I'm a Scientist debate kits

Report on phases one and two

A Wellcome Trust funded project to distribute structured debate kits to science teachers.

Summary

"This is great I couldn't have done a debate without it"

I'm a Scientist debate kits is a project to help get more debate and discussion going in the UK's science classrooms. We are developing and distributing debate kits to UK science teachers. The kits are designed to give a teacher everything they need to run a structured debate on a set topic and help their students develop their discussion skills. The activity gives them a structured way to start discussing and gets them practicing the behaviour. The Wellcome Trust have funded Gallomanor to produce and distribute three sets of kits in 2009/10.

The first kit was developed as part of I'm a Scientist, Get me out of Here!, in 2008. This first kit was re-printed and distributed to 1,500 teachers and science communicators in Summer term 2009 as the first nationally distributed IAS debate kit. We also provide an electronic version of each kit, which more people can download from the website. The second kit was produced in Autumn term 2009. The topic (suggested and picked by teachers) was 'Are we too clean?' The third kit will be produced and distributed in Spring term 2010. A fourth kit will be developed in Summer term and distributed electronically.

Outcomes

Key aims met:-

- Kits well used
- The resources worked 'straight out of the box'
- They really engaged the students
- They developed students' discussion and critical thinking skills

Kits also:-

- Were good way for students to learn new content
- Were effective with a range of students
- Got quieter students talking
- Inspired teachers to start making their own!

Key milestones

<u>Kit 1</u>

June – July 2009	Kit 1 (IVF) distributed
31st July 2009	Report on phase one published

<u>Kit 2</u>

2nd Sept	Teachers invited to suggest topics for Kit 2
15th Sept	Topic shortlist available for voting on
23rd Sept	Voting closed: topic 'Are we too clean?' chosen
	Research, writing, design
	Orders open
7th Oct	Kit 2 to printer
19th Oct	First batch of kits posted out
30th Oct	Second batch of kits posted out

Feedback on the kits overall

Qualitative

Teachers were overwhelmingly positive about the kits

> "This is great I couldn't have done a debate without it"

> "Can you make some more please?"

> "Congratulations for making our job a lot easier and encouraging me to use active learning"

> "Looking forward to using the other kit as well as using the IVF kit again with y13, and Y11 want to do it again! - thought we could get more into character by using props."

> "I shared this kit with other Biology Teachers and they all wished they had more than 1 kit."

The key outcomes for teachers were:-

The resources worked 'straight out of the box'

> "I think that these kits are a fantastic idea. Having a set of reliable reference material in a pre-prepared format lifts such a weight from teachers. The kit allows teachers to maintain control, whilst avoiding excessive input to a student-based activity."

> "Info from different perspectives saves a lot of time trawling the internet to find it"

> "Easy to use, nothing to print or prepare, small and available"

> "Very simple to organise, and to identify for the students what I wanted them to get out of it."

They really engaged the students

> "[The most important outcome was] the enthusiasm of the pupils for the debate"

> "Fab!! Such an easy resource to integrate into a lesson, students enjoy using it."

> "Putting science into real life context so that most kids can relate to something in the scenarios."

> "The students really engaged and empathised with the characters and helped them to understand the role of science in a wider context than a school room or lab"

> "Once groups started to ask their question, I encouraged the questioning and answering group to follow up with responses to each other - some lively debate blewup which was excellent."

> "The class talked enthusiastically about a scientific issue"

They developed students discussion and critical thinking skills

"Students - especially Y10 – [now] have a much clearer idea of the process by which they form their opinion, and what might validly change it."

"Pupils talking about their thoughts and helping their understanding of controversial topics"

"Some students are too used to following specific instructions, which is great, but the kits let them get out there are question science analytically."

"Students gained debating skills and realised the benefit of basing their opinions / arguments on sound knowledge of facts."

"The discussion around being 'too clean' was not a concept the children had really considered before."

Gave students practice at structuring a debate

"a good introduction to debates in science"

"Useful format to structure the debate"

"Allowed students to gain good debating skills."

"It brought about productive debate within the class"

"Gave the background and set the scene then for the pupils to make their own decisions on the topic"

Got students to see different viewpoints and explore ideas

"The students were able to see different sides of the argument."

"Was a good way to get the students thinking about other peoples view points and not necessarily relying on their first impressions of a topic."

"Really got pupils thinking about the issues regarding IVF"

"In role the pupils had freedom to set aside their own opinions."

"Getting the pupils to think in different directions"

Kits were also a good way for students to learn new content

"Convenient to use and targeted at the right level. Excellent introduction to the main concepts of microbiology."

"Students felt that they had retained a lot of information by using this kit. The content was neither too light, nor over-laden. I think that the amount of information per card was just right and provided students with bitesize information, without patronising them."

The kits were effective with a range of students

"Lent the kit to our RE teacher who used it with a class of Yr10 GCSE RE

students as part of their debate on the morality of IVF."

"It encouraged the (ASN) pupils to express an opinion, think about the facts (they found some of them hard to believe) and to talk to each other about what they thought."
*(*ASN = Additional Support Needs)*

It's pretty striking that while some teachers were finding the kits very useful with students with special educational needs, or in pupil referral units, other teachers were seeing them as stretching talented students and developing advanced skills:-

"Good prep for pupils being interviewed for entry to medicine."

We feel that this is because the resource is flexible and leaves a lot of room for student input.

"The variation and that it's a kinesthetic resource."

"Very understandable content and language used in the resource which makes it useable with many different ages and abilities. Everyone seems to get something out of it."

There were also some more unexpected outcomes:-

Got quieter students talking

"Good for getting even the quietest pupils to make a comment."

"Getting some of the kids to actually speak in lesson."

Teachers started making their own!

"I have used these kits and actually produced 2 of my own based on the idea"

"Other [teachers] praised it for giving them ideas to design something similar on other subjects."

We think it's fantastic that teachers are taking the idea of the debate kits and creating their own versions. That's part of the point of them being Creative Commons! We propose to make this easier for teachers by creating simple 'templates' of character cards that teachers can fill in with their own content. Teachers could them easily upload the resources they've created to our site, and access kits written by other teachers. Our interview research with teachers suggests this would be very helpful for teachers.

What teachers didn't like

Several teachers (nearly all working with students with special educational needs) requested larger cards with larger writing, and some requested less text, or simpler text.

Our response
We really want the kits to be as inclusive as possible and as useful as possible. However, we can't afford to print different versions and we think the level of the language is about right for the target audience (apart from SEN teachers, 3 teachers said there was too much text, but a similar number said there was too little or that they wanted more info).

Given the wide age range teachers have used the kits with, we feel the information is pitched about right for the main intended audience (age 13-15). It's to be expected that a small number of teachers at either extreme of the secondary audience would feel the kits aren't ideally pitched for their students. If anything we will err slightly on the side of making the language in future kits more accessible. It's easy for teachers to add more detail to stretch higher ability students, not so easy to take things out for lower ability students.

However, what we can do relatively easily is provide a large-type download version of the kit. This will be useful for visually impaired students, and helpful for some SEN students.

Quantitative

Based on 61 completed online surveys
24 had used the 'Are we too clean?' kit. 37 had used the IVF kit.

Response

Most teachers (54/60) thought the resource overall was excellent or pretty good – the remaining 6 thought it was 'OK'.
Most (51/59) thought the content was excellent or pretty good.
Most (51/59) thought the design and format was excellent or pretty good.

	Excellent	Pretty good	OK	Not that good	Rubbish	Total
Overall	42% (25)	48% (29)	10% (6)	-	-	60
Content	41% (24)	46% (27)	12% (7)	2% (1)	-	59
Design/format	41% (24)	46% (27)	12% (7)	2% (1)	-	59
Average %	41.0%	46.6%	11.2%	1.1%	0.0%	178

Almost all (58/61) would recommend the kit to a colleague.

Drilling down into these results, of the three teachers who would not recommend the kits:-

- One had used the kit with a mixed ability year 8 class and felt there was too much text and it was too advanced for some of her students.
- One answered no further questions so we cannot analyse any further.
- One liked the format, but commented that the content was 'Too politicised. I would prefer topics to be focused on ethics not economics.'
  We would be very interested to discover more about this ability to consider ethics divorced from practical considerations. However, we are reasonably confident it is not what the national curriculum means by 'to consider how and why decisions about science and technology are made, including those that raise ethical issues, and about the social, economic and environmental effects of such decisions'. In fact it might be seen as the exact antithesis of everything HSW is supposed to be about. I guess you just can't please everyone.

Usage

Just over half (32/61) had used the kit once, of the remainder 16 had used it twice, with the remaining 13 spread out. (fig 4)
Half had used the kit with one class, 19 had used it with 2 classes, with the remainder spread out – 2 had used it with 12 classes (i.e. the entire year group). (fig 5)

Half (29/60) had lent their kit to at least one other teacher. Half of those who specified (14/26) had lent the kit to more than one teacher – 4 to the whole department. Most (50/60) definitely plan to use the kit again – 9 haven't decided.

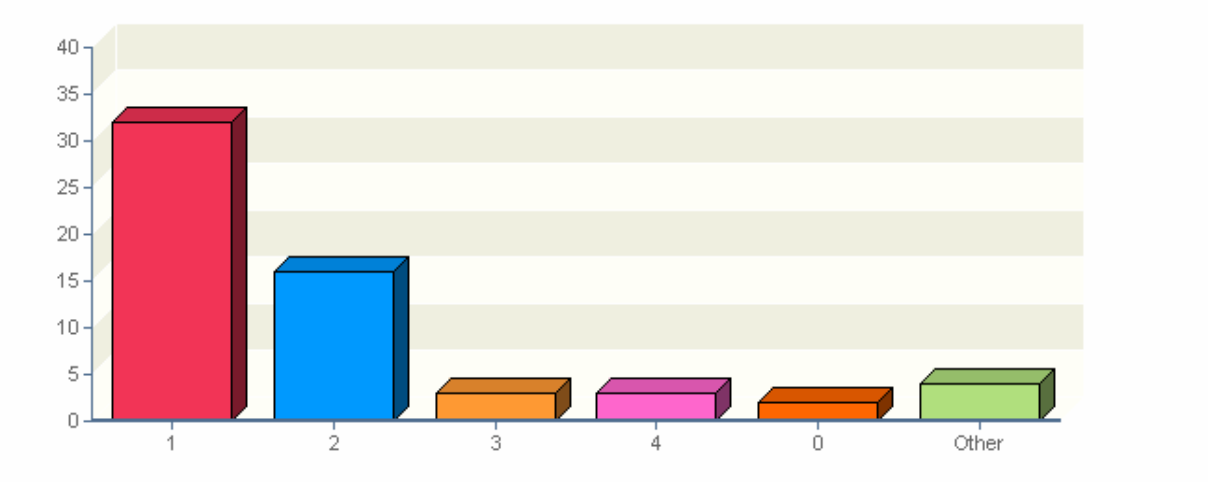

Fig 4. Responses to 'How many times have you used the kit?'
'Other' responses =
11 (1)
12 (1)
6 (1)
Have put in into a scheme of work so will be used by the whole department! (1)

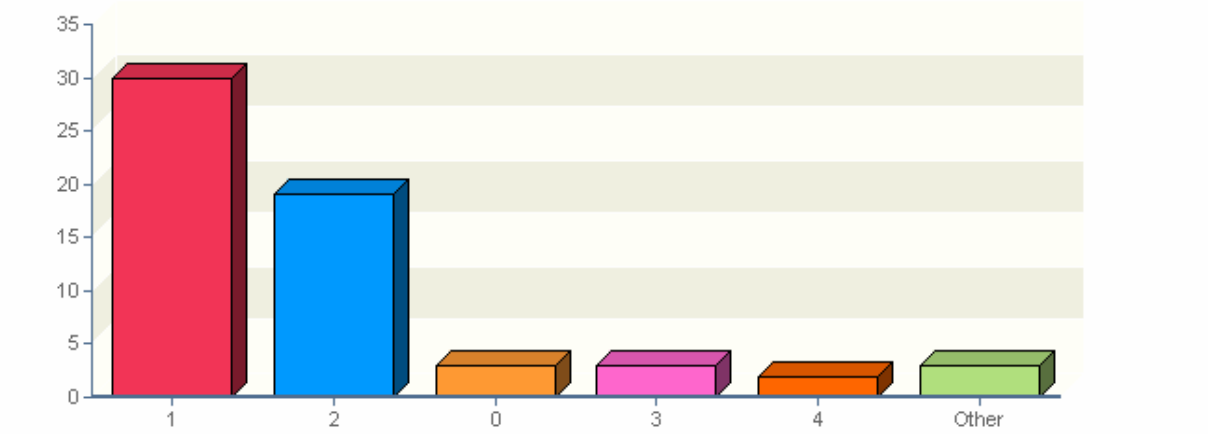

Fig 5. Responses to 'How many classes did you use the kit with?'
'Other' responses =
12 (2)
6 (1)

Age of students (fig 5)
Half (30/58) had used it with 14/15 year old students (year 10 in England and Wales, S3 in Scotland).
A quarter (15/58) had used it with 13/14 year old students (year 9/S2)
One sixth (9/58) had used it with 12/13 year old students (year 8/S1), with the same number using it with 15/16 year old students (year 11/S4).
The youngest students using the kit were 11/12 year old students (year 7/P7 – 3 classes), the oldest were 17/18 (year 13/S6 – 2 classes)

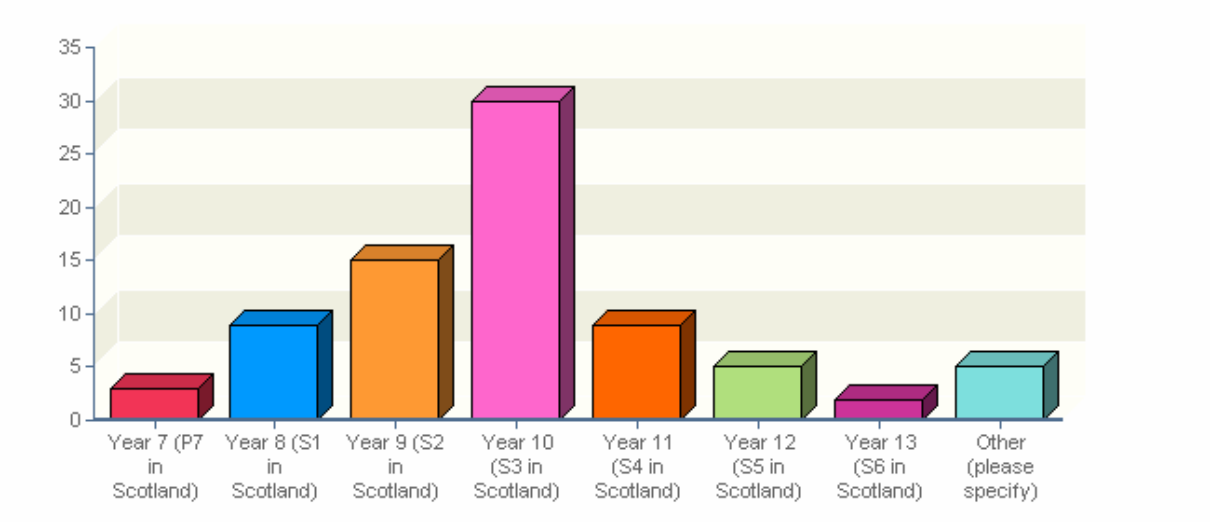

Fig 6. Responses to 'What year group of students did you use the kit with?'
'Other' responses =
FE (1)
Just tested with colleagues so far (1)
post 16 students (1)
second yr of a BTEC National Diploma in Applied Science (1)
third level year one (1)

Ability of students (fig 6)
Half (29/57) of teachers used the kit with a middle ability set, almost half (25/57) with a top set, almost one quarter with a mixed ability set and few (5/57) with a low ability set.

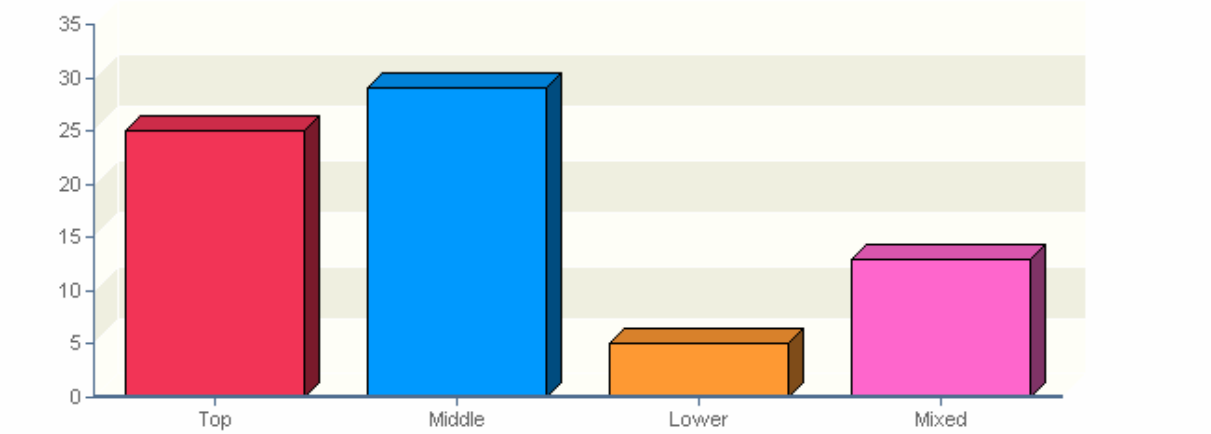

Fig 5. Responses to 'What ability level classes have you used the kit with?'

Breakdown of evaluation of the two kits to date

Kit 1

Kit 1 (on IVF) was distributed in Summer term 2009 to 1,500 people. More details in our phase one report. Since then, the electronic version has also been downloaded 446 times.

Feedback for formative evaluation

We will analyse most of the feedback from kits 1 and 2 together, later in this report. However, of course we looked at the Kit 1 feedback as it came in, and took it into account when producing Kit 2. Here is a summary of that feedback and what we did in response to it.

Kit availability
Several teachers asked for more copies of the kit, or for download copies they could print out themselves.

We have been providing download copies since day one, however, we have now made this more prominent on the website and also told teachers about it in an email to all teachers who've had a kit sent to them.

Content
A couple of teachers flagged that students might have issues with the content of Kit 1 (IVF) – one character is a man dying of cancer (to raise issues of the NHS having finite resources) and one is a lesbian couple wanting to have an IVF baby.

It was a real oversight on our part not to consider that the terminally-ill man might upset some students, depending on their personal circumstances, and might be best omitted in some classrooms. The lesbian couple may cause embarrassment or teasing in younger students, but we don't feel that's a cause for omitting them. However, teachers deserve some warning that the resource may raise issues so they can be prepared for them. In Kit 2 (and in all future kits) we will flag in the teacher notes anything that we think might possibly be an issue.

Appearance
A small number of teachers also suggested the kits should be brighter and more colourful and feature less 'childlike' cartoons.

We therefore improved the design of the kits to have a little more energy, and changed the character drawings to be less 'cartoony'.

Info provided
One teacher (having discussed the matter with her students) suggested that a glossary card for the topic would be useful.

We felt that one of the great things about the kit is that the information comes out gradually during the course of the activity – so it's much easier to take in and to remember. And students (as they read out their cards) feel that they are contributing – rather than the teacher being the source of all knowledge and students being passive receptacles. A definitions card for students would, we think, work against that. However, what we have done is change the layout of the teachers notes slightly, adding a bit and breaking the text up into sections so it is easier to consult. We can also, for future kits, provide links to further info, but that does seem to counteract what we are trying to do.

Kit 2

Distribution

Batch 1: 1,158 kits sent out to 1,040 people
Batch 2: 193 kits sent out
Total: 1,351 sent out so far

Plus 145 people have downloaded a copy of Kit 2, since 1st Nov (as of 14th Dec 2009).

Narrative account of Kit 2 development and distribution

We wanted to make sure our topics were useful for teachers, and also make the teachers who've signed up feel more involved in our project. We therefore gave as much input to end-users as possible. We 'crowd-sourced' the topic for this kit, by asking all the teachers we were already in contact with, plus all those who had ordered the first debate kit, to suggest topics. We then drew up a shortlist of those suggestions (based on popularity) and set up a poll on our blog. 306 people voted in our online poll and another 30 by email, choosing 'Are we too clean?' as the topic, to our surprise.

Fortunately Dr Mark Roberts, a former IAS participant, is a microbiologist and was able to point us in the direction of suitable background reading and introduce us to the Society for General Microbiology. Based on this research we developed a kit based around the question 'Should advertising of antimicrobial cleaners be banned?'.

We started taking orders for Kit 2 soon after the topic had been chosen. We advertised this by emailing teachers who'd had the first kit and putting information on our blog, on twitter and on the TES message boards.

Following many requests from teachers, with Kit 1, with Kit 2 we let teachers order more than one kit (up to five). There wasn't a way for us to set our order form to only accept orders up to 5. So text on the form said 'max 5' but people could actually enter any number. We found that many teachers happily filled in much larger numbers (125 being the highest) but we limited it to five per teacher as advertised.

Even with the limit of five orders per teacher, by the time the kit was printed we had orders for 1,158 kits, and this was before publicity had appeared in the Planet Science newsletter, or the Aimhigher bulletin. At this point we decided to restrict future orders to one copy per person, as this would get the resource to more teachers.

As orders were still coming in, we checked the geographic and academic profile of the schools where kits had been ordered. The geographic distribution was examined by plotting the postcodes of all schools on a map (see fig 1), the academic achievement by sampling 100 schools and looking up in the school league tables what percentage of their students gained 5 or more GCSEs at grades A*-C (see fig 2).

We found no problems in the geographic distribution (i.e. there were no obvious gaps) but the academic achievement was skewed towards the high achieving schools (see fig 2 for graph, national average 47.6%, our sample mean, 56.6%). However, it is not clear how the national averages are calculated and therefore whether this result might be an artefact.

It is a priority for us that the kits were going to where they could make the most difference. We decided to stop taking general orders and reserve the last 100 kits for teachers in Aimhigher target schools. We spoke to Aimhigher and they suggested an item in their bulletin would be the best way of preferentially reaching those teachers. We therefore took down the general order form, made the 'download a kit' option more prominent on the website, but put up a 'hidden' exclusive order form which we advertised in the Aimhigher bulletin.

We have only had 15 orders since then, via the exclusive order form. Unfortunately the bulletin does not go directly to teachers, but to local Aimhigher practitioners who work with teachers in schools. Potentially these practitioners are not subject specialists, so they may not appreciate the value of the debate kits to science teachers. Or maybe they and the teachers they work with are very busy. We are looking into other ways of reaching these target teachers.

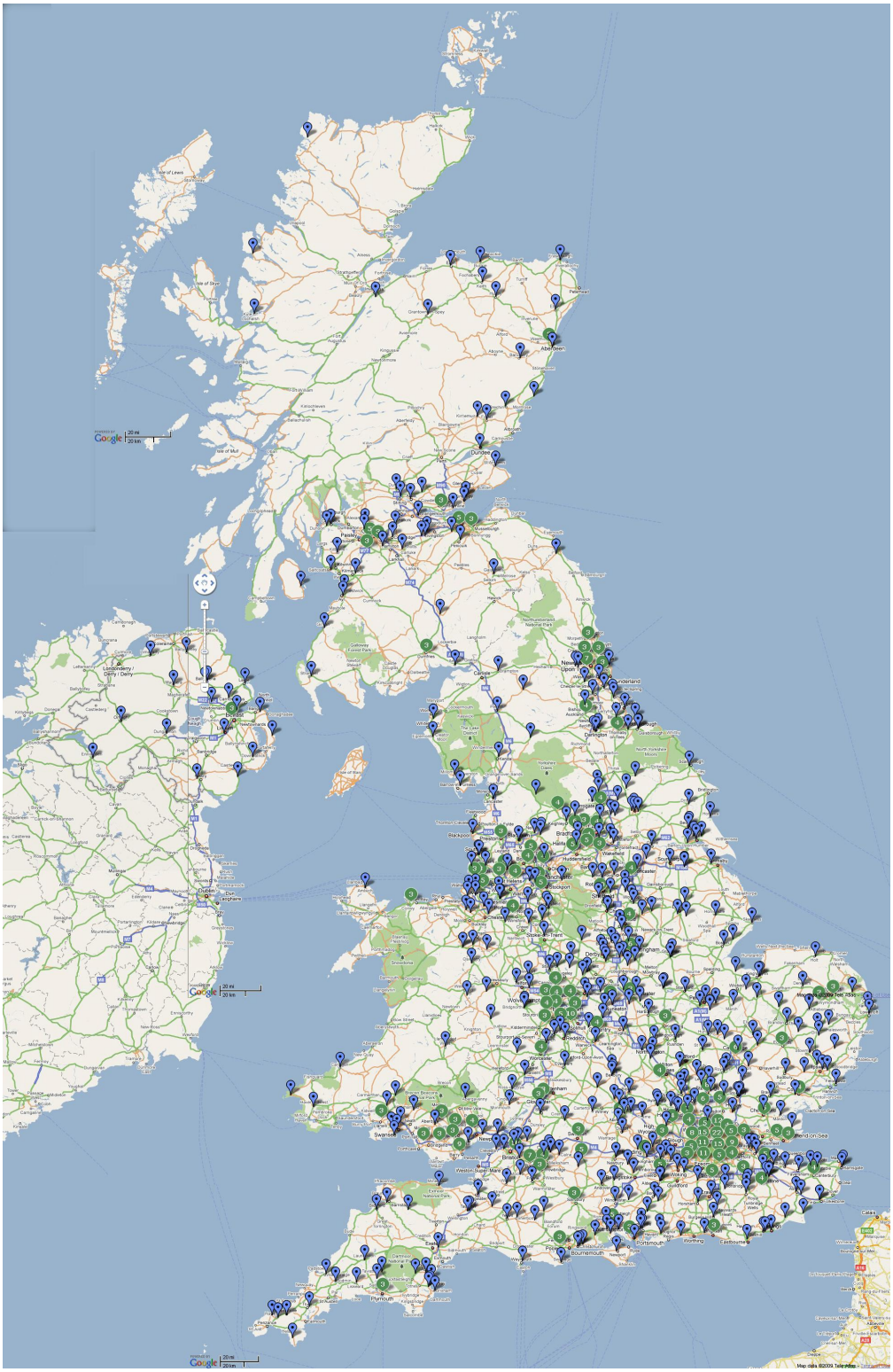

Fig 1. Map showing postcodes debate kits have been sent to

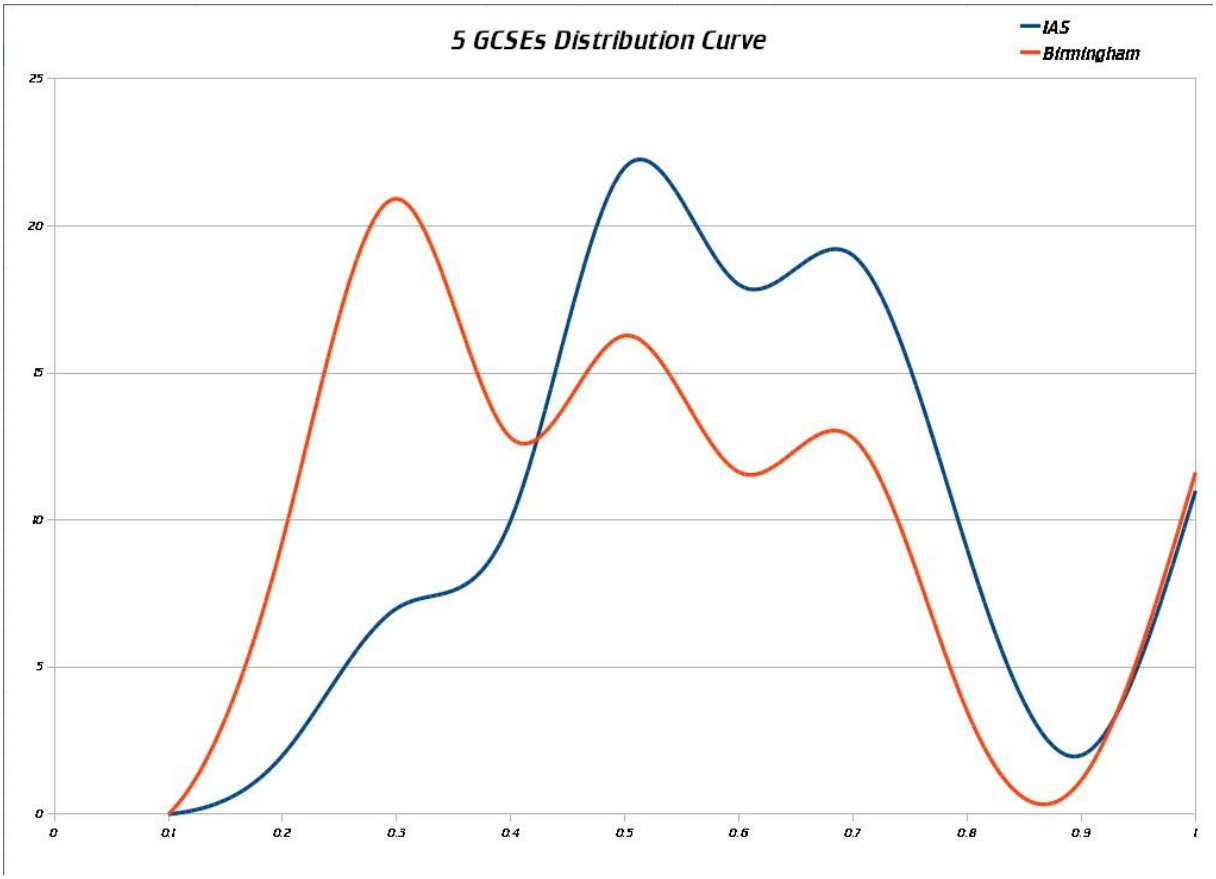

Fig 2. Graph showing GCSE achievement profile of schools who have ordered a debate kit.
Graph shows percentage of students achieving 5 or more GCSEs at grades A-C in 2008, based on DCSF figures. The x axis shows %age of students, the y axis shows frequency of schools by decile.*
The blue line shows the distribution of IAS debate kit schools, the red line (for comparison) shows distribution of schools in Birmingham. Birmingham City Council was used as the statistics are published by local authority area, rather than nationally, and BCC is the largest.

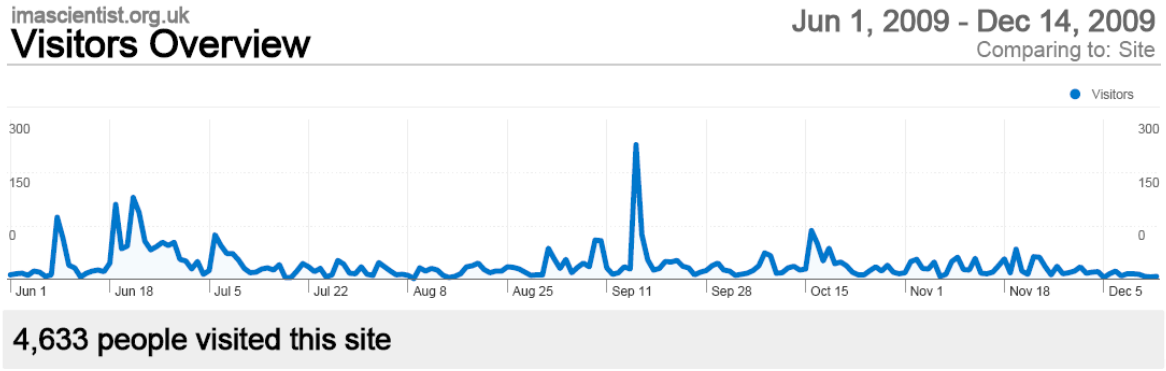

Fig 3. Google Analytics: Site visitors overview during life of debate kits project.
Spikes in June and July coincide with advertising and orders for Kit 1, spike in Sept coincides with voting for Kit 2 topic, spike in October coincides with orders opening for Kit 2.

Lessons from Kit 2

- Teachers are keen to be involved in shaping the content of resources offered to them. Voting on the topic of debate Kit 2 resulted in the largest spike in activity on the blog since the debate kits project started (see fig 3).
- Teachers will take no notice of what you say the limits are, if they think they can get away with ordering extra, they will.
- The kits are in demand by teachers, which suggests they are meeting a real teaching need.
- The Aimhigher bulletin is not a successful way of reaching Aimhigher target teachers and/or getting them to order science debate kits.

Budget

Overall we are approx £1,500 below the budget for the project. We have significantly underspent on promotion and overspent on origination, print, despatch and project management. On kit 3 we will increase the print to 2,000 and spend additional money on promotion to help achieve that target. Overall we expect to end the project on budget.

	Kit #1		Kit #2		Kit #3		Kit #4		Total		
	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Remaining
Origination	£0	£238	£1,050	£1,016	£1,050	£0	£1,050	£0	£3,150	£1,254	£1,897
Print & Despatch	£1,681	£2,177	£1,681	£1,570	£1,681		£0		£5,043	£3,747	£1,296
Promotion	£3,225	£2,323	£1,753	£0	£1,740		£0		£6,718	£2,323	£4,395
PR	£600	£360	£600	£360	£600		£0		£1,800	£720	£1,080
Website	£500	£500					£0		£500	£500	£0
Project Mgt & Eval	£1,850	£2,740	£1,850	£2,740	£2,600		£0		£6,300	£5,480	£820
Contingency	£400		£400		£377		£0		£1,177	£0	£1,177
	£8,256	£8,337	£7,334	£5,686	£8,048	£0	£1,050	£0	£24,688	£14,024	£10,664
Spend to date	£8,256.00	£8,337.45	£15,590.00	£14,023.77	£23,638.00	£14,023.77	£24,688.00	£14,023.77			

Next steps

Summary of proposed additions for next kit

- Downloadable 'large print' version
- Downloadable templates for teachers to make their own kits
- Facility on our website for teachers to share their 'home-made' resources

Timings

We will have an extremely busy term next term, now that we will be rolling out the I'm a Scientist event, which will put pressure on debate kit production. We propose to:-

1. Miss a term next term, as there is some concern that we aren't giving teachers time to use the kits before deluging them with another one. We will check whether there is any evidence to support this view. The obvious way to do this is to poll the teachers. As we have been intending to email all the debate kit teachers and let them know about our good fortune re I'm a Scientist funding anyway, that would seem to be efficient.
2. Instead of a long process to choose the topic of the next kit, we propose to take the runner up from the last vote (stem cells) and make that the topic of the next kit. This will save a lot of time and effort, we know it would produce a topic that teachers want, and there is plenty of material to help us produce the kit. Teachers have told us that stem cells are an interesting topic for students and because of the ethical issues raised there are many resources out there that cover it, but nothing as simple, clear and easy to use as our debate kits. This suggests it will be fairly straightforward for us to look at the existing resources and create something suitable.