FFT Development Paper: KS1 estimates based on EYFSP (09/11)

Overview

As part of our ongoing development programme, a number of important new features will be added to FFT Live over the next four weeks. This document summarises the key features providing a brief outline of the developments along with projected timescales.

Background

Analyses providing estimates for Key Stage 1 (KS1) attainment using Foundation Stage Profile (EYFSP) data were piloted in 2010 and, following positive feedback, made available to all schools and LAs in July 2011.

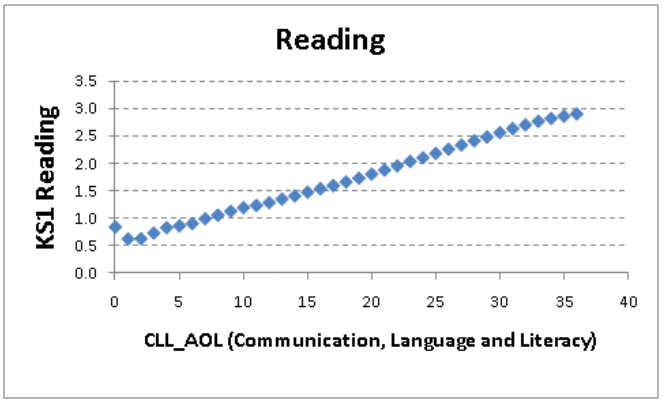
This paper provides:

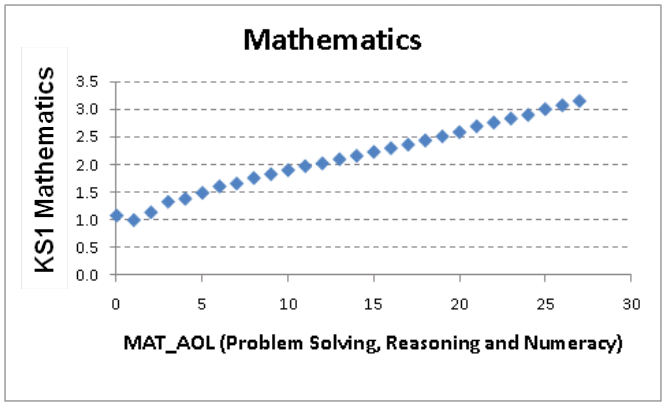
- Details of the investigations and analyses which informed development of the model
- A brief summary of the feedback from pilot schools and LAs
- Details of how estimates are calculated
- Notes regarding use of estimates

Initial Investigations

The first stage was to examine the relationship between EYFSP and KS1 outcomes. The following charts show the average KS1 level achieved for two combinations:

- EYFSP Communications, Language and Literacy (CLL) -> KS1 Reading Level
- EYFSP Problem Solving, Reasoning and Numeracy (MAT) -> KS1 Mathematics Level



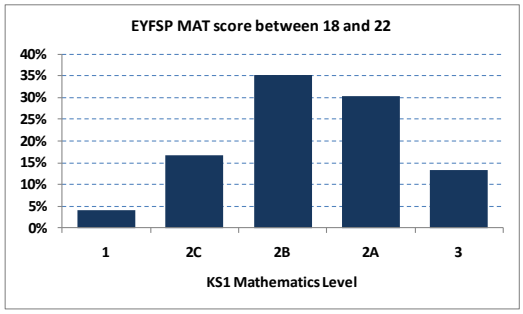


Both charts show a consistent relationship between EYFSP scores and their 'equivalent' at KS1. **Please note that by using the term 'equivalent' we are not implying that the EYFSP and KS1 outcomes are assessing the same set learning competencies and skills – merely that there is a consistent relationship between EYFSP assessments and KS1 attainment levels.**

It is also important to remember that the charts show the average KS1 attainment for pupils with the same EYFSP scores. If we look, for example, at the range of outcomes in KS1 mathematics for pupils with MAT_AOL scores between 18 and 22, we find:

- Mean KS1 Mathematics Level is 2.62 (i.e. slightly above level 2B)
- 13% of pupils attained level 3
- 4% of pupils attained level 1

This reminds us that overall (estimated) levels can mask the range of outcomes for pupils with similar prior-attainment scores.



A statistical method for looking at the strength of the relationship between inputs (EYFSP prior attainment) and outcomes (KS1 attainment) is called correlation. In broad terms, a correlation of 0 (zero) implies that there is no relationship and a correlation of 1 implies that there is a 'perfect' relationship i.e. the same input always results in the same output.
In most education research, a correlation of 0.7 or higher is taken to mean that the relationship is sufficiently strong for further analysis. Correlations of 0.8 or above are considered to be high.

The following table shows the correlation between a range of EYFSP scores and KS1 outcomes:

EYFSP Scores		Key Stage 1 Outcomes					
		Overall	English	Reading	Writing	Mathematics	Science
PSE_AS1	Dispositions and Attitudes	0.56	0.53	0.50	0.51	0.52	0.48
PSE_AS2	Social Development	0.49	0.48	0.45	0.46	0.45	0.43
PSE_AS3	Emotional development	0.50	0.49	0.46	0.46	0.46	0.44
PSE_AOL	AS1+AS2+AS3	**0.56**	**0.54**	**0.51**	**0.52**	**0.52**	**0.49**
CLL_AS1	Language for communication and thinking	0.58	0.56	0.53	0.52	0.53	0.51
CLL_AS2	Linking sounds and letters	0.69	0.69	0.67	0.66	0.63	0.57
CLL_AS3	Reading	0.68	0.67	0.65	0.63	0.62	0.57
CLL_AS4	Writing	0.68	0.69	0.66	0.66	0.62	0.56
CLL_AOL	AS1+AS2+AS3+AS4	**0.73**	**0.72**	**0.69**	**0.68**	**0.66**	**0.61**
MAT_AS1	Numbers as labels and for counting	0.67	0.64	0.61	0.59	0.64	0.56
MAT_AS2	Calculating	0.68	0.64	0.62	0.60	0.64	0.57
MAT_AS3	Shape, space and measures	0.62	0.59	0.56	0.54	0.58	0.54
MAT_AOL	AS1+AS2+AS3	**0.71**	**0.68**	**0.65**	**0.63**	**0.67**	**0.61**
KUW_AOL	Knowledge and understanding of the world	0.55	0.51	0.49	0.47	0.51	0.49
PHY_AOL	Physical development	0.51	0.49	0.45	0.45	0.47	0.44
CRE_AOL	Creative development	0.50	0.49	0.46	0.46	0.45	0.44
FSP_TOT	Total across all FSP elements	**0.73**	**0.69**	**0.66**	**0.65**	**0.66**	**0.61**

	Correlation below 0.5		Correlation between 0.6 and 0.7
	Correlation between 0.5 and 0.6		Correlation above 0.7

This table shows that for many of the individual EYFSP elements, the relationship with KS1 outcomes is fairly weak (correlation of below 0.6). The strongest correlations are with overall EYFSP total score and with the CLL and MAT overall scores.
The next stage of investigation was to examine the impact of using a more sophisticated approach to analysis, such as the models developed and used by FFT for outcomes at Key Stages 2,3 and 4. Typically, these models which:

- Take into account both overall prior-attainment and the variations within this between different components (normally English, mathematics and science).
- Also take into account a range of additional pupil- and school-level factors.

The impact of using variations within EYFSP total score (FSP TOT) can be seen in the following table:

Input	Correlation
FSP Total	0.710
FSP Total + CLL_AOL + MAT_AOL	0.748
All 6 'AOL' scores	0.749
FSP Total + CLL (AS2,AS3,AS4) + MAT (AS1,AS2)	0.755
All individual PSE, CLL and MAT scalesplus KUW, PHY and CRE scores	0.757

Moving to a full contextual model (FFT SX) we find, when comparing EYFSP->KS1 with KS1->KS2:

Outcome	FSP -> KS1		KS1 -> KS2	
	Pupil	School	Pupil	School
Overall KS Attainment	0.80	0.90	0.85	0.94
English	0.79	0.89	0.83	0.93
Mathematics	0.76	0.89	0.82	0.92
Science	0.69	0.87	0.75	0.91

This shows that the overall correlations, both those at individual pupil level and also when aggregated to school level, are substantially improved more complex modes are used.

Overall, the investigations showed that:

- the relationship between EYFSP assessments and KS1 outcomes were sufficiently good to warrant the development of models for analysis of value-added and calculation of estimates;
- simplistic models, such as those using a single EYFSP overall or individual element provided lower levels of accuracy and were not felt to be sufficiently reliable

Piloting and Feedback

Following discussion with LA project contacts at the 2009 regional meetings, KS1 estimates (pupil, school and LA level) were piloted with a small number of LAs during 2010.
The reports provided estimates using two models (PA and SE) with the following factors being taken into account:

FACTORS INCLUDED IN PILOT MODEL

Factor	PA Model	SE Model
Overall EYFSP Score	●	●
CLL Score	●	●
MAT Score	●	●
Gender	●	●
Age	●	●
Socio-Economic Context		●

Note: Socio-Economic Context is a school-level variable calculated by linking individual pupil postcodes to demographic data and then averaging the results

The overall feedback from the pilots was very positive:

- Schools found the reports to be helpful and the estimates to be sufficiently reliable (please see section later in the document regarding the dangers of over-reliance on estimates)..
- The consistency of approach with other reports in FFT Live (KS2 estimates) was viewed positively.

A number of schools felt that the EYFSP score in Personal, Social and Emotional Development (PSE) should be taken into account. Further investigation showed that inclusion of PSE in the model provides some improvement in overall correlation and it also brings about some worthwhile improvements in consistency of the model over the whole prior-attainment range, particularly for pupils with the lowest 20% of overall EYFSP scores. The final model was, therefore, refined to include PSE as an additional input variable:

FACTORS INCLUDED IN FINAL MODEL

Factor	PA Model	SE Model
Overall EYFSP Score	●	●
CLL Score	●	●
MAT Score	●	●
PSE Score	●	●
Gender	●	●
Age	●	●
Socio-Economic Context		●

Estimates Model – Weighting of Factors

A small proportion of users involved in piloting the reports were interested in knowing about the overall weightings used in the calculations. The complexity of the model, particularly the inclusion of interaction terms, makes this difficult to present in a simple manner.

Interaction terms are used in statistical analysis to take account of relationships between different input variables. Pupils with high CLL scores tend also to have high MAT scores i.e. they are not completely independent. To take account of this, the calculation would use 3 variables:

- (CLL Score)
- (MAT Score)
- (CLL Score) x (MAT Score)

The full model uses a number of interaction terms and, whilst this increases accuracy, it also increases complexity. Using a simpler model (without interaction terms) provides a guide to the overall weighting of different factors:

	KS1 Reading	KS1 Writing	KS1 Mathematics
CLL	58%	58%	44%
MAT	26%	24%	43%
PSE	8%	5%	3%
Gender	5%	11%	9%
Age	2%	1%	1%

The higher weighing of CLL score in relation to KS1 reading and writing outcomes is consistent with what most users would expect. **The weightings for KS1 mathematics, where CLL and MAT scores are of almost equal importance, shows that – for pupils with the same MAT score – progress in mathematics is also influenced by attainment in language**. Again, not a surprise – but something which confirms the need to use models with sufficient complexity to take this into account.

Using Estimates

An important principle is that FFT estimates should not be used, without moderation, as targets. This is true at all levels – pupil, school or LA – and should involve an understanding of the difference between estimates, predictions and targets:

Estimate: A calculation, based upon the pupils' prior attainment plus other characteristics, which indicates what outcome (or likelihood of a range of outcomes) would be likely if they made average progress.

Prediction: Taking into account the estimate plus other factors (including current attainment, attitude, motivation) to arrive at a view of what the pupil is likely to achieve at the end of the key stage.

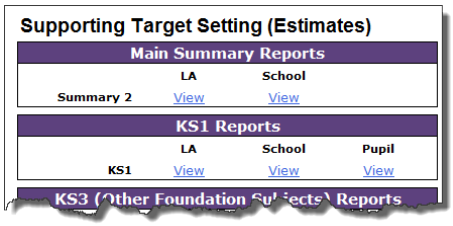
Target: A decision about how much improvement (above the prediction) to aim for – and what will be needed to achieve this.

A key feature of FFT Estimates is a focus upon the likelihood of different outcomes – shown as a percentage figure against each outcome. Let's consider a pupil who has an 81% likelihood of attaining 2B or higher in KS1 reading and a 24% likelihood of attaining level 3. This should raise questions like:

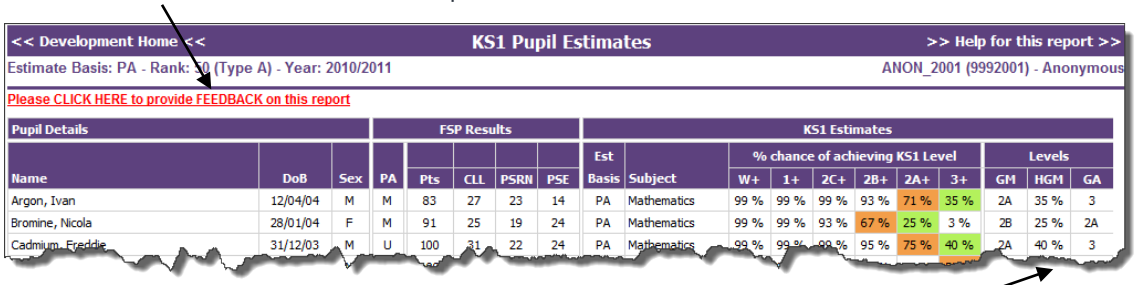
- Fewer than 1 in 5 pupils like this attain below 2B. Are they on track to attain this and, if not, what can be done to achieve this?
- Nearly 1 in 4 pupils like this attain level 3. How likely is that for this pupil – and what support will they need to achieve this?

Where can I find the new FFT KS1 Pupil Estimate reports and how can I provide feedback?

KS1 LA, School and Pupil level estimate reports are all available from the **Development** menu in FFT Live



As the KS1 estimate reports are still in development, we would value further feedback from schools and LAs. This can be done via the **Feedback** link on the KS1 Estimate reports:



Pupil Details			FSP Results					KS1 Estimates										
										% chance of achieving KS1 Level						Levels		
Name	DoB	Sex	PA	Pts	CLL	PSRN	PSE	Est Basis	Subject	W+	1+	2C+	2B+	2A+	3+	GM	HGM	GA
Argon, Ivan	12/04/04	M	M	83	27	23	14	PA	Mathematics	99 %	99 %	99 %	93 %	71 %	35 %	2A	35 %	3
Bromine, Nicola	28/01/04	F	M	91	25	19	24	PA	Mathematics	99 %	99 %	93 %	67 %	25 %	3 %	2B	25 %	2A
Cadmium, Freddie	31/12/03	M	U	100	31	22	24	PA	Mathematics	99 %	99 %	99 %	95 %	75 %	40 %	2A	40 %	3

What do the GM, HGM and GA levels show?

GM – the likelihood of achieving this level or higher is at least 50%. You can think of it as a 'median' or 'middle' level but please remember that estimates are just a starting point which should be used alongside other information to arrive at a prediction and ultimately a target.

HGM – the likelihood of achieving higher than the GM level. HGM should be used alongside the GM level to give an idea of potential. An HGM of 40% for example, means that last year 4 out of 10 similar pupils achieved a higher level than the GM level!

GA – one level above the GM estimated level. If the HGM percentage estimate is high, then for some pupils the GA estimate may be a more appropriate starting point?