Measuring School Performance

A discussion of the difficulties associated with the current system and implications for the School Improvement agenda in Northern Ireland.

WE Thompson

Contents

SECTION 1

The problem in general terms

Introduction

This is a paper about education in Northern Ireland and the way in which the 'good' and 'not-so-good' post-primary schools are currently identified.

The current system has a fundamental flaw which will be outlined in detail later, but before this is done, the analogy contained in the following story will help to prepare the reader for the discussion that comes after.

A company wants to reduce its fuel bills which have been rising over the past few years as the building they occupy has become older. They decide to engage an expert in the field of thermal insulation to survey the building, draw up a plan to improve the thermal efficiency of the building and carry out any necessary works. This involves a substantial investment on the part of the company but they are confident that the resulting long term savings justify the initial outlay and disruption.

The expert sends in an engineer who takes temperature readings at multiple points in the building at different times of the day and night over a period of 1 week. He is well trained and collects the data with care. When he has finished a detailed analysis is carried out. Areas within the building whose thermal efficiency is poor are identified and a plan of work is drawn up to address this. All of this is done correctly and with care.

The work is carried out over a period of several weeks causing considerable disruption to the company and the workforce as anticipated. This work is completed in time and to a high standard.

The total cost is high, but the company is pleased with the rigour and professionalism of the engineers who have delivered the project and the company now looks forward to reduced fuel bills and an upturn in profits.

A few days after the work has been completed the company learns that the digital thermometers used by the engineers to collect all of the data for the building are faulty.

Therefore none of the data on which the entire project has been based is reliable. The engineer took readings in the correct manner. The data analyst carried out her work in the

correct manner. The team that carried out the improvement work on the building did so to a high standard.

And yet the entire project has been a huge waste of time, energy and money.

The data on which conclusions regarding the thermal efficiency of the building were flawed and as a result the conclusions were wrong and all of the actions that followed were misguided and a waste of resources. Work may have been carried out in areas that did not require any improvement, but it is not possible to know.

If the measuring instrument is not fit for purpose then all subsequent judgements and actions will be flawed resulting in significant waste of resources.

Measuring performance in schools.

In any education system it is appropriate to want to identify which schools are serving their pupils well and which are not so that improvements can be made where needed.

The 'measurement' currently used to make judgements about standards of school performance is based on examination outcomes. The principle of using examination outcomes in order to draw conclusions about a school's performance is in itself sound. However, this data can be presented in a variety of formats. Some of these formats genuinely help meaningful conclusions to be drawn. Others are misleading and result in erroneous conclusions with potentially damaging consequences for some schools, creating the ‘not-so-good’ perception in cases where performance is actually high.

The format currently used as an indicator of school performance in Northern Ireland is of the latter variety and is consequently unfit for purpose.

In England, the Department of Education has already recognised this issue and moved to a new system of performance measurement. A government video setting out the rationale can be accessed at:

https://www.youtube.com/watch?v=4IAEgFMSGDY&feature=youtu.be

Remarkably, under the system used in Northern Ireland it is currently possible for the pupils in a school to be outperforming their counterparts in other schools and yet at the same time for their school to have a lower overall average % exam stat than the schools they are outperforming.

It is therefore possible, under the current system, for a school to be outperforming other schools which are ranked above it. This is a startling fact.

The following section illustrates why this is the case.

SECTION 2

Using averages from examination data to compare school performance: Limitations and Risks

Imagine that as a prospective parent or a member of an organisation, you wish to compare the performance of three schools in an area in terms of the academic attainment of their pupils in, say GCSE examinations.

How would you go about doing this?

The approach that is currently taken is to compare a single figure, for example the percentage of A*-C grades achieved in each school. The school with the highest 'performance' statistic is generally deemed to be the highest performing school. Indeed 'common sense' would dictate such a conclusion to most of us.

In the illustration given below, three fictitious schools are compared.

The single performance statistics for each school used for the purpose of this illustration is the percentage of grades achieved at A*-B. These percentages have been calculated from the data provided in this paper and are as follows:

	School X	School Y	School Z	Overall Average
% A*-B achieved	95	82	79.3	84.6

The 'common sense' interpretation of these figures would be to conclude that School X is the highest performing by a considerable margin while School Z is the lowest performing. Many parents decide which school they will send their child to based on this kind of data so the consequences of such decisions can be far-reaching and it is therefore vital that publicly available data, intended to enable judgements about school performance to be made, is fit for purpose.

The illustration that follows shows that this 'common sense' conclusion is fundamentally flawed. In fact analysis of the data provided in this paper shows that School X is the worst performing of the three in question.

Analysis of pupil attainment for schools X, Y and Z.

When pupils enter the schools in question they take a baseline standardised test to determine their academic ability. Standardised tests then generate an 'expected' grade based on their performance and this grade provides an indication of the potential of the pupil. It is the aim of each school to help their pupils achieve or exceed their potential.

The data provided below shows the 'expected' grade for each pupil in each school along with the actual grade that they ultimately achieved. An analysis is then carried out to show the percentage of pupils exceeding, equalling or failing to achieve their expected grade. This provides a measure of how effective each school is in helping its pupils to achieve or exceed their potential.

Because the academic ability profile for the pupils varies between schools and in order to facilitate like-for-like comparison, the analysis takes the pupil potential into consideration.

Information on the schools whose performances are being compared.

As 'expected' grades are assigned to individual pupils based on their academic ability, high ability pupils will have high expected grades assigned to them while pupils of lower ability will have correspondingly lower expected grades.

School Z is larger than school X. The academic ability (i.e. expected grades) of the first 100 pupils in schools X and Z are identical as are the actual grades they achieved. The remaining 50 pupils in school Z are of lower average academic ability than the pupils in school X.

School Y is the same size of school X but with pupils from a broader range of academic ability.

A table showing the expected and actual grades for each pupil in schools X, Y and Z is given below:

School X			School Y			School Z		
	expected grade	actual grade		expected grade	actual grade		expected grade	actual grade
pupil 1	A*	A*	pupil 1	A*	A*	pupil 1	A*	A*
pupil 2	A*	A*	pupil 2	A*	A*	pupil 2	A*	A*
pupil 3	A*	A*	pupil 3	A*	A	pupil 3	A*	A*
pupil 4	A*	A	pupil 4	A*	A	pupil 4	A*	A
pupil 5	A*	A	pupil 5	A	A*	pupil 5	A*	A
pupil 6	A*	A	pupil 6	A	A*	pupil 6	A*	A
pupil 7	A*	A	pupil 7	A	A*	pupil 7	A*	A
pupil 8	A*	A	pupil 8	A	A*	pupil 8	A*	A
pupil 9	A*	A	pupil 9	A	A*	pupil 9	A*	A
pupil 10	A*	A	pupil 10	A	A	pupil 10	A*	A
pupil 11	A	A*	pupil 11	A	A	pupil 11	A	A*
pupil 12	A	A*	pupil 12	A	A	pupil 12	A	A*
pupil 13	A	A*	pupil 13	A	A	pupil 13	A	A*
pupil 14	A	A*	pupil 14	A	A	pupil 14	A	A*
pupil 15	A	A	pupil 15	A	A	pupil 15	A	A
pupil 16	A	A	pupil 16	A	A	pupil 16	A	A
pupil 17	A	A	pupil 17	A	A	pupil 17	A	A
pupil 18	A	A	pupil 18	A	A	pupil 18	A	A
pupil 19	A	A	pupil 19	A	A	pupil 19	A	A
pupil 20	A	A	pupil 20	A	A	pupil 20	A	A
pupil 21	A	A	pupil 21	A	A	pupil 21	A	A
pupil 22	A	A	pupil 22	A	A	pupil 22	A	A
pupil 23	A	A	pupil 23	A	A	pupil 23	A	A
pupil 24	A	A	pupil 24	A	A	pupil 24	A	A
pupil 25	A	A	pupil 25	A	A	pupil 25	A	A
pupil 26	A	A	pupil 26	A	A	pupil 26	A	A
pupil 27	A	A	pupil 27	A	A	pupil 27	A	A

pupil 28	A	A	pupil 28	A	A	pupil 28	A	A
pupil 29	A	A	pupil 29	A	A	pupil 29	A	A
pupil 30	A	A	pupil 30	A	A	pupil 30	A	A
pupil 31	A	A	pupil 31	A	A	pupil 31	A	A
pupil 32	A	A	pupil 32	A	A	pupil 32	A	A
pupil 33	A	A	pupil 33	A	A	pupil 33	A	A
pupil 34	A	A	pupil 34	A	A	pupil 34	A	A
pupil 35	A	A	pupil 35	A	A	pupil 35	A	A
pupil 36	A	A	pupil 36	A	A	pupil 36	A	A
pupil 37	A	A	pupil 37	A	A	pupil 37	A	A
pupil 38	A	A	pupil 38	A	A	pupil 38	A	A
pupil 39	A	A	pupil 39	A	A	pupil 39	A	A
pupil 40	A	A	pupil 40	A	A	pupil 40	A	A
pupil 41	A	A	pupil 41	A	A	pupil 41	A	A
pupil 42	A	A	pupil 42	A	A	pupil 42	A	A
pupil 43	A	A	pupil 43	A	A	pupil 43	A	A
pupil 44	A	A	pupil 44	A	A	pupil 44	A	A
pupil 45	A	A	pupil 45	A	A	pupil 45	A	A
pupil 46	A	A	pupil 46	A	B	pupil 46	A	A
pupil 47	A	A	pupil 47	A	B	pupil 47	A	A
pupil 48	A	A	pupil 48	A	B	pupil 48	A	A
pupil 49	A	A	pupil 49	A	B	pupil 49	A	A
pupil 50	A	A	pupil 50	A	B	pupil 50	A	A
pupil 51	A	A	pupil 51	B	A	pupil 51	A	A
pupil 52	A	A	pupil 52	B	A	pupil 52	A	A
pupil 53	A	A	pupil 53	B	A	pupil 53	A	A
pupil 54	A	A	pupil 54	B	A	pupil 54	A	A
pupil 55	A	A	pupil 55	B	A	pupil 55	A	A
pupil 56	A	A	pupil 56	B	A	pupil 56	A	A
pupil 57	A	A	pupil 57	B	A	pupil 57	A	A
pupil 58	A	A	pupil 58	B	A	pupil 58	A	A
pupil 59	A	A	pupil 59	B	B	pupil 59	A	A
pupil 60	A	A	pupil 60	B	B	pupil 60	A	A

pupil 61	A	A	pupil 61	B	B	pupil 61	A	A
pupil 62	A	A	pupil 62	B	B	pupil 62	A	A
pupil 63	A	A	pupil 63	B	B	pupil 63	A	A
pupil 64	A	A	pupil 64	B	B	pupil 64	A	A
pupil 65	A	A	pupil 65	B	B	pupil 65	A	A
pupil 66	A	A	pupil 66	B	B	pupil 66	A	A
pupil 67	A	A	pupil 67	B	B	pupil 67	A	A
pupil 68	A	A	pupil 68	B	B	pupil 68	A	A
pupil 69	A	A	pupil 69	B	B	pupil 69	A	A
pupil 70	A	A	pupil 70	B	B	pupil 70	A	A
pupil 71	A	A	pupil 71	B	B	pupil 71	A	A
pupil 72	A	B	pupil 72	B	B	pupil 72	A	B
pupil 73	A	B	pupil 73	B	B	pupil 73	A	B
pupil 74	A	B	pupil 74	B	B	pupil 74	A	B
pupil 75	A	B	pupil 75	B	C	pupil 75	A	B
pupil 76	A	B	pupil 76	B	C	pupil 76	A	B
pupil 77	A	B	pupil 77	B	C	pupil 77	A	B
pupil 78	A	B	pupil 78	B	C	pupil 78	A	B
pupil 79	A	B	pupil 79	B	C	pupil 79	A	B
pupil 80	A	B	pupil 80	B	C	pupil 80	A	B
pupil 81	A	B	pupil 81	C	B	pupil 81	A	B
pupil 82	A	B	pupil 82	C	B	pupil 82	A	B
pupil 83	A	B	pupil 83	C	B	pupil 83	A	B
pupil 84	A	B	pupil 84	C	B	pupil 84	A	B
pupil 85	A	B	pupil 85	C	B	pupil 85	A	B
pupil 86	A	B	pupil 86	C	B	pupil 86	A	B
pupil 87	A	B	pupil 87	C	B	pupil 87	A	B
pupil 88	A	B	pupil 88	C	B	pupil 88	A	B
pupil 89	A	B	pupil 89	C	C	pupil 89	A	B
pupil 90	A	B	pupil 90	C	C	pupil 90	A	B
pupil 91	B	A	pupil 91	C	C	pupil 91	B	A
pupil 92	B	B	pupil 92	C	C	pupil 92	B	B
pupil 93	B	B	pupil 93	C	C	pupil 93	B	B

pupil 94	B	B	pupil 94	C	C	pupil 94	B	B
pupil 95	B	B	pupil 95	C	C	pupil 95	B	B
pupil 96	B	C	pupil 96	C	C	pupil 96	B	C
pupil 97	B	C	pupil 97	C	C	pupil 97	B	C
pupil 98	B	C	pupil 98	D	C	pupil 98	B	C
pupil 99	C	C	pupil 99	D	C	pupil 99	C	C
pupil 100	D	D	pupil 100	D	D	pupil 100	D	D
						pupil 101	b	a
						pupil 102	b	a
						pupil 103	b	a
						pupil 104	b	a
						pupil 105	b	a
						pupil 106	b	b
						pupil 107	b	b
						pupil 108	b	b
						pupil 109	b	b
						pupil 110	b	b
						pupil 111	b	b
						pupil 112	b	b
						pupil 113	b	b
						pupil 114	b	c
						pupil 115	b	c
						pupil 116	c	b
						pupil 117	c	b
						pupil 118	c	b
						pupil 119	c	b
						pupil 120	c	b
						pupil 121	c	b
						pupil 122	c	b
						pupil 123	c	b
						pupil 124	c	b
						pupil 125	c	b
						pupil 126	c	b

pupil 127	c	c
pupil 128	c	c
pupil 129	c	c
pupil 130	c	c
pupil 131	c	c
pupil 132	c	c
pupil 133	c	c
pupil 134	c	c
pupil 135	c	c
pupil 136	c	c
pupil 137	c	c
pupil 138	c	c
pupil 139	c	d
pupil 140	d	c
pupil 141	d	c
pupil 142	d	c
pupil 143	d	c
pupil 144	d	c
pupil 145	d	c
pupil 146	d	d
pupil 147	d	d
pupil 148	d	d
pupil 149	d	d
pupil 150	d	d

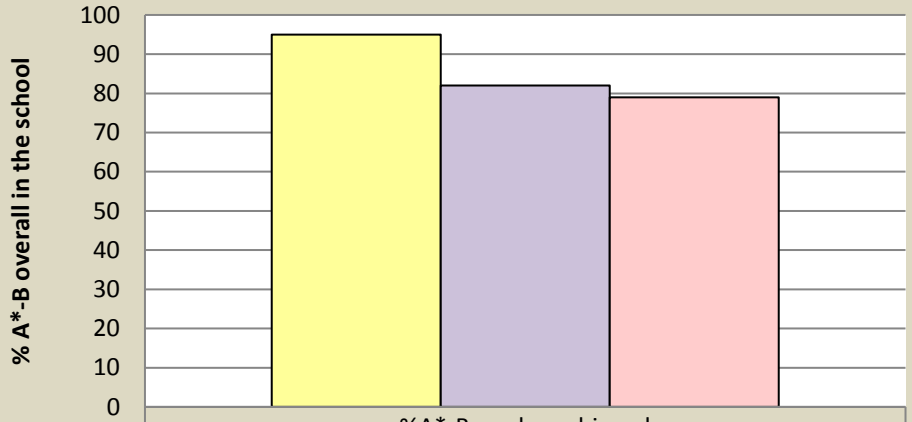
From the above data the percentage of pupils exceeding, equalling and achieving below their expected grade for each academic ability group has been calculated and is shown below. **This makes it possible for the academic attainment of pupils in one school to be compared to that of pupils of the same ability in the other schools and hence for appropriate judgements to be made about the relative performance levels of the schools.**

	% Exceeding expected grade				
Expected Grade	**A***	**A**	**B**	**C**	**D**
School X		5	12.5	0	0
School Y		10.9	26.7	47.1	66.7
School Z		5	26.1	44	50
	% At expected grade				
Expected Grade	**A***	**A**	**B**	**C**	**D**
School X	30	71	50	100	100
School Y	50	78.2	53.3	52.9	33.3
School Z	30	71	52.2	52	50
	% Below expected grade				
Expected Grade	**A***	**A**	**B**	**C**	**D**
School X	70	24	37.5	0	0
School Y	50	10.9	20	0	0
School Z	70	24	21.7	4	0

	Overall % of grades achieved at A*-B
School X	95
School Y	82
School Z	79

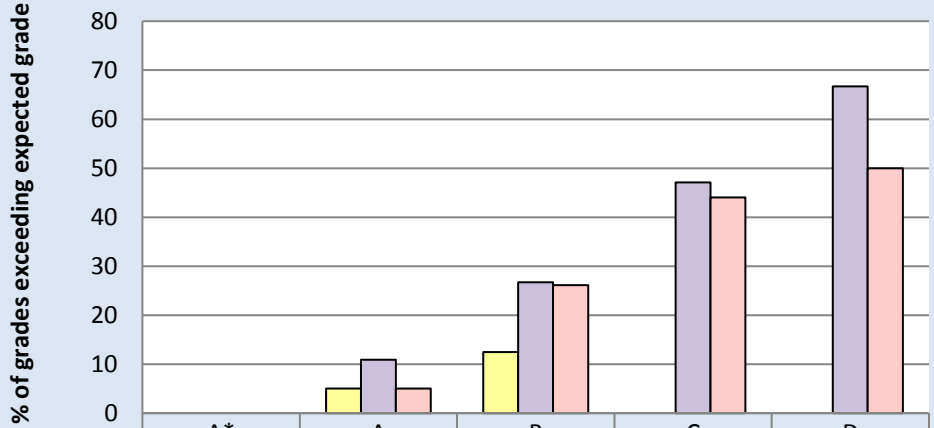
The results of this analysis are presented in the form of bar charts below:

Chart 1. Overall % of grades achieved at A*-B



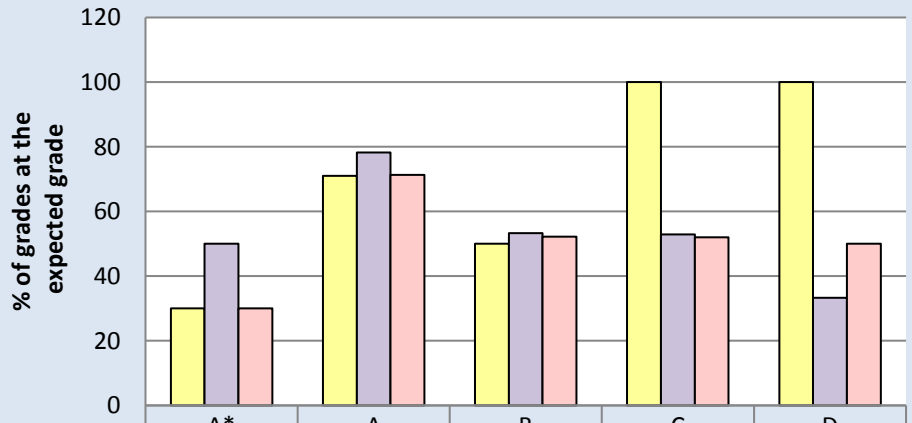
	%A*-B grades achieved
School X	95
School Y	82
School Z	79

Chart 2. % Exceeding Expected Grade



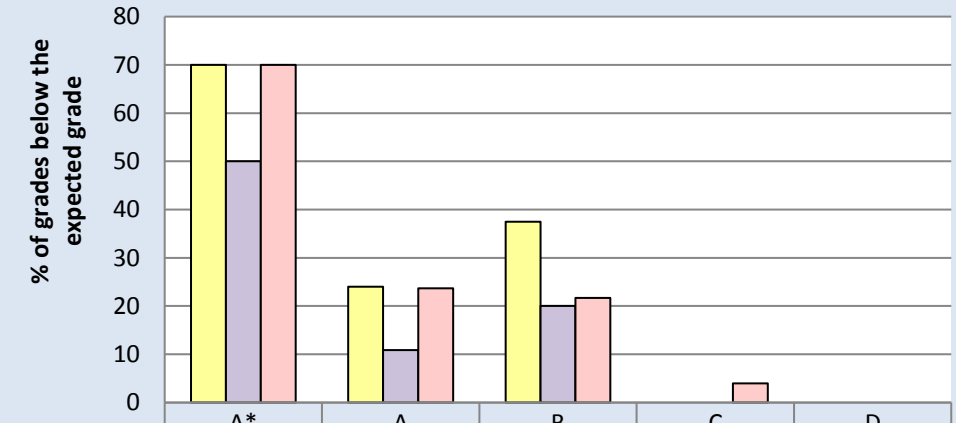
	A*	A	B	C	D
School X		5	12.5	0	0
School Y		10.9	26.7	47.1	66.7
School Z		5	26.1	44	50

Chart 3. % At Expected Grade



	A*	A	B	C	D
School X	30	71	50	100	100
School Y	50	78.2	53.3	52.9	33.3
School Z	30	71.3	52.2	52	50

Chart 4. % Below Expected Grade



	A*	A	B	C	D
School X	70	24	37.5	0	0
School Y	50	10.9	20	0	0
School Z	70	23.7	21.7	4	0

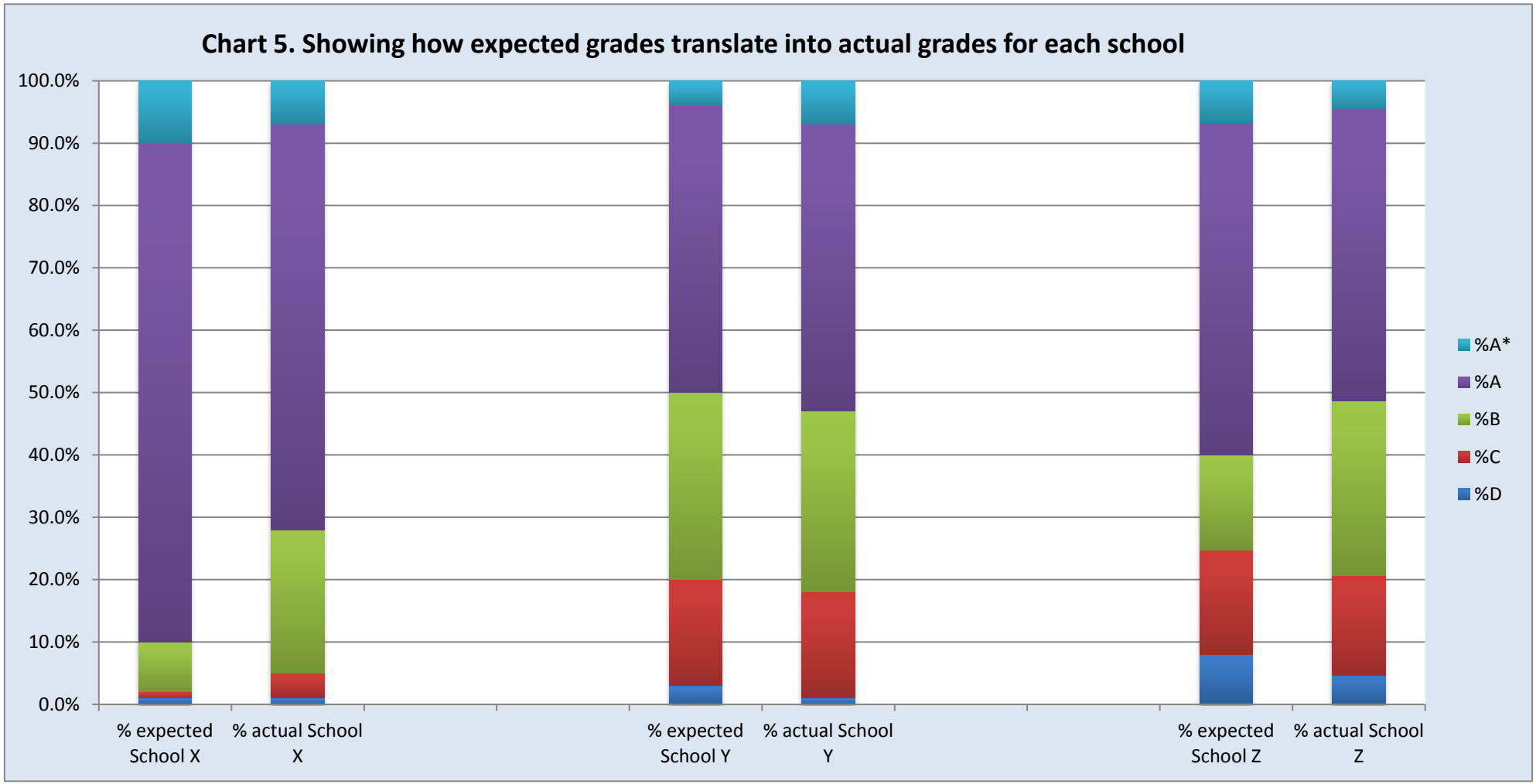
Chart 1 shows the overall percentage of grades actually achieved at A*-B for each school. This is the type of data that is currently readily available in the public domain. This chart would suggest that school X is performing at a higher level than the other two schools. However, as it does not take account of the differing academic ability profiles of the pupils in each school it does not provide a like-for-like comparison.

Chart 2 shows the percentage of grades that exceeded the expected grade for each academic ability group within the schools. This makes it possible for comparisons to be made between the academic attainment of pupils of the same academic ability between schools. As the expected grade can be interpreted as a proxy for the potential of each pupil, this chart shows the percentage of instances where pupils in each school and at each academic ability level exceeded their potential. The chart shows that a larger proportion of pupils in school Y achieve beyond their expected potential than in schools X and Z. It also shows that in general a smaller proportion of pupils in school X achieve beyond their potential than in the other two schools.

Chart 3 shows the percentage of grades that equalled the expected grade for each academic ability group within the schools. For pupils at the highest end of the academic ability range (i.e. expected to achieve grade A*), school Y once again performs best with the other two schools being equal. For pupils expected to achieve grades A or B, the three schools are roughly on a par. However we note that school X has a larger percentage of pupils achieving at the expected grades of C and D compared to the other two schools. This is because a significant proportion of these pupils in schools Y and Z exceeded their expected grade i.e. schools Y and Z have outperformed school X at the lower end of the ability range as well as at the higher end.

Chart 4 shows the percentage of grades that fell below the expected grade for each academic ability group within the schools. It can be seen that, for each academic ability group, fewer pupils in school Y fail to reach their potential than in the other 2 schools. It can also be seen that a significant proportion of pupils at the highest end of the academic ability range in schools X and Z are failing to fulfil their potential.

Chart 5 below shows how expected grades translate into actual grades at each ability level for each school. This makes it possible to make a visual comparison of the degree to which each school helps its pupils to meet or exceed their potential.



The

Conclusion.

Very different conclusions will be drawn about the performance levels of the three schools in question depending on how the data is interpreted.

If a single overall percentage attainment figure such as that shown in Chart 1 is used to draw comparisons between the schools in question, school X will mistakenly be identified as the highest performing. **Such a conclusion can have serious repercussions, for example for parents who are choosing a school for their child or for an organisation which is trying to identify high and low performing schools.**

An analysis which takes account of the academic ability of each child and carries out a like-for-like comparison between schools of pupil progress based on an expected grade (input measurement) and an actual attainment grade (output measurement) as presented in Charts 2-4 shows that the pupils in school X are achieving at lower levels than pupils of similar ability in the other two schools. This is in sharp contrast to the impression given by Chart 1.

If the relative performance levels of schools are to be identified with any degree of reliability, it is critical that the correct question is asked.

The question currently asked *is "Which school has the highest examination performance statistics?"* In the illustration above, this question will result in school X being wrongly identified as the highest performing school.

Instead, the question that will lead to a truer conclusion might be *"How are the pupils in this school achieving compared to pupils of the same ability in other schools?"* In the illustration above (as shown in Charts 2-4) this leads to the conclusion that school X is in fact the worst performing of the group.

SECTION 3: A Case Study

Evaluating Standards of Attainment in Glenlola Collegiate School

Baseline testing and expected grades.

When pupils enter Year 8 in September they take commercially produced 'baseline' tests which give an indication of, amongst other things, their academic potential at that point in time. A database, built up over a number of years by the company that produces these tests and containing the baseline test scores and actual GCSE grades of 229,500 other pupils, is used to generate 'expected' GCSE grades for our pupils for each subject. When they finally complete their GCSEs the actual grades they achieve can be compared with the grades that pupils of their ability are expected to achieve.

It is then possible to determine how well the pupils in Glenlola Collegiate have performed at GCSE compared with pupils of the same ability in other schools, giving an indication of how well the school is performing.

Baseline tests are taken again at the beginning of Y11 enabling a second analysis to be carried out for that year group.

In order to quantify the standard of pupil attainment at GCSE in a meaningful way it is necessary to ask the following question:

'How do pupils in Glenlola Collegiate perform in GCSEs compared to pupils of the same ability in other schools?'

This question is answered in the following pages. The analysis of standards of pupil attainment which generated the charts below has been verified by the Education Authority.

It is currently common practice to use comparative data based on average examination scores (such as % pupils achieving 7+A*-C grades at GCSE, including English and Mathematics) for a defined group of schools as a means of determining standards of pupil attainment within a given school. For that reason the relevant comparative data charts (hereafter referred to as the 'system' charts') which the Education & Training Inspectorate (ETI) use to make judgments about standards of attainment have been included for comparison with those generated by this analysis.

As the following section shows, the two types of chart lead to very different conclusions regarding standards of pupil attainment.

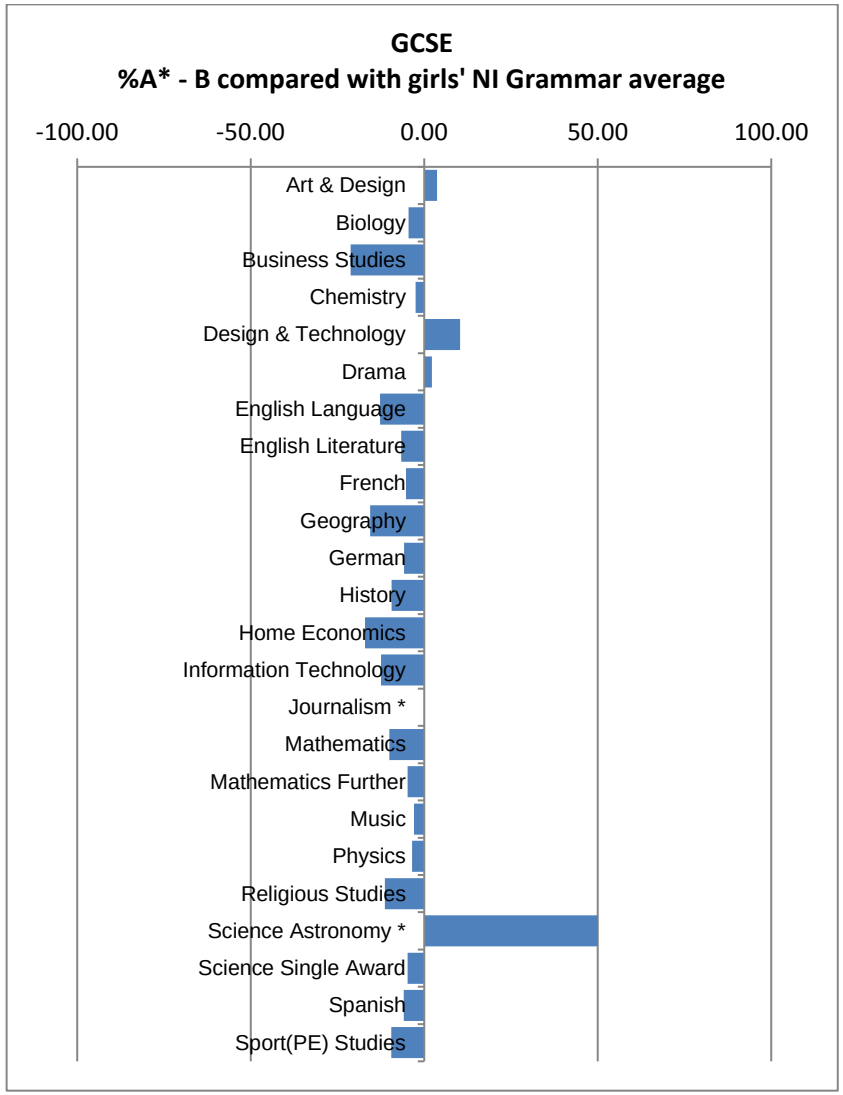
The conventional ‘system’ approach that uses the comparison with school averages does not take account of the significant differences in the ability profile of pupil cohorts between different schools and, as a consequence, can lead to erroneous judgments regarding standards of pupil attainment being made.

Section 2 illustrated clearly the general principle that conclusions drawn from this type of data can be completely at odds with the reality. This is a cause for concern and it highlights the pressing need for a system that can more reliably identify underperforming schools.

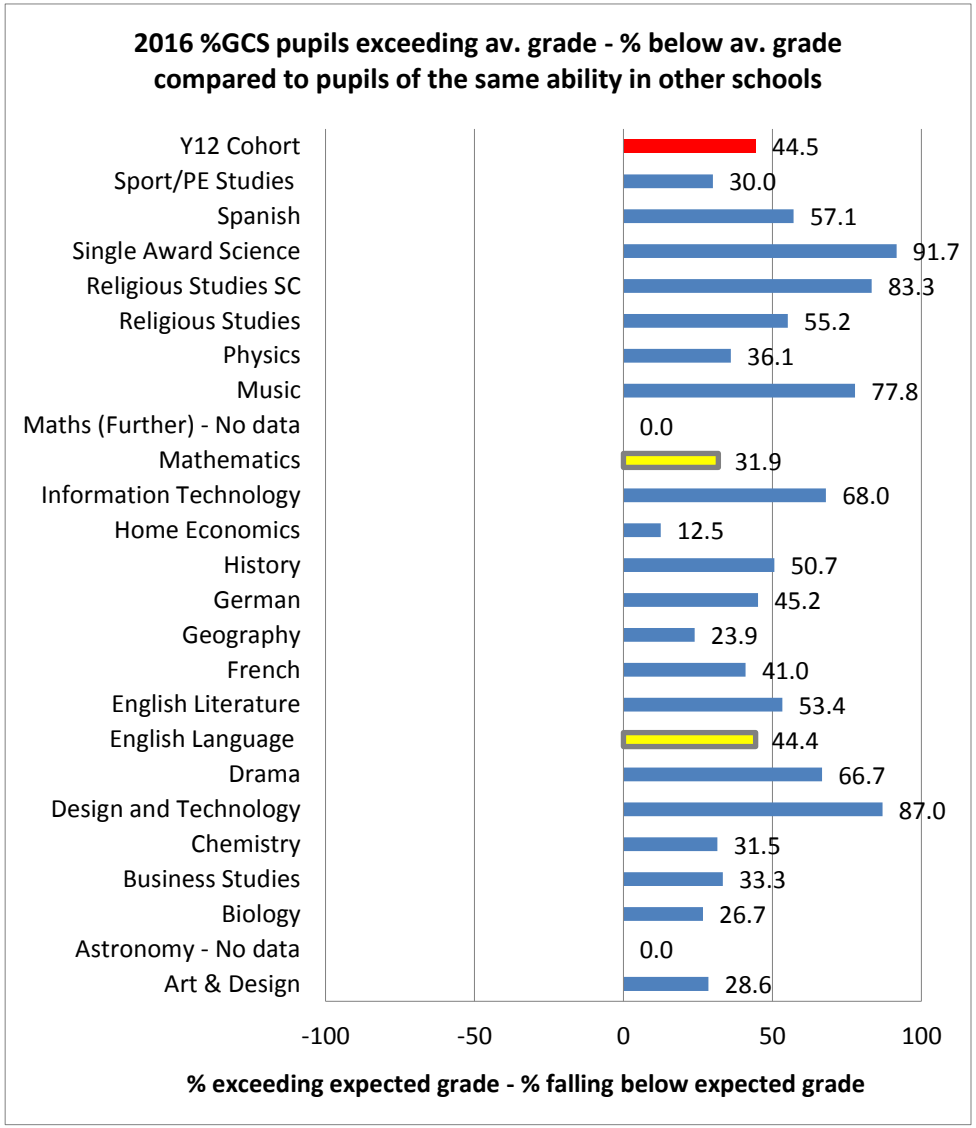
This section examines the GCSE results obtained by pupils of Glenlola Collegiate School as a particular illustration of how the ‘system’ approach currently in use can be misleading.

GCSE cohort summer 2016

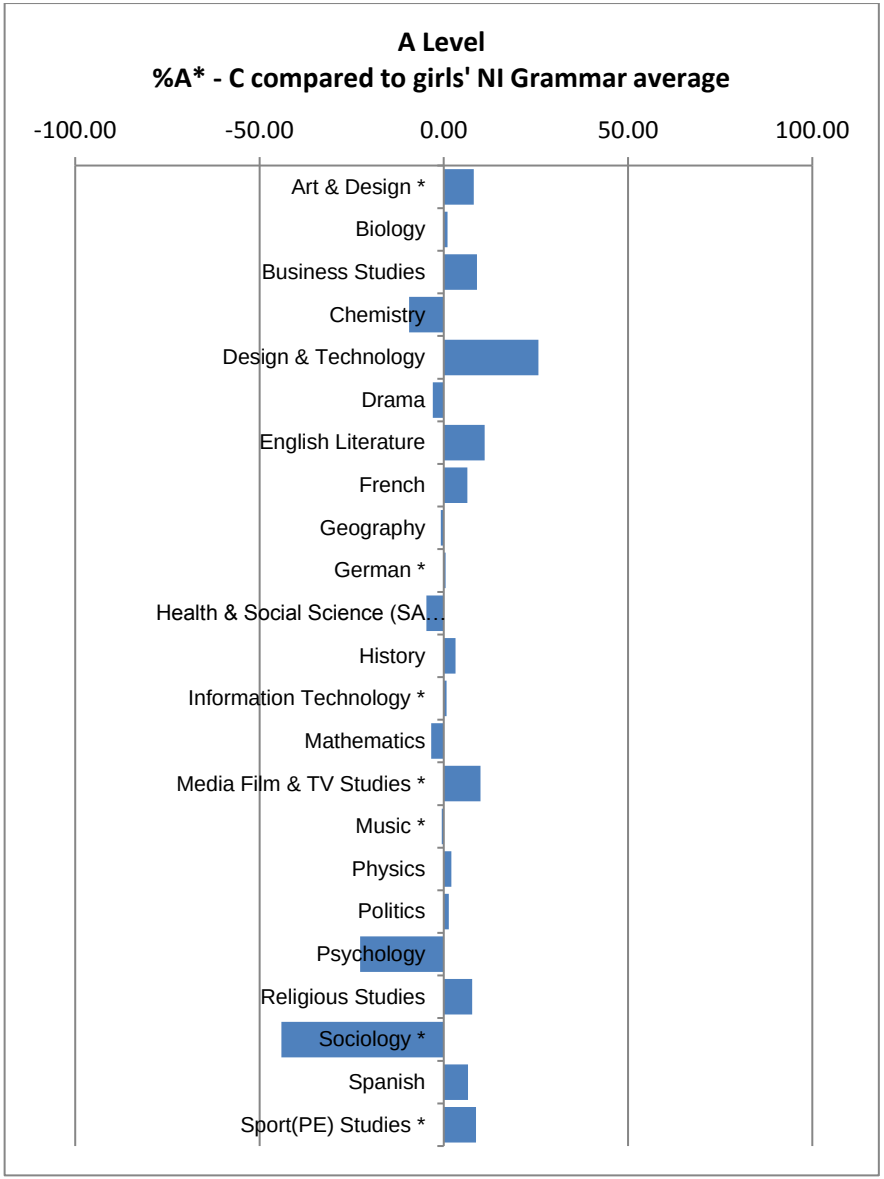
SYSTEM COMPARATIVE 3YR GRAMMAR AVERAGE used by ETI
(% pupils achieving A*-B) by subject. Average for schools = 0



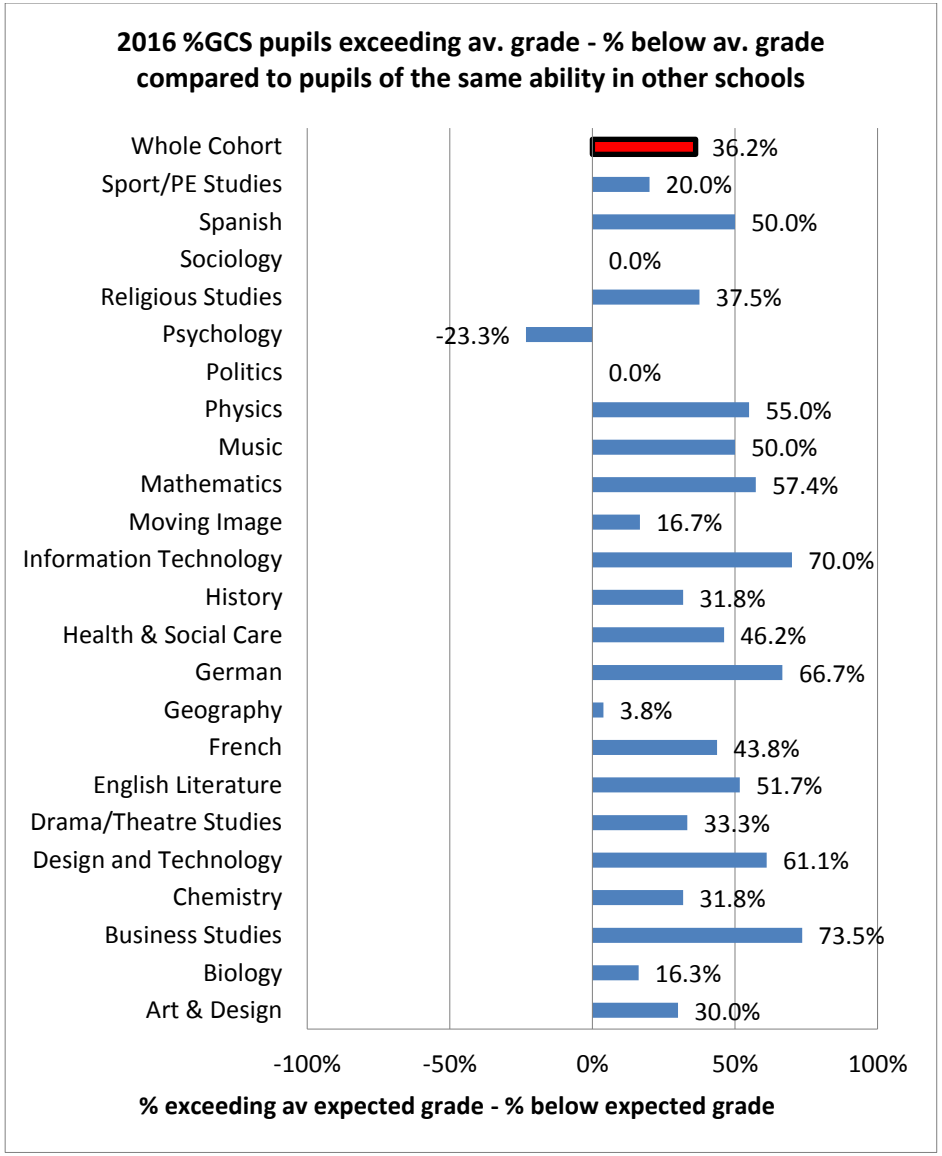
STANDARDS of ATTAINMENT ANALYSIS
AGAINST PUPIL POTENTIAL (expected grade). Average for schools= 0



When the analysis is carried out at A-level we obtain the following result. **Average for schools = 0**



STANDARDS of ATTAINMENT ANALYSIS
AGAINST PUPIL POTENTIAL (expected grade). Average for schools = 0



Conclusion:

In response to the question

"How are the pupils in this school achieving compared to pupils of the same ability in other schools?"

the above analysis leads us to conclude that:

On average, pupils in Glenlola Collegiate achieve better at GCSE and A-level than pupils of the same ability in other schools.

This suggests that Glenlola Collegiate is a high performing school in which pupils achieve or exceed their potential to a degree that is significantly above the average. This conclusion is in sharp contrast to that based on the system chart currently used in Northern Ireland to evaluate standards of pupil attainment in schools.