

The Relationship of Mathematics to the Performance of SHCT it Students in Programming Courses

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Abstract— This correlational study investigates whether Mathematics has a role in the performance of the students in their programming courses. Students' grade points from their basic mathematics and programming courses were collected and correlated, specifically the grade points of the exiting Advanced-Diploma students from Semester 1 of Academic year 2016-2017 of Shinas College of Technology in Oman. Determining the relationship was analyzed through the use of Pearson r. Hypothesis is tested and the results of the correlation were established.

Keywords— mathematics, programming performance

I. INTRODUCTION

Information Technology (IT) in academia refers to an undergraduate degree programs that prepare students to meet the needs in of business, government, healthcare, schools and other kinds of organizations. The emergence of this discipline, led to the development of standard computing curricula. Math and Statistics for IT, Programming Fundamentals and Integrative Programming and Technologies are just three of the many areas in the IT body of knowledge. ^[1] Programming skills is defined as the skills required to write a computer program so that data may be processed by a computer or a machine^[2]. IT degree and computer Science degree are both computer-related disciplines. Duran (2016) emphasized that one key factor to consider in pursuing Bachelor of Science in Computer Science is the programming skills. ^[3] Information Technology degree, which is now being offered in many colleges and universities, also requires programming skills from their students.

Shinas College of Technology (ShCT), one of the seven colleges of Technology, under the ministry of Manpower in Oman, offers Information Technology courses. The Information Technology department of the college offers avenues for students to develop their skills in programming and software development. It can be make sure that students are acquiring the needed and necessary skills after completing a programming course. All IT students in the diploma level take basic mathematics courses and basic programming courses before they can proceed to the next level, the Advanced-Diploma and the Bachelor levels. The basic programming courses taken by the diploma students include Introduction to Programming, Applied Database, Object-Oriented Programming and Ecommerce. On the other hand, basic mathematics courses are as follows: Calculus I, Managerial Statistics and Math II. This study was conceived for the purpose of determining the correlation of basic mathematics grade points to the performance of the students in the basic programming courses of the exiting Advanced Diploma students of Semester 1 for AY 2016-2017 of Shct.

II. LITERATURE REVIEW

A lot of studies and researches have been done correlating the relationship of Mathematics to programming performance. The study conducted by Eid and Millham (2013) found that Mathematics is a factor in the performance of students in Information Technology learning. They even concluded that Mathematics should be a component mandatory for all IT disciplines. They even cited that although a research done by Bennedsen and Casperen in 2006 was not able to establish a link between the students scores in Mathematics and in programming, which was caused by using a single practical test as a basis ^[4], a lot of researches have been conducted emphasizing the strong relationship of the two. Early studies done by Alspaugh(1970), Ricardo (1983), and Ignatuk (1986), proved that one needs to have a strong mathematical background to succeed in procedural programming. ^[5] Ali, Farag and Ali (2013) also presented in their papers the strong argument of authors like Baldwin and Henderson on the importance of Mathematics to software engineering and to its practitioners. They also noted that poor mathematical skills jeopardize the ability of the student to learn, understand and appreciate computer science' fundamental theories. ^[6]

III. CONCEPTUAL FRAMEWORK

The study used the conceptual framework below:

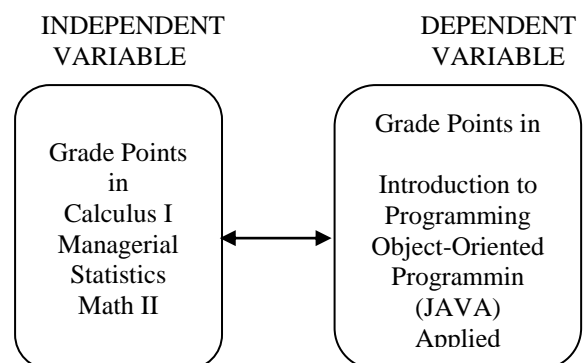


Figure 1. Research Paradigm

The relationship of the grade points in the basic mathematics courses to the performance of the students in their basic programming courses.

IV. STATEMENT OF THE PROBLEM

The study tried to seek the correlation of basic mathematics courses grade points to the grade points of the students in Introduction to Programming, Object-Oriented Programming, Applied Database and E-commerce. The following specific questions were also identified:

1. What is the academic performance of the Exiting Advanced-Diploma students in the Semester 1 of Academic Year 016-2017 in Calculus 1, Managerial Statistics and Math II?
2. What is the academic performance of the Exiting Advanced-Diploma students in the Semester 1 of Academic Year 2016-2017 in Introduction to Programming, Object-Oriented Programming, Applied Database, and Ecommerce?
3. Is there a significant relationship between the grade points of the basic Mathematics courses and the performance in the basic programming courses of the students in the Semester 1 of AY 2016-2017?

V. HYPOTHESIS

Based on the problems identified, the hypothesis below was formulated. There is no significant relationship between the grade points of the basic Mathematics courses like Calculus I, Math II and Managerial Statistics and the basic programming courses like Introduction to Programming, Object-Oriented Programming, Applied Database and Ecommerce for the exiting Advanced-Diploma students of Semester 1 for AY 2016-2017.

VI. PARTICIPANTS

A total of twenty one IT students, 18 female and 3 male, who exited the Advanced-Diploma level for Semester 1 of AY 2016-2017 were used as participants of the study. The students are currently in the Bachelor level and have completed their basic mathematics and programming courses. Since the total number of exiting students in the Advanced Diploma level for Semester 1 of AY 2016-2017 is only 21, 100% of the participants were used in this study.

VII. PARTICIPANTS

A request was sent to the registrar of the Information Technology department to obtain the list of students who exited in the Advanced-Diploma level for Semester 1 of AY 2016-2017. From the list provided, the TOR containing the grade points for basic mathematics and programming courses were collected from the college system.

VIII. METHODS OF DATA ANALYSIS

Pearson r was used by the researchers to determine the correlation in the grade points of the basic mathematics courses and the performance of the students in the basic programming courses. The Pearson product-moment correlation coefficient is a measure of the strength of the linear relationship between two variables. It is referred to as Pearson's correlation or simply as the correlation coefficient. If the relationship between the variables is not linear, then the correlation coefficient does not adequately represent the strength of the relationship between the variables.^[7]

IX. RESULTS AND DISCUSSION

Question 1: What is the academic performance of the Exiting Advanced-Diploma students in the Semester 1 of SY 2016-2017 in Calculus 1, Managerial Statistics and Math II?

Basic Math Courses	GPA	Rank
MATH1201 (Managerial Statistics)	3.05	1
MATH1200 (Calculus I)	2.63	2
MATH3103 (Math II)	2.60	3
MEAN	2.76	

Table 1. Academic performance of the students in basic mathematics courses.

Table 1 shows that the students got the highest GPA in Managerial statistics, followed by Calculus I and they got the least GPA in Math II. The performance in basic programming courses slightly varies. Several factors may affect the performance of the students in their basic mathematic courses. In many studies, a lot of factors have been identified related to the achievement of students in Mathematics. Saritas and Akdemir (2009) proved the effectiveness of Demographic factors like gender, socio-economic status, and parent's education level as well as instructional and individual factors in students achievement in Mathematics.^[8] A study also showed that most female prefer Statistics over Calculus (Forbes and Robinson, 1990).^[9] Although, the female participants (18) outnumbered the male participants (3) in this study, the slight variation in the grade points in Basic Mathematics courses could be attributed not only in the gender but to the other factors mentioned above. Question 2. What is the academic performance of the Exiting Advanced-Diploma students in the Semester 1 of Academic Year 2016-2017 in Introduction to Programming, Object-Oriented Programming, Applied Database, and Ecommerce?

BASIC Programming Courses	GPA	Rank
ITSE1101 (Introduction to Programming)	3.01	1.5
ITDB1204 (Applied Database)	2.86	4
ITSE2100 (Object-Oriented Programming using Java)	3.01	1.5
ITBS2203 (E-Commerce for IT)	2.99	3
MEAN	2.96	

Table 2. Academic performance of the students in basic programming courses.

The table shows the academic performance of the exiting Advanced Diploma students in their basic programming courses. The grade point average are ranked from the highest to the lowest GPA. Introduction to programming and Object-Oriented Programming using Java are the two highest GPA followed by Ecommerce and in the least is Applied Database. The GPA slightly varies also. The results show that the GPA of the basic mathematics courses is relatively similar to the results of the GPA of the programming courses.

As to whether Introduction to Programming which uses C++ and Object-Oriented Programming using Java are the subjects students find the easiest cannot be justified fully, as the second highest GPA of the programming course is only a slight lower. But there are some evidences pointing that Java and C++ are among the best-liked programming language for beginners, just

like the results of an online polls posted in 2015 by Alan Henry where Java also ranked Number 1 and C and C++ at fourth rank.^[10] Even in the comparative study by Nanz and Furia (2015) comparing programming languages including C, Java and Visual basic using Rosetta Code to determine which programming language is the best for a certain task, they came up with a conclusion that answering the question of which is the best programming language to use will still be a subject of intense debate as the programming languages tested in their study differ in features. The implication of the results of their study was discussed to educators, developers and language designers.^[11] The slight variation in the grade points can be attributed to several factors that may have contributed to the academic performance of the students. Akinola and Nosiru (2014) presented several factors like lecturers punctuality and regular attendance, teaching methodologies, attitudes and friendliness, the personal interest of students in programming and the regular attendance of students in programming classes that are contributors to the students performance in computer programming.^[12] Raadt (2005) identified learning approach as the most correlated to the success in computer programming.^[13]

Question 3. Is there a significant relationship between the grade points of the basic Mathematics courses and the performance in the basic programming courses of the exiting Advanced-Diploma students in the Semester 1 of AY 2016-2017?

Basic Math and basic Computer Programming Course	$r = 0.64$
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Table 3. Correlation between basic mathematic courses and basic programming courses.

Description Legend: Very strong relationship $\geq .70$; Strong relationship: $.40-.69$; Moderate relationship: $.30-.39$; Weak relationship: $.20-.29$; No or negligible relationship: $.01-.19$; Negative relationship: <0 Table 3 showed that there is a strong relationship between mathematics and the performance of the students in their programming courses. It proved that if a student is good in Mathematics, the student will also perform better in programming. In a tech blog written by Phil Johnson, he confirmed that Math knowledge really helped in programming basing the answer from his very own experience as a programmer.^[14] Anwar (2012) found out that tudents who got poor grades in Mathematics also got poor grades in programming courses.^[15] In the same way, Bly (2012) included in his paper two sections providing possible evidence used by the National Mathematics Advisory Panel in basing their claim on the important relationship between Mathematics and computer programming. The sections are: Mathematics as predictor of Success in Computer Programming and Logo Programming in mainstream Education.^[15] From these, it can be concluded that the programming courses require the same competencies with that of mathematics courses. Therefore, the null hypothesis which states that there is no significant relationship between mathematics and the performance in programming is rejected. The results also shows that Mathematics plays an important role in predicting the performance of the students in their programming courses.

X. CONCLUSION

Based on the findings of this study, the researchers conclude that the performance of the students in their Mathematics course is correlated with their performance in the programming subjects. The mathematics performance can predict the performance in the programming courses of the students.

Recommendation

The researchers are recommending related studies be conducted to include other areas and variables not covered in this research.

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