

# The Effect of a Number of SEC Subjects on A-Level Physics in Malta

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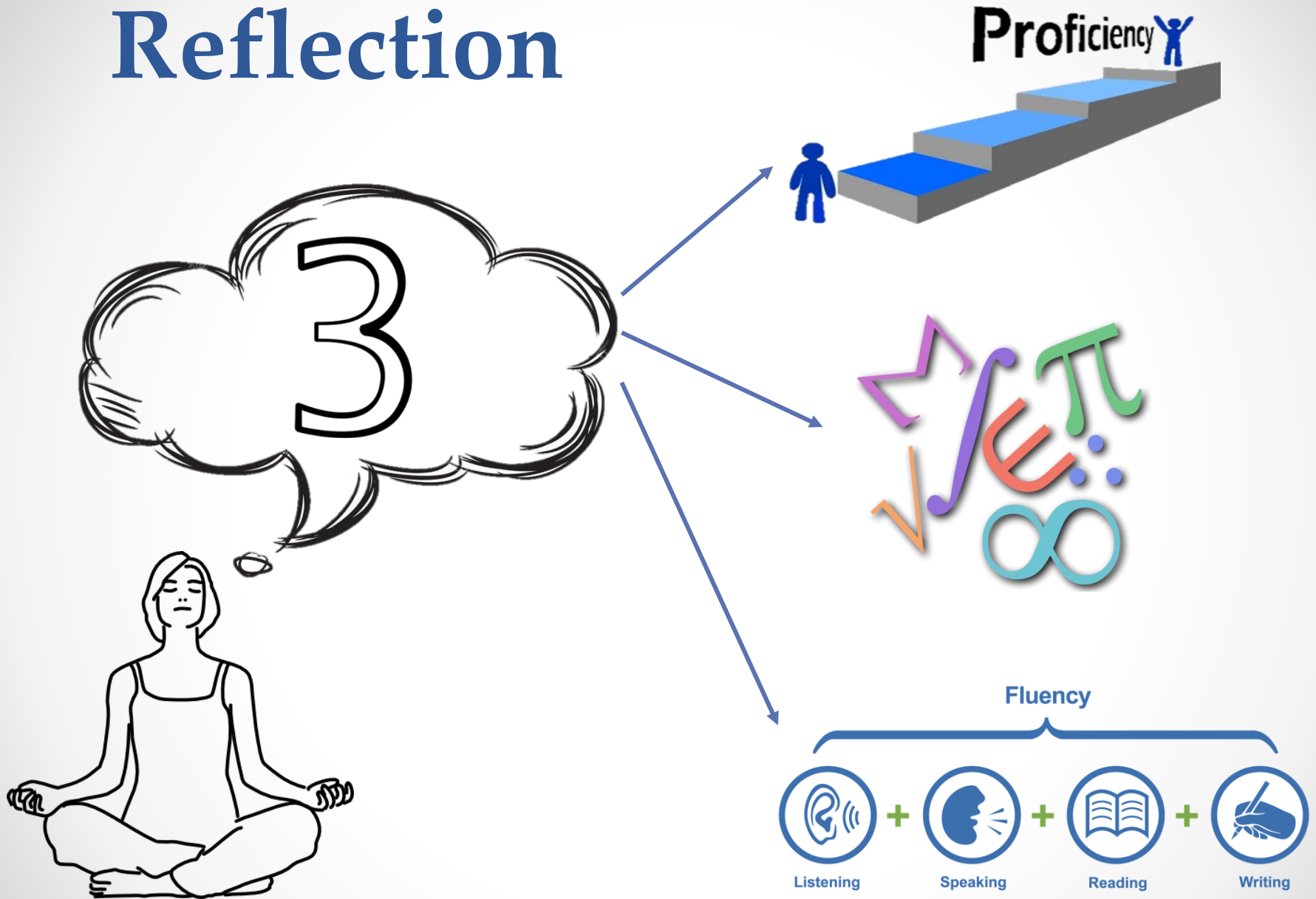
# Interest in the topic?



???



# Reflection



# Aim of the Study



Investigation of:

- i. The changes in the 2012 SEC Physics syllabus (where several LO's were removed and some others were added);
- ii. SEC Physics as a background for A-level Physics;
- iii. SEC Mathematics as a preparation for A-level Physics;
- iv. The correlation of SEC Physics, Mathematics and
  - English Language with A-level Physics
  -

# Methodology

**4 INTERVIEWS**

with SEC level  
teachers



**CORRELATIONAL  
STUDY** between the  
grades in SEC Maths,  
Physics and English  
Language and A-level  
Physics

**165 QUESTIONNAIRES**

to 6<sup>th</sup> Form 2<sup>nd</sup> year  
students

&

**1 FOCUS GROUP** with 6<sup>th</sup>

- Form 2<sup>nd</sup> year students

**16 QUESTIONNAIRES**

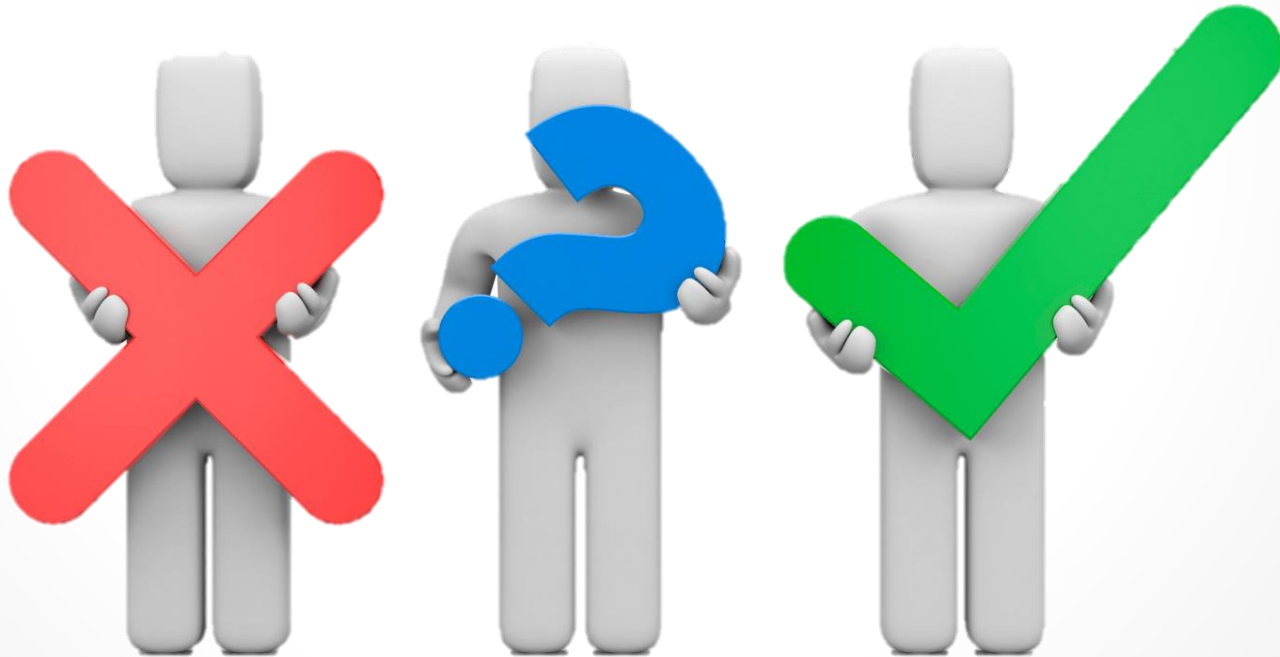
to 6<sup>th</sup> Form 2<sup>nd</sup> year  
teachers

+

**5 INTERVIEWS**

with 6<sup>th</sup> Form 2<sup>nd</sup> year  
teachers

# Results



# Changes in the 2012 SEC Physics syllabus

- How much do you consider the changes in the SEC Physics syllabus to be helpful to you and to the students?

	Helpful	Not so helpful
To teachers	31.3%	68.8%
To students	37.5%	62.5%

- By comparing the students with the ones you used to teach before the 2012 changes, how are your present students being prepared to study A-level Physics?

More Prepared	The Same	Less Prepared
0%	56.3%	43.8%

# Changes in the 2012 SEC Physics syllabus

- The majority of the teachers declared that following the changes, the SEC Physics syllabus lacks the detail to help students in higher order thinking, thus, increasing the gap between SEC and A-level syllabi.
- Is the transition from secondary to post-secondary smooth or challenging for the majority of students?

	Smooth	Challenging
Teachers	18.8%	81.3%
Students	37.0%	63.0%



# Is SEC Physics a Good Foundation for A-level Physics?

- Do you consider that SEC level Physics is a good foundation for A level Physics?

	Very good	Good	Not so good	Not good at all
Teachers	12.5%	37.1%	50.0%	0.0%
Students	15.8%	55.8%	26.1%	2.4%

“Some topics could be delivered better” - Teachers

“The two levels are only slightly different” - Students

# Is SEC Physics a Good Foundation for A-level Physics?

- Do you consider A-level Physics to be:

	A continuation of what you studied in SEC level but harder	Completely different from the SEC level
Teachers	81.3%	18.8%
Students	63.6%	36.4%

# Is SEC Physics a Good Foundation for A-level Physics?

- Are your students' difficulties/ your difficulties in A-level Physics related to:



Teachers' Responses

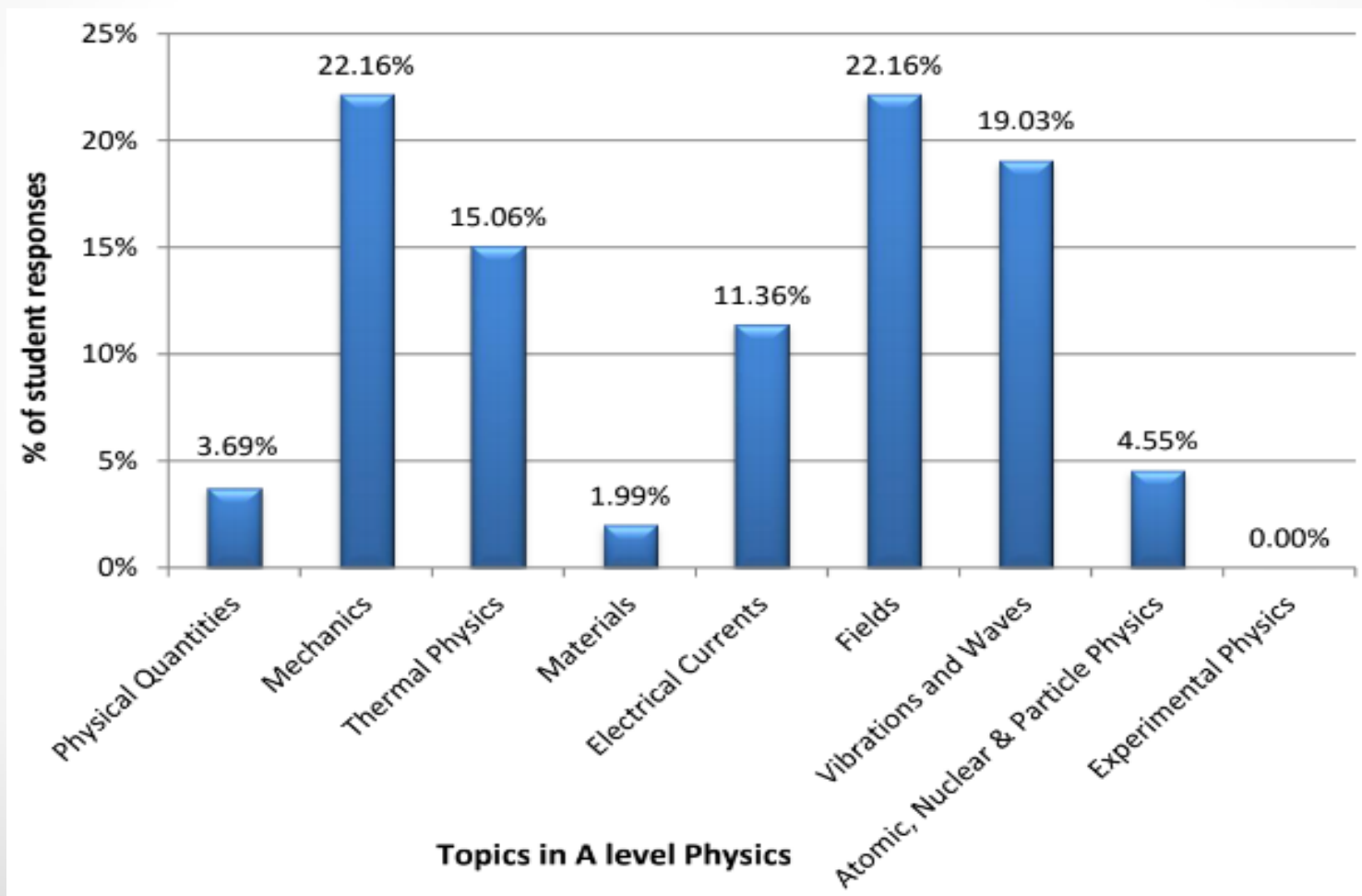
- Discontinuity between what you learnt in SEC and A-level Physics
- Understanding Physics concepts, theories and laws
- Confusion about the meaning of symbols and symbolic equations
- Applying mathematical skills to solve Physics problems
- Language difficulties in expressing oneself properly
- Other



Students' Responses

# Is SEC Physics a Good Foundation for A-level Physics?

- Students' responses with regards to the topics which did not have a good preparation at SEC level



# Is SEC Physics a Good Foundation for A-level Physics?

2015 SEC Physics grades and 2017 A-level Physics grades obtained by the same cohort of students

		Physics A level grade							
		A	B	C	D	E	F	Total	
Physics SEC level grade	1	Count	13	14	18	1	1	0	47
		Percentage	5.2%	5.6%	7.1%	0.4%	0.4%	0.0%	18.7%
	2	Count	6	25	41	18	2	1	93
		Percentage	2.4%	9.9%	16.3%	7.1%	0.8%	0.4%	36.9%
	3	Count	2	12	25	24	13	6	82
		Percentage	0.8%	4.8%	9.9%	9.5%	5.2%	2.4%	32.5%
	4	Count	0	0	5	10	5	4	24
		Percentage	0.0%	0.0%	2.0%	4.0%	2.0%	1.6%	9.5%
	5	Count	0	0	0	0	2	3	5
		Percentage	0.0%	0.0%	0.0%	0.0%	0.8%	1.2%	2.0%
	6, 7 or U	Count	0	0	0	0	0	1	1
		Percentage	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.4%
	Total	Count	21	51	89	53	23	15	252
		Percentage	8.3%	20.2%	35.3%	21.0%	9.1%	6.0%	100.0%

$\chi^2(25) = 133.235, p < 0.001$

# Is SEC Physics a Good Foundation for A-level Physics?

2015 SEC Physics grades and 2017 A-level Physics grades obtained by the same cohort of students

$$\chi^2(25) = 133.235$$

$$p < 0.001$$

		Physics A level grade						Total
		A	B	C	D	E	F	
Physics SEC level grade	1	Count	13	14	1	1	0	47
	Percentage	5.2%	5.2%	0.4%	0.4%	0.0%	18.7%	
2	Count	6	41	18	2	1	93	
	Percentage	2.4%	9.9%	16.3%	7.1%	0.8%	36.9%	
3	Count	2	12	25	24	13	6	82
	Percentage	0.8%	4.8%	9.9%	9.5%	5.2%	2.4%	32.5%
4	Count	0	0	5	10	5	4	24
	Percentage	0.0%	0.0%	2.0%	4.0%	2.0%	1.6%	9.5%
5	Count	0	0	0	0	2	3	5
	Percentage	0.0%	0.0%	0.0%	0.0%	0.8%	1.2%	2.0%
6, 7 or U	Count	0	0	0	0	0	1	1
	Percentage	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.4%
Total	Count	21	51	89	53	23	15	252
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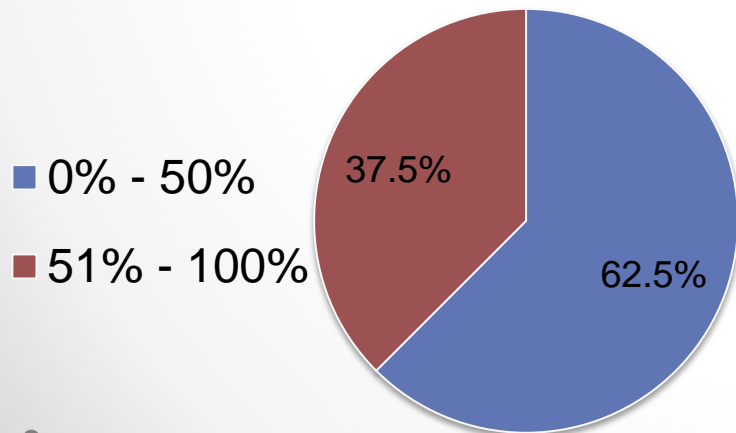
$$\chi^2(25) = 133.235, p < 0.001$$

# Is SEC Mathematics an Adequate Preparation for A-level Physics?

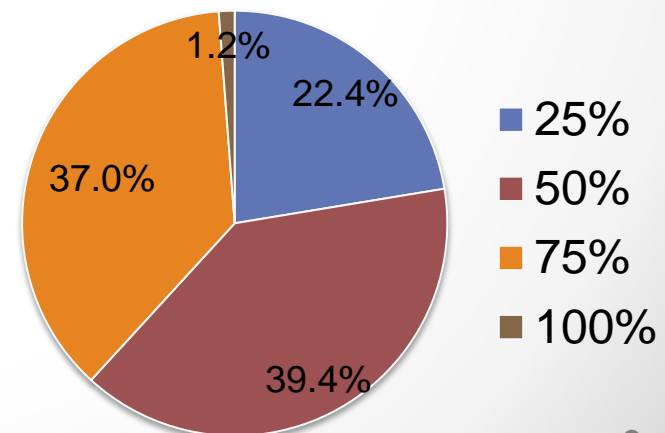
- Are mathematical concepts important for the study of Physics?

	Yes	No
Teachers	100.0%	0.0%
Students	94.5%	5.5%

- Give an estimate of the percentage of the A-level Physics syllabus that requires mathematical skills and knowledge.



Teachers' Responses



Students' Responses

# Is SEC Mathematics an Adequate Preparation for A-level Physics?

2015 SEC Mathematics grades and 2017 A-level Physics grades obtained by the same cohort of students

		Physics A level grade						Total	
		A	B	C	D	E	F		
Mathematics SEC level grade	1	Count	13	22	19	4	1	2	61
		Percentage	5.2%	8.7%	7.5%	1.6%	0.4%	0.8%	24.2%
2		Count	8	15	35	16	4	3	81
		Percentage	3.2%	6.0%	13.9%	6.3%	1.6%	1.2%	32.1%
3		Count	0	10	27	24	9	3	73
		Percentage	0.0%	4.0%	10.7%	9.5%	3.6%	1.2%	29.0%
4		Count	0	2	6	9	4	3	24
		Percentage	0.0%	0.8%	2.4%	3.6%	1.6%	1.2%	9.5%
5		Count	0	2	2	0	5	3	12
		Percentage	0.0%	0.8%	0.8%	0.0%	2.0%	1.2%	4.8%
6, 7 or U		Count	0	0	0	0	0	1	1
		Percentage	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.4%
Total		Count	21	51	89	53	23	15	252
		Percentage	8.3%	20.2%	35.3%	21.0%	9.1%	6.0%	100.0%

$X^2(25) = 101.152, p < 0.001$



# Is SEC Mathematics an Adequate Preparation for A-level Physics?

2015 SEC Mathematics grades and 2017 A-level Physics grades  
 same cohort of students

$$X^2(25) = 101.152,$$

$$p < 0.001$$

		Physics A level grade						Total
		A	B	C	D	E	F	
1	Count	13	22	15	1	1	2	55
	Percentage	5.2%	8.7%	5.9%	0.4%	0.4%	0.8%	24.2%
2	Count	3	35	16	4	3	3	81
	Percentage	3.2%	6.0%	13.9%	6.3%	1.6%	1.2%	32.1%
3	Count	0	10	27	24	9	3	73
	Percentage	0.0%	4.0%	10.7%	9.5%	3.6%	1.2%	29.0%
4	Count	0	2	6	9	4	3	24
	Percentage	0.0%	0.8%	2.4%	3.6%	1.6%	1.2%	9.5%
5	Count	0	2	2	0	5	3	12
	Percentage	0.0%	0.8%	0.8%	0.0%	2.0%	1.2%	4.8%
6, 7 or U	Count	0	0	0	0	0	1	1
	Percentage	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.4%
Total	Count	21	51	89	53	23	15	252
	Percentage	8.3%	20.2%	35.3%	21.0%	9.1%	6.0%	100.0%

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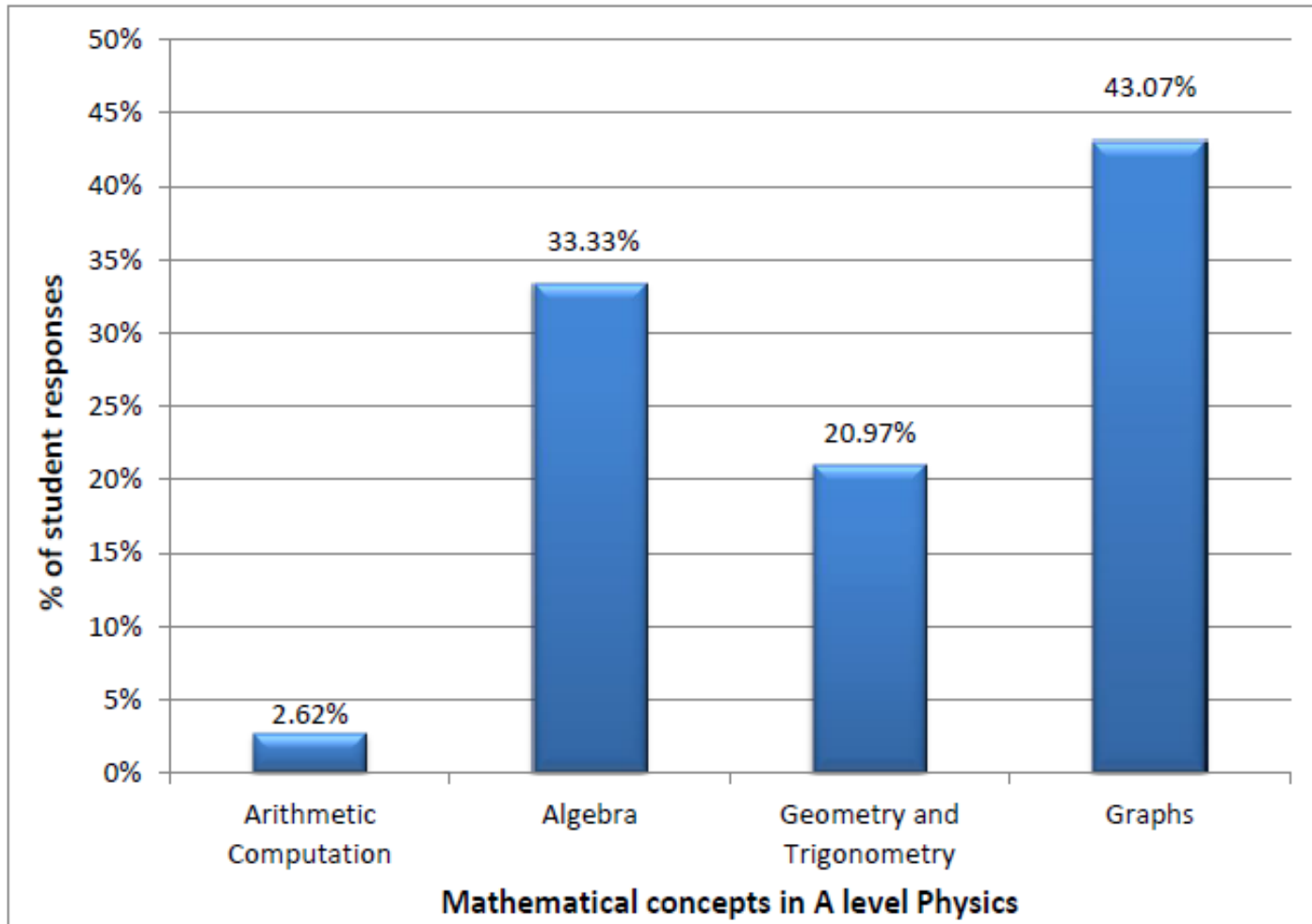
# Is SEC Mathematics an Adequate Preparation for A-level Physics?

- How prepared do you feel to work out A-level Physics problems using knowledge from SEC level Mathematics only?

	Very Well Prepared	Prepared	Not prepared enough
Students	4.2%	37.0%	58.8%

# Is SEC Mathematics an Adequate Preparation for A-level Physics?

The most difficult mathematical topics for A-level Physics students



# Is SEC Mathematics an Adequate Preparation for A-level Physics?

- In your opinion, what is the minimum level of Mathematics a student should have to study A-level Physics?

	SEC level	Intermediate	A-level
Teachers	62.5%	37.5%	0%
Students	24.2%	71.5%	4.2%

During interviews, teachers stated that an **Intermediate level** in Mathematics or a **very good understanding of SEC Mathematics** would be a bonus because it was difficult to teach mathematical concepts too due to time constraints.



# Correlation between SEC English Language and A-level Physics

- 100% of the teachers agreed that English language skills were important to study A-level Physics.
- How do English language skills help in the A-level Physics examination?

	Understanding the concepts of Physics well	Understanding the question properly	Answering clearly by applying English writing skills	Other
Teachers	21.9%	36.6%	31.7%	9.8%
Students	28.1%	39.8%	31.0%	1.16%

# Correlation between SEC English Language and A-level Physics

2015 SEC English Language grades and 2017 A-level Physics grades obtained by the same cohort of students

		Physics A level grade						
		A	B	C	D	E	F	Total
English 1 SEC level grade 1	Count	5	7	6	1	0	0	19
	Percentage	2.0%	2.8%	2.4%	0.4%	0.0%	0.0%	7.5%
2	Count	9	23	31	5	4	3	75
	Percentage	3.6%	9.1%	12.3%	2.0%	1.6%	1.2%	29.8%
3	Count	6	11	27	22	4	3	73
	Percentage	2.4%	4.4%	10.7%	8.7%	1.6%	1.2%	29.0%
4	Count	1	5	15	17	10	5	53
	Percentage	0.4%	2.0%	6.0%	6.7%	4.0%	2.0%	21.0%
5	Count	0	4	9	4	4	4	25
	Percentage	0.0%	1.6%	3.6%	1.6%	1.6%	1.6%	9.9%
6, 7 or U	Count	0	0	1	4	1	1	7
	Percentage	0.0%	0.0%	0.4%	1.6%	0.4%	0.4%	2.8%
Total	Count	21	50	89	53	23	16	252
	Percentage	8.3%	19.8%	35.3%	21.0%	9.1%	6.3%	100.0%

$\chi^2(25) = 67.694, p < 0.001$

# Correlation between SEC English Language and A-level Physics

2015 SEC English Language grades and 2017 A-level Physics grades of the same cohort of students

$$X^2(25) = 67.694$$

$$p < 0.001$$

		Physics A level grade						Total
		A	B	C	D	E	F	
English 1 SEC level grade	Count	5	7	6	0	0	0	19
	Percentage	2.0%	2.8%	2.3%	0.0%	0.0%	0.0%	7.5%
2	Count	9	11	11	5	4	3	75
	Percentage	3.6%	4.1%	12.3%	2.0%	1.6%	1.2%	29.8%
3	Count	6	11	27	22	4	3	73
	Percentage	2.4%	4.4%	10.7%	8.7%	1.6%	1.2%	29.0%
4	Count	1	5	15	17	10	5	53
	Percentage	0.4%	2.0%	6.0%	6.7%	4.0%	2.0%	21.0%
5	Count	0	4	9	4	4	4	25
	Percentage	0.0%	1.6%	3.6%	1.6%	1.6%	1.6%	9.9%
6, 7 or U	Count	0	0	1	4	1	1	7
	Percentage	0.0%	0.0%	0.4%	1.6%	0.4%	0.4%	2.8%
Total	Count	21	50	89	53	23	16	252
	Percentage	8.3%	19.8%	35.3%	21.0%	9.1%	6.3%	100.0%

$$X^2(25) = 67.694, p < 0.001$$

# Correlation Coefficients

Between:

- SEC Physics and A-level Physics  $\rightarrow 0.54$
- SEC Mathematics and A-level Physics  $\rightarrow 0.45$
- SEC English and A-level Physics  $\rightarrow 0.41$



# Conclusion

- ✓ The current SEC Physics syllabus lacks the necessary detail to help students in higher order thinking which is crucial when studying A-level Physics.
- ✓ A good understanding and a good grade in SEC Mathematics is enough to study A-level Physics however students prefer to opt for an Intermediate level in Mathematics.
- ✓ Correlation Coefficients:
  - SEC Physics and A-level Physics  $\rightarrow$  0.54
  - SEC Mathematics and A-level Physics  $\rightarrow$  0.45
  - SEC English and A-level Physics  $\rightarrow$  0.41

Thank you