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**ANALYSIS BETWEEN STUDENTS' GENRE AND THEIR
SCHOOL RESULTS TO REAL DISCIPLINES**

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Abstract

In society, there are preconceived ideas that the girls are not as talented like boys in the area of natural sciences, technologies, engineering and math – STEM education. Despite the fact that girls perform similarly to boys in all countries, there is a tendency to underestimate girls' performance compared to boys. The paper presents the school results of students by real path to the natural sciences, technology, engineering and math disciplines to the moment of graduating. This research aims to analyse, according to the students' gender, the school results to the real disciplines - mathematics, physics, chemistry, biology and informatics. The study was conducted in two stages; the first stage consisted in analysing the results to the STEM disciplines: 60 students in the 9th, 11th and 12th grades, in the years 2015-2016. The study extended to graduates from baccalaureate in 2017, from profile of mathematics-IT and the profile of natural science. The number of students analysed was 400, 200 of those at the top of the rankings and 200 of those promoted in the rank queue, with scores higher than 6. The hypothesis that starts is that the girls have weaker results in the field of accurate sciences. As a result of the study, the hypothesis is denied because more girls obtained good grades compared to boys for the 2017 baccalaureate exam.

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Keywords: Girls, boys, assessment, STEM education, gender differences in education, social perception.



1. Introduction

In society, there are preconceived ideas that the girls are not as talented like boys in the area of STEM sciences. On the other hand, according to the study "Gender Differences and Their Effects on School Outcomes: A Study of the Measures Taken So far and the Current Situation in Europe", conducted by the European Commission through Eurydice, published in 2009, they are small differences between the results in science field and the gender of students. Despite the fact that girls perform similarly to boys in all countries, there is a tendency to underestimate girls' performance compared to boys. As a result, boys will generally choose professions or careers identified as "characteristic to boys," while girls will opt for professions or careers identified as "characteristic to girls". Depending on the subject areas - maths, physics or natural sciences and, depending on the age of students, international student assessment surveys can produce different reports on identified gender profiles. TIMSS studies have often revealed gaps in favour of boys, while PISA reported that there are generally no significant differences between competencies of girls and boys (European Parliament, 2015).

Genders' role is defined as a set of expectations that provide behavioural prescriptions for women and men. The gender stereotype is defined as a set of social or cultural prescriptions of gender roles (Petrovai, & Bursuc, 2004). Also, in the online article "Women in the History of Europe", we find that "There were many pseudoscientific theories which arose which tried to demonstrate the physical or intellectual inferiority of women" (Ballarin, 1996-1998).

Differences in the cognitive abilities of girls and boys explain the different needs in their learning process. Cognitive skills are the set of processes involved in information processing (reasoning, memorization, attention, use of language, etc.). From a classical perspective of cognitive differences between genres, Maccoby and Jacklin (1974) publishes a study-synthesis on research into girls and boys and identifies three cognitive abilities as the differences between them: verbal skills, quantitative abilities and computational (mathematical) and visual-spatial abilities. The research concludes that the boys have mathematical and visual-space skills better than girls and the girls have superior verbal skills.

Verbal and mathematical skills differentiate boys and girls only as further acquisitions and are not prerequisites for starting in individual development. How to use and adequately capitalize on cognitive differences in the learning process can equalize the boys-to-male difference in mathematical and verbal skills (Santrock, 2001).

In the opinions of some researchers (Gurian, 2010; Halpern, 1992, Halpern & Wright 2002), the cognitive aspects that mark gender differences in learning are represented in the following areas: deductive / inductive reasoning, abstract / concrete reasoning, language use, space and movement use), the use of symbolism, the advantages of group learning, self-evaluation of performance or motor skills. In terms of deductive / inductive reasoning, (Gurian, 2010), boys would have a deductive thinking, using the general principle in individual situations, while girls have a kind of inductive thinking; they start from concrete examples, on which they generalize. Similarly, boys would have superior abilities to girls in terms of abstraction, aspect with implications for facilitating the development of math abilities for girls.

Nevertheless, in many countries, boys have a tendency to achieve lower school performance than girls, a trend that is accentuated when students promote in upper secondary education and is less visible in

the lower secondary cycle. Boys are more likely to drop out of school before obtaining a higher secondary education diploma compared to girls (see Figure 01) (EURYDICE, 2009).

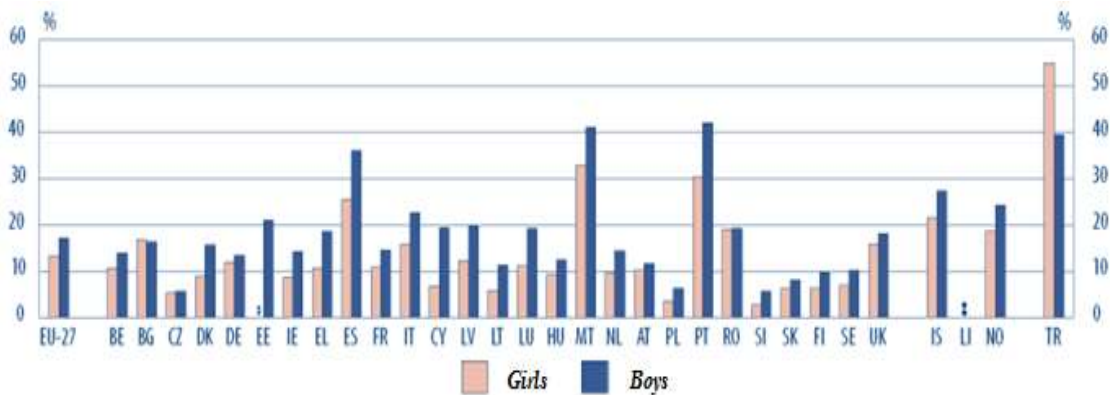


Figure 01. Gender differences and their effects on school results. The young and early school leavers - boys and girls aged 18-24 who have completed lower secondary education and don't intend to pursue the further studies (2007)

It should be underlined that mixed education has a tradition of up to 60 years, and the wide access of girls to education is relatively young (end of 19th century - start of the 20th century)

2. Problem Statement

The study was conducted in two stages; the first stage consisted in analysing the results to the STEM disciplines: 60 students in the 9th, 11th and 12th grades, 20 persons in every classroom, in the school year 2015-2016. The study extended to graduates from baccalaureate in 2017, from profile of mathematics-IT and the profile of natural science. The number of students analysed was 400, 200 of those at the top of the rankings and 200 of those promoted in the rank queue, with scores higher than 6.

The hypothesis that starts is that the girls have weaker results in the field of accurate sciences.

3. Research Questions

The research answers to the question whether boys are better than girls to the real disciplines or not. It should be investigated the social causes that generate the perception that girls are less intellectually endowed to the exact disciplines, how is myth or reality.

4. Purpose of the Study

This research aims to analyse, according to the students' gender, the school results to the real disciplines - mathematics, physics, chemistry, biology and informatics.

5. Research Methods

The research is based to two statistics:

- The first is made with 60 students in a high school, 25 boys and 35 girls, and

- The second use <http://static.bacalaureat.edu.ro/2017/rapoarte/rezultate/index.html>, the official site of Romanian exam of bacalaureate. For the mathematics-computer science and the natural sciences profiles was extracted following data about candidates: gender, county and the passing note the bacalaureate exam

6. Findings

The findings of research are present according to the final marks at the end of the school year 2015 -2016 and the results of bacalaureate exam 2017 for real profile.

6.1. Results and discussion about the final marks at the end of the school year, according to genre

The student outcomes at the end of the school year 2015 – 2016 are presented on figure 01. The results were collected from all boys and all girls from the three classes, mathematics – IT profile. The annual average mark for boys is 8.57, while for girls is 9.19.

Girls' achievements are higher than those of the boys for all considered subject. The difference between girls' and boys' results is 1.27 point to math; 0,64 point to physics; 1.13 to chemistry, 0.87 point to biology and the smaller, 0.39 point to computer science, all in favour of girls. (Figure 02).

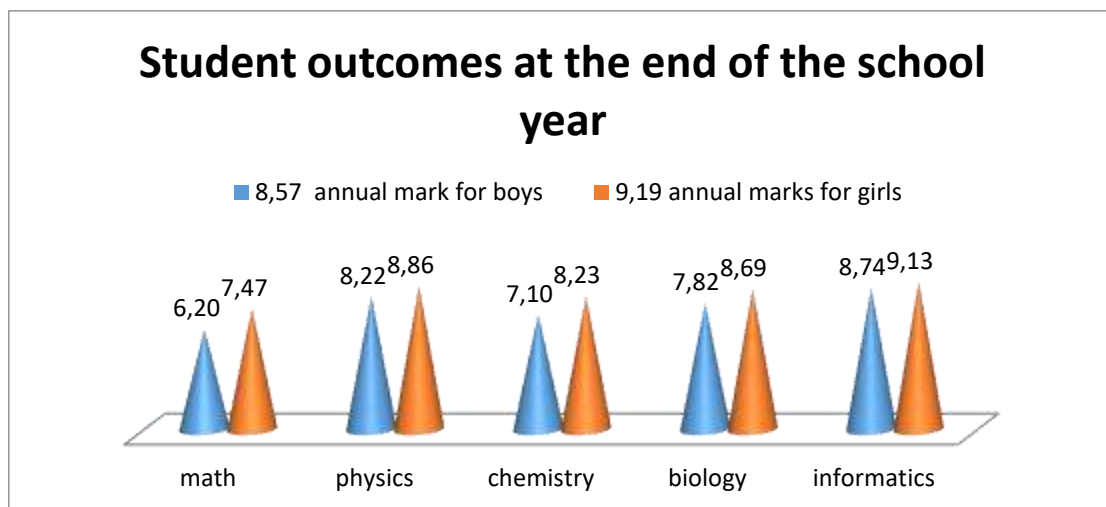


Figure 02. Ranking of students' results to real subjects

6.2. Results of bacalaureate 2017 for real profile, function of gender

It was take into account 400 students, 200 for each category:

- on top of ranking 151 girls and 49 boys, first with marks between 10 and 9.93;
- on down of ranking 66 girls and 134 boys, the last that have passed the exam, with scores ranging from 6.03 to 6.

The distribution by gender is approximatively equal, 183 boys respectively 46% percent and 217 girls, which mean 54% percent.

The distribution by profile, according to table 01 shows that the number of girls is greater than of boys; the lot of students are same 400 considered into research (Table 01).

Table 01. The distribution by gender to the real profile: math-IT and Natural Sciences

Students	Math - IT	Natural Sciences	Total
Girls	33.00%	21.25%	54,25%
Boys	30.75%	15.00%	45,75%

Distribution by gender of the first 200 candidates to the front of list, reveal that 75% are girls and 25% are boys. Distribution of the last 200 candidates to the bottom of ranking, and which passed the baccalaureate exam, show that 33% are girls and 67% are boys. (Figure 03).

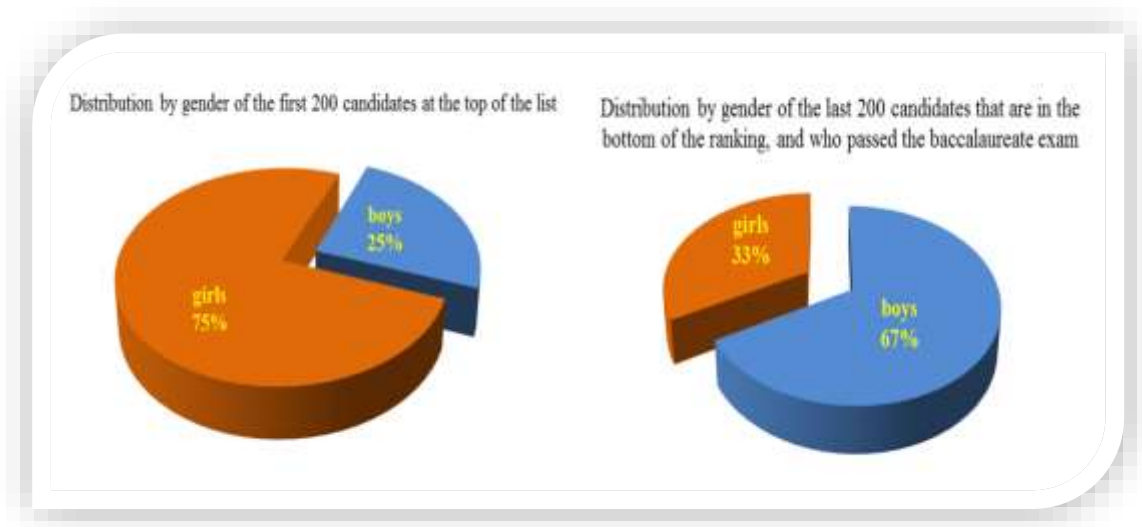


Figure 03. The distribution by gender on top, respectively bottom of ranking, reporting to 200 students

If the research is reported to all 400 students take into account, 218 girls and 182 boys, results show on top 37,75% girls and 12,25% boys; the report are reversed to bottom, where 16,50% are girls and 33,50% are boys. (Figure 04)

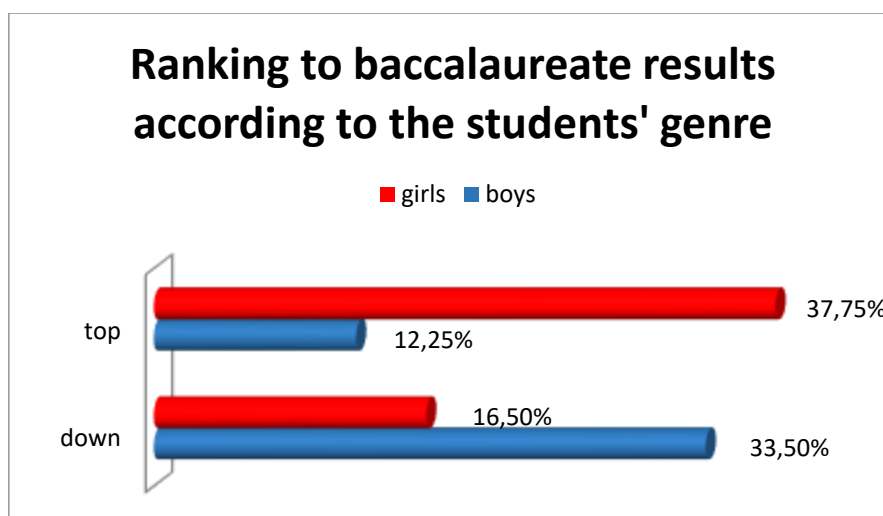


Figure 04. Ranking of students takes into account to research

The average of the results obtained for the 400 candidates is 7.99. The average of girls results is 8.76, while for boys have 7.07.

The results by profile show on top are more girls than boys for both profiles (table 02). It isn't a rule for distribution of notes on baccalaureate exam, both for up list, or for bottom list. On top, more girls obtained 10 to math-IT, while more boys obtained 10 to natural sciences profile. (Figure 05).

Table 02. The distribution on top by gender to the real profile: math-IT and Natural Sciences

Students	Math - IT	Natural Sciences
Girls	71,32%	84,38%
Boys	28,68%	15,63%

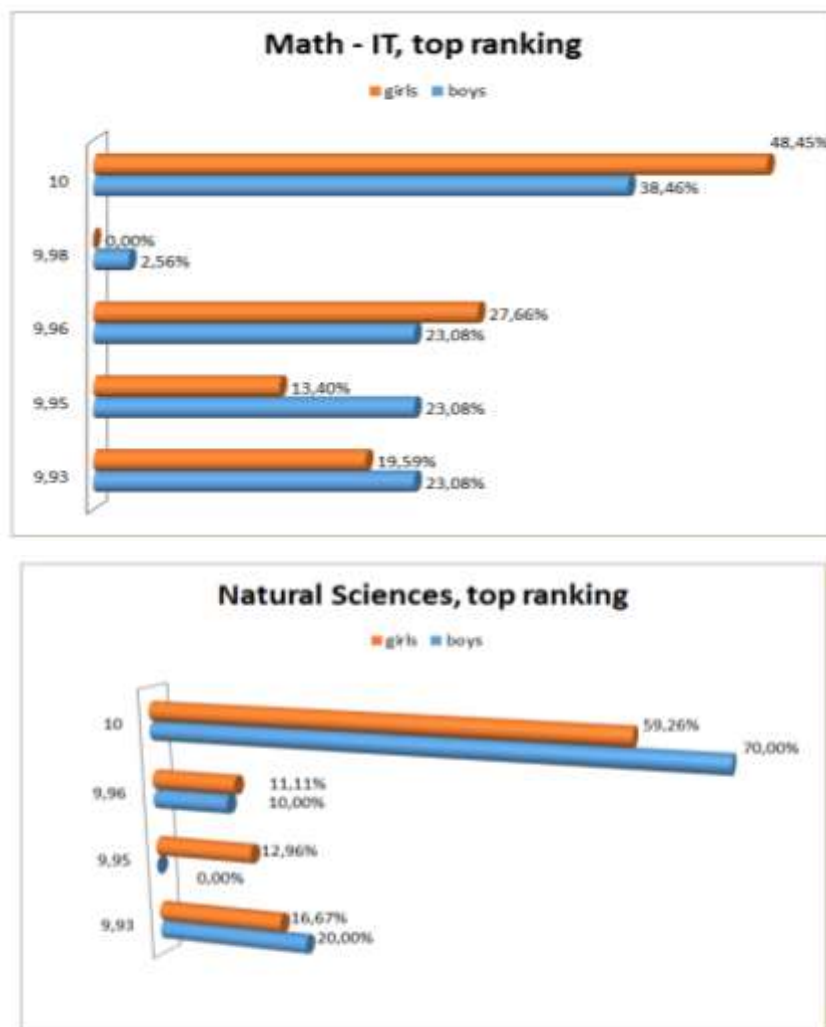


Figure 05. Ranking on top of list, if taking into the notes of students for each profile

On down list of baccalaureate exam are more boys than girls (table 03). Like top list, aren't a rule for distribution of results corroborating with genre (figure 06).

Table 03. The distribution on down by gender to the real profile: math-IT and Natural Sciences

Students	Math - IT	Natural Sciences
Girls	29,17%	38,75%
Boys	70,83%	61,25%

Reporting has been made to the number of girls or boys who have achieved a certain note. Thus, the boys to the Math - IT profile, situated at the bottom of the table have obtained: 21.18% - the note 6.03; 1.18% - the note 6.02-; 38.82% - the note 6.01 and 38.82% - the note 6. To Natural Sciences profile, more girls than boys obtained the note 6 – 48,39% versus 34,69% (Figure 06).

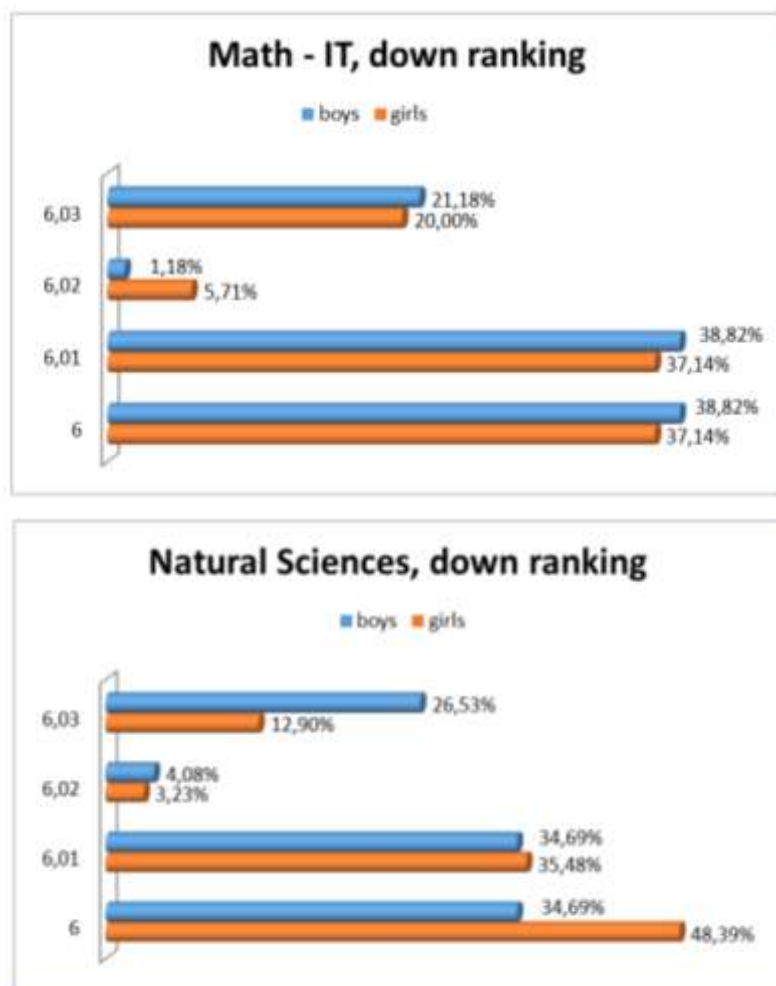


Figure 06. Ranking on bottom of list, if taking into the notes of students for each profile

7. Conclusion

As a result of the study, the hypothesis is denied because more girls obtained good grades compared to boys into both research: the one about the school year 2015 – 2016 and the other on the 2017 baccalaureate exam.

In the school year 2015 – 2016, the boys' achievements are lesser than those of the girls for all considered subject. More that, the annual mark for boys are 8,57 and for girls are 9,19 (figure 02)

The research on the baccalaureate exam in 2017 comes to reinforce the results obtained in the first, meaning that more girls have good results than boys.

The research does not address the cognitive skills of the two categories of subjects, but refer only to their school results.

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