were removed from the list of respondents.

**RESULTS AND DISCUSSION**

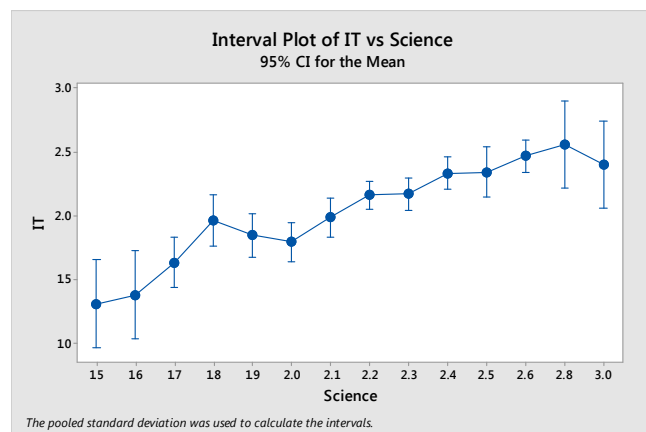


**Figure 1. Performance in the STEM Course**

It shows that the BSIT students have lower grades in Mathematics, Science and IT courses considering that. The three courses have higher standards than English subjects. The degrees in science are relatively close to the classes in the IT Courses. The Higher the degrees in Science, Math, and English, the higher the degree in IT courses. The result implies that Science, Mathematics, and English subject relatively affect the performance of the student/s in the IT courses. According to Fakeye, D. O. and Ogunsiji, Y. (2009) In the field that there is a substantial relationship between English language Proficiency and academic achievements of the subjects studied ( $r = 0.499$ ). It proposes that as English proficiency increases so does academic success. However, in the findings of the study of Wong, D. S. and Chia, Y. M. (1996) suggests that a higher degree of performance was associated in mathematics with a higher level of performance in the financial accounting course with students who were more competent in English. (Bergin and Reilly 2005; cited: Qian, Yizhou; Lehman, James D. 2016) found that mathematics and science both significantly correlated with students’ performance in programming.



**Figure 2. Performance in IT Subjects vs. Mathematics**



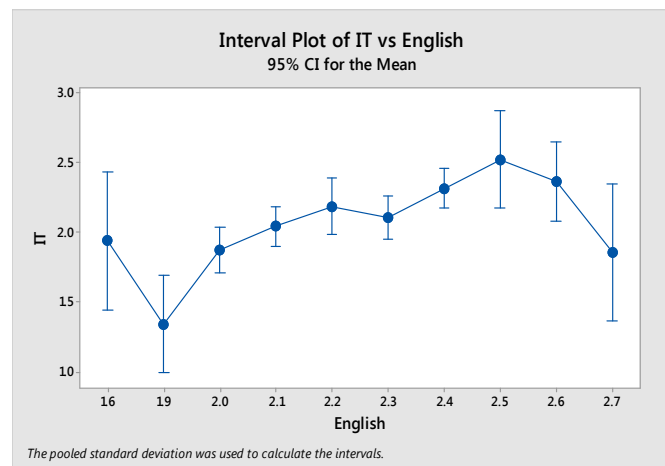
**Figure 3. Performance in IT Subjects vs. Science**

The interval plot shows that the grades of the third year BSIT students in Mathematics are nearly close to the grades in IT courses, but there were instances that the grades of the students in IT courses are deficient, but the performance in Mathematics subjects is outstanding. It implies that students who experience difficulty in mathematics would experience the same in IT subjects. According to Boateng, C. O. (2015) mathematics is an essential issue which influences students’ academic progress.

Correlations

		IT	Math	Science	English
IT	Pearson Correlation	1	.768**	.830**	.529**
	Sig. (2-tailed)		.000	.000	.000
	Sum of Squares and Cross-products	5.765	4.608	4.642	1.995
	Covariance	.101	.081	.081	.035
	N	58	58	58	58
Math	Pearson Correlation	.768**	1	.757**	.459**
	Sig. (2-tailed)	.000		.000	.000
	Sum of Squares and Cross-products	4.608	6.240	4.405	1.804
	Covariance	.081	.109	.077	.032
	N	58	58	58	58
Science	Pearson Correlation	.830**	.757**	1	.480**
	Sig. (2-tailed)	.000	.000		.000
	Sum of Squares and Cross-products	4.642	4.405	5.426	1.757
	Covariance	.081	.077	.095	.031
	N	58	58	58	58
English	Pearson Correlation	.529**	.459**	.480**	1
	Sig. (2-tailed)	.000	.000	.000	
	Sum of Squares and Cross-products	1.995	1.804	1.757	2.471
	Covariance	.035	.032	.031	.043
	N	58	58	58	58

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



A student who does not receive a firm ground in basic maths will be threatened relentless educational challenges regarding the nature of the Financial Accounting course. In his study Masasi, Noah J, (2011) notes that those who did well in the last primary test before the examination had good performance scores; this means that for the students with no right solutions in the central experiment would end earning low grades in the overall performance. The outcomes indicate a correlation .353 for Mathematics points and programming examination score. A significant result in the .01 level. Mathematics skill is often a pre-requisite for acceptance into computer science (Byrne, P. and Lyons, G. 2001, June). The interval plot of IT versus Science courses shows that the grades in IT and science are relatively close. If the degree in IT is high, the class in Science is upper also. Additionally, science subject has shown the positive impact to IT subjects because student developed their cognitive to include problem-solving, abstract reasoning, problem translation skills, logical ability and cognitive styles as possible predictors in student performance. Students' math ability was strongly related to their programming performance, and their English proficiency was the best predictor of their

success in introductory programming for these Chinese students (Qian, Y. and Lehman, J. D. 2016). In the study of (Rahimi, M. and Yadollahi, S. 2011) said that computer anxiety and achievement in English were inversely related. High achieving students in English used computers (both online and offline) more than low achieving students (Bergin, S. and Reilly, R. 2005). Coding in programming follows syntax in making a program similar to grammar and writing skills which follows particular sentence structure. In the coding phase of programming, attention to construction and syntax might be considered similar to language grammar skills, and creative writing skills might be regarded as identical to developing innovative programming solutions. The correlation shows that the IT, English, Math, and Science are closely correlated. Science, Math, and English are highly significantly contributing to the performance of the BSIT students. Students should be motivated to improve their math skills and have a positive attitude towards mathematics since good foundation in math enhances academic achievement in computer programming (Owolabi, Olanipekun, & Iwerima, 2014). According to (Byrne, P. and Lyons, G. 2001; Cited by Pillay, N. and Jugoo, V. R. 2005), there is a definite correlation between the performance in problem-solving in Math and Science to the student performance in programming courses. It is because science and math follow requires cognitive skills in computing problem in a structured approach.

**Conclusion**

It was found out during the study that Science, Math, English and IT subjects are highly correlated which can affect the academic performance. Students should have a strong foundation in the STEM subjects from their previous years, which harness their cognitive skills in solving problems, analytical reasoning to answer the challenge in IT matter. However, writing code in programming follows a structure and syntax to create a system similar to writing an essay that accompanies the grammatical structure to construct a sentence. Having a weak foundation in STEM subject will result in reduced academic performance.

**REFERENCES**

Byrne, P. and Lyons, G. 2001. The effect of student attributes on success in programming. In *ACM SIGCSE Bulletin* (Vol. 33, No. 3, pp. 49-52). ACM.

Boateng, C. O. 2015. The influence of mathematics ability on students' academic performance in financial accounting (Doctoral dissertation, university of cape coast).

Bergin, S. and Reilly, R. (2005). Programming: Factors that influence success. *ACM SIGCSE Bulletin*, 37(1), 411-415. <http://dx.doi.org/10.1145/1047124.1047480>

Chumra G.A., What Abilities are Necessary for Success in Computer Science? In *SIGCSE Bulletin - inroads*, Vol. 30, No. 4, pp. 55a - 58a, ACM Press, December 1998.

Fakeye, D. O. and Ogunsiji, Y. 2009. English language proficiency as a predictor of academic achievement among EFL students in Nigeria. *European Journal of Scientific Research*, 37(3), 490-495.

Key, James P. 1997. Research Design in Occupational Education. Retrieved from <https://www.okstate.edu/ag/agedcm4h/academic/aged5980a/5980/newpage110.htm>. Retrieved on February 7, 2017.

CHED memorandum order no. 53 series of 2006

- Masasi, Noah J. 2011. How Prior Academic Expose Affect Student Performance in Undergraduate Accounting Course in Tanzaniz. *International Journal of Business and Management Tomorrow*, Vol 1 No.1, 149-159.
- Owolabi, J., Olanipekun, P. and Iwerima, J. 2014. Mathematics Ability and Anxiety, Computer and Programming Anxieties, Age and Gender as Determinants of Achievement in Basic Programming. *GSTF Journal on Computing (JoC)*, 3(4), 109.
- Pillay, N. and Jugoo, V. R. 2005. An investigation into student characteristics affecting novice programming performance. *ACM SIGCSE Bulletin*, 37(4), 107-110.
- Verecio, R. 2013. On-the-Job Training of the BS Information Technology Program of Leyte Normal University, Tacloban City: An Assessment
- Qian, Y. and Lehman, J. D. 2016. Correlates of Success in Introductory Programming: A Study with Middle School Students. *Journal of Education and Learning*, 5(2), 73.
- Rahimi, M. and Yadollahi, S. 2011. Success in learning English as a foreign language as a predictor of computer anxiety. *Procedia Computer Science*, 3, 175-182.
- Wong, D. S. and Chia, Y. M. 1996. English language, mathematics and first-year financial accounting performance: a research note. *Accounting education*, 5(2), 183-189.

\*\*\*\*\*