

# Progress 8 Modelling

A report of the modeling session held at TRGA on Monday 7 November 2016



## Staff

## Objectives

To use mathematical modeling to identify the most advantageous curriculum model(s) for maximising Progress 8  
To interrogate the models to measure the effects of "offers" and potential grade achievement on various cohorts

## Approach

Come at the problem with no preconceived ideas or ethical considerations; we simply want to test curriculum models to see which tend to generate the highest P8 scores for the academy.

## Purpose

The findings of the study will be presented at the Leadership Board Meeting on 18 November. This will open the discussion as to whether the current curriculum models suffice for our cohorts or whether modifications must take place in our current offers and whether these are ethically sound decisions.

## Methodology

1. Discussion of P8 and factors affecting; identification of factors to vary in our models
2. Using existing data sets to generate comparative changes in P8
3. Creation of a virtual school (Wranglers' Academy) in which to modify curriculum offers and measure changes in P8
4. An 8-outcome model was used in the simulations to see significant changes in P8 resulting from curriculum changes; a 9-outcome model would have masked these

## Meetings

7.11.16, 15.11.16 & 16.11.16

## Discussion of P8 limiting factors

We discussed possible interrogations to make of our data sets:

- Curriculum models
- Gender split schools
- Removal of MFL from offer
- Splitting the curriculum to include BTEC / VCert courses
- Removal of students whose history precluded achievement of less than a few low outcomes

Our feeling was that current models allowed us to contain the effect of poor MFL outcomes by having offers that included higher scoring qualifications (e.g. ECDL and Statistics). We could move to an 8-Outcome model that had the advantage of maximising time on that band of subjects and also (if it included MFL) would generate a high EBacc percentage in our headline data (assuming that many students achieved C or B equivalents at GCSE). Our instinct at this point was that MFL would be a limiting factor in such a model and that a nominal MFL entry could be around 35%. Whilst all students could be entered for MFL in Year 9, 65% would not continue in Year 10 and instead switch to an alternative programme (possibly including BTECs).

provided a comprehensive set of curriculum models with proposed time allocations that could be made to work. investigated the P8 scores of various single-sex schools. We felt that in terms of this modelling exercise, it would be impossible to model the effect of moving to single-sex academies because it would be impossible to model any potential uplift in separating genders; we simply have no reference points for this. The academies are listed in Appendix 3.

# **Phase 1 Modelling**

## Using existing data-sets to measure changes to P8

We had full sets of data from BA, TFA and TMA. We decided to use the TFA data-sets and adjust the results of students in order to track changes in P8 overall.

The results (using 2016 GCSE scores for comparison with 2018 results) are presented in *Table 1*.

**Table 1**

Change Made	Assumptions Applied	Students	Impact on P8	Notes
GCSE Art to BTEC Art	Students obtain one grade higher on BTEC than GCSE; students with E grades get Passes on BTEC.	17	+0.01	
GCSE PE to BTEC Sport	Students obtain one grade higher on BTEC than GCSE; students with E grades get Passes on BTEC.	44	+0.02	
GCSE Business to BTEC Business	Students obtain one grade higher on BTEC than GCSE; students with E grades get Passes on BTEC.	29	+0.01	
Removal of any students who are specifically studying PE	That students who are negatively 'anchoring' P8 could be taken off-role and put on the full roll of an alternative provider.	10	+0.15	
Moving students from MFL onto another EBACC option	That students would replicate the progress they made on other EBACC options, if another similar EBACC option was substituted for their MFL grade.	75	+0.02	This small change is because MFL was only counting for P8 for a minority of students, as they had better grades elsewhere.
Moving students from MFL onto a DTCC option	That students would do at least one grade better on a BTEC option than they would on GCSE Geography or History.	78	+0.04	
Redesign of EBACC or similar qualification		132	+0.10	
Inclusion of GCSE Stats	Studied in Year 10	139	+0.07	
Removing 'extras' such as ECDL & Stats to leave MFL as the selected option for P8	MFL entry at 44%		0.57 to 0.29	
Removing 'extras' such as ECDL & Stats to leave MFL as the selected option for P8 Reducing MFL coverage to 50%	MFL entry at 30%		0.57 to 0.38	
Removing MFL from the curriculum			+0.00	This made no difference to overall P8, as MFL grades did not contribute due to better performance in other subjects.

## The "Big Beasts"

### 1. ECDL (+0.16)

The biggest impacts seen related to the high scoring ECDL qualification. In the Westminster meeting attended by [redacted] in November, it seems clear that such qualifications are on borrowed time, but as yet, no decision has been made about their future. It is currently still in the qualifications tables for 2018. ECDL is regarded as being part of an educational "arms race" where schools make entries simply to keep up with the rest – as can be seen, such is its impact on P8.

### 2. Removal of "Anchor" Students (+0.15)

In each academy there are students who for whatever reason have not been able to achieve consistently. They have poor outcomes, likely poor attendance and also are in significant danger of becoming NEETs once they leave. In other words, they are exactly the sorts of students who will be "saved" by the Stephen Longfellow Academy provision. Currently the support they receive is inadequate to the task of matching their potential and consequently their P8 scores are large negative values. Removing 10 from the TFA data in 2016 boosted the overall P8 of the academy (around 230 students) by 0.15. This was a truly staggering revelation, but completely understandable, since they are underperforming across the piece. There are at least 16 in the 2017 cohort.

The issues relating to removal of students from the roll are tricky but will become simpler with the start of the Stephen Longfellow Academy. Currently, if we wish to remove a Year 11 student from roll now, for them not to count in this year's results, they must be re-designated as Year 10. This has to be done by the January census. We would of course have to provide for them (by negotiating with parents that it is in their best interest to take an extra year to complete their GCSE studies). They would, however, count on our 2018 figures – if they have not been provided for and have not sat any exams during this "extra" year, their null-results will be counted in – we could be in a worse position. With Stephen Longfellow Academy starting in 2017, we have an opportunity to move students to an appropriate provision before they become an issue in KS4. For further expansion on the DfE rules regarding student removal, see Appendix 4 and [redacted] explanations.

### 3. Placing MFL into a central P8 position (-0.21 to -0.28)

The purpose of this investigation was to see what impact placing MFL more centrally (by removing the "crutches" of ECDL and Stats) and to see what effect it would have on overall P8 scores. This assumed the results remaining at 2016 scores: the consequence was a -0.28 drop in P8 with TFA's 44% MFL cohort and a -0.21 drop for a hypothetical 30% cohort (with student reallocated to other subjects). Either way it can be seen that reliance on MFL jeopardises the overall P8 score.

This investigation tied into our musings regarding the required size of a MFL cohort in order to minimise damage to P8. We were mindful of trying to retain the EBacc percentage as a headline result.

### The "Lesser Beasts"

It comes as no surprise that replacing MFL with a BTEC would generate a positive increase in P8 (+0.04), and this effect would be seen with the LAL and MAL students. The interesting offer that seems to operate by stealth is Statistics, generating a +0.07 lift in P8. The beauty of it is that it can be taught alongside Mathematics.



# **Phase 2 Modelling**

## Creation of the Wranglers' Academy

Using existing data is helpful for initial lines of inquiry and can give good comparison to existing results that are real. We did feel that it could be useful to create our own numerical ecosystem in which we could simply modify offers and measure P8 outcomes. Although this wouldn't necessarily compare to TFA directly, it would be *consistent within itself* and the changes recorded would be *comparable*. This child with five parents has the following attributes:

- 100 students on roll
- 25% HAL (estimated A8 scores between 5.8 and 5.0)
- 50% MAL (estimated A8 scores between 5.4.8 and 4.0)
- 25% LAL (estimated A8 scores less than 4.0)
- Performance in all subjects was distributed exactly like TFA

The results of changes made are shown in Table 2:

Factor Change	P8	+/-	P8 HAL	P8 MAL	P8 LAL
Control (35% MFL)	0.58	0.07	0.14	0.7	0.78
100% replacement of MFL with high-scoring BTEC	0.83	0.06	0.33	0.7	0.78
65% MFL uptake	0.57	0.07	0.18	0.65	0.78
65% MFL uptake with E grades included (LAL students)	0.55	0.06	0.18	0.62	0.78
BTEC+ : all students entered for Lit. but bottom 18 students study BTEC in its place	0.61	0.07	0.14	0.7	0.89
Outstanding MFL: 35% (best students) achieve at least B	0.62	0.06	0.27	0.72	0.78
Top 10 Intervention: top 10% of students achieve 8 rather than 7 in all subjects bar MFL	0.63	0.06	0.35	0.7	0.78
Poor Option Choice	0.56	0.08	0.01	0.76	0.7

Table 2

Taking our Control experiment as our reference throughout, we can see the implications of tinkering with the curriculum.

1. The acquisition of a high-scoring BTEC course <sup>[1]</sup> (or something similar such as VCert) generates an immediate uplift in P8 of +0.05 if it replaces MFL. We felt that the 35% MFL threshold was reasonable and would be in line with current Board wishes; we could of course modify this.
2. Increasing MFL uptake at the expense of other qualifications may reduce P8 by up to -0.03.
3. Boosting intervention with MFL to ensure the 35% achieve 'outstanding' results – these follow our distribution of 8 and 7 grades – led to an uplift in P8 of +0.04.
4. HAL intervention to secure high grades with the top 10% (so they achieved 8 rather than 7 in most subjects) led to an uplift in P8 of +0.05.
5. LAL-specific curriculum modification involved entering all students for Literature, but with the bottom 18 students – they would study a BTEC in its place. This led to an uplift of +0.03.
6. It can be seen that a poor option choice (one that generates less than estimated A8 scores) reduces P8 by +0.02.

#### Conclusions on Ability Groups

The changes that were implemented to the curriculum offer seem to have very little impact on LAL students. They are already scoring highly in terms of P8. This is a function of the P8 system, whereby LAL students are required to make less progress than HAL students <sup>[2]</sup>.

[1] Appendix 1

[2] Appendix 2

# Phase 3 Modelling

Using Specific Curriculum Models in the Modelling

has been working on curriculum models for TRGA and TFA. We wanted to feed these into the simulations in order to see what effect making changes to the offers would have. These are 8-outcome models, again to show changes in P8 that are not smothered by a 9<sup>th</sup> option.

#### The 8-Outcome Model

ENGLISH LANGUAGE ENGLISH LITERATURE	HISTORY	MFL	OPEN Group OPTION 2
MATHEMATICS	GEOGRAPHY	OPTION 1	
SCIENCE SCIENCE			
Strand 1 "The Hard 6"		Strand 2	Strand 3

#### Model 1

95% of students 5% do not do humanities (lowest ability tier)	30% MFL	50% BTEC 50% GCSE
	70% BTEC	

The key feature of this model is that a BTEC is used to replace the MFL offer for the bottom 70%. In the simulation, around 40% of the top tier (MFL students) graded less highly than the BTEC students. This could be an issue for decision-making in terms of allocation of HAL students to MFL. The BTEC lifts P8 because the bottom ability students can achieve pass grades (5). Also a reasonable number of those in the bottom 70% would achieve D\*, D and M ensuring higher P8 scores for them.

Progress 8	+/-	P8 HAL	P8 MAL	P8 LAL
+0.68	0.08	+0.14	+0.90	+0.77

### Model 2

95% of students 5% do not do humanities (lowest ability tier)	30% MFL	30% GCSE 70% BTEC
	70% BTEC	

We assumed that the Strand 3 GCSE would generate results in line with humanities. The impact of the second BTEC is enormous.

Progress 8	+/-	P8 HAL	P8 MAL	P8 LAL
+0.73	0.09	+0.14	+1.01	+0.77

### Model 2b

95% of students 5% do not do humanities (lowest ability tier)	30% MFL	30% GCSE 70% BTEC
	70% BTEC	

In this model we bite the bullet and tackle the issue of HAL underperformance. IN doing so, we assume more 8 and 7 grades and this is responsible for a significant shift in P8.

Progress 8	+/-	P8 HAL	P8 MIAL	P8 LAL
+0.78	0.08	+0.33	+1.01	+0.77

### Model 3

95% of students 5% do not do humanities (lowest ability tier)	30% MFL	100% BTEC
	70% BTEC	

This model moves towards all students completing a BTEC in Strand 3. The consequence is likely to be higher performance, when compared to Models 2 or 1. We may expect students such as HAL students to do exceptionally well with such courses because of their skill set. Traditionally we would never have entered these students for such courses because of the restrictions of a specific academic pathway.

Progress 8	+/-	P8 HAL	P8 MAL	P8 LAL
+0.77	0.08	+0.23	+1.03	+0.77

#### **Model 4**

<b>95% of students</b> <b>5% do not do humanities (lowest ability tier)</b>	30% MFL	100% GCSE
	70% BTEC	

We can see what effect a 100% GCSE Strand 3 has in comparison in Model 4. Here, all groups study for a GCSE. We assume a performance profile similar to what we see with various ability groups in humanities. The consequence is a noticeable drop in P8 for the cohort.

Progress 8	+/-	P8 HAL	P8 MAL	P8 LAL
+0.62	0.08	+0.14	+0.89	+0.56

### **Conclusions on Ability Groups**

#### **Comparison of TFA with TWA**

The Wranglers' Academy has a higher proportion of HAL students than TFA, and this accounts for the differences seen in HAL performance. TFA showed P8 of +0.51 for HAL students, +0.57 for MAL students and +0.58 for LAL students, in 2016. The larger number of HAL students (25%) at TWA with modest grades depresses their P8 in comparison. The MAL group is similar and our model tends to give higher P8 scores.

### Comparing the Data for Ability Groups

Model	Progress 8	+/-	P8 HAL	P8 MAL	P8 LAL
1	+0.68	0.08	+0.14	+0.90	+0.77
2	+0.73	0.09	+0.14	+1.01	+0.77
2b	+0.78	0.08	+0.33	+1.01	+0.77
3	+0.77	0.08	+0.23	+1.03	+0.77
4	+0.62	0.08	+0.14	+0.89	+0.56

#### HAL Students

In our model, the greatest changes to HAL performance came in models 2b and 3. Model 2b assumes that in our GCSE teaching we maximise the performance (possibly in a way yet to be tapped). Our shift institutionally would have moved away solely from "C/D" or "5/4" groups to the HAL learners, ensuring that those scoring 7 and 8 can maximise their performance to achieve 8 and 9. The best teachers are selected for these sets in order to secure those high grades. The consequence of such a shift would be felt at EHC, where learning would be developed to a fully independent level. It would have a large and lasting impact on our P8 scores.

The addition of a BTEC option for HAL learners we felt could be a useful addition. Many of these students will be sitting a large number of long exams and providing a different intellectual offer could keep them fresh as learners and minimise exam pressure. Their ability to write extensively and to complete short exams would work in their favour and we would expect high grades accordingly. However, the offer must be right, in terms of what they want to study and the sales-pitch has to be carefully designed to bring them on board, knowing that this will be an offer where they can enjoy learning in a different way.

#### MAL Students

The worst possible option for our MAL students was Model 4; a GCSE-heavy curriculum is unlikely to maximise their performance and excellent outcomes seem to appear with Models 2, 3 and 4. These favour BTEC options for MAL and LAL students in Strands 2 and 3. The slight uplift in Model 3 may be due to minor changes in the results of the cohort programmed into the model. The results seem to back up our instincts that a GCSE-heavy curriculum counts against these students.

#### LAL Students

In all of our Phase 2 and 3 modelling, the LAL students were least affected by changes to the curriculum. These students do not have to make high rates of progress to get outstanding P8 scores (see Appendix 2). We must ensure that they have an offer that best suits them, particularly at the very low end. A 100% GCSE Strand 3 had a devastating impact on our P8 scores.

### Our recommendations



1. Alternative provision for vulnerable students (Stephen Longfellow Academy)
2. BTEC / VCert provision for at least MAL and LAL students
3. Model 3 which gives the highest P8 score without HAL-specific intervention
4. Model 2b which gives the largest P8 score with HAL-specific intervention

#### Final Notes

The Phase 3 model gives P8 values that are self-consistent. Changes made to the curriculum can be seen in the changes produced in the HAL, MAL and LAL P8 scores. Because this is a closed system the comparisons are valid. The point has been made that the P8 scores differ from those of TFA for the ability groups. This is not a barrier to the conclusions made. A final point must be made about the "blinding" of the models. Whilst we had preconceived ideas about what a good curriculum offer should look like, we have let the models run in order to explore the effects of various changes.

#### Further Considerations

Wranglers' Academy caters only for 100 students. Its PAN can be increased but we would likely keep the same distribution of grades. Since all changes in P8 are averages, we would see similar changes in a larger school.

Currently we are not modelling SEN, Gender or Disadvantaged students. They would need building into the model; we may wish to return to the real data from TFA.

A more detailed view of available BTEC and VCert courses would need to be completed since any curriculum changes would be made with a view to a better outcome compared to the original course.

November 2016

# Appendices

## Appendix 1

### How easy are BTECs?

A number of assumptions have been made during the modelling process and one is that BTECs automatically infer a higher outcome. Instinctively we may assume this; BTECs have a smaller exam component. The coursework-based nature means that students can, under skilled supervision achieve grades higher than they may get at GCSE. The applied nature of the syllabus could also be an advantage, giving a more interesting feel to the course for many students.

We wanted to check this and used existing TFA data to do so.

Forename	Level	Prerequisite Indicator	GCSE English PG	GCSE Maths PG	GCSE English	GCSE English Language	GCSE English Literature	GCSE Mathematics	GCSE Science (Core)	GCSE Science: Additional RAC	GCSE Geography	GCSE History	GCSE D&T Product Design	GCSE D&T Textiles Tech.	GCSE Film Studies	GCSE Physical	GCSE Statistics	vGCSE Health & Soc Care	VR02 Computer Use	BTECAwd Hospitality Studies	BTECAwd Travel & Tourism	BTEC A/B	
1	9	9	D					B		B					B								
0	20	15	C					D	E	E	F				B				M				M
1	9	15	D					F	E	F					B					N			M
1	25	25		D	D	C	C	C	D			B	B				C		M				D
1	22	18		D	C	D	D	E	E					C				D			NQ		M

As can be seen (for this admittedly small sample) the grades achieved for the BTECs tends to be stronger than the GCSEs. If Merits and Distinctions can be achieved by students who across the piece are achieving F, E, D and C grades at GCSE, then it seems logical to place them into our offers. Whilst the word "easy" is disingenuous, the point can be made that they facilitate a higher level of performance.

## Appendix 2

### Progress 8 and Expected Progress

Expected Progress was a headline progress measure up until 2015. If a student made three full levels of progress from their KS2 starting point in English, then they were said to have made expected progress. The same measure could also be calculated for a student's performance in mathematics. Although this measure was presented as a progress measure, it was actually an attainment measure by proxy, as it was still an indicator which showed whether or not students had made it across a threshold.

Progress 8 is a type of value added measure that is calculated by determining a student's performance across a range of eight different subjects (Attainment 8) and then comparing this performance to the attainment of other students nationally who started secondary school with a similar KS2 results profile (Estimated Attainment 8). Different students from different starting points are required to achieve different Attainment 8 scores in order to meet or exceed the average performance of students from the same starting point. It is not a measure that relies on a set amount of progress as the Expected Progress measure did.

Although Expected Progress and Progress 8 are not directly linked, it is possible to take the 2015 national average Attainment 8 estimates for each KS2 starting point (used to calculate Progress 8 scores in 2015) that were released by the DfE and equate them to a GCSE grades profile. The amount of progress between KS2 starting point and final GCSE outcome can then be calculated and compared to Expected Progress. This is shown in the table below:

KS2 average base level (English & maths)	Full Level	2015 Attainment 8 estimate					
		Attainment 8/10	Grade	"DE" Number	LEP FULL Levels	LEP SUB-Levels	
1.5	0	13.20	1.32	G	3.92	1.82	5.46
1.6	1	13.20	1.32	G	3.32	1.73	5.16
1.7	1	13.20	1.32	G	3.32	1.82	4.86
1.8	1	13.20	1.32	G	3.32	1.52	4.95
1.9	1	13.20	1.32	G	3.32	1.42	4.25
2.0	2	17.79	1.78	D	3.78	1.28	5.34
2.1	2	17.79	1.78	D	3.78	1.38	5.04
2.2	2	17.79	1.78	D	3.78	1.58	4.74
2.3	2	17.79	1.78	D	3.78	1.68	4.44
2.4	2	17.79	1.78	D	3.78	1.38	4.24
2.5	2	18.39	1.84	D	3.84	1.44	4.32
2.6	2	18.39	1.84	D	3.84	1.54	4.02
2.7	2	18.39	1.84	G	3.84	1.28	3.72
2.8	3	20.38	2.04	F	4.04	1.24	3.71
2.9	2	21.88	2.19	F	4.19	1.29	3.80
3.0	3	23.27	2.24	F	4.34	1.34	4.01
3.1	3	25.91	2.39	F	4.29	1.29	3.87
3.2	3	24.42	2.44	F	4.44	1.24	3.73
3.7	3	32.11	3.21	F	5.21	1.51	4.55
3.8	3	33.02	3.30	F	5.30	1.56	4.05
3.9	3	35.27	3.53	F	5.53	1.53	4.33
4.0	4	36.48	3.65	F	5.65	1.65	4.94
4.1	4	38.80	3.88	F	5.88	1.78	5.34
4.2	4	40.62	4.06	D	6.06	1.86	5.54
4.3	4	42.50	4.25	D	6.25	1.94	5.87
4.4	4	44.49	4.45	D	6.45	2.05	6.23
4.5	4	45.87	4.59	D	6.59	2.09	6.26
4.6	4	48.50	4.85	D	6.85	2.25	6.75
4.7	4	50.71	5.07	C	7.07	2.37	7.11
4.8	4	52.76	5.28	C	7.28	2.48	7.43
4.9	4	55.08	5.50	C	7.50	2.60	7.81
5.0	5	56.46	5.65	C	7.65	2.65	7.85
5.1	5	59.82	5.98	C	7.98	2.88	8.50
5.2	5	61.51	6.15	B	8.15	2.95	8.85
5.3	5	63.92	6.39	B	8.39	3.09	9.28
5.4	5	66.31	6.63	B	8.63	3.23	9.69