Relationship between Gender and Performance with Respect to a Basic Math Skills Quiz in Statistics Courses in Lebanon

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Abstract—The present research investigated whether gender differences affect performance in a simple math quiz in statistics course. Participants of this study comprised a sample of 567 statistics students in two different universities in Lebanon. Data were collected through a simple math quiz. Analysis of quantitative data indicated that there wasn't a significant difference in math performance between males and females. The results suggest that improvements in student performance may depend on improved mastery of basic algebra especially for females. The implications of these findings and further recommendations were discussed.

Keywords—Gender, education, math, statistics.

I. INTRODUCTION

RESEARCH on gender-related differences and affective variables in mathematics education has been conducted from a variety of perspectives. Several authors studied the role of gender on students' performance in math; some research found that the sex difference in learning strategies accounted for girls' edge over boys in terms of grades as mentioned [1], [2]. No differences were detected between females and males in the combined percentage completing advanced mathematics courses [3]. Moreover, studies didn't support the commonly held view that men and women experience teaching and learning activities differently based on gender [4]. On the other hand, some research claimed that male and female differ in terms of mathematics activities that required complex reasoning [5].

This study explores the relationship of gender with student performance on a simple math quiz in statistics courses. The math quiz prepared and tested by Ballard and Johnson, in 2004, included the ability of students to calculate the slope of a line, the area of a triangle or to divide by a fraction. The quiz was administrated in two universities during the third week in statistics course. Students were enrolled in their first semester, so they didn't have the opportunity to take any remedial math courses.

The results were surprising because it revealed that even basic math skills weren't mastered by college students regardless of the gender, and sex didn't have a significant influence on their performance. These results suggest that student should master the basic math skills in order to succeed regardless of gender. Moreover, there wasn't any significance

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difference regarding performance in this simple math quiz in terms of gender.

II. LITERATURE

Gender was the factor analyzed in this study as predictor of mathematics achievement. Several studies have long investigated more factors as predictors of mathematics achievement but gender was the most issue studied in terms of mathematics achievement. A study reveals that females tend to achieve better in computation as [6]. Males do better in problem solving [7] and there is no gender difference in the understanding of mathematics concepts. According to the third international mathematics and science study, males and females' results on mathematics scores are closed to each other at the primary and middle school years [8]. But gender differs in the final year of secondary school. Therefore it is very important for researchers to pay attention to gender issues since it has impact on achievement in mathematics. Some studies found a difference where girls focus more on learning and mastery than do boys [9]-[11]. However, no differences are significant in some studies as [8], [9]. In terms of disruptive behavior, boys are less compliant with teachers 'requests than are girls [12], [13]; boys also engage in more disruptive behavior, such as talking to others or annoying the teacher, in the classroom [14]-[16]. Moreover, some research has shown that boys are more concerned than girls with how smart relative to others they appear to classmates as evidenced by their endorsement of performance goals [17]-[19].

III. METHODOLOGY AND RESULTS

The central goal of this research was to examine whether there is a difference in terms of grades on a simple math quiz between males and females in their first semester in statistics courses. The data was collected in the first week of the statistics course in two different universities located in Lebanon, 567 students were enrolled in their first statistics course and they were told that the grades of the quiz will be counted so they will be interested on achieving well, the decision was left to individual instructors, some of them counted the test as a quiz and others used the grades for helping the students in the final exam. The answers for each student on each question of the basic skills test were recorded into a spreadsheet. The test was not returned to the students.

While this study used more students than the study done by Ballard and Johnson who wrote the math quiz, it was also

simpler in that it did not consider as many predictors as their study. Only the gender was used in order to test its impact on the achievement in the quiz. Not many explanatory variables were used in the model of this study as Ballard and Johnson in order to have useful amount of data for teachers with heavy teaching loads.

The independent variable was gender and the dependent variable was the score on the math quiz. The analysis was done using a t- test for difference in means and the results appeared to have a slightly difference in means between males and females but not statistically significant. Males' grades were slightly higher than females but not significant to report a great difference. The variability of the data was slightly higher for males than females and this was due to the difference in means. Moreover when the results were analyzed in terms of the two section of the test; algebra and geometry, a small difference appeared in favor of males. The questions of algebra are higher than the questions in geometry, algebra questions are about fractions and geometry are about coordinate system. The results are shown in Table I.

TABLE I
DIFFERENCES IN MEANS

	Gender	Mean	Std Deviation
Correct answers	male	9.406	3.3025
	female	9.271	3.3731
Algebra	male	7.14	2.719
	female	7.06	2.744
Geometry	male	2.27	1.135
	female	2.21	1.156

The statistical method is a simple linear regression using the model Y= $\alpha + \beta x$ where Y is the dependent variable: test score and X is the independent variable gender, the statistical software revealed no significance relationship between gender and the math test score, the non-significance is proved by the value of p-value = 0.578 < 0.05. The coefficient beta gives a negative value, which means a negative relationship between gender and scores. Table II summarizes the results.

TABLE II
REGRESSION TEST

Model	BETA	t	Sig.
Constant		25.036	0.00
Gender	-.020	0.556	0.578

a. Dependent Variable: Correct answers

The non-significance difference between male and female appears in a box-plot figure in figure1 the mean lines are approximately the same and no outliers appeared in the figure, it reflects how the results between males and females were very close to each other's, and emphasis the assumption that there was no significance difference between males and females in terms of their ability to achieve on a simple math quiz in their first semester.

When looking at the figures representing the results when testing the correct answers separated by geometry and algebra,

it was clear that a difference exists in the results between males and females in the algebra section, the mean average of males still slightly higher than females, but several grades of females were very low, which reflect the weaknesses of females in the algebra section in math, even in very easy algebra questions. This result appears as outliers in the bottom of the box of the females grades. These results did not appear in the geometry part of the quiz, where the slight difference between males and females appeared as the results of the whole quiz. Figs. 2 and 3 summarize this result.
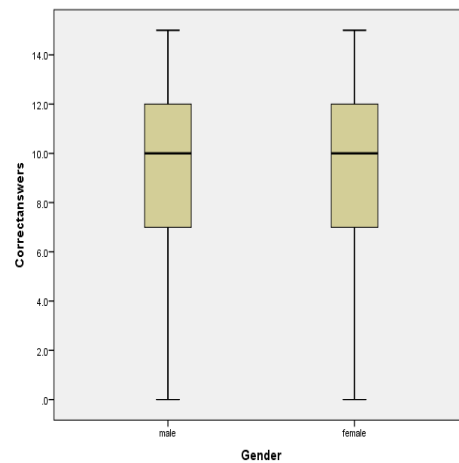

Fig. 1 Box plot of the difference in means of the correct answers of the quiz between males and females
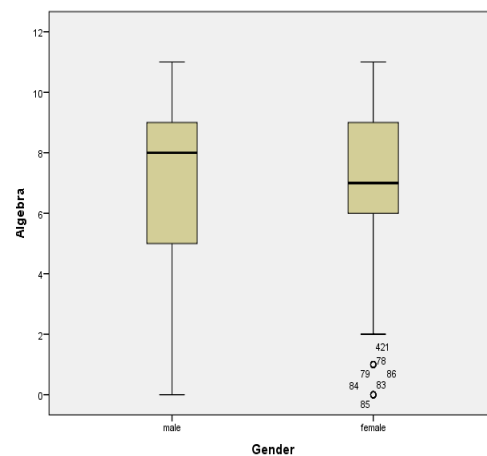

Fig. 2 Box plot of the difference in means of the correct answers of Algebra section in the quiz between males and females

IV. DISCUSSION

Several studies showed that girls outperform boys in terms of their grades in all subject areas as [20]-[24]. However, other studies showed no significance difference in terms of performance. To explore more on this issue, the current research focused on gender differences in terms of math quiz.

The results of this study have given us valuable information about the impact of gender on math performance. The study showed that gender has no significance on math performance

in the test done by Ballard and Johnson [25]. Moreover, the data for this study show very few statistically significant gender differences for the 567 students in the statistics course in their first semester. As noted, there were only a slightly difference in the results in favor of males, this could be due to the enrolment of the students in the university where it was their first semester and males usually think that math is their field. Another factor could be the reason behind the slight higher means in favor of males, there were in their first semester and in this university, students can change their major after the first semester, so it could be the reason of the higher results of males in the two sections. A surprising results appear in terms of the low grades of these students on a simple math quiz, this identify the high needs of help in math for students.
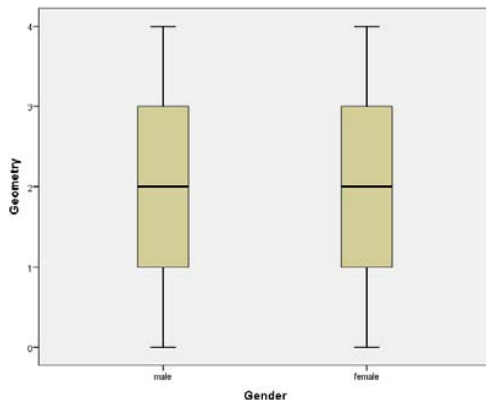

Fig. 3 Box plot of the difference in means of the correct answers of Geometry section in the quiz between males and females

APPENDIX

The math quiz done by Ballard and Johnson [25].

Mathematics Quiz

Answer the following mathematics questions to the best of your ability. Please do not use a calculator; you have 20 minutes to complete this Quiz, **No Need** for justification.

1. Solve the following system of equations for the pair($x; y$):

$$x = y - 6$$
$$y = 10 + 3x$$

(a) (-6, 0) (b) (-2, 4) (c) (2,-4) (d) (0, 10) (e) (-6, 0)

2. Find the value of x :

$$\frac{5}{2x-3} = \frac{3}{x+5}$$

(a) 43 (b) 34 (c) 34/11 (d) 11/34 (e) none of the above

3. Suppose that $x = \frac{a}{b}$. Then if $x = 4$ and $a = 8$, solve for b.

(a) 1 (b) 2 (c) 32 (d) 4 (e) 1/2

4. Perform the following division: $x = \dfrac{\frac{1}{2}}{\frac{2}{3}}$

(a) 3 (b) 3/2 (c) 3/4 (d) 4/3 (e) 1/3

5. Find the value of : $\sqrt[4]{\sqrt{3^{12}}} - \sqrt{27}$

(a) 0 (b) $\sqrt{27}$ (c) $\sqrt{3^{12}}$ (d) $\sqrt{12}$ (e) 27

6. Simplify : $\left(\left(\frac{16}{9} \right)^4 \right)^{\frac{1}{8}}$

(a) $\frac{3}{4}$ (b) $\frac{4}{3}$ (c) $\frac{16}{9}$ (d) $\frac{2}{3}$ (e) $\frac{3}{2}$
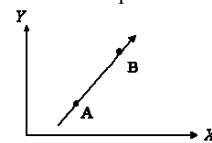
7. Find the area of the triangle drawn below.

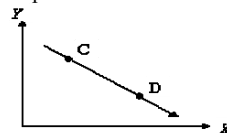The lengths of sides are: a = 6, b = 4 and c = 4. The area of the triangle is:

(a) 3 (b) 4 (c) $\sqrt{7}$ (d) $3\sqrt{7}$ (e) $\sqrt{52}$

8. The coordinates of point A are (1, 2) and the coordinates of point B are (2, 4). Find the slope of the line.

(a) 1/2 (b) 1 (c) -1 (d) 2 (e) -2

9. The coordinates of point C is (1, 4) and the coordinates of point D is (5, 2). Find the slope of the line.

(a) 1/2 (b) -1/2 (c) 2 (d) -2 (e) 5/4

10. Suppose you want to carpet a rectangular room that is 3 m by 6m. Carpet costs $10 per square meter. How much does it cost to carpet the room?

(a) $1800 (b) $180 (c) $450 (d) $90 (e) $9

11. The fraction 13/38 is approximately

(a) 0.15 (b) 0.25 (c) 0.35 (d) 0.45 (e) 0.55

12. The square root of 100,000 is about

(a) 30 (b) 100 (c) 300 (d) 1,000 (e) 3,000

13. In a group of 900 voters, two-thirds said they would vote for a specific person in the race for deputy. How <u>many</u> of the 900 voters said they would vote for the deputy?

(a) 200 (b) 300 (c) 330 (d) 600 (e) 660

14. In 2005, a total of 3,000 students were enrolled at LIU University. In 2006, the corresponding figure was 3300. What is the percent increase in the number of students from 2005 to 2006?

(a) 1% (b) 3% (c) 10% (d) 30% (e) 33%

15. What is 80% of 60?

(a) 24 (b) 36 (c) 40 (d) 48 (e) 50

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