

Assessment of gender differences in secondary school achievement among Moroccan students

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ABSTRACT

In Morocco, as in many other countries of North Africa and Middle East, access to education has improved during the last few decades, and gender gaps in secondary school enrolment have already disappeared. In addition, there is increasing evidence that girls have been outperforming boys in education during the last decade. The aim of this study was to assess the gender differences in three Moroccan high schools. Data was collected, in August–October 2022, from the results of 2022 Morocco's Baccalaureate exam which refers to the secondary school graduation examinations. We have analyzed the general baccalaureate grades of all students from three establishments. The sample of three options (experimental sciences, literature and Human sciences, and mathematic) was categorized by gender into male and female. To assess the gender difference, a Mann–Whitney test was used. Results have showed that there was an increase in the number of girls compared to boys at the three studied high schools, and that girls have proved to outperform boys in the two options of experimental sciences as well as in literature and human sciences streams. On the contrary, although the number of boys exceeds that of girls for the mathematics option, they both score identical results in the subject. This difference between male and female students, which favors girls over boys, has been discussed in the light of numerous scientific studies.

Keywords: Academic achievement, Education, Gender difference, High schools, Morocco, Morocco's Baccalaureate exam.

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Highlights of this paper

- This study is the first academic research aiming to evaluate the gender differences in secondary school achievement in Morocco.
- There was an increase in the number of girls compared to boys at the three studied high schools, and that girls proved to outperform boys in the two options of experimental sciences and of the literature and human sciences.
- Educated women are empowered to take a greater economic role in their families and countries, but the decrease in the academic results of boys is considered a major problem for families and society.

1. INTRODUCTION

Gender differences have been the subject of several studies for more than a century. Numerous researchers have tried to find out and explain the main factors behind these gender discrepancies and designed the major theories to tackle it. Among these theories, we can mention evolutionary theories, cognitive social learning theory, sociocultural theory, and expectancy-value theory (Bey, Ulbricht, & Person, 2019; Hyde, 2014; Miller, 2016; Sigmon, Stanton, & Snyder, 1995; Sork, 1997). In the field of education, countless studies and researches have aimed to explain the gender differences in schools and universities. Although the gender inequalities in education have witnessed a lot of change in recent decades, males and females still play different roles both in school, family and in society. Numerous studies have shown that females have outperformed their male counterparts in some subjects (Gammie, Paver, Gammie, & Duncan, 2003). For example, girls consistently outperform boys on reading comprehension tests (Logan & Johnston, 2010) in mathematics (Felson & Trudeau, 1991) as well as on a paired-associates word-learning task (Kaushanskaya, Gross, & Buac, 2013). Another study has reported that although females access university with lower scores, they excel in their studies and outperform their male counterparts (Dayioglu & Türüt-Asik, 2007). However, many studies have reported that the magnitude of the gender difference has declined over the years and declared that gender differences are negligible in some subjects such as in mathematics performance (Hyde, Fennema, & Lamon, 1990).

Although Morocco has gone further in getting a lot of young children into school, there are still major gender differences in rural areas whereas in urban regions, this phenomenon has almost disappeared (Smits & Huisman, 2013). During the last decade, there has been increasing evidence that girls are outperforming boys in education. This is explained by an outstanding increase in the number of girls who perform well compared to boys in different school and university levels (CPGE Higher School Preparatory Classes, 2022; Hdi & Fagroud, 2018; Tawjihnet, 2022). The aim of this study was to assess the gender differences in three Moroccan high schools, in Beni Mellal-Khenifra region. Data was collected, in August-October 2022, from the results of 2022 Morocco's Baccalaureate exam. The population was categorized by gender into male and female and a Mann-Whitney test was used to assess the gender difference in each sample.

2. MATERIALS AND METHOD

The study was conducted in three Moroccan higher schools, in the Beni Mellal-Khenifra region. This region is one of the twelfth regions of Morocco and it is located in the middle of the Kingdom. Data were gathered from the results of 2022 Morocco's Baccalaureate exam of students from three high schools (high school 1, high school 2 and high school 3). We have analyzed the general baccalaureate grades of all students from the three establishments, i.e. a total of 36 classes. Among them, there are 19 classes of experimental science option (14 physics-chemistry classes and 5 life and earth sciences stream classes), 15 of literature and Human sciences option (3 literature classes and 12 Human sciences stream classes) and two classes of mathematic science option. The majority of Moroccan scientific students opt for the options of physics-chemistry rather than life and earth sciences. As for literary students, a big

number of them choose the options of Human sciences. In addition, accessing the mathematic option is restricted to very small number of scientific students who have obtained high marks in mathematics and physics-chemistry during the first-year baccalaureate cycle. Consequently, the number of classes and the number of students in classes of mathematic science, literature and of life and earth sciences classes are lower compared to other options in schools. In addition to the options listed below, there are other options that students can opt for in the secondary cycle, such as technical and professional specialties.

We have chosen to use the general national Baccalaureate grades for this study as it is considered the most important for each student educational career because it is the key which opens new horizons for students to access the most prestigious institutes and universities inside and outside the country. In Morocco, the basic education cycle lasts nine years and is followed by three years of secondary education. The secondary cycle of school studies in Morocco is three years in duration and is open to students who have successfully completed nine years of basic education. All students follow a common curriculum in the first year of secondary school studies (common core) followed by the two-year baccalaureate cycle (first-year baccalaureate cycle and second-year baccalaureate cycle). The overall average of baccalaureate (AB) cycle is the aggregation of the average of the two-year baccalaureate cycle and is calculated as:

$$AB=(NE \times 1/2)+(RE \times 1/4)+(AA \times 1/4)$$

Where AB is the overall average of baccalaureate, NE is the grade obtained in the national exam at the end of second-year baccalaureate cycle, RE is the average of regional exam at the end of the first-year baccalaureate cycle, and AA is the average points of continuous assessment for the second-year baccalaureate cycle. Students are awarded the baccalaureate certificate if they achieve an overall average of 10 or more on a 20-point scale (10/20 is the required secondary school passing grade on the national examination). The sample of each option (experimental sciences, literature and Human sciences, and mathematic) was categorized by gender into male and female. We calculated the frequencies of girls and boys in each sample and a Mann-Whitney test was used to assess the gender difference in each sample. In addition, we calculated the percentages of girls and boys of each option according to five intervals of the baccalaureate averages ($<10,00$); (10,00-11,99); (12,00-13,99); (14,00-15,99); $>16,00$).

3. RESULTS

3.1. Frequency of Girls and Boys per Establishment and per Baccalaureate Cycle Option

We recorded a total of 985 baccalaureate averages of students of the three studied high schools, of these, 514 in the high school 1, 190 in the high school 2 and 281 in the high school 3 Table 1. The analysis of the frequencies of girls and boys for each high school showed that the frequency of girls is much higher than that of boys in the three high schools (Min=56.81% of girls, Max=69.47% of girls, Mean=59.90% of girls) Table 1.

Table 1. Frequency and percent of girls and boys in the three studied high schools in the region of Beni Mellal-Khenifra, Morocco.

Option	High school 1		High school 2		High school 3		Overall	
	Number	Percent %	Number	Percent %	Number	Percent %	Number	Percent %
Female	292	56.81	132	69.47	166	59.07	590	59.90
Male	222	43.19	58	30.53	115	40.93	395	40.10
Total	514	100	190	100	281	100	985	100

Among the 985 students of the three studied high schools, there were 504 students in the experimental science option, 464 of the literature and Human sciences option and 17 of Mathematic sciences option Table 2. We noted that there were only two classes of the mathematic sciences option in the three high schools. The analysis of the

frequencies of girls and boys for each high school showed that the frequency of girls is much higher than that of boys in the experimental sciences and in the literature and Human sciences options (60.13% of girls in experimental sciences; 60.32% of girls in literature and Human sciences), on the contrary, there was only 41.18% of girls in the two classes of mathematic sciences [Table 2](#).

Table 2. Frequency and percent of girls and boys according to the option in the three studied high schools in the region of Beni Mellal-Khenifra, Morocco.

Option	Experimental sciences		Literature and human sciences		Mathematic sciences		Overall	
	Number	Percent %	Number	Percent %	Number	Percent %	Number	Percent %
Female	304	60.32	279	60.13	07	41.18	590	59.90
Male	200	39.68	185	39.87	10	58.82	395	40.10
Total	504	100	464	100	17	100	985	100

3.2. Gender Difference in High School Achievement

The Baccalaureate average mean, standard deviation, minimum, maximum of baccalaureate average, and the statistical test used to investigate gender differences in baccalaureate results of the 984 students according to the option of baccalaureate in the three studied high schools were given in [Table 3](#). Importantly, the commonality that characterizes the scores of the experimental sciences students and those in the literature and human sciences options is manifested in the fact that girls obtained an overall baccalaureate average mean of 11.38 and 11.71 respectively, while boys got only a mean of 10.62 and 10.68 respectively. The statistical test showed that the baccalaureate averages of girls were significantly higher than those of the boys in the experimental sciences as well as the literature and human sciences options [Table 3](#). However, among students of the mathematic sciences option, both girls and boys obtained similar overall baccalaureate average (13.51 for girls and 13.61 for boys), and the statistical test showed that the distribution of baccalaureate averages was not significantly different between boys and girls [Table 3](#).

Table 3. Baccalaureate average mean, standard deviation (SD), minimum, maximum of baccalaureate average, and statistical test used to assess gender differences among students of three baccalaureate options in the three studied high schools.

Option		Mean	N	SD	Min	Max	Statistical test
Experimental sciences option	Girls	11.3810	304	2.31896	4.77	18.31	Mann-whitney U test. n1= 304. n2 = 200. two-tailed P < 0.001)
	Boys	10.6217	200	2.65603	3.81	17.67	
	Total	11.0797	504	2.48366	3.81	18.31	
Literature and human sciences option	Girls	11.7124	278	1.74651	5.78	17.12	Mann-whitney U test. n1= 278. n2 = 185. two-tailed P < 0.001)
	Boys	10.6826	185	1.99196	4.13	17.86	
	Total	11.3010	463	1.91420	4.13	17.86	
Mathematic sciences option	Girls	13.5100	7	1.92717	11.10	15.33	Mann-whitney U test. n1= 7. n2 = 9. two-tailed P > 0.05)
	Boys	13.6110	10	2.6309	10.40	17.08	
	Total	13.5694	17	2.2997	08.77	17.08	

Results of the comparison of percentages of girl and boy students of the experimental sciences option, the literature and human sciences option and mathematic sciences option according to five baccalaureate average intervals were detailed respectively in [Figure 1](#), [Figure 2](#) and [Figure 3](#). Results showed that the number of girls who did not obtain their baccalaureate diploma is lower than that of boys for the all three options ([Figure 1](#), [Figure 2](#), [Figure 3](#)). The percentages of girls enrolled in the experimental sciences option who have obtained their baccalaureate diploma were higher than those of boys regarding the two baccalaureate average intervals of (12.00-13.99) and (14.00-15.99), while these percentages were identical for the intervals of (10.00-11.99) and (>16.00) [Figure 1](#). The percentages of girls of the literature and human sciences option who have obtained their

baccalaureate diploma were higher than those of boys for the baccalaureate average intervals of (12.00-13.99), (14.00-15.99) and (>16.00) , while the percentage of boys was higher than that of girls for the intervals of (10.00-11.99) Figure 2. The percentages of girls in the mathematic sciences option who have obtained their baccalaureate diploma were higher than those of boys for the baccalaureate average intervals of (10.00-11.99) and (14.00-15.99), while the percentage of boys was higher than that of girls for the intervals of (12.00-13.99) and (>16.00) Figure 3.

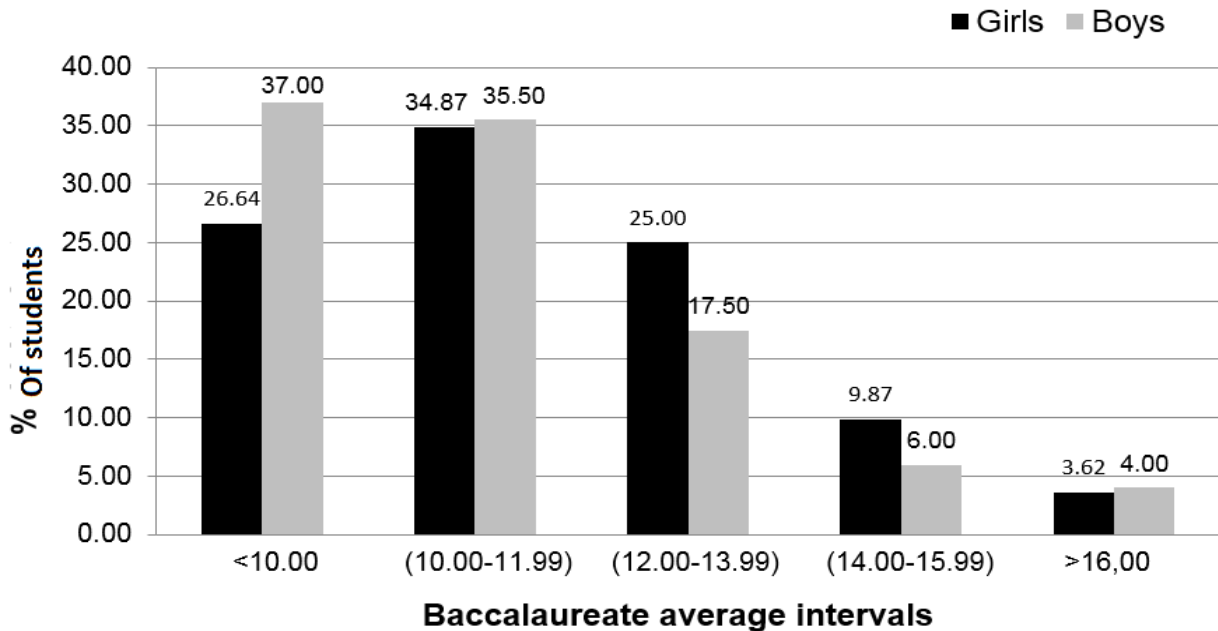


Figure 1. Comparison of percentages of girl and boy students of the option of experimental sciences according to five baccalaureate average intervals.

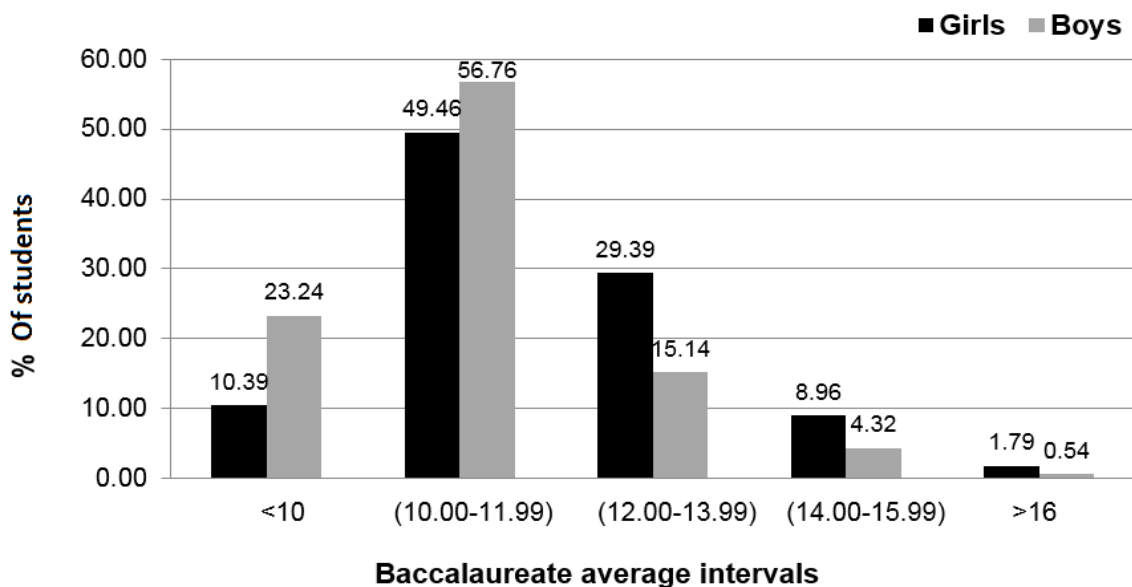


Figure 2. Comparison of percentages of girl and boy students of the option of literature and Human sciences according to five baccalaureate average intervals.

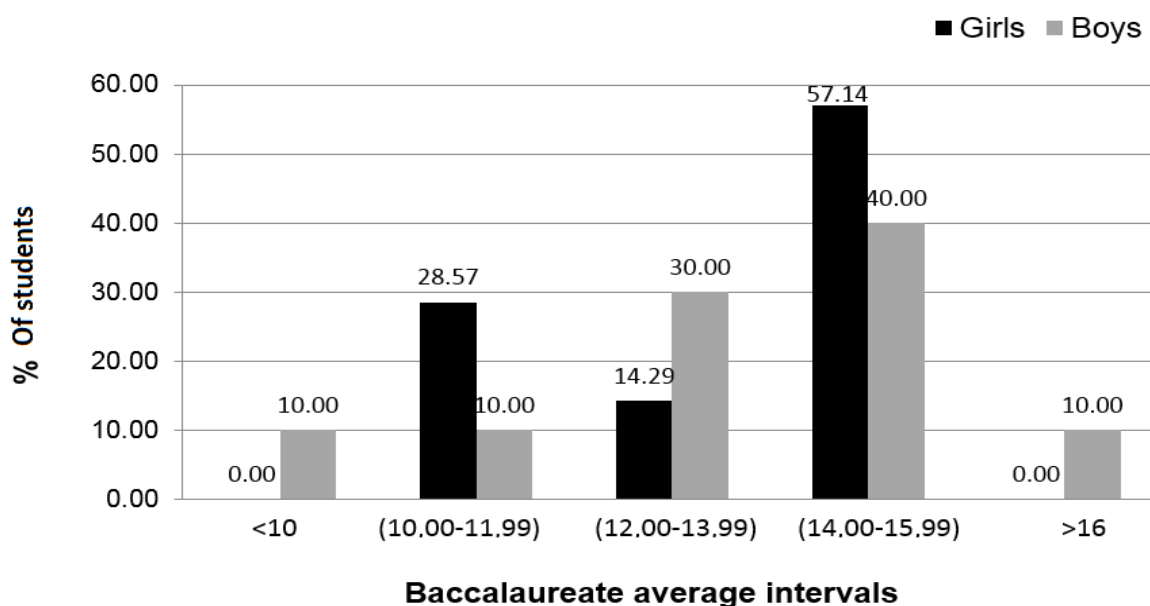


Figure 3. Comparison of percentages of girl and boy students of the option of mathematic sciences according to five baccalaureate average intervals.

4. DISCUSSION AND CONCLUSION

In Morocco, as in many other countries of North Africa and Middle East, access to education has improved during the few last decades, and gender gaps in secondary school enrolment have already disappeared (Roudi-Fahimi & Moghadam, 2006). One study, conducted in Morocco, Algeria, Tunisia and Egypt, reported that that women’s tertiary education is a master-key to economic growth and development accompanied by a healthy and good quality of institutional capital and by eliminating all forms of gender discrimination (El Alaoui, 2016). Our study confirmed that girls were outperforming boys in secondary studies (baccalaureate cycle). Results showed that there was an increase in the number of girls compared to boys at the three studied high schools, and that girls proved to outperform boys in the two options of experimental sciences and of the literature and human sciences. On the contrary, although the number of boys exceeds that of girls for the mathematics option, girls and boys obtain identical results. This is in line with results of other studies and data in Morocco. For example, among the 13 students who scored highest grade in Morocco’s baccalaureate exam, there are 10 of girls in 2022 (Tawjihnet, 2022). Results of another study showed that girls proved to be more likely to perform better than boys in different subjects at the National School of Agriculture in Meknes from 2008 to 2015 (Hdii & Fagroud, 2018). The results of candidates accessing the majority of Moroccan Higher School Preparatory Classes in 2022 showed a dominance of girls in some specialties, especially in physics and chemistry, but there was dominance of boys in some other specialties, especially mathematics (CPGE Higher School Preparatory Classes, 2022).

Educated women are empowered to take a greater economic role in their families and countries. On the other hand, the decrease in the number of males in Moroccan high schools and universities and in their academic results is considered a major problem for families and society. It can affect many economic indicators, such as high male unemployment rates. Hence the importance of discussing the factors responsible for the decrease of the number of male students in high schools and universities and of the decline in their academic results compared to their female counterparts. Since a long time, several studies have investigated the gender difference, and tried to explain the factors responsible for this difference (Cogle & Tasker, 1982; Maccoby & Jacklin, 1987; Mauldin & Meeks, 1990). Available data indicates that several factors may be responsible for the decline in academic results of Moroccan student boys, such as school dropout, intention to migrate abroad; percent of time spent outdoors, excessive new

technologies use. On the other hand, several data showed that there is no difference in many other factors that can affect the gender differences in academic achievement, especially socio-economic factors and factors related to the teaching and education system.

School dropout is a significant education problem in the Moroccan society. The number of students, who drop out of school annually, in the elementary, preparatory, and secondary cycles, exceeds 331 thousand female and male students (Raji, 2022). Several studies showed that girls drop out less than boys except in rural areas (Gueddari, 2015). Intention to migrate abroad is also one of the main factors responsible for the decrease of boy's school results. A recent report of the Moroccan National Observatory for Human Development revealed that seven out of ten young Moroccans have a desire to emigrate, the highest number in the Arab region (UNDP (United Nations Development Programme), 2020). Another report showed that the percent of males who desire to emigrate is higher than that of females (Abou Fghla, 2022).

Available data showed that the amount of time spent outdoors and the excessive new technologies use can affect boy's education results. One study showed that girls, compared to boys, spent very less time outdoors (Klinker, Schipperijn, Kerr, Ersbøll, & Troelsen, 2014). Although being outdoors may have a positive influence on a range of health parameters among children and adolescents (McCurdy, Winterbottom, Mehta, & Roberts, 2010) We believe that the increase in time spent outdoors, especially at night for various activities such as watching football matches in cafes and video game use, may have a negative effect on their education. Several studies showed that boys engaged in more TV watching and video game use compared to girls (Archbell, Coplan, & Rose-Krasnor, 2020; Lou, 2014; Pizarro, Correia, Lopes, Teixeira, & Mota, 2022; Soltero et al., 2021). Several studies reported that boys spend more time on computers, laptops and then girls (Chen et al., 2017; Lee & Kim, 2018). Males spend more time than females on their Smartphone, for social networking sites, instant messaging applications and for leisure and entertainment (Anshari et al., 2016; Weiser, 2000). Smartphone dependence may decrease the vitality and mental health of male adolescents. Excessive Smartphone use can have a serious impact on your overall mental health. Yang, Lin, Huang, and Chang (2018) concluded that Smartphone dependence may decrease the vitality and mental health of male adolescents. The increased Smartphone usage disadvantages also include hindering classroom performance, dropping out of college, and causing anxiety because they have the constant need to have their phone on them at all times (Jesse, 2015).

In the three Moroccan high schools included in the study, there were gender differences in number as well as in academic results, in favor of girls. Similarly, in all the institutions, there was an increase in the number of girls compared to boys. Additionally, girls proved to outperform boys in the major baccalaureate cycle options. In addition to the increase in the number of girls compared to boys in the main post-secondary high school, colleges and institutions in Morocco, girls have also proved to be more likely to perform better than boys in different subjects. Undoubtedly, the increase in women's education quality and level has many benefits for society. But the decrease in male academic achievement is a serious problem for the families and communities. Therefore, it is necessary to carry out other scientific studies on this subject. As part of our current project, we have just initiated other studies on the evolution of numbers of male and female students in several high schools and of their academic results during the last ten years. Moreover, we have started research on the determinant factors for gender differences in Moroccan schools.

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