



Subject Choice and Performance in SEC Biology: Patterns According to Gender and School Type in Malta

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Abstract

Malta's educational system has three levels – a six-year primary cycle (ages 5 to 11), five years of secondary school, and tertiary education – and three school types: the state, the Church and the independent schools. The MATSEC Examinations Board of the University of Malta offers circa 40 subjects at the 16+ Secondary Education Certificate (SEC) level and over 30 subjects at the 18+ Intermediate (IM) and Advanced Matriculation (AM) levels. One needs six SEC passes for entry into mainstream Sixth Form, including one of the three sciences. Entry to the University of Malta requires the Matriculation Certificate (MC), comprising two AM and four IM subjects. The MC includes a language, a science subject and a humanistic or commercial subject. Some subjects are taught throughout secondary school while others are optional, starting at Form 3. Integrated Science is taught in Forms 1 and 2, and (at least) one of the science subjects is compulsory as from Form 3. The study traces the number of registrations in the three sciences through the last ten years and investigates the reasons behind subject choice. It compares patterns in subject choice, registration and performance according to gender and school type. The main focus of the study is Biology, leading to a Maltese Biology 'map' within an encompassing science 'map'. This 'snapshot' will be enhanced by stakeholder perceptions of the subject, according to gender and school type.

Keywords: *Subject choice, Performance, Biology, Gender, School type;*

1. Introduction

1.1 Aims of the Research Study

This research study focuses on factors which influence student subject choice, specifically in Biology, at secondary and sixth form levels, as well as performance in the subject. Gender and school type differences in Malta will be discussed.

1.2 Subject Choice in Malta

Students in Malta choose school subjects at the end of Form 2, at 12-13 years of age. Subject choice has to be taken seriously, as it affects future academic life and influences career choice (Ryrie, A. C., 1979). They study these subjects for the subsequent three years, alongside other compulsory subjects.

1.3 Student Performance in Science in Malta in the PISA Results

Some tests are carried out in different countries to monitor student abilities in various subjects. The PISA results, released biannually, show that out of 72 countries in the 2015 survey, 38 countries had a better mean score than Malta, 25 of which being EU countries. The proportion of Maltese students performing at proficiency level 5 or higher (7.7%) was close to the international average (7.8%). The percentage of Maltese students performing below proficiency level 2 (basic level) was much higher, at 14.5%, than the international average (5.5%) (PISA Results, 2015).

1.4 The General Situation at SEC Level

From around 30 in the early 2000s, SEC subjects increased to 39 by 2017. Four subjects are compulsory for sixth form entry: English Language, Maltese, Mathematics, and a science subject. Table 1 portrays SEC registrations from 2008 to 2017 for the three sciences separately, and their total. Figure 1 shows a plot of the registrations for the three sciences at SEC level, per gender per year.



	2008			2009			2010			2011			2012		
	M	F	all	M	F	all	M	F	all	M	F	all	M	F	all
B	580	120	178	522	115	167	473	117	165	473	106	152	471	998	146
C	482	527	1009	458	457	915	398	510	908	398	475	836	366	459	825
P	220	209	429	214	202	416	221	205	426	221	196	404	202	188	391
B+C+P	326	382	708	312	363	675	308	374	682	308	350	640	286	334	620

	2013			2014			2015			2016			2017		
	M	F	all	M	F	all	M	F	all	M	F	all	M	F	all
B	488	104	153	488	102	149	455	944	139	482	986	146	437	862	129
C	372	451	823	372	427	779	349	386	735	349	474	823	329	400	729
P	201	174	376	201	178	374	182	163	345	172	169	342	163	147	310
B+C+P	287	324	612	287	323	602	262	296	558	255	315	571	239	273	513

Table 1. Data for SEC registrations for the science subjects per gender per year, 2008 – 2017

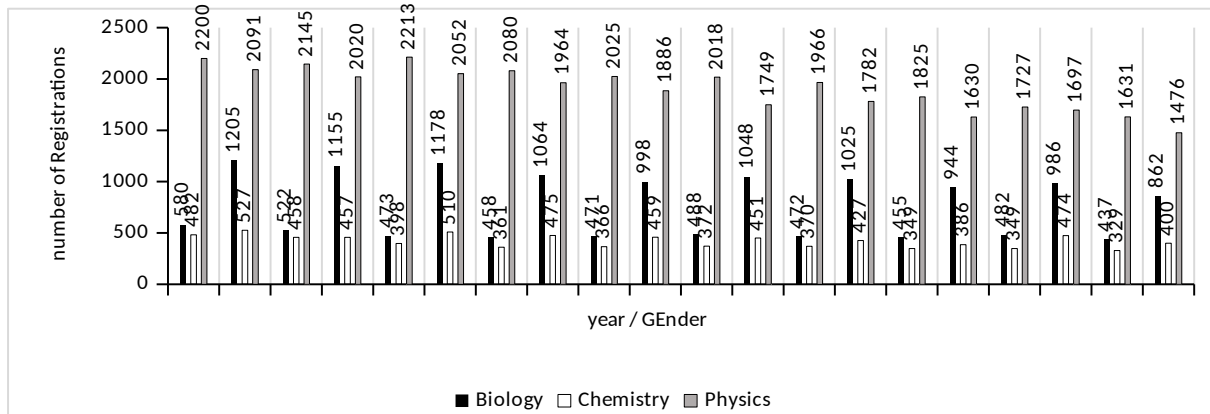


Figure 1. Registrations for Biology, Chemistry and Physics per gender per year, 2008 – 2017

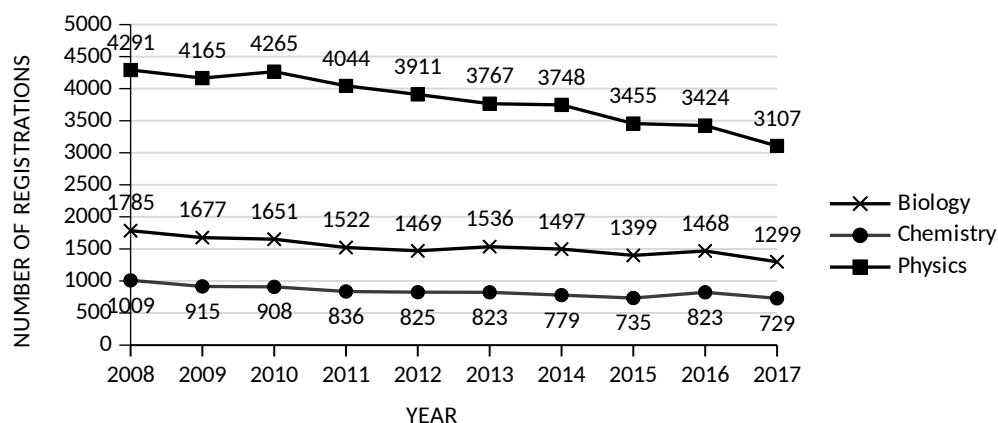


Figure 2. Number of yearly SEC registrations for Biology, Chemistry and Physics, 2008 – 2017

Figure 2 shows the yearly SEC registrations for the three sciences. Chemistry is the least chosen of the three subjects, with Biology at circa twice and Physics at roughly four to five times as much. In percentage terms, they are circa 12%, 25% and 55% of total registrations for Chemistry, Biology and Physics respectively. Gender differences in Chemistry and Physics are not pronounced, but there is



considerable bias in female participation in Biology (Musumeci, 2015; Musumeci, 2018; MATSEC Examinations Board, 2008-2017).



1.5 Subject Choice and Performance in Biology in Malta – Gender Differences

Females tend to opt more for Biology. In 2017, 862 females and 437 males registered for SEC Biology. Considering the choice between Paper IIA (the more difficult version) and Paper IIB, there were no major genders differences: 77.3% males and 74.2% females taking Paper IIA, and 22.7% males and 25.8% females opting for Paper IIB. A distinct difference is that, there were six times as much females as males choosing Biology as their only compulsory science subject (MATSEC Examinations Board, 2017).

There were slight differences in performance between males and females: 16.5% males and 13.9% females getting (the highest) grades 1 or 2; 46.4% males and 48.5% females obtaining grades 3, 4 or 5; and 7.1% males and 7.0% females getting grades 6 or 7. There were 26.8% males and 28.4% females who failed the exam. (MATSEC Examinations Board, 2017).

2. Methodology

Questionnaires were used as research tools. Nearly all questionnaire items were closed questions, i.e. the answer has to fit into a pre-determined category chosen by the respondent (McLeod, 2014). Eight experts – educational officers and teachers with specialisation in Biology – were asked to suggest reasons for choosing or nor choosing Biology at Form 2 and at sixth form. These ‘reasons’ were the basis to construct the student questionnaires.

A total of 300 questionnaires were distributed in six schools: two state schools, two Church schools and two independent schools. In each school type, half the questionnaires were given to Form 2 students and the other half to Form 4 students, and distributed evenly between male and female students. Out of 300 questionnaires, 228 were successfully collected.

3. Analysis of Results

3.1 SEC Biology Subject Choice

Figure 3 portrays the May 2017 registrations for SEC Biology, highlighting the differences between genders and the three school types.

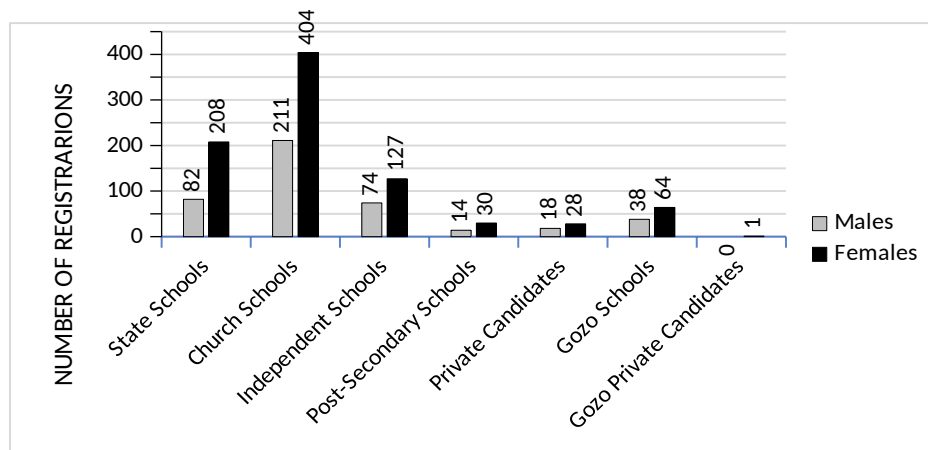


Figure 3. May 2017 Registrations for Biology, per gender and school type

3.2 Reasons for Choosing Biology indicated by the Experts

According to the experts, the top reasons for choosing Biology at Form 2 included:

(i) a positive experience in Integrated Science, and enjoyed the subject; (ii) inspiration from parents and help from guidance teachers; (iii) need for future career options; (iv) a limited option of choices; (v) a positive experience of friends who chose Biology; and (vi) it is a rather easy subject.

The top reasons for choosing Biology at Sixth Form given by the experts were:

(i) did very well in exams and feel confident in the subject; (ii) career choice where Biology is required; (iii) inspired by family, friends or guidance teachers; (iv) need of a science subject, and considering it as a softer option; and (v) a positive experience at secondary level, and enjoyed it.



3.3 Reasons for Not Choosing Biology indicated by the Experts

The experts were also asked to suggest possible reasons for not choosing Biology at Form 2. The top reasons were:

(i) very vast subject requiring a lot of memorisation; (ii) not doing very well in Integrated Science; (iii) interested in a career path not requiring Biology; (iv) a negative experience of friends who chose Biology; (v) do not enjoy topics about plants; and (vi) afraid of blood and disgusted by dissections.

The experts' top reasons for not choosing Biology at Sixth Form were:

(i) not doing very well in annual exams and not feeling confident in the subject; (ii) considering Biology as a very vast subject, with too much to memorise; (iii) guided not to choose Biology by family, friends or guidance teachers; (iv) choosing a career where Biology is not required; and (v) preferring other subjects over Biology.

3.4 Outcomes of the Study

3.4.1 Reasons for Choosing or Not Choosing Biology in Form 2

Almost two thirds (62.5%) of the students that took part in the Form 2 questionnaires wish to choose Biology. The main reasons were their positive experience in Integrated Science, their aspirations for future careers, and inspiration from parents and guidance teachers. These reasons were given high priority across both genders and all school types. A considerably lower percentage, just over a third (37.5%), of the Form 2 sample did not wish to choose Biology. The main reasons for this choice were career aspirations not involving Biology, and Biology being a vast subject requiring memorisation. Once again, high priority was given by both genders and the three school types.

3.4.2 Reasons for Choosing or Not Choosing Biology at Sixth Form

A very high portion of Form 4 students (82.4%) were interested in choosing Biology at Sixth Form. Independent school students were lowest in choice of Biology compared to the other school types. The top reasons for choosing Biology were career aspirations requiring Biology, and a positive experience at secondary level. This was again true for both genders and all three school types. Out of the small percentage (17.6%) of students who did not wish to choose Biology at Sixth Form, the vast majority (78.9%) were from independent school students. The main reason was a career where Biology is not required.

4. Conclusion

This study indicates that there are potentially some issues as regards the science subjects in Malta's educational system. In general, males are less inclined to choose Biology at Form 2, while females tend to choose it more although they show lower performance in the subject. Considering the three school types, Church school students perform best in Science and Biology. Independent school students seem to 'focus' less on Biology, as proportionately not as many students choose it. According to the Form 2 questionnaire data, and considering the school types, independent school students are by far the least likely, at 56.8%, to choose Biology. State schools seem to be somewhat problematic with students wishing to choose Biology, but showing lower levels of performance.

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