

Researching the impact of language on assessed practical marks at Key Stage 4 Science

BPRS S1538

Alexander Readyhoof: St Ivo School

BPRS Report Dec 2003

Alexander Readyhoof St Ivo School Cambridgeshire

1 What were your original aims?

Following much frustration with the failure of many recommended strategies to raise the final practical marks for Key Stage Four Dual Award Science, I decided to try out another strategy which I suspected may have a more marked impact upon raising marks than “word frames” etc.

Practical assessment at G.C.S.E. currently represents twenty per cent of the total available marks. A good set of practical marks could make a very significant difference to students at the grade boundaries so I thought it worthwhile. Many pupils clearly capable of higher scores fail to achieve marks above 75% for the analysis and evaluation components. It was my belief that due to the nature of the specific language used in both textbooks and the universal mark scheme, it is not clear to many pupils exactly what is required to achieve these marks. I wanted to find out if a student written mark scheme and self-analysis procedure would produce better results and understanding of the process of scientific experimentation. The analysis and evaluation components are historically poorly written up.

I wanted to develop a student-generated resource that could be used within my department and possibly extending in to Key Stage 3 later on, perhaps even into other area such as Design Technology, ICT or Business Studies coursework.

The following is typical of a pupil-generated scheme for “Analysis”

# Student Centred Language for Planning of Practical Assessment

<b>25%</b>	<p>Write down something you plan to do. It should be simple and safe. It can be in the lab, in the computer room, or outside.</p> <p>Say what special equipment you need so that your teacher can order it for next lesson. Draw a picture in pencil.</p>	<b>2 Marks</b>	<b>Grade G</b>
<b>50%</b>	<p>Say what you going to try and prove and what you think will happen. It is OK to just have a guess at this because that is the whole point of doing the experiment</p> <p>Say roughly how many measurements you will make? (You can make more later if you want).</p>	<b>4 Marks</b>	<b>Grade D</b>
<b>75%</b>	<p>List all the things you could change but remember to say which ones you're going to keep the same to make things fair.</p> <p>Say what the biggest and smallest readings will probably be. If you can, make a prediction about what might happen and give scientific reasons to back up your arguments.</p>	<b>6 Marks</b>	<b>Grade C</b>
<b>100%</b>	<p>Use detailed scientific knowledge in your plan.</p> <p>Say how you use equipment to give precise, accurate and reliable results. Use either a 'trial run', your earlier work, a text book, a CD Rom, or the Internet, to help in the planning of your task.</p> <p>If you can, justify or explain further, your prediction, using detailed knowledge.</p>	<b>8 Marks</b>	<b>Grade A</b>

2. In what ways did you refine your aims?

After applying for the BPRS Scholarship, I was somewhat disappointed to learn that in the new GCSE specifications, the AT1 component represented only 20% rather than the previous 25% of the final marks so that the impact of any positive findings would be reduced for my research. I later noticed as the research progressed that very often those pupils that scored high London Reading Scores in Yr 7 (eg 125+) frequently did no better and sometimes even *worse* than others in the latter components of the AT1 write ups. I asked another member of staff who had a class with London Reading Scores typically in the 70s and 80s to use the pupil centred mark schemes to see if there was any truth in this.

Initially I aimed to depend upon taped student interviews, which I would use later to generate mark schemes but found myself tempted to correct grammar and avoid colloquialisms. For this reason I asked for small groups to work together to produce marks schemes where there was often a “natural volunteer” who would write down the consensus construction of criteria for mark. For reasons beyond my control, the other school mentioned in the original bid could not be involve with the research.

### 3 Which research processes did you find helpful?

- The personal interviews with KS4 students proved to be particularly useful. I chose key students whom I had noticed were used by other as “verbal helpers” to “translate things”.

For example “plot the data” became translated to “just do the graph like in maths last week”. I also targeted a number of disaffected students for advice about how to make the mark schemes more readable.

- The study of personal and departmental data and KS4 AT1 results from the last 3 years confirmed the pattern showing the degree of difficulty that many students have achieving high marks for Evaluation.
- Interviews with other teachers. I discoverer that each has made similar observations to myself and were actively trying out a host of techniques to improve the marks of their classes.
- Informal interviews with John Andrews (Head of English) for general advice.
- Students’ workbooks revealed many perspectives and interpretations of the formal mark scheme, which gave me a much better perspective of how they saw the AT1 criteria.  
It revealed for some students, the large degree of misunderstanding with the language used. For instance “anomalous results” could be written as “*anonymous* results” or “systematic” could become “*automatic*”.

### 4 Which research processes did your pupils find most helpful?

- Involvement.

The pupils who helped produce the various mark schemes were happy to be involved with the research as they believed that not only were they helping themselves but also future students to do better in subsequent years.

They often came to very accurate conclusions by simply discussing the “translation” of the mark scheme with others.

- Inclusion

Students were pleased that everyone in the classes were give the chance to input their interpretations, including (and often more so) the less motivated.

- Value

Pupils believed that their responses were valued especially when a full explanation of this BPRS research was explained to them.

## 5 Learning points gained from undertaking this research and findings.

That;

- Improvements *are* possible
- Language does change results but not always in a predictable way.
- It is not difficult to get students (and other staff) to get involved with their own assessment.
- The involved students are a very useful source of knowledge and perspective.
- There is far less correlation between Analysis and Evaluation marks at GCSE with London Reading Scores than I has previously assumed. For some classes there seemed to be no correlation at all which leads me to believe that results are more to do with other factors including motivation than sheer ability.

Also

- Retrospectively I have come to realise that I personally have had a strong leaning towards experiments being written up fully in a formal way since this is the way I have been trained. I have come to realise that for students at both KS3 and KS4, this is not always necessary and that it would be better for my students in future to write up only parts of the experiment eg. the teacher designs and collects the evidence, leaving the class to analyse the results only. The positive spin off would be that there could be more practicals and such practicals would not be associated with lengthy write ups.

- I have discovered the wide range of “off the peg” GCSE coursework available on the Net, especially the now almost standard “Thiosulphate” disappearing cross experiment is so accessible that splitting up AT1 assessments may be the only way to really avoid plagiarism.

6. What evidence related to this learning and your findings?

Note:

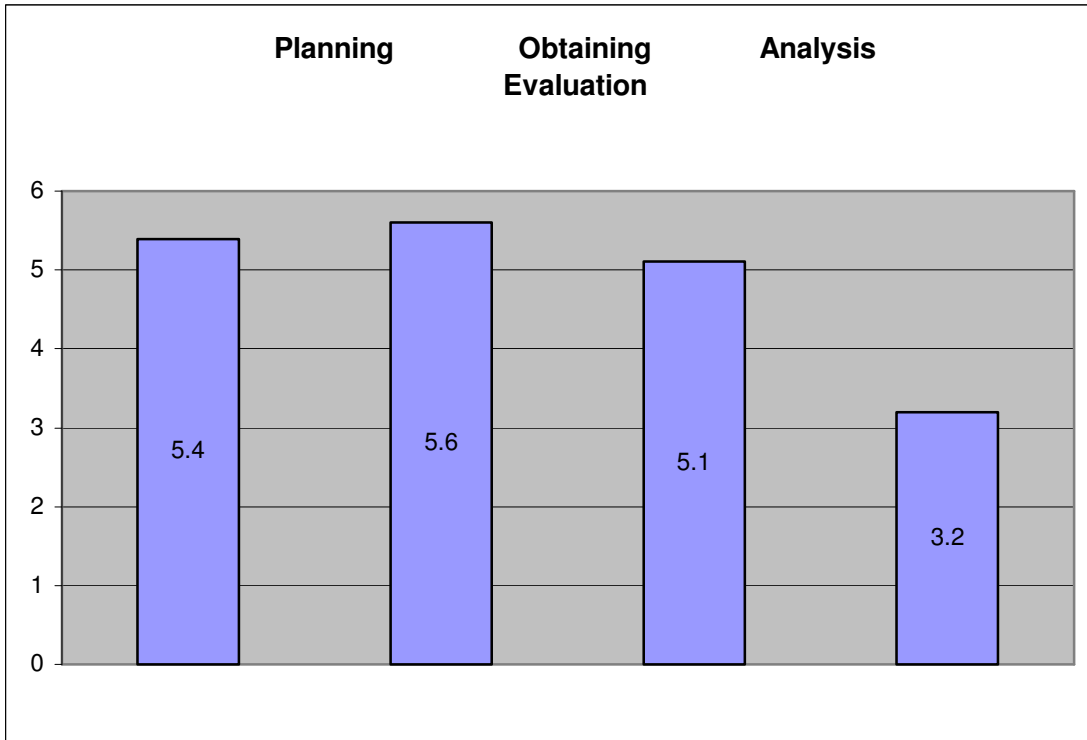
Due to the large storage space requirements of Excel files, only one sample has been included here.

The spreadsheet shows typical Planning, Obtaining, Analysis and Evaluation results for a mixed intermediate

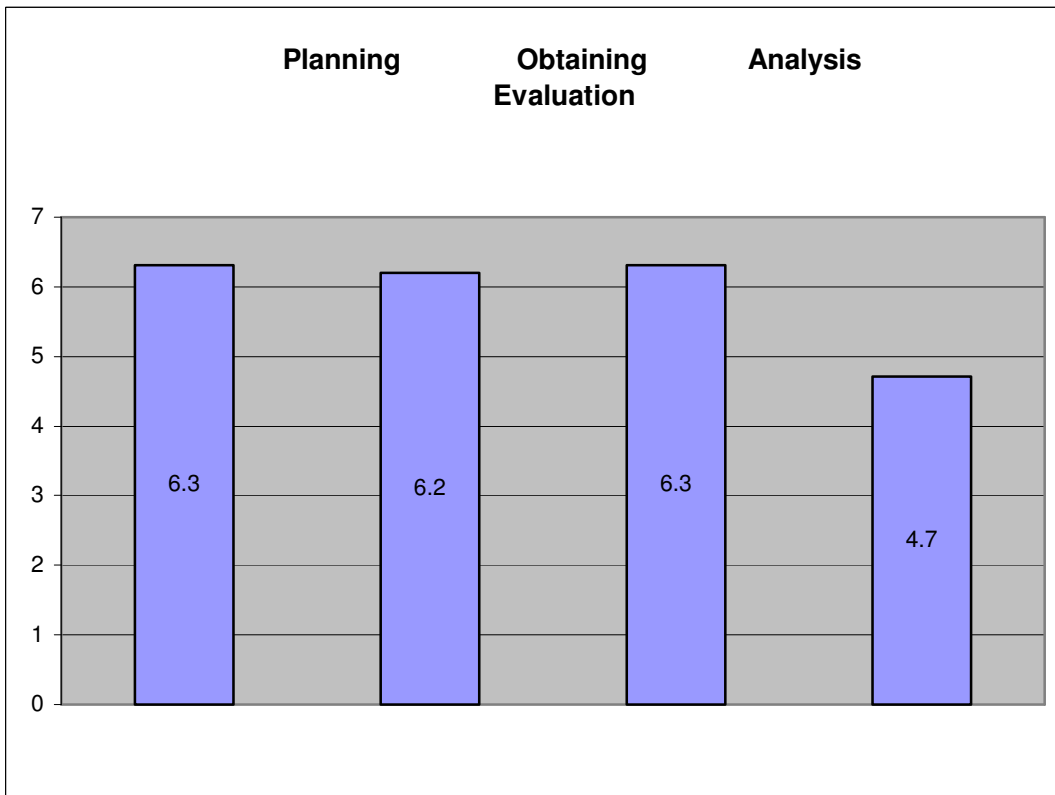
11X4			P1	P2		O1	O2		A1	A2		E1	E2
	London												
	reading												
Laura	93												
Marie	91		7	6		7	7		7	7		2	6
Dan	87		5	6		6	6		5	6		4	3
Tom	104		6	6		6			6			3	
Siobhan	103		6	5		5	5		3	5		2	2
Indira	93		5	6		5	6		5	5		2	3
Luke	84		3			4			3			3	
Mitchell	86		3	4		3	4		3	4		2	3
Matt	107		6	5		6			6			4	
Cheryl	113		5	6		6	5		6	6		3	3
Luke	94		5	3		6	6		6	5		3	4
Laura	96		3	6		6	8		6	5		3	2
Max	107		6	4		8	5		5	5		2	3
Stuart	93		5	4		7	5		6	6		2	4
Jamie	?		7	6		7	5		7	5		5	5
Michael	96		6	5		4	8		6	5		2	3
Abi	90		6	7		5	6		6	5		5	3
Laura	?		6	6		6	6		5	6		3	3
Tom			6	6		5	6		5	5		3	4
Ashley	85		7	3		0	3		0	3		0	2
Shaun	89		5			5			5			4	
Stephanie	114		5	5		6	5		5	5		4	4
Tammy	98		7	6		7	7		6	6		6	5
Philip	97		6			6			5			3	4
Emily	98		7	5		6	6		6	6		3	4
Chris	?		3			3			3	4		2	2
Roy	93		7			6			4	4		4	3
Luke	84		7			6			5	5		4	3
	95.6		5.6	5.2		5.4	5.7		5.0	5.1		3.1	3.4
<b>Means</b>	<b>P</b>	<b>5.4</b>		<b>O</b>	<b>5.6</b>		<b>A</b>	<b>5.1</b>		<b>E</b>	<b>3.2</b>		

Class means were plotted for easy viewing at departmental presentations etc.

Results before research:



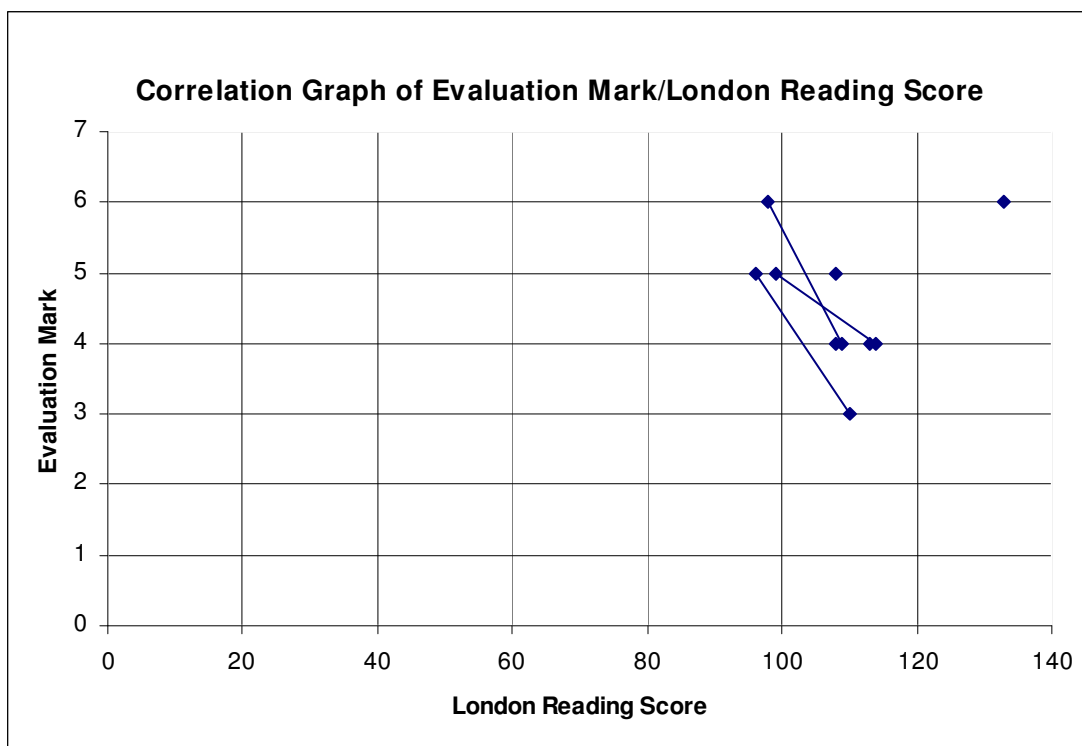
After the pupil-generated resources were used, the following results were obtained.



These results show higher marks towards the Evaluation element.

The poor correlation between Evaluation marks and London Reading Scores was true for all classes tested.

This surprised me as I had strongly suspected that poor literacy was the primary factor for poor written conclusions/evaluations.



7. What are the questions for your future practice?

Does vocabulary or reading ability really have a marked effect upon how the final parts of practical are written up and therefore on grades or is there some other agent at work? Is the London Reading score relevant in KS4? Is there a better indicator (or series of indicators), which correlate?

Is there an issue regarding the fact that Evaluation is always done last and so becomes the obstacle to beating coursework deadlines?

Many lower ability students manage to get very respectable coursework marks through sheer "plod". Could it be that such students simply do not question the need for an Evaluation so actually complete it unquestioningly?

Higher ability students often claim that "the results " or "the graph" speak for themselves, which sadly, they do not when it comes to assessment. For me now, I will change a considerable number of elements of my teaching in the lab. Firstly , I will give **at the very least**, one practical per term, which I will design, execute and plot data. Students will be asked to write up *the evaluation only*. Hopefully they will then no longer associate every practical with lengthy write-ups and for the one single full evaluation demanded from the exam board, the task will not be too onerous.

I will ask them to mark their own and each other's answers and scripts using the pupil generated mark schemes. Sadly Evaluation marks collected in this

manner cannot be used according to the exam board rules (EdExel) but more time needs to be spent on this problem.

8. What are the questions for your school?

Could language be a problem with curriculum based technical language and how is this supported in subjects across the school? How could the language difficulties be improved and is it the responsibility of the English dept or all subject areas supporting such language?

9. Further research

Please refer to 7 & 8

10. How will you disseminate the findings with others?

The work was presented to school staff, on the Professional Day, Tuesday January 2004 alongside the theme of Pupil Voice led by Dr Mike Fielding.

ASE Conference to receive a copy

Beacon School partner to receive a copy

WEB Super network learning.com

Cambridgeshire Science advisor to receive a copy.

This report is available on the Cambridge SUPER NLC website at the Cambridge Faculty of Education. This paper is available on the BPRS research website and by request from St Ivo School Science Dept.