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Subject Choice After Having the Three Science Subjects at School: Is It Beneficial?

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Abstract
This study has focused on and compared two different systems that lead to subject choice within Maltese schools: one wherein students are taught all three Science subjects (Biology, Chemistry and Physics) in Form 3 before proceeding with their subject choices, and the other where students make subject choices at the end of Form 2 having prior experience of Integrated Science rather than the three separate Science subjects.
Research was carried out through questionnaires distributed amongst Form 5 students, Science teachers and parents coming from the three school sectors in Malta, in order to investigate perceived benefits, if any. Potential benefits of these two systems of subject choice for Science subjects have also been investigated through the students' performance in their Form 4 school annual examination and prospects in pursuing a Science subject at a higher level.
Results show that even though a clear majority of students, teachers and parents shared the opinion that subject choice at Form 3 is perceived to be more beneficial to students, those students who actually had subject choice at Form 3 did not show any significant distinctions in performance or in their prospects for further study in a Science subject with respect to those who carried out their choices in Form 2. Moreover, they were found to be the ones who would have mostly preferred to change their Science subject choices.

1. Introduction
This research study was aimed to investigate the factors, if any, that influence secondary school students hailing from different school sectors in Malta in their choice of Science subjects which occurs (in the vast majority of schools) in Form 2, and comparing this scenario with that of students where subject choice occurs in Form 3.
The Maltese "*educational system is structured in four stages: Pre-primary (ages three to five), Primary (five to 11), Secondary (11 to 18) and Tertiary education. Attending school is compulsory up to the age of 16.*" (Government of Malta, 2013, para. 17)
In Malta, secondary school students study a vast range of subjects. In Form 1, "*students generally study one foreign language, which may include Arabic, French, German, Italian, Russian and Spanish, according to availability in schools.*" (NCF, 2012, p. 62) Students in Maltese schools make further choices in Form 2, with the exception of two Church schools where students have their subject choice in Form 3. Science is studied by all students in the compulsory (5 – 16) school years. (NCF, 2012)

2. Methodology
This research study was carried out in seven Form 5 classes, from different school sectors in Malta: one each from a boys' Church school, a girls' Church school, a boys' state school, a girls' state school, and two independent (co-educational) schools. In all these schools, subject choice is undertaken in Form 2. A boys' Church school, where subject choice occurs in Form 3, was considered; this school is indicated as CSBF3 in the Tables below.
Questionnaires were answered by students who study at least two Science subjects (from Biology, Chemistry and Physics). Physics was a compulsory subject in all the schools included in this study. Questionnaires were also administered to the Science teachers and the parents of the participating students.

3. Results
Tables 1 and 2 show the sample composition of the participating students and the parents per school sector. In the case of parents, a notable difference can be observed: an overwhelming

female participation at 76.4% as contrasted to 23.6% of males. This indicates that educational matters are usually taken care of by mothers, and this was observed in all school types.

Table 1: Profile of students in the research sample

		Gender of Students		
		Male (47.4%)	Female (52.6%)	Total (100.0%)
School Type	State	2	14	16
	Church	10	9	19
	Independent	10	17	27
	CSBF3	14	–	14
	Total	36	40	76

Table 2: Profile of parents in the research sample

		Gender of Parents		
		Male (23.6%)	Female (76.4%)	Total (100.0%)
School Type	State School Girls	0	13	13
	Church School Girls	2	6	8
	State School Boys	0	2	2
	Church School Boys	4	6	10
	Independent	6	20	26
	CSBF3	5	8	13
	Total	17	55	72

Table 3: The students' Science subject choices

What Science subjects have you chosen?					
			Biology	Chemistry	Physics
School Type	State	Count	16	9	16
		Percentage	39.0%	22.0%	39.0%
	Church	Count	19	17	19
		Percentage	34.5%	30.9%	34.5%
	Independent	Count	24	17	27
		Percentage	35.3%	25.0%	39.7%
	CSBF3	Count	11	14	14
		Percentage	28.2%	35.9%	35.9%
	Total	Count	70	57	76
		Percentage	34.5%	28.1%	37.4%

Table 3 shows that Physics was the most popular Science subject (37.4%) – it being compulsory in all schools involved – followed by Biology (34.5%) and Chemistry (28.1%). Percentages of students studying Physics and Biology in state and Church schools were similar. In the school with subject choice in Form 3, the number of participants studying Physics and Chemistry was identical (35.9%).

When asked about the reasons behind their subject choice, the top three student responses were: (i) related to work you wish to pursue (23.2%), (ii) found Integrated Science interesting (20.7%), and (iii) obtained good grades in Integrated Science (18.1%). The three least popular responses were: (i) influenced by friends (0.7%), (ii) had no choice due to subject choice offers in this school (1.5%), and (iii) influenced by brothers/sisters (2.2%). These results are similar to those by McQuaid and Bond (2004) and Rodeiro (2007), where the main factor behind students' subject choice was the usefulness for future careers.

Only a low number of students indicated their choice as being influenced by other people (teachers, parents, friends). Edwards and Quinter (2011) explain that students are faced with a problem in order to match their abilities and school performance when doing subject choice. Smyth and Darmody (2009) point out that students choose the subjects that they perceive as interesting and useful, and those in which they score higher grades. Edwards and Quinter (2011)

suggest that it could be that schools do not give substantial background and practical occupational opportunities to help students with appropriate career choices.
Cochrane (2007) emphasises that Form 2 students may have doubts about their future career prospects, and thus may find subject choice difficult and confusing. He argues that although most students consider future careers, at age thirteen they are too young to actually have concrete ideas regarding the matter. Furthermore, Santrock (2005) sustains that adolescents can be overwhelmed, and often experience considerable uncertainty, when considering educational and career prospects.
Table 4 shows that 86.8% of respondents indicated that their school provided them with adequate guidance regarding subject choice, with the lowest positive feedback in state schools, at 62.5%. This percentage may be considered relatively low when compared to the data from Church (89.5%) and Independent (96.3%) schools, and the school where choice is at Form 3 (92.9%). Thus guidance in state schools may be improved. This may be due to the fact that Church and independent schools generally have a smaller student population with respect to state schools.

Table 4: Students' responses regarding the guidance provided by school

Do you feel your school provided you with adequate guidance in your choice of optional subjects?				
			Yes	No
School Type	State	Count	10	6
		Percentage	62.5%	37.5%
	Church	Count	17	2
		Percentage	89.5%	10.5%
	Independent	Count	26	1
		Percentage	96.3%	3.7%
	CSBF3	Count	13	1
		Percentage	92.9%	7.1%
	Total	Count	66	10
		Percentage	86.8%	13.2%

Table 5: Students' responses regarding satisfaction with choice of Science subjects

Have your expectations regarding the chosen Science subjects been met?				
			Yes	No
School Type	State	Count	12	3
		Percentage	80.0%	20.0%
	Church	Count	15	4
		Percentage	78.9%	21.1%
	Independent	Count	24	3
		Percentage	88.9%	11.1%
	CSBF3	Count	8	6
		Percentage	57.1%	42.9%
	Total	Count	59	16
		Percentage	78.7%	21.3%

Table 5 shows that the vast majority of participants (78.7%) were satisfied with their choice of Science subjects. Considering the students from the various groups, the percentage ranges from 88.9% in Independent schools to 57.1% for the Form 3 choice students. Interestingly, the most satisfied with their subject choice come from schools where subject choice is in Form 2, as opposed to the lowest (57.1%) for the Form 3 choice group. Although state school students were not so satisfied with the guidance offered by school, their Science subject choices met the expectations of their vast majority (80.0%). Conversely, although practically all respondents (92.9%) in the Form 3 choice group were satisfied with the guidance offered, a relatively low 57.1% were satisfied with their choice.
Table 6 reports that, considering all respondents, the highest number of students who would change their Science subject choice is for Chemistry (38.9%), followed by Physics (33.3%) and Biology (27.8%). In the state schools, the highest number of students wishing a subject change is for Biology (57.1%), followed by Chemistry (42.9%), and no student indicating Physics. As regards

Church school students, the highest percentage wishing a change was in Physics (46.2%), then Chemistry (38.5%) and Biology (15.4%). Independent school students indicated the highest choice for Physics (62.5%), followed by Biology (37.5%) and no change in Chemistry. The students from the Form 3 choice group indicated a significant change for Chemistry (75.0%), with Physics and Biology both at 12.5%. It is clear that, there is no clear pattern that emerged across the different school sector groups.

Table 6: Students' responses on the opportunity of changing a Science subject

If you had the opportunity to change a subject, which subject/s would you change?					
			Biology	Chemistry	Physics
School Type	State	Count	4	3	0
		Percentage	57.1%	42.9%	0.0%
	Church	Count	2	5	6
		Percentage	15.4%	38.5%	46.2%
	Independent	Count	3	0	5
		Percentage	37.5%	0.0%	62.5%
	CSBF3	Count	1	6	1
		Percentage	12.5%	75.0%	12.5%
	Total	Count	10	14	12
		Percentage	27.8%	38.9%	33.3%

Table 7: Students' responses on Science subject choice at Form 3

Do you think that experiencing all subject options at Form 3, before subject choice is done, would help you better in your choice of Science subject/s?					
			Yes	No	Total
School Type	State	Count	13	3	16
		Percentage	81.3%	18.8%	100.0%
	Church	Count	14	5	19
		Percentage	73.7%	26.3%	100.0%
	Independent	Count	16	11	27
		Percentage	59.3%	40.7%	100.0%
	CSBF3	Count	12	2	14
		Percentage	85.7%	14.3%	100.0%
	Total	Count	55	21	76
		Percentage	72.4%	27.6%	100.0%

Table 7 shows that 72.4% of all participants declared that experiencing all subjects in Form 3 prior to actual subject choice enables better subject choice in Science. The highest percentage (85.7%) was for the ones who actually studied the three Sciences in Form 3 before subject choice, with all other groups showing clear majorities: state schools (81.3%), Church schools (73.7%) and independent schools (59.3%). The majority of students (72.4%), teachers (75.6%) and parents (69.0%) believe that having all Science subjects in Form 3 before subject choice would help students in choosing a Science subject better.

Even though the majority of students, teachers and parents indicated that subject choice at Form 3 would be more beneficial, students who actually have subject choice at Form 3 do not show any distinctive differences in either their performance or their prospects of pursuing a Science subject at a higher educational level.

Student responses showed that there was no particular difference between students choosing in Form 3 and the other student groups. The group with subject choice in Form 3 did not show any significant, distinctive differences in their Form 4 annual examination performance. This data indicates that subject choice at Form 3, instead of at Form 2, does not give any particular advantage in the students' performance in the three Science subjects.

4. Conclusion

Considering this study, one understands that although most students, teachers and parents perceive that subject choice at Form 3 (following exposure to the individual subjects) is more

beneficial, those students who actually had subject choice in Form 3 did not show any distinctive differences in their performance or their prospects for further study in a given Science subject. Moreover, such students were found to be the ones who would have mostly preferred to change their Science subject choices.

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