

The Effect of Gender on University Students' School Performance: The Case of the National School of Agriculture in Meknes, Morocco

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Abstract. *Throughout our experience as teachers, we feel intrigued by the observation of changes that have occurred in relation to gender in terms of number and performance. However, this observation needs to be confirmed by studies and scientific results in order to avoid prejudice. This paper investigates the number of girls enrolled in the School of Agriculture compared with the number of boys since the establishment of the school. The study also explores gender differences in their academic achievement. The data used include exam scores of students at the National School of Agriculture in Meknes from 2008 to 2015. The scores will be considered according to the independent variables, namely subjects, the graduating classes and gender. Subjects are classified into three main categories: scientific subjects (mathematics and statistics), technical subjects (agronomy and animal care), and language subjects (English and French). The analysis results showed a noticeable increase in the number of girls compared to boys. Moreover, girls proved to be more likely to perform better than boys in different subjects.*

Keywords: *gender, academic achievement, scientific subjects, university.*

Introduction

Academic achievement or performance in different subjects has always been an issue of great concern to students, teachers, parents, and specialists in education as well. Many reasons are behind the desire to achieve academic performance. Some students, for example, seek self-satisfaction or want to demonstrate their competences while others try to attain high academic achievement to satisfy their parents or teachers by showing them that they are making efforts and working hard (O'Reilly, McNamara 2007). In the same way, parents

desire and encourage their children to aspire to outstanding academic achievement while teachers adopt different strategies to ensure effective teaching and learning so that their students get good grades and perform well.

As a matter of fact, there are many factors which contribute to high or low academic achievement of students. These factors include, among others, the role of the students, teachers, family, society, the school environment, and the educational system. Another factor that is assumed to have a considerable effect on students' academic performance is gender. Indeed, differences in how both males and females perform academically have been noticed but need scientific confirmation. Hence, the present paper attempts to study academic performance in relation to gender. First, the concept of academic achievement will be clarified according to the scholarly literature. Then some studies, which have dealt with academic achievement in relation to gender, will be described.

The present study aims at exploring the change in gender disparity at the university level in terms of number and performance during the past few years. For this purpose, we will use the official data from the web site of the Ministry of Higher Education from 2009 to 2015 in order to highlight gender differences and dominance in academic ranks among teachers in the Moroccan higher education system. In the same way, data from the National Agriculture School of Meknes (a school of limited access) will be used to show gender discrepancies in academic performance among students.

Academic achievement

The literature defines achievement in many ways. Simpson and Weiner (1991), for example, defined achievement as attained success in any act while Hornby (2006) viewed it as the ability of an individual to reach a set goal through effort, skill or courage. In fact, academic achievement is the outcome of a good education and indicates how well a student or class of students is doing academically (Ali 2013).

In the same vein, Ganai and Muhammad (2013) defined academic achievement as knowledge attaining ability or degree of competence in school tasks usually measured by standardized tests and expressed in a grade or unit based on pupils' performance. Academic achievement is commonly measured by continuous assessment and examinations. It is, actually, the results of these examinations that have been used for the purpose of the present research.

It is worth mentioning that students' academic achievement is affected by a host of factors. Among these are factors classified by Ocho (2005) as

student factors, teacher factors, environmental factors, and economic factors. First, academic achievement is generally affected by students' personal characteristics, namely their conscientiousness, personal efforts and motivation in addition to their intellectual abilities, learning strategies and awareness of academic goals. Moreover, family support, social economic background, family income, parents' education, family participation and involvement and siblings in school have also a considerable effect on the academic success or failure of students (Abubakar, Bada 2012; Boujut, Bruchon-Schweitzer 2007; Majzub, Rais 2010). Additional factors according to Khurshid (2014) involve institutional support, institutional environment, effective teachers, teachers' expectations and behaviors, quality of lecturers and their instructional strategies, and class size.

A determinant element that is closely related to all the previous factors and that is discussed in the present study is gender. The gender gap in academic achievement is an important issue to explore as it is an significant aspect of educational inequality.

Gender and academic achievement

Many studies on gender discrepancies (e.g. Hyde, Fennema, Lamon 1990; Kahle 2004; Chang 2008; Lai 2010; Abubakar, Bada 2012; Eze, Ezenwafor, Obi 2015) focused on differences in performance related to different science subjects. There are many different points of view, a fact which makes it a contested area (Kahle 2004; Penner 2008; Guo, Tsang, Ding 2010). Some of these studies have shown significant gender achievement gaps, with boys generally outperforming girls in Math and Science (O'Reilly, McNamara 2007; Penner 2008; Else-Quest, Hyde, Linn 2010) and girls excelling at literacy subjects. Others noted that these differences were not consistent. Ajai and Imoko (2015) undertook a study to assess gender differences in mathematics achievement and retention. The study proved that male and female students did not significantly differ in achievement and retention scores, which showed that they are capable of competing in mathematics.

Likewise, Voyer and Voyer (2014) conducted a research from 1914 through 2011 using a meta-analytic model and found out a small but significant female advantage that was largest for language courses and smallest for math and science. In this vein, Voyer and Voyer (2014, 1174) stated, "Although gender differences follow essentially stereotypical patterns on achievement tests, for whatever reasons, females generally have the advantage on school marks regardless of the material." This implies that in spite of the stereotypical belief that boys perform better than girls in tests as far

as logical reasoning is concerned, we, as educators, observe a tendency from the part of females to excel in scientific subjects which require logic and reasoning. In fact, our study intends to confirm the extent to which this observation can be valid.

The gender gap in academic achievement has been extensively examined in the U.S. and many other Western countries, yet virtually no rigorous studies of the gender achievement gap have been conducted in developing countries because of the limited availability of these countries' secondary education data.

Therefore, the present study is an attempt to show gender differences in academic achievement. It is worth noting that the paper does not aim to reinforce these gender differences but rather to explore them in order to find out major problems and obstacles that both males and females face to eventually reach gender equality.

Methodology

The quantitative data used was based on two separate sources. First, the official data from the website of the Ministry of Higher Education from 2009 to 2015 were used; we limited our analysis to teachers and university graduates' frequency. Second, we also used data from the National Agriculture School of Meknes (ENAM); they consist of the historical frequency of graduates as well as scores of all modules of the third year from 2009 to 2015 to check if there is any possible difference in academic achievement between males and females.

Accordingly, two subjects were chosen from each field of study: Statistics and Computing Science representing Science, Fertilization and Animal feeding for agricultural subjects, and Sociology and English for Human Sciences and Language.

To make some results more noticeable, appropriate charts were adopted, and descriptive statistics were produced. Then a two-factor ANOVA was performed to deepen the understanding of the effect of gender on students' achievement over the years. Finally, some correlations were calculated to model the students' final results obtained for each subject.

Results and discussion

Ministry

The most important results are related to the exclusion of girls as elaborated by the UNESCO on its official website. In 1970, Morocco was ranked

among countries where the exclusion of girls represented more than 30%, which is somehow congruent with the girls' conditions at that time. This position did not change until 2000 when we moved to the group between 20 and 30%. Then, immediately in 2002, a notable change took place with the percentage dropping between 10 and 20%. The last shift occurred in 2010 to less than 10%. It is worth noting that, although it is slow, there is a change in the way governments deal with the issue of gender in education.

A direct consequence of this historical exclusion of girls is the number of graduates and teachers in the Higher Education System. Indeed, based on the official website of the Ministry, men completely dominate all ranks of Higher Education teachers (Figure 1a) with about 80% of males and only 20% of females in the university lecturer grade "PES". Yet, when analysing the trend separately, some increase in female representation and a relative decrease in male percentage over the last years could be noticed (figure 1c and 1d). A similar pattern is observed for the other ranks namely associated professor "PH" and Assistant Professor (figure 1b).

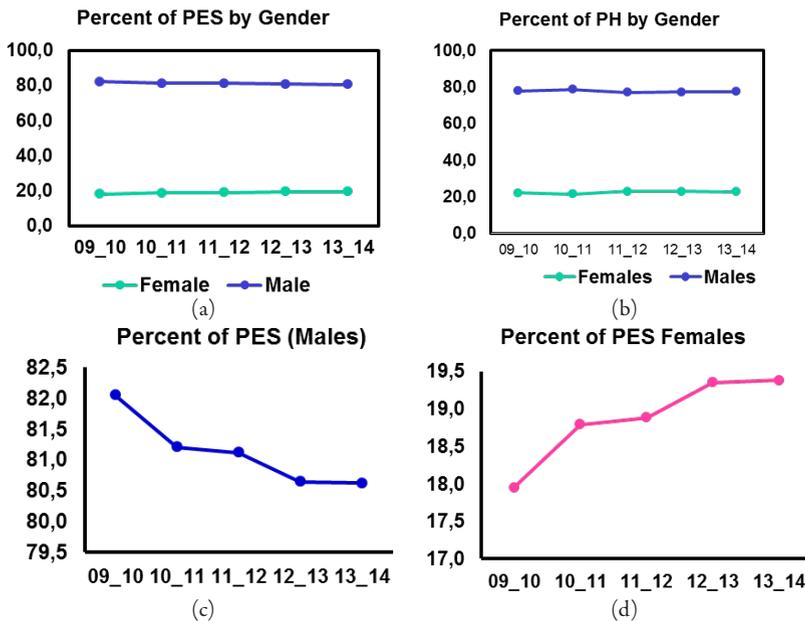


FIGURE 1. PERCENTAGE OF MALES AND FEMALES IN TEACHING GRADES FROM 2009 AND 2014. (A) PES, (B) PH, (C) PES MALES AND (D) PES FEMALES

This unbalanced situation, as mentioned above, can have an important impact on the percentage of female entrance to universities and their progress

in this system. There are some ratios elaborated in order to evaluate the female entrance to universities. At the national level, it seems that both males and females have the same chance at the undergraduate level. However, when it comes to post-graduates, males are more privileged than girls with a difference of 20% that was reduced to less than 10% in 2014 (figure 2).

This national gap changes according to the university and the field of study. For example, for Law and Economics college and Arts and Humanities school, the percentage of females is greater than that of males at the undergraduate level and the percentages change in favor of males for graduate students. It is also apparent that the gap is different from one year to another. On the other hand, for Science, there are more males than females both in undergraduate and postgraduate levels; this gap became smaller in 2014. It should be noted here that the same trend is observed for engineering schools.

Overall, for all fields, the gap is narrowing and a conclusion could be drawn that in the near future, there will be no difference in male and female numbers of students if not the opposite (dominance of females in all fields).

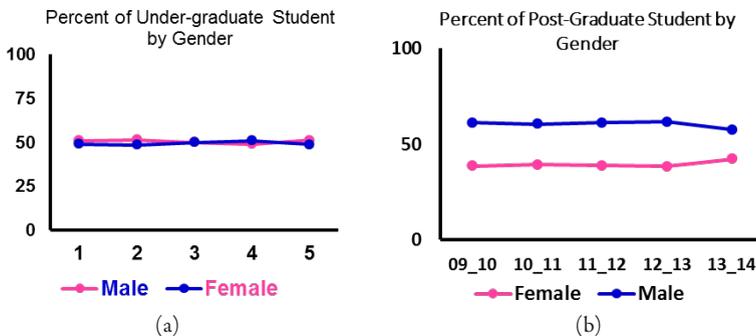


FIGURE 2. PERCENTAGE OF (A) UNDERGRADUATE AND (B) POSTGRADUATE STUDENTS BY GENDER

National School of Agriculture (ENA)

The present study focuses on ENA, Meknes. It is one of the engineering schools that has long been contributing in providing experts in agricultural engineering since 1942. The school has gone through stages as far as gender enrollment is concerned (Figure 3).

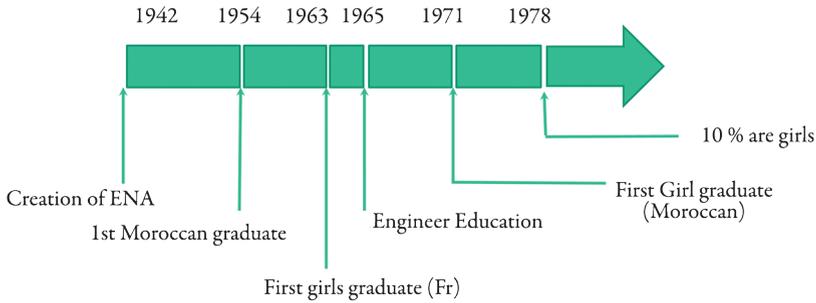


FIGURE 3. THE MOST IMPORTANT MILESTONES OF ENA SINCE ITS CREATION IN 1942.

As figure 4 shows, the percentage of girls has changed over time since the creation of the school. In fact, in the first years, registration was dominated by male students while girls entrance to the school was very slow. However, starting from 1984, the number of girls increased drastically. On the other hand, the number of male students decreased proportionally. Interestingly, in 1996, this growth was even revolutionary as the number of females surpassed the numbers of males. Indeed, many reasons could explain this change, which can be the subject of a future study. The present paper, however, deals with differences in students' academic achievement in terms of their gender.

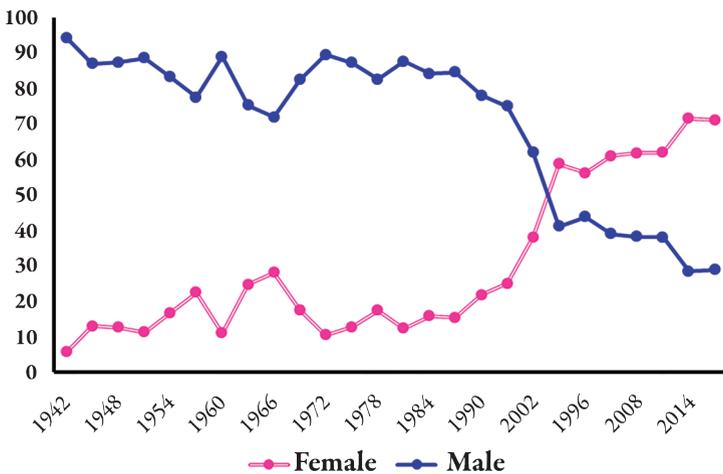


FIGURE 4. PERCENTAGE OF ENAM GRADUATES BY GENDER FROM 1942 TO 2015

To verify the extent to which males and females differ in academic achievement in ENAM, the method of ANOVA (Analysis of the Variance) was used to determine whether the means are statistically different. Indeed, the scores means could be affected, in this study, by two factors, years and gender. Based on p -values, the findings revealed that for the Final Results of the Year (FRY) and means of all subjects, there was no interaction between years and gender. This implies that if there are any differences between males and females, they remain the same for all the years and the gap between boys and girls does not change significantly from one year to another.

As far as the FRY is concerned and as shown in figure 5, females undeniably outperform males for all the years of the present study. This gap varies from 1.14 in 2014 to 1.5 in 2011. There are also differences over the years and the highest grades were obtained in 2014 (13.7) and the lowest ones in 2010 (12.7). Although the range is small, it is statistically significant due to the small values of standard-deviation which indicates that grades are somehow homogeneous.

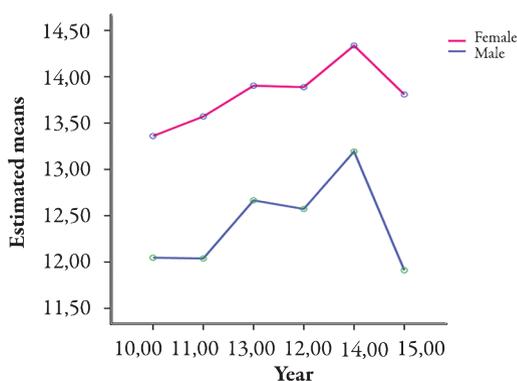


FIGURE 5. MALES AND FEMALES' FINAL RESULTS OF THE YEAR FROM 2010 TO 2015

Concerning thereabouts that are indicated in the literature as female fields, namely sociology and English, gender effect was evaluated. For sociology, ANOVA results indicate that there is no interaction between years and gender and no effect of years; in other words, the level of students doesn't change over the years. Yet, the performance of males and females is statistically different in favor of girls. Similarly, a high gender gap of 2.3 was reached in 2015 for the English subject (figure 6) although, unlike in Sociology, both males and females performed better in English over the observed years with a mean of 15.8 compared to 10.9 for sociology.

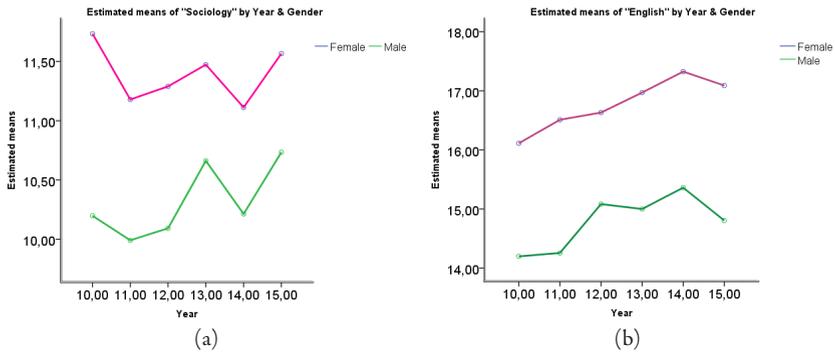


FIGURE 6. MALES AND FEMALES AVERAGE SCORES OF (A) SOCIOLOGY AND (B) ENGLISH FROM 2010 TO 2015.

As mentioned in some previous studies (O'Reilly, McNamara 2007; Penner 2008), girls are expected to achieve higher grades in human sciences and language. In order to explore whether girls maintain this advantage, a study of technical and scientific subjects is performed.

The ANOVA results presented in figure 7a show that, although the gap is smaller for technical subjects embodied here by Fertilization and does not exceed 1.6, females obtained better grades than males. More importantly, females largely dominate scientific subjects with a significant difference that can reach 3.3 and which doesn't go below 1.5 as illustrated in figure 7b.

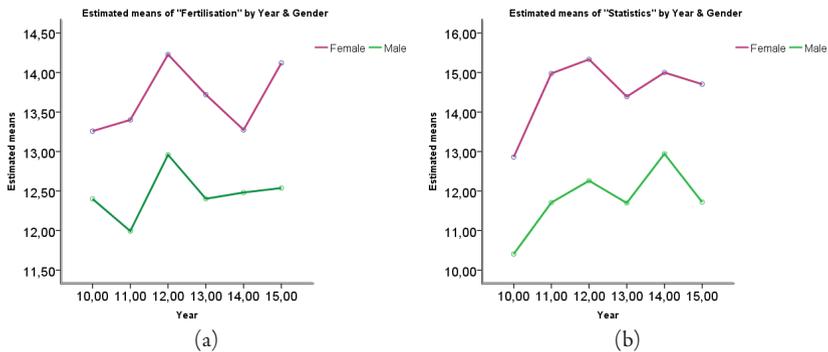


FIGURE 7. MALES AND FEMALES' AVERAGE SCORES OF (A) FERTILIZATION AND (B) STATISTICS FROM 2010 TO 2015

Finally, to check whether there is a relationship between variables, simple bivariate correlations were calculated for all students, and then separately for males and females. Correlation is a coefficient that varies between -1 and +1. A correlation of 1 or -1 means that the relationship is perfect and

the closer is the coefficient to 1 or -1, the better is the relationship while a correlation near to 0 implies a poor relationship. In addition, a positive correlation implies an increasing relationship while a negative coefficient indicates a decreasing relationship.

All correlations are positive, which means that good students are generally good in all subjects and the weak ones have poor achievement in all subjects. English and sociology are the less correlated (0.27) followed by Statistics and Sociology (0.37) whereas Fertilization and Computing are the most correlated (0.58).

The final results of the year are well correlated to all grades of subjects but with different levels. The highest correlation is observed with statistics (0.77) while the lowest one is for English (0.57). The same results are obtained when males and females are analyzed separately.

Conclusion

The present study was an attempt to explore students' performance in different subjects according to their gender. It was found that female academic achievement is changing in terms of number and performance. In fact, as it has been observed in the data used, female students nowadays not only outnumber male students but also get better grades in all the categories of subjects. This implies that the stereotype of categorizing subjects as female or male ones should no longer be accepted. In other words, the gender variable should no more consist an obstacle or hindrance in learning or teaching school subjects.

However, these interesting results should be enhanced by other studies in order to seek explanations behind good females' achievement. For this reason, research in the environment of larger classes and other institutions is necessary to confirm the obtained results.

Moreover, these findings, which are in favor of females, push us to ask questions about the performance of males. Therefore, more research should be oriented towards boys' tendency to lag behind in order to discover the reasons why girls tend to perform better than boys.

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Received 10-08-2017

Accepted 01-05-2018

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Lyties poveikis universiteto studentų pasiekimams: Nacionalinės žemės ūkio mokyklos Maroke, Mekneso mieste, atvejis

Santrauka

Mūsų, kaip dėstytojų, patirtis liudija, kad vyksta studentų skaičiaus ir pasiekimų pokyčiai, susiję su lytimi. Tačiau norint išvengti nepagrįstų apibendrinimų, turi būti remiamasi moksliniais tyrimais ir studijomis. Šiame straipsnyje aptariama, kiek merginų, lyginant su vaikinais, studijuoja Maroke, Mekneso mieste, esančioje Nacionalinėje žemės ūkio mokykloje, nuo pat šios mokyklos įkūrimo. Remiantis šitos mokyklos studentų egzaminų, laikytų nuo 2008 m. iki 2015 m., įvertinimais, tyrime taip pat gilinamasi į tai, kaip lyčių skirtumai veikia akademinis pasiekimus. Šie įvertinimai analizuojami, atsižvelgiant į nepriklausomus kintamuosius, tokius, kaip studijų dalykai, baigimo metai ir lytis. Studijų dalykai skirstomi į tris pagrindines kategorijas: mokslinius dalykus (matematiką ir statistiką), techninius dalykus (agronomiją ir gyvulininkystę) ir kalbos dalykus (anglų ir prancūzų kalbas). Tyrimo rezultatai rodo, kad į šią aukštąją mokyklą įstoja žymiai daugiau merginų negu vaikinių. Be to, atlikta analizė liudija, jog merginų akademiniai pasiekimai yra aukštesni nei vaikinių skirtingose srityse.

Reikšminiai žodžiai: lytis, akademiniai pasiekimai, studijų dalykai, universitetas.