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creating community conversations

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I'm a Scientist Debate Kits Evaluation Report

Final evaluation report on this Gallomanor project, funded by the Wellcome Trust, WT088682MA.

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1. Summary

I'm a Scientist Debate Kits is a project to help get more debate and discussion in the UK's science classrooms. It was a Gallomanor project funded by the Wellcome Trust

- Over the last 18 months we have produced and distributed four kits, on different biomedical topics.
- Altogether roughly 4,500 printed copies, on three biomedical topics, have been printed and distributed, plus a further 4,000 copies downloaded.
- They have proved extremely popular with teachers, apparently meeting a teaching need for high-quality, simple-to-use resources to stimulate debate and discussion in the science classroom.

- Teachers judged them to be very effective.
- The kits got students seeing different sides to an argument, expressing their opinions and backing them up with facts, and developing their confidence and discussing science issues.
- They also increased teachers' confidence and skills at running debates and saved teachers time in lesson preparation.
- Teachers told us they also supplied far more in-depth coverage of each topic than they would have had time to provide.

If you would like a copy of a Debate Kit please email debatekits@imascientist.org.uk

Kits can be downloaded and viewed here:
http://project.imascientist.org.uk/download-science-debate-kits/

Key findings

Total kits distributed (print and electronic): **8,521**.

98% of teachers would recommend the kits to a colleague.

The kits

- Were effective at prompting in-depth discussion.
- Engaged young people.
- Were easy to use and saved teachers' time.

2. Background

The first debate kit was developed, after consultation with teachers, as a teaching resource as part of the I'm a Scientist, Get me out of Here! pilot event in 2008. It proved so effective and popular with teachers, that we applied to the Wellcome Trust People Award scheme for a grant to produce more.

The thinking behind the kits is that, for very sound reasons, the post-2006 GCSE curriculum calls for far more debate and discussion in science. However, simple-to-use and effective resources to support this are lacking. As it's a relatively new requirement, many teachers feel unequipped to facilitate discussions and told us that students often lack the skills they need.

These kits are designed to plug that gap. They give a teacher everything they need to run a debate on a set topic and help their students develop their discussion skills. The activity provides a structured way to start discussions and gets the students engaged in thinking about contentious science issues. Using eight characters, with different points of view, allows us to introduce issues from many different angles – ethical, social, economic, political. Young people consider and weigh up these questions in an integrated way.

Project objectives

As outlined in our grant application

- To produce three sets (one set per term for three terms) of debate kits suitable for students aged 14-18 on issues in biomedicine.
- To distribute 1,500 copies of each kit.

Desired outcomes

As outlined in our grant application

For secondary school students

General

- Develop their skills at debating and discussing biomedical issues.
- Develop their higher thinking skills around these issues.
- Develop confidence in their own opinions.
- Develop their ability to see all sides of an issue and the points of view of others.

Specific

- Learn more about the topics covered in the kits.
- Explore the social, ethical and environmental aspects of the topics.

For teachers

- Increase their confidence at running debate and discussion sessions.

- Increase their skills at running debate and discussion sessions.
- Provide effective resources which they can re-use in future to help develop students skills, which don't require lots of preparation or effort from them

Description of project

Summary

Four kits produced altogether:

1. IVF
2. Are we too clean?
3. Stem Cells
4. Cannabis

All topics were suggested and chosen by teachers.

All content was developed by I'm a Scientist staff, in consultation with appropriate experts.

Total kits distributed: 4,425 printed copies, 4,096 electronic copies.

For more details on the development and contents of the four kits, please see Appendix 4

Formative evaluation findings during the project

1. Direct mail, Planet Science and posting on TES message boards were the most effective of a range of methods for reaching teachers.
2. Feedback from the first two kits was very positive, although some requested larger-print versions for partially-sighted students, and suggested slight changes to format. These changes were implemented for subsequent kits.
3. The kits have good geographic reach, with no obvious gaps.
4. We reported how the project was going as we went along, here: http://project.imascientist.org.uk/2009/07/debate-kits-report-on-phase-one/. This is covered briefly in Appendix 4.

3. Evaluation methodology

Formative evaluation

Formative evaluation is key in a project of this kind,; there's no point finding out after the project is finished that it would have been better to provide the kits in a different format. Formative evaluation was incorporated into the project in a number of ways:-

- Teachers were asked to suggest what topics they wanted kits on. They then voted on the shortlist of topics, to ensure that topics were useful and relevant in the classroom.
- A feedback survey for teachers who'd used the kits was published soon after the first kit was sent out. The findings from this survey informed the production of later kits. These findings, and our response, are detailed in the interim evaluation report produced in December 2009.
- Each kit was developed in consultation with experts in the issue it covered.
- The Producer and Executive Producer of the project visited a nearby school to observe a debate using the kits.

Summative evaluation

Online feedback survey

The survey on the kits was emailed to all teachers who'd signed up for them. It consisted of a mixture of 17 quantitative and qualitative questions. 141 people completed the survey. Most were teachers, two were home educators and one a STEM ambassador. For convenience we'll refer to all respondents as teachers.

Not all teachers answered all questions in the survey. The total number of respondents is quoted for each question, in the Evaluation findings analysis section.

Usage audit

Completing the survey was self-selecting (which is somewhat unavoidable). In order to survey how many kits were used, we also emailed a random sample of 50 teachers from the list (and then followed up non-responders with letters and phone calls) to ask which (if any) kits they had used.

38 of these 50 teachers responded. 2 teachers had moved schools and were no longer contactable. The remaining 10 teachers were emailed, contacted by letters and by phonecalls but could not be reached. We therefore reduced the size of the sample to the 38 teachers that responded. Whilst this could introduce bias, we were clear that teachers should still respond even if they didn't use any kits. Confidence in our sample was increased as those who did not respond to the initial email but responded to the later contacts were just as likely to have used the kits as those who responded to the first contact.

For the online download versions of the kits, we were also able to track downloads using google analytics.

4. Evaluation findings

Distribution

	Printed copies	Downloads
Kit 1: IVF	1,450	1,299
Kit 2: Clean	1,351	826
Kit 3: Stem Cells	1,624	739
Kit 4: Cannabis	n/a	1,232
Totals:	**4,425**	**4,096**

Overall total kits distributed: 8,521

This does not include extra kits distributed at meetings, conferences, etc. We estimate this to be approximately 300 - most of the remainder of a print run of 1,500 Clean kits and half of the remainder of the 2,000 Stem Cells kits. We will not include these in further analysis however. Some of these kits were given directly to teachers, or to those who work with them, or with young people. Some, however were given to other professionals in the sector for information purposes, and are unlikely to see the inside of a classroom.

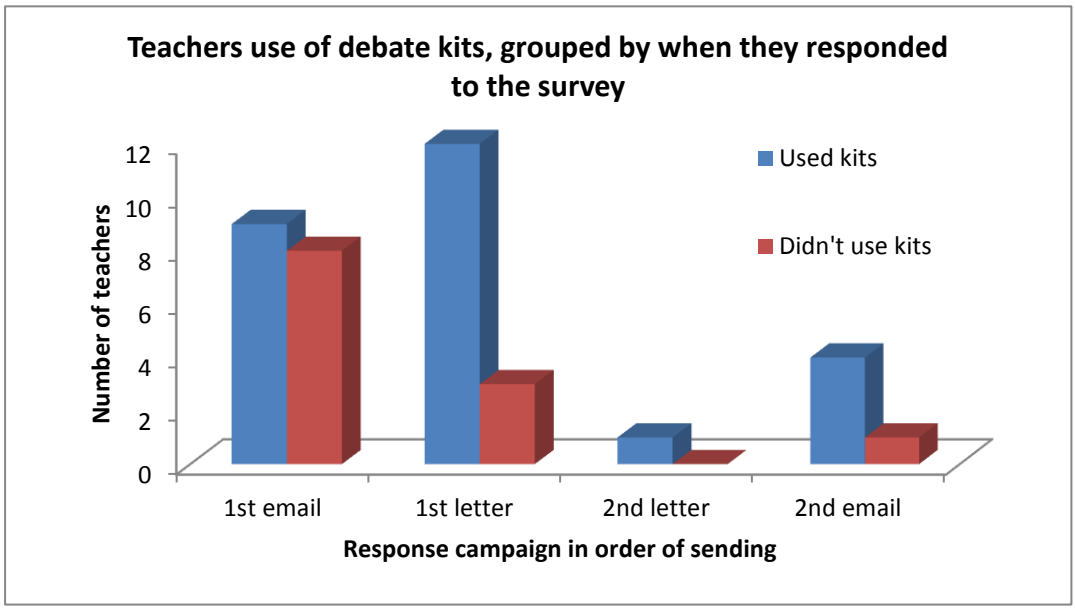
Usage

How many kits were used?

Of the random sample of 50 teachers, 38 teachers replied. Of these 38, 26 had used the kits. Therefore 68% of teachers have used at least one kit. 2 teachers were unsure if the kits had been used in their school (they were technicians that had passed them onto colleagues) and the remaining 9 hadn't used the kits. It wasn't possible to contact the remaining 12 teachers.

A total of 94 kits were sent to the random sample of 50 teachers surveyed. We know from the responses that 31 of these kits were definitely used. If NONE of the non-responders used a single kit that indicates a 33% usage. **This is the least use scenario**. In this case of 33% usage 1,460 of the 4,425 printed kits distributed have been used.

However, this figure is likely to underestimate the usage of debate kits. In emails and letters sent to all 50 teachers we explicitly stated that they should reply even if they had not used any of the kits, and we explained why that was important. Teachers who only replied to the later reminder email and letters were **just as likely** to have used the debate kits as teachers who replied to the initial email. The highest proportion of teachers who had **not** used the debate kits replied to the initial email (see graph below). It is therefore unlikely that the least use scenario is correct.



The 38 teachers who responded to the survey were sent 74 kits, of which 31 were used. This represents a usage rate of 46% in this group. If we assume the same rate of usage in non-responders then that gives us 46% overall. **This is the most use scenario**. This would mean that 2,036 of the 4,425 printed kits distributed were used.

We are discounting the possibility that non-responders had a higher usage rate than responders, as an unlikely scenario.

We think it's reasonable to take the average of these two figures, which gives us an estimate of 40% of kits used. In this case we estimate 1,770 of the 4,425 printed kits distributed have been used.

Downloaded kits: We don't have any contact information for the people who've download the online kits, so we have no way to ask them about usage. Given that a physical kit, printed on card, is a metaphorically weightier object than a computer file, it doesn't seem reasonable to assume the same usage rates. Although, in many ways an electronic file is more flexible, can be copied and printed out many times and passed on to others. Doubtless a significant percentage of the downloaded files have been used in the classroom, but there is no realistic way to estimate the numbers. However, the 38 teachers who responded to the random sample survey used 16 downloaded kits. 34% of the debate kits they used were therefore downloaded.

How often were they used?

31% used the kits once

26% used the kits twice

36% of teachers have used a debate kit 3-6 times

6% had used a kit 10 or more times

65% of 126 teachers questioned have lent the kits to other teachers

Of the 67 teachers who specified the number of other teachers they had lent the kits to, 67% of teachers lent the kits to one or two other teachers

10 teachers made the kits available to the whole of their department

This indicates that once a teacher used a printed kit it was used, on average, a further 2.1 times by other teachers.

We therefore estimate the kits have been used to run 4,526 debates under the least use scenario, and 6,312 debates under the most use scenario.

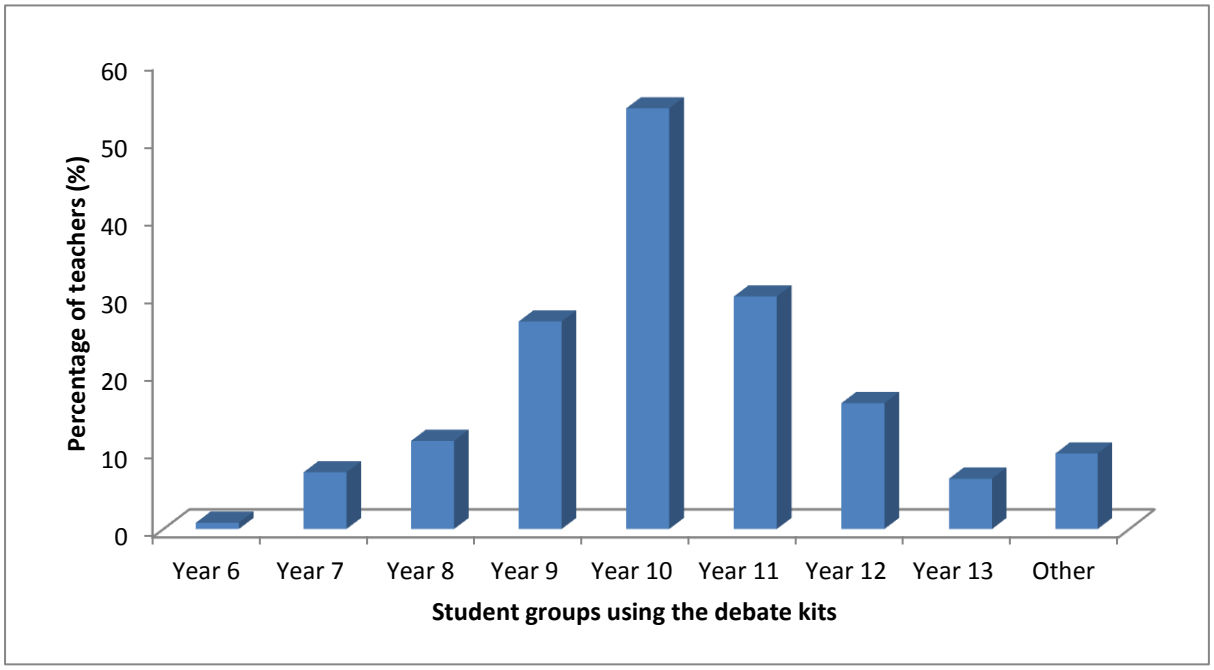
This means that, under the most likely scenario and based on the above data, we estimate that the kits have been used to run 5,487 debates.

This figure does not include usage of the 4,096 kits downloaded from the internet. Respondents to the random sample survey indicated that 34% of the debate kits they used were downloaded.

This also does not include future use of the kits. Many teachers told us that they have laminated the cards and plan to use them next year.

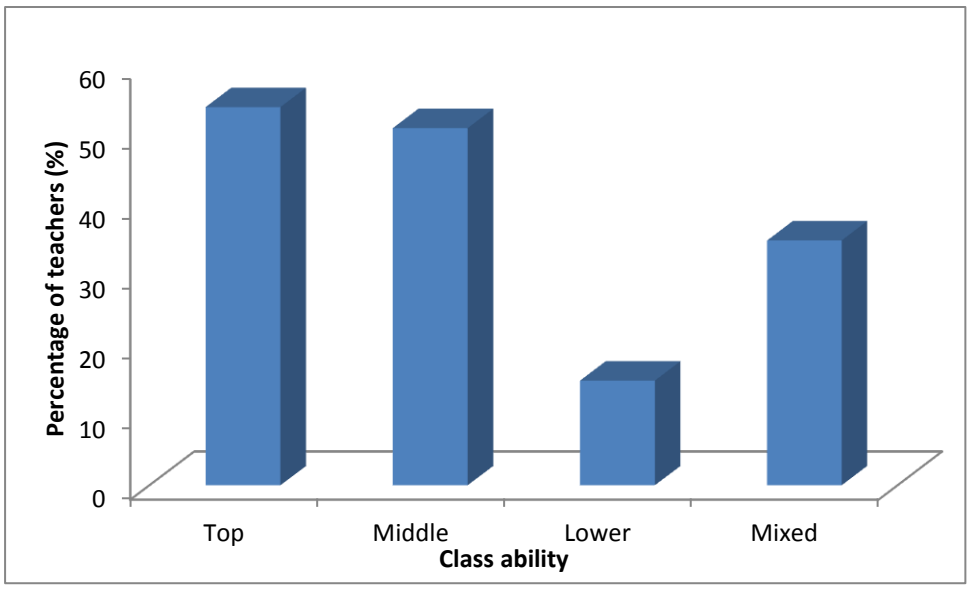
What age group were they used with?

The age groups that debate kits have been used with fit a normal distribution, centred on 54% of teachers using the kits with Year 10 students. 27% of teachers have used the debate kits with Year 9 students and 30% with Year 11 students. The debate kits were used with Year 9 – Year 11 students 68% of the time. Whilst 16% of teachers used the debate kits with Year 12 students, their use with Year 13 students drops to only 6%. One teacher used the kits with Year 6 students, and users in the 'other' category contain all stages of the BTEC, further education and with student science teachers.



What ability level were they used with?

There is a clear skew to the debate kits being used with higher ability classes – over 50% of teachers are using the kits with top, and with middle ability classes, whilst only 15% of teachers are using them with lower ability classes. The debate kits are being used with top and middle ability classes 68% of the time, with lower ability students only 9% of the time, and mixed ability classes 23% of the time.



What did teachers think of the kits?

They liked them!

98% (of 133 respondents) would recommend the kits to a colleague.

90% of 126 respondents intend to use the kits again – only one teacher said 'no', and a further 12 were undecided.

96% of 133 respondents, rated the kits 'excellent' or 'pretty good' overall

What did you think of the kits?	Excellent	Pretty good	OK	Not that good	Rubbish
Overall	56%	40%	5%		
Content	53%	40%	6%	1%	
Design/format	49%	42%	8%	1%	

Project objectives

1. The debate kits achieved all desired outcomes (see project objectives, page 2).
2. We were able to identify several unexpected positive outcomes.

In the following sections we illustrate each of these desired and unexpected outcomes with representative quotes from teachers. These quotes were given in response to a series of questions with open-text responses.

A summary analysis of the answers to each of these questions is in Appendix 1 at the end of this report. In the interests of transparency, **all** text responses are included in Appendix 2.

a. Desired outcomes

Developing students' skills at debating and discussing biomedical issues

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

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

Pupils engaging in debate about the issues raised - once they got used to the idea of discussion like this in a science lesson, the debate became quite passionate!

Empathy. Students actively needed to take someone else's role, therefore gain a deeper understanding

Developing students' higher thinking skills around these issues

To develop independent learning skills, some students are too used of following specific instructions which is great, but the kits let them get out there are question science analytically.

The kit allowed an objective discussion- personal experiences and opinions were discussed with a greater understanding of alternative views. Students commented that their ' eyes had been opened

Developing students' independent thinking skills - forming an opinion and supporting it with evidence.

Enables pupils to make decisions, which are often controversial as there is no one 'right' answer, for themselves. Provoke pupils to see others' points of view.

Developing students' confidence in their own opinions

generating debate and getting students to think about issues and formulate and express their own views

Pupil be able to communicate their ideas and thought

Made planning activity MUCH easier and allowed weaker pupils to be more confident about what to say, so livened up their debate and consequently others too

Supported students through guided discussions. They felt more confident and were visibly more engaged than previously.

Developing students' ability to see all sides of an issue and the points of view of others

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.

Getting the pupils to consider both sides of an argument when many of them thought they had already decided on their position before the debate started.

That the pupils understand that people have different points of view based on the same facts and that there is no right or wrong answer

The content was interesting and varied; sometimes we ended up discussing why people would hold those opinions rather than which was correct; for our pupils this was a valuable exercise in understanding others

Students learn more about the topics covered in the kits

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

Helped the delivery of the curriculum content, as well as raised pupils awareness to real, everyday issues.

Able to deliver areas of the curriculum which can be difficult to engage pupils with.

Students explore the social, ethical and environmental aspects of the topics

They are easy to use, topical and students have responded to them really well, opening up and sharing their own views and critically, yet sensitively, evaluating the views of others. I like the variation of information within each kit that enables you to go off the beaten track discussing life choices, careers, relationships etc without going off task! Its gives purpose and format to important discussions.

getting the pupils to see science in the real world. Encouraging pupils to develop a point of view and be ready to discuss it

The clear characters and view points enables students to explore different view points from realistic, accessible perspectives. Gave them great starting points to validate their own opinions and encouraged them to see the topics as real issues.

The content is great. We often don't use the questions as the fact and summary of each characters view is enough to sustain an hours lesson. I think the variation in characters is great; especially giving their jobs which leads us to discuss how science can impact on all warps of life, and enables more real life information to be pulled into the issues. e.g. the economist and Macmillan nurse in the cannabis debate kit. The variation in the arguments is clear and different which keeps them interesting.

For teachers

Increasing their confidence at running debate and discussion sessions

Building confidence in holding debates with pupils

I realised that it takes much more time for the students to get a handle on it. But when it is set up slowly then they really get it

Increasing their skills at running debate and discussion sessions

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

I have conducted debates on IVF before, but found using the kit was less contentious and provoked thought and discussion on a wide range of issues.

I shared this kit with other Biology Teachers and they all wished they had more than 1 kit. Others praised it for giving them ideas to design something similar on other subjects.

Having effective resources which they can re-use in future to help develop students skills, which don't require lots of preparation or effort from them

Not having to prepare the resource.

No. I like the way they are split into viewpoint, fact and issue. This gives teachers more choice about how they use the kits.

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.

Accessible information and discussion points - a well-designed classroom activity.

b. Unexpected outcomes

These are outcomes we hadn't specified when developing the project, but which we noticed were frequently mentioned in teacher feedback.

Exploring new ways to teach

new approach to teaching

ready made, well researched format. different ideas (i am an old teacher!) to be carried out in creative ways is always refreshing

It allows a structured debate (which is not something that we do much of in Science) and so it is something novel, which motivates the pupils

Saved them time and worked 'right out of the box'

Easy to use, took me 10 mins to read over the plan and I knew exactly what I was doing

Little preparation time for an activity that lasted over an hour

ready made resource with facts already there

info from different perspectives saves a lot of time trawling internet to find it

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

Teachers appreciated the balance/impartiality of having resources prepared by a third party

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. Students left to research a subject alone will all too often come up with false information or arguments based only on their own opinion, whilst for teachers making up information sheets / nuggets for reference, it is very hard not to feed students the conclusions that they wish them to draw. The kit provided a neutrality to teachers that is very comfortable for all concerned.

the fact that it included points on their that I as a teacher may not HAVE COVERED OR PUPILS RESEARCHED

It was very easy to use and presented no particular bias

thought of ideas and points of view that I couldn't

Students were engaged and enjoyed the debates

Students enjoyed the discussions that arose

A good quality resource that engaged the students and prompted participation from all.

The way in which it gets the students thinking and allows them to enjoy the lesson at the same time

They allowed pupils to engage effectively in groupwork and supplied enough guidance so teacher intervention was rarely needed to keep the pupils on track.

They got ALL students talking

It encouraged the ASN [additional support needs] 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

Used to promote discussion on intervention in fertility. Good for getting even the quietest pupils to make a comment.

getting some of the kids to actually speak in lesson

The kits were flexible

There is a balanced content in the kit with arguments for and against which is useful. The questions can be used in different ways.

An excellent resource suitable for all abilities- the discussion could be steered to bring in aspects of the scientific background relevant to different abilities/ levels of courses.

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.

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

The facts and questions opened up wider possibilities than just read and vote.

Large print versions were appreciated

thank you for now producing a large print version we have many visually impaired students at our school

I thought they were very good. The option of a larger type version in the new downloadable kit is a very good idea

Really liked the format SEN VI versions great how about having them available in different languages

Active learning, students finding things out for themselves

The pupils are actively involved in their own learning. It opens up aspects that they would possibly not have considered. Makes them think.

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

the variation and that it's a kinaesthetic resource

Pupils enjoyed a different way of learning (from each other)

Teachers liked the gender and ethnic diversity of the kits

it was socially and culturally diverse

Multi cultural and promotion of gender equality. Good range of experts

Personally, I liked the variety of viewpoints and the balanced gender roles.

Teachers want more kits!

Fabulous content on current topics - let's hope there are more! They fit in well with Curriculum for Excellence content too.

would love more on other controversial issues such as nuclear energy or environmental issues

I love it !!!!

Can you make some more please?

when can we have some more?

I sincerely hope you get more funding for further kits as they are a valuable resource; if ADN children can get so much out of them the benefits for pupils who can access them fully must be at least as valuable

Please bring out more!!! These are extremely useful and a type of resource which sadly is scarce in schools at the moment.

I, my department and my pupils really value the kits and I feel that we have got a lot out of using them over the years.

Let's have some more! Found them useful/inspiring and the pupils gave positive feedback.

Such a fantastic resource for teachers, and science communicators. I hope there are plenty more in the future

They are brilliant, please find funding for more!

Criticisms

With early kits some teachers felt they were hard to read for visually impaired, or poor literacy students

We responded by producing downloadable large-print versions

Some felt that teachers should have had warning of the potentially difficult characters (in the IVF kit: man dying of cancer and a lesbian couple).

In subsequent kits we have been sensitive to this and warned of possible issues in the teachers notes.

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'.

A small number of teachers (mainly for the first kit) felt the language was too advanced, or the content too complex. Although one or two felt it was too simple, and wanted more hard science.

We've tried to keep the language accessible, and hopefully the large print versions help a bit. We've also written slightly longer teachers' notes with later kits with more background science information.

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 kits is that the information comes out gradually during the course of the activity – so it's much easier to take in and to remember. 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, we did change the layout of the teachers notes slightly, adding a bit and breaking the text up into sections so it is easier to consult.

One teacher 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.

Dissemination

"I think these are brilliant! Can I have one to keep please?"

Peter Finegold, Director of Public Programmes at Nowgen

Disseminating the debate kit format

One of our aims was to encourage more debate and discussion about science, by introducing people to this simple, yet effective format. So we worked at letting people in the sector (not just teachers) know about the kits, and we have had a very good response from that. Often those familiar with the classroom immediately grasp how useful the kits can be.

Roughly 200 copies of the first kit were sent out to people working in the sector (Science Learning Centres, LEA science advisors, education officers, etc), along with a letter inviting them to sign up for future copies. Many did, including Andrew Jones, Resources Co-ordinator at National STEM Centre, who asked for extra kits to demonstrate to teachers on CPD courses.

The kits have also been shown to people at the ASE conference, Science Online Conference London 2010, Science Online 2011 (USA), the Science Council and various other meetings. We have also promoted the kits online via twitter, psci-comm, the TES message boards and various educational newsletters. We believe they have therefore reached many people in the sector and we hope they have influenced practice.

One of the points we made in our grant application was that our research with teachers suggested there was a real gap. Science teachers would like a resource to get discussion going, which is at the same time simple-to-use and complex in its effects. Existing discussion resources are often far too complex to use (e.g. Democs) or too simplistic in their approach (i.e. They don't prompt a nuanced discussion).

Our hope was that by disseminating these resources widely, we would prompt other providers to see that it's possible to make something which is useable for teachers but does effectively promote a complex discussion.

We know that both Science Oxford, and NC3Rs have been persuaded, and have produced debate kits modelled on ours. We know this because they contacted us, out of courtesy, to let us know. As the resources are creative commons, there's nothing to stop many others having done the same without telling us.

We've also produced 'DIY Debate Kit' templates, so that teachers, and others, can easily produce their own kits on different topics. This helps spread the use of this effective format, and encourages debate and discussion.

Disseminating the lessons learned

We promoted our interim report on the debate kit project, where we tried to not only evaluate our project, but also draw out the learning points that might be useful to others in the sector. These included things like what methods of advertising to teachers were most effective. We published the report on our blog and promoted it, on twitter, on psci-comm, to our database of education contacts (including all science teacher training providers and LEA science co-

ordinators) and on the TES message board. This is to spread the learning throughout the sector.

5. Conclusions

The kits were distributed widely, meeting the distribution targets. If we include electronic versions, then we have well exceeded the distribution targets. We estimate that the printed kits have **prompted 5,487 science discussions so far**. This figure does not include usage of the 4,096 kits downloaded from the internet.

The kits worked extremely well at promoting a **complex response and depth of engagement** from students, while still being simple-to-use. Teachers frequently mentioned that the kits were very good at getting students to see other people's points of view, and that 'things aren't black and white'. They also improved students thinking skills and the way they engaged in debate (e.g. backing up their opinions with facts).

Having eight different characters raised many different issues. Students realised that there were **many sides to the debate**, and that you can agree on the facts, but differ on what you think is important. It also integrated consideration of different issues (social, ethical, economic) in a way that many classroom exercises can't.

Teachers felt the resource engaged students and was very effective at getting them to **participate and express their points of view** (while also listening to others). Several mentioned that it was effective at getting quiet students talking, or those with Special Educational Needs. Teachers also liked that the activity included active learning – with students finding things out for themselves and from each other.

Teachers also appreciated that the resource **saved them time** and effort researching the topic and was very simple-to-use. And that it was flexible and could be used in different ways depending on the circumstances.

There were some minor criticisms and suggestions regarding early kits. These have mostly been addressed during the development of the project.

We conclude that this format is an **effective way to prompt debate on contentious questions**, and helps users to consider the issues. We have done our best (and will continue to do our best) to promote the format to others who may find it useful. We recommend (naturally) that others make use of the format. And also that someone funds us to produce more kits, to satisfy all our teachers who are crying out for more!