

Association between Nursing Students' Academic Performance in Computer with Nursing Informatics and Epidemiology Course at Tobruk University

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Abstract: Extraction of data was performed with data mining technique using the database of TUCON-GSv2. The research used quantitative correlational research in finding the association of nursing students' academic performance between Computer and Epidemiology where it resulted in high positive correlation with an r of 0.796420. The study population consist of 47 students who took up both courses in the same school year. The performance of students was better in Epidemiology with a mean of 69.19 compared with 63.02 in Computer and a p -value of 0.000095 showing a significant difference in the paired t -test score. Scatter plot was used to visualize the correlation between the courses.

IndexTerms: Nursing, Informatics, Epidemiology, Computer, Data Mining, Education

I. INTRODUCTION

Public health informatics by definition is the systematic application of information, computer science and technology in areas of public health, including surveillance, prevention, preparedness, and health promotion [1]. The main applications of this are the following; promoting the health of the whole population, [2][3], preventing diseases and injuries by changing the conditions that increases the risk of the population, by using informatics in public health data collection, analysis and actions [1]. Importance is given on disease prevention of the population, with the objectives of using a large variety of interventions, and work within governmental settings makes public healthinformatics different than other fields of informatics [4] The scope includes the conceptualization, design, development, deployment, refinement, maintenance, and evaluation of communication, surveillance, and information systems relevant to public health [5][6]. The increase in digitization of health data and advances in several fields of computer science including natural language processing and deep learning offer further prospects for applications in the domain of public health and epidemiology [7]. Other definition by researchers of health informatics research quoted as such, "a scientific endeavor that applies information science, computer technology, and statistical modeling techniques to develop decision support systems for improving both health service organizations' performance and patient care outcomes" [8][9]. Nursing Informatics, a related branch of Public Health Informatics on the other hand, had scope and roles that constantly evolved and nurses, leaders and organizations were required to acclimate to increasing demands that these changes bring, as every new knowledge emerges and technologies being implemented into practice [10]. Epidemiology is the study of the distribution and determinants of health-related states among specified populations and the application of that study to the control of health problems [11][12] and together with Informatics, shapes public health recording and analysis of data.

In this paper, it was aimed to find the functional relationship or association between two courses handled in the 3rd year school level of nursing students of Torbruk University. Only one school year will be studied for this is the first school year that both courses are available as a subject, wherein previously Epidemiology was offered together with Biostatistics [13]. The subject Computer Application with Nursing Informatics has been offered in the 3rd year level starting from 2016. That being said, the number of respondents was also limited to those enrolled on both courses with a total of 47. The idea for the association stems from the relation of Informatics in performing Epidemiology, and with the result of this paper proof of its correlation can be cemented. The study will also employ the use of data mining for data extraction in the database of the College.

II. MATERIALS AND METHODS

Materials and methods

The research used a quantitative correlational research design to identify the association between the academic performance of respondents on two courses, Computer Application with Nursing Informatics and Epidemiology. Population will be 3rd year students who took the said courses. The study used the overall result of the students grade on the said course, this includes Class standing and Major exams.

2.1 Study Population

The respondents consisted of 47 nursing students who took Computer Application with Nursing Informatics and Epidemiology in their 3rd year school level. The whole 3rd year class who attended the class from 1st and 2nd semester of school year 2021-2022 including taking the final exam was utilized in the study. Final grade of the said courses will be used for the evaluation. To qualify as respondents the students must be currently in the 3rd year level and took both subject. The sample was then also divided into two groups, repeater and regular students for comparison in data measures.

2.2 Students' Grades and Extraction

The researchers' used the final grade of the students who took up both courses. It should be the officially posted marks for the 1st assessment of students as result of 2nd assessment (removal exam) would affect/fluctuate the 1st result. The marks were extracted

from the database of the College of Nursing using Tobruk University College of Nursing Grading System Version 2 (TUCON-GSv2) as shown in figure 1. A simple data mining technique were observe here.

Course_coc	Subject	Duty	Cs	Lab/C	Finals	Grade	2nd	Final G	status
MED301ly	Epidemiology	0	0	0	50	50	0	50	Passed-ح
MED301ly	Epidemiology	0	10	0	31	41	57	57	Passed-ح
MED301ly	Epidemiology	0	18	0	45	63	0	63	Passed-ح
MED301ly	Epidemiology	0	22	0	29	51	0	51	Passed-ح
MED301ly	Epidemiology	0	22	0	45	67	0	67	Passed-ح
MED301ly	Epidemiology	0	21	0	50	71	0	71	Passed-ح
MED301ly	Epidemiology	0	20	0	43	63	0	63	Passed-ح
MED301ly	Epidemiology	0	18	0	44	62	0	62	Passed-ح
MED301ly	Epidemiology	0	20	0	55	75	0	75	Passed-ح
MED301ly	Epidemiology	0	18	0	43	61	0	61	Passed-ح
MED301ly	Epidemiology	0	15	0	37	52	0	52	Passed-ح
MED301ly	Epidemiology	0	14	0	46	60	0	60	Passed-ح
MED301ly	Epidemiology	0	28	0	66	94	0	94	Passed-ح
MED301ly	Epidemiology	0	21	0	44	65	0	65	Passed-ح
MED301ly	Epidemiology	0	17	0	57	74	0	74	Passed-ح
MED301ly	Epidemiology	0	17	0	57	74	0	74	Passed-ح
MED301ly	Epidemiology	0	20	0	54	74	0	74	Passed-ح
MED301ly	Epidemiology	0	29	0	64	93	0	93	Passed-ح
MED301ly	Epidemiology	0	15	0	53	68	0	68	Passed-ح

Figure 1: Extraction of records form TUCON-GSv2

2.3 Data Measures

To permit ease of analysis collected data were tallied and organized into tables. Frequency distribution is used to count the number of respondents on the equivalent rating. Measures of central tendency like weighted mean and standard deviation were used to look for variation in the relative contribution of individual data values to the mean. Paired t-test was used to compare the means between the courses and independent t-test between two groups, those who took nursing on a regular basis, and those with at least a repeated school year. Differences between genders were not performed due to limited number of male students over female. Pearson product moment coefficient correlation was also computed between the courses.

The computed mean were also analyzed with the use of an interpretation with specific mean score ranges and a subsequent adjectival interpretation, this is the same rating used for final grade assessment for every course not counted as core subject in the nursing curriculum. Shown below is the interpretation used for the study.

Table 1: Interpretation of student’s Academic performance in Computer and Epidemiology

Range	Adjectival Interpretation
85 – and above	Excellent
75 – <85	Very Good
65 – <75	Good
50 – <65	Passed/Fair
Below 50	Poor

2.4 Software Tools

The researchers’ used Microsoft Excel as a tally sheet and permit the data to be computed using function average for mean, stdev for standard deviation sample size. Tallied values also underwent data analysis tool pack to get the difference of mean the courses using paired t-test and independent t-test between groups, with some help from Minitab statistical version 17 to double check statistical results. Scatter plot chart was used to visually compare the differences between groups and the correlation between Computer with Nursing Informatics and Epidemiology.

III. RESULT AND DISCUSSION

The extracted data from TUCON-GSv2 [14] undergone statistical treatment and presented in tables’ and figures’. Table shows frequency distribution, weighted mean, standard deviation, t-test, p value, and correlation (r and correlation rating).

3.1 Frequency Distribution of Respondents

Table 2: Frequency Distribution of Students Rating in Advance Nursing Procedure

Rating	Computer	%	Epidemiology	%
85 – and above (Excellent)	4	8.51	5	10.64
75 – <85 (Very Good)	5	10.64	10	21.28
65 – <75 (Good)	10	21.28	14	29.79
50 – <65 (Passed)	24	51.06	15	31.91
Below 50 (Poor)	4	8.51	3	6.38
Total	47	100	47	100

Table 2 shows the frequency distribution between Computer Application with Nursing Informatics (labeled as Computer) and Epidemiology. With a passing mark of 50 and above, Epidemiology has one more students with passing mark with 44 out of 47, while Computer has 4 students in poor rating. Epidemiology also has more students with better ratings, 5 Excellent against 4 for Computer, 10 Very Good against 5, and 14 Good against 10, thus Computer have more Passed/Fair rating with 24 against only 15 for Epidemiology.

3.2 Weighted Mean of Students Academic Performance in Computer and Epidemiology

Table 3: Weighted Mean of Students Academic Performance in Computer and Epidemiology

Rating	Computer		Epidemiology		T-Test	P Value	r	Correlation
	WM	SD	WM	SD				
Repeater	53.71	17.25	57.88	16.77	-1.374179	0.188331	0.728887	High
Regular	68.30	12.18	75.60	9.83	-4.960295	0.000028*	0.751619	High
All Students	63.02	15.72	69.19	15.26	-4.275574	0.000095*	0.796420	High

In table 3, Computer has a lower weighted mean as compared to Epidemiology with 63.02 and 69.19 respectively. Dividing them into two groups, repeater has a mean of 53.71 in Computer and 57.88 in Epidemiology, there is no significant difference between the 2 groups. But compared to regular students results with 68.30 on Computer and 75.60 on Epidemiology, the p-value is at 0.000028, wherein significant difference were observe between the two groups. Overall, with Epidemiology having a higher mark as compared to Computer, the p-value of 0.000095 shows a significant difference in the paired t-test result. The different result in the two course might be attributed to the reason that the students are taking up nursing degree, and epidemiology is more nursing related than computer course.

A similar study at least on the mean of Computer course performed in 2014 shows that the current research’s performance of students has a higher weighted mean, with the previous study in 4 different school years has a weighted mean of 54.91, 60.13, 53.48, and 56.11 in school year 2010-2011 until 2013-2014 [A] which were the school year that the course was offered in the 1st year level [R]. The difference in the mean might be largely attributed to maturity of students, 3rd year level students were more academically inclined and serious in their studies as compared to 1st year students. There was no similar study for Epidemiology at present in Tobruk University.

3.3 Relationship of Students Academic Performance in Computer and Epidemiology

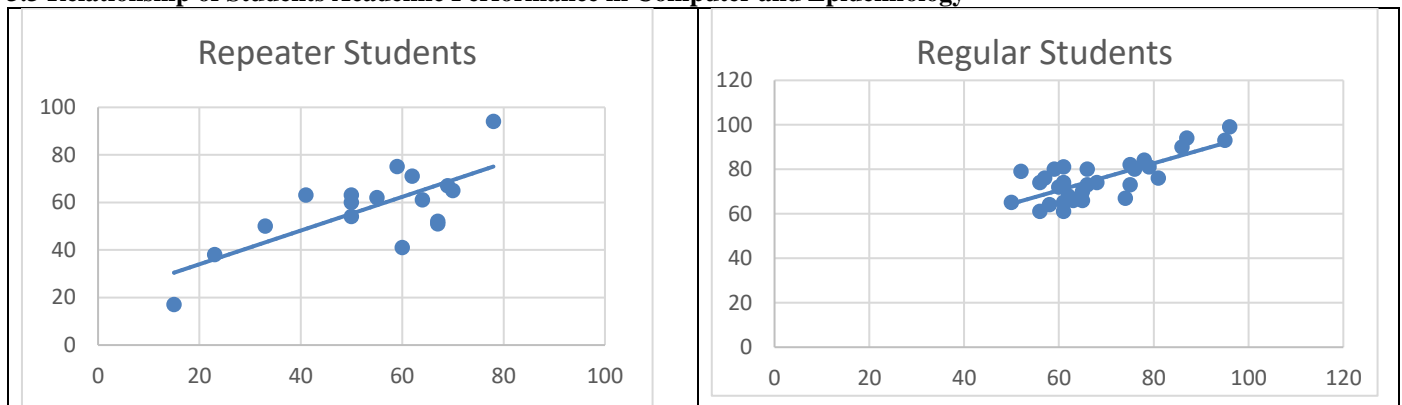


Figure 2: Scatter plot on the difference of Students Academic Performance in Computer and Epidemiology

Figure 2 shows the scatter plot between Computer and Epidemiology, group between Repeater and Regular students. The plot displays a high positive correlation on both groups were r value is equals to 0.728887 for Computer and 0.751619 for Epidemiology (shown in Table 3). It shows that in terms of Academic performance, there appears to be an association, as the mark in Computer goes higher, the mark in Epidemiology also goes higher per student.

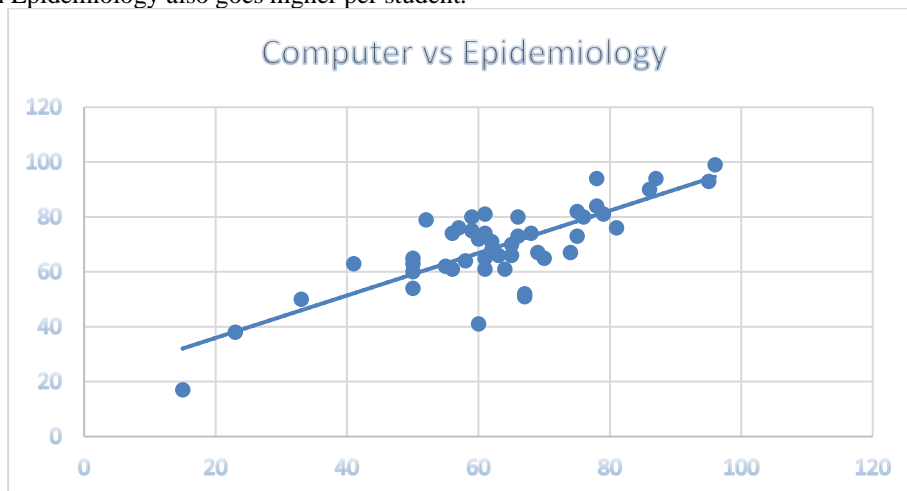


Figure 3: Scatter Plot Association of Students Academic Performance in Computer and Epidemiology

Combining the plot as can be seen in figure 3, positive high correlation strengthens the paired course. With an r of 0.796420 the paired value shows a high association between the marks, wherein when Computer goes higher, mark in Epidemiology also goes higher per student. It can be argued that positive correlation occurs because students perform almost the same academically despite the different course, meaning if the student is good in one subject, he/she might be as good as the next one.

A study on correlation of two different subjects was also performed in 2014, using the 3rd school year level of batch 2008, 2009 and 2010-2011, albeit not computer or epidemiology shows that the r values 0.7690, 0.6286, and 0.6903, high and substantial correlation observation [15], is almost consistent to the current r , might suggest that the result was student factor, a good student performing well in one course might perform well in another as well [15].

IV. CONCLUSION

The study presented the result on the association between the academic performance of students in Computer application with Nursing Informatics and Epidemiology where it shows that there is a high correlation between the paired values, with an r of 0.796420 p -value of 0.000095, with a paired t -test of -4.275574, Epidemiology is significantly higher with a mean of 69.19 as compared to 63.02 for Computer. The scatter plot also shows a positive correlation between the two courses as Computer grades go higher, the mark in Epidemiology for very students goes higher as well. Significance difference was observed when grouped according to Regular students, while Repeater does not have a significant difference in the result.

The generated result of the study would help in the improvement of the educational sector as well as to promote Nursing Informatics [A] and Epidemiology not only as a basic subject but a key to nursing education as well [15]. Furthering the data mining technique would help a lot by using classification and clustering technique of data mining process would help predict future performance of students' and with that addressing their needs before an exam would improve their performance in the future and the quality of education in the College as well [16]. Using data mining in education may provide us with more varied and significant findings that would lead to an improved quality education [17]. The result of the study would be a useful element in the promotion of quality education in the College [14][15][18].

As College of Nursing students of Tobruk University performed generally well in their academic subjects, a fruitful observation that students were suited up to the advancement of technology in the future generation may be seen. Further study was needed to address factors that may affect the result [15] [18]. More study population across more school years will verify results further. The TUCON-GSv2 can generate helpful data and turn it into meaningful data in promoting even a simple educational data mining for the improvement of quality education in the College [14]. Advance data mining approach with proper elements involved would further improve data result transformation and the research as a whole [18].

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