

Gene Jury
Pilot project Evaluative Report September 2008
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Project summary:

The Gene Jury project aims to engage children aged between 7 and 13 with bioethical issues surrounding the use of modern genetic technology, and does so via interactive workshops delivered in their school classroom. The “Gene Jury” workshops exploit e-learning technology, particularly the personal response system (clickers). All workshops take the same format, which constitutes a 45 minutes-1 hour powerpoint presentation making use of “clickers” throughout, such that pupils can vote to convey their understanding of the material and their opinions. Interactive games or activities and regular class and group discussions are also used to encourage reflection. The workshop begins with science fact to convey the minimum information necessary to understand the issue in hand, and the class are then asked to vote on the bioethical question. A number of salient examples or scenarios are next considered by the class, before re-voting on the bioethical question. The workshops complement the curriculum, fulfill many of the values identified by the “Curriculum for Excellence”, and are supported by a project website (<http://www.biology.ed.ac.uk/projects/GeneJury/>) providing information, links, resources and a question-asking box for further clarification. There are currently 4 workshops which have been tested and evaluated in the classroom, and which address the following bioethical issues;

- 1) Genetic testing (“Build a monster”, targeted at P4-P5)
- 2) Pre-implantation genetic diagnosis (“Designer babies”, targeted at P6-S1)
- 3) Genetic modification (“GM, ll fix it?” targeted at P6-S1)
- 4) Whole genome sequencing and DNA privacy (“Whose DNA is it anyway?” targeted at P7-S1).

Funding and personnel:

The project has been funded by grants from the Wellcome Trust and the Scottish Government and is managed and executed by a University lecturer in genetics and two dedicated post-doctoral science communicators. The project team has also included a final year Genetics undergraduate student working on his assessed honours project from January 2008 until April 2008, and three volunteer post-graduate students.

Audience:

From April 2007 until Jun 2008 we presented a total of 147 workshops in primary 4-7 or S1 classrooms (including one to a troupe of Scouts), as well as 10 workshops at the Edinburgh International Science Festival (see table 1). We estimate to have presented to 3,250 children throughout that time. Schools (representing a variety of socio-economic contexts and a range of child attainment and progression levels) were visited in

Edinburgh, Midlothian, East Lothian, Falkirk, and Dumfries (table 1). An additional 10 workshops were presented at Our Dynamic Earth (ODE) by ODE staff.

Feedback from participants and observers:

Our extensive evaluation strategy has provided an overwhelmingly positive response to the project by children, teachers and academic colleagues alike.

External support for the project has come from:

- Gene Jury steering group meetings in May '07, November '07 and April '08
- 3 independent external evaluators (principal or head teachers from one primary and one secondary school and one science communicator) who were commissioned to attend workshops and to provide evaluative reports (appendix 2,3,4).
- Edinburgh Education Authority Science Quality Officer who approved workshops and final evaluative reports.

After each of our workshops, the children and teachers were asked to rate their opinion of the session both electronically and on paper. Written comments solicited from both children and teachers generated a few constructive criticisms which were acted upon, while the majority of comments affirmed enjoyment and usefulness of the workshops. Examples would include; *"The children were made to think and make judgements, which they enjoyed"*, *"The interactive element allowed all the children to contribute their ideas"*, *"It was good to have a thought provoking workshop that adults and children enjoyed"*

Childrens' responses

Children's responses are shown in figures 1-3 which demonstrate that overall 85 % of children "liked the workshop" (figure 1), and that this level of appreciation was maintained across all workshops and age brackets (figures 2,3). Data from the GM workshop is included in figures 1 and 4 but excluded from workshop specific figures due to small sample size (n= 54).

Figure 1: Child enjoyment of workshops.

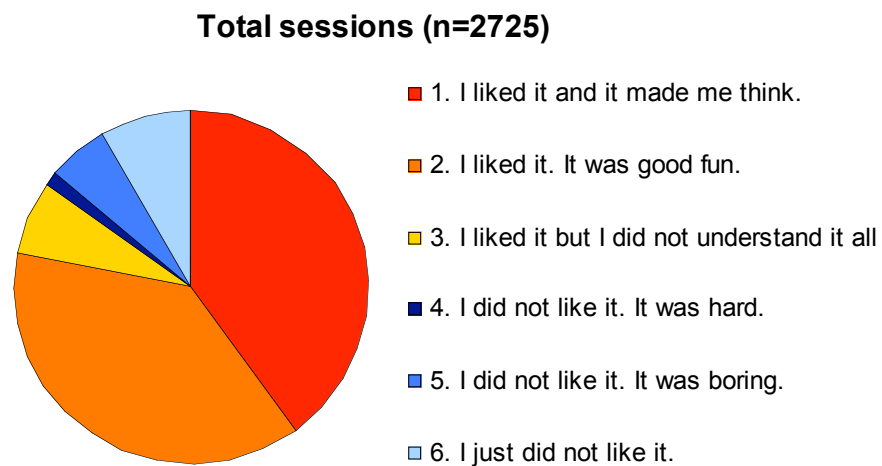


Figure 2: Child enjoyment graphed by workshop.

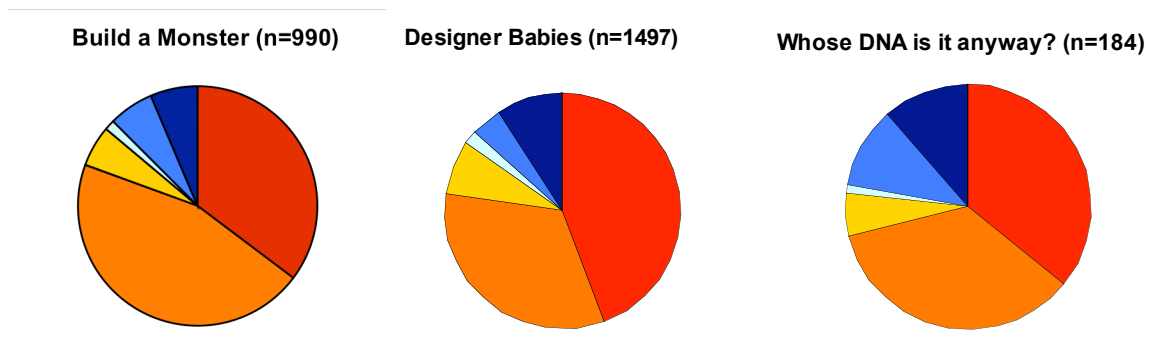
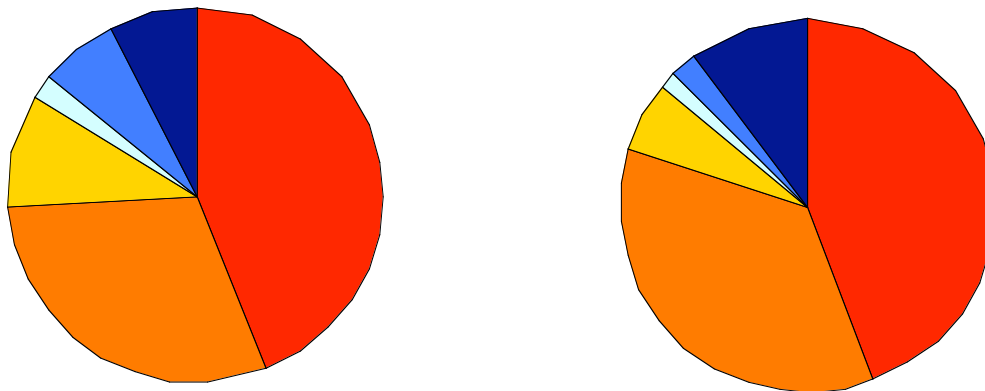


Figure 3: Child enjoyment, primary vs secondary school pupils.

Designer Babies: P6 & P7 (n=666)

Designer Babies: S1 (n=831)

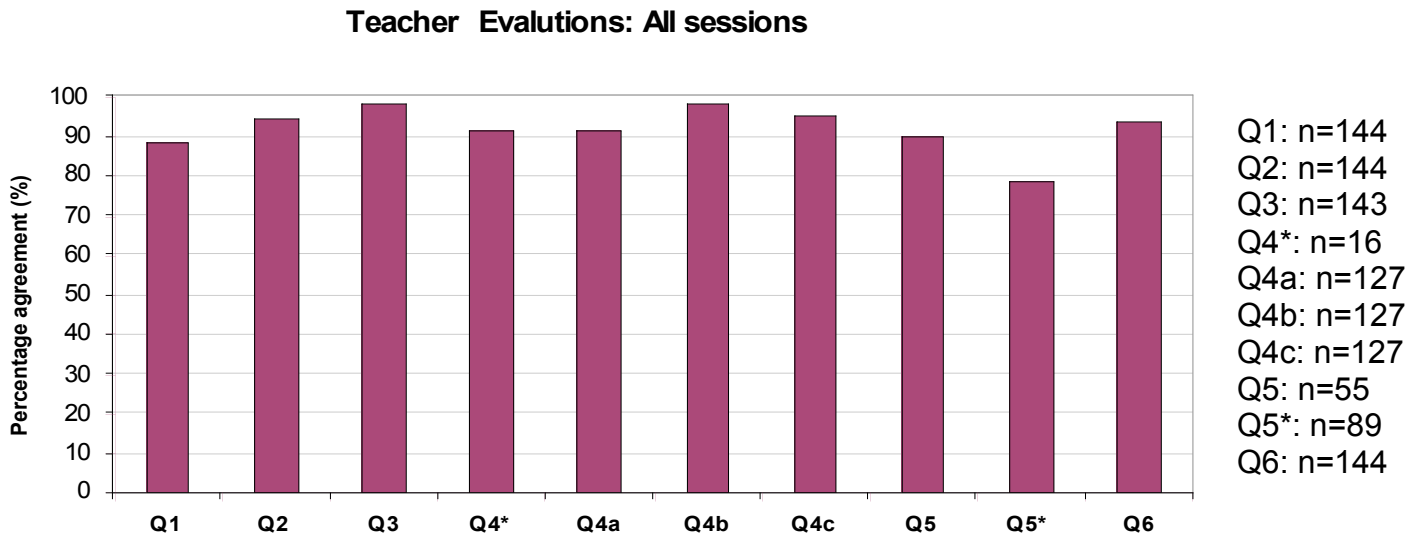


- 1. I liked it and it made me think.
- 2. I liked it. It was good fun.
- 3. I liked it but I did not understand it all
- 4. I did not like it. It was hard.
- 5. I did not like it. It was boring.
- 6. I just did not like it.

Teacher responses

Teachers were asked to rate their responses, on a scale of 1-5, to a series of 8 questions (figure 4). The overall response was >88% positive for all but one of the questions (question 5*) which, on reflection, was deemed misleading and was thus re-worded to better reflect our learning intentions of engagement rather than factual learning. Question 4* was also replaced during the project with 3 separate questions to better ascertain the success of the interactive learning tools used.

Figure 4: Teacher evaluation questions.



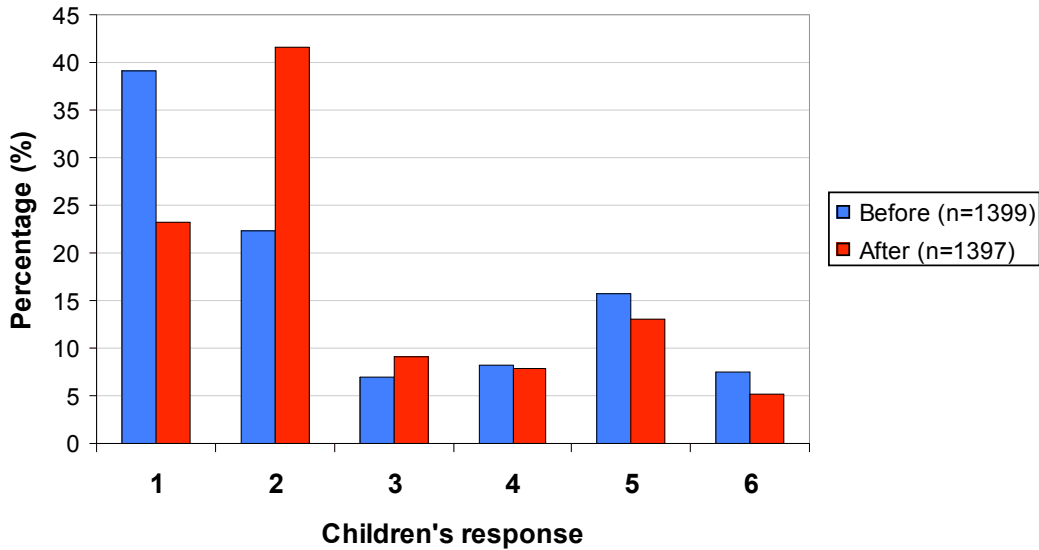
1. How enjoyable did you find the session?
2. How interesting did you find the session?
3. How would you feel about further visiting workshops of a similar nature in the future?
- 4*. How do you think the children coped with the interactive teaching style? (pre-December 2007).
- 4a. How did you think the children coped with the teaching style of the presentation?
- 4b. How did you think the children coped with the teaching style of the clickers?
- 4c. How did you think the children coped with the teaching style of the game?
5. Did you feel that the children were engaged with the scientific concepts in the workshop?
- 5*. Did you feel that most of the children were able to grasp the scientific content?
6. Did you feel that the themes discussed in the workshops were appropriate for the age of the children?

Bioethical Responses:

All of our workshops focus on a different bioethical question, which is asked and then re-asked after deeper engagement. As a measure of the level of engagement, we have compared the childrens' responses to our bioethical question before and after reflection (figure 5-7). Chi square tests confirm that the overall spread of opinions is significantly

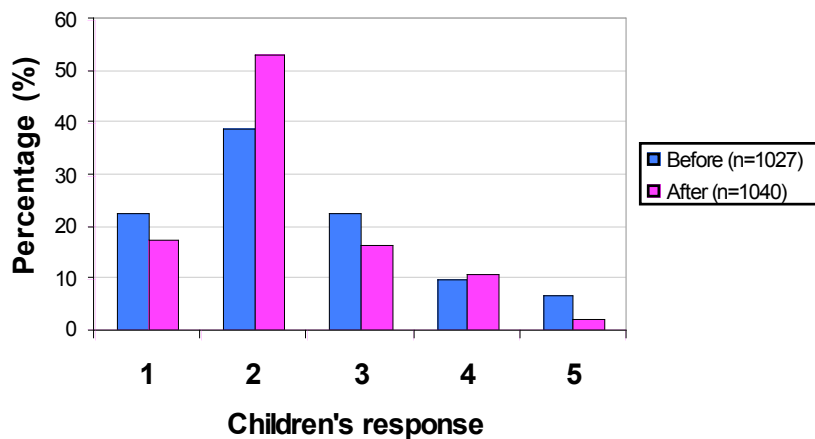
different after engagement in all 3 workshops analysed. By further examining individual responses we have established the actual percentage of children choosing a different response at the second vote (% change).

Figure 5: Child responses to “Designer Babies: What do you think?” (69.3% change)



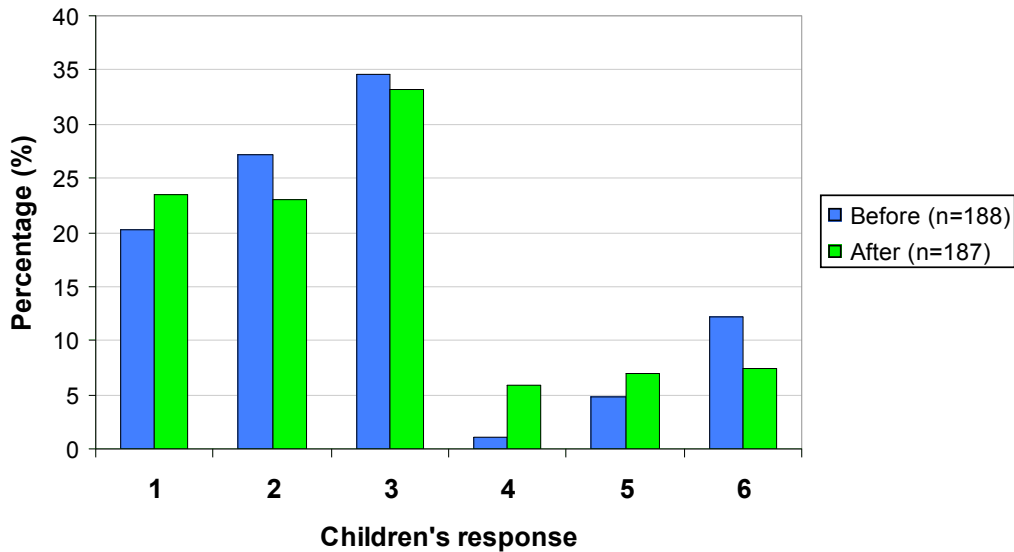
1. Never choose genes
2. Only choose “healthy” genes
3. Choose some genes, but not boy/girl
4. Choose some genes inc boy/girl
5. Choose any genes
6. Don't know

Figure 6: Child responses to “Monsters should be allowed to find out about their hidden genes.....” (58.9% change).



1. Whenever they want.
2. Whenever they want but be allowed to keep it secret.
3. When the police or a doctor say it's OK.
4. Never
5. Don't know

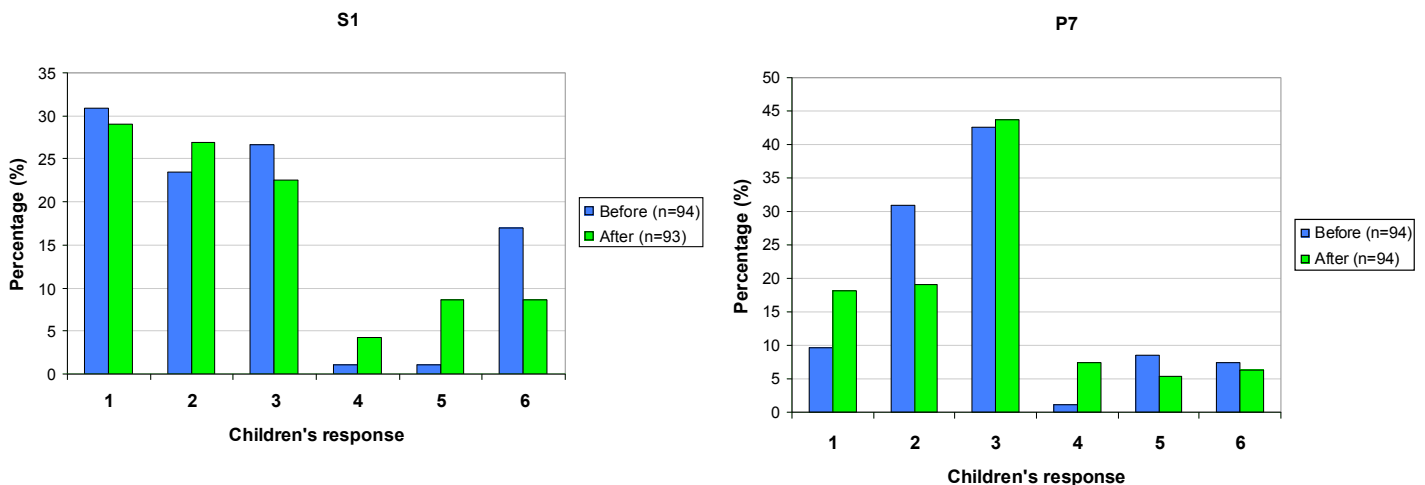
Figure 7: Child responses to “Who do you think should store information on your genes?” (P7, S1 combined, 64.3% change).



1. Nobody
2. Doctors & scientists – to give medical help
3. Doctors, scientists & the police – to help solve crime
4. Doctors, scientists, the police & companies – to make money
5. Free access to all.
6. Don't know

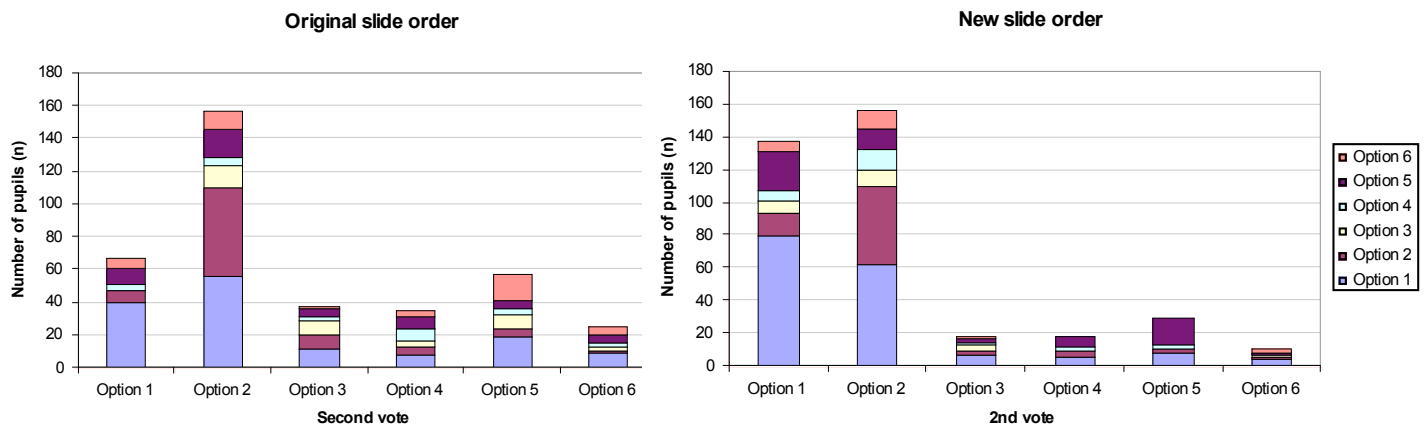
Graphs were also drawn to compare the responses of P4 vs P5 children for the “Build a monster” workshop (not shown), and P6 and 7 vs S1 for the other 2 workshops. Responses were broadly similar for the P4 and P5 audiences, which alleviated concerns that P4 might be too young to engage with the issues. In contrast, we noted a general tendency towards more conservative responses in the S1 classes compared to the p7 classes, as shown in figure 8.

Figure 8: S1 vs P7 child responses to “Who do you think should store information on your genes?” (S1, 67.4% change; P7, 61.2% change).



We also considered whether slide order would affect the childrens’ opinions and accordingly compared workshops where the pros and cons of designer babies were discussed at different places in the workshop . The original slide order placed the discussion of negative aspects of the technique before the scenarios, well before the second vote, while the new slide order placed this discussion after the scenarios and directly before the second vote. This new slide order also normally led to a fuller and deeper discussion of the issues. Full analysis of the voting swing (figure 9) shows that the new slide order resulted in more people moving to and sticking with more conservative responses such as "never" (...choose genes).

Figure 9: Effects of changing slide order for “Designer Babies: What do you think?”
 In each case, the second voting profile is shown with a break down indicating where this vote was cast on the first ask. N= 396 for original slide order. N= 357 for new slide order.
 1. Never choose genes. 2. Only choose “healthy” genes. 3. Choose some genes, but not boy/girl. 4. Choose some genes including boy/girl. 5. Choose any genes. 6. Don’t know.



Conclusions:

The Gene Jury project has successfully produced and presented a series of bioethical workshops to a large number of children. Children, teachers and educational authorities alike have been supportive of the project aims, and have found it educationally useful as well as enjoyable. Engagement of children with the selected bioethical issues has been achieved and enjoyed by all involved. Further dissemination has been achieved via the website, leaflets, talks and demonstrations to teaching representatives and science communicators. Our workshops are also presented at Our Dynamic Earth (ODE) where workshop summaries are included in the ODE educational literature, and we expect this partnership to continue without the need for further input.

Table 1: Gene Jury workshops, June 2007-April 2008.

<u>School</u>	<u>classes visited (n)</u>	<u>workshop</u>
Primary schools (79):		
Kings park primary, Midlothian	p4 (3)	Build a monster
Kings park primary, Midlothian	p6 (2)	Designer Babies
Humbie primary, East Lothian	p4 (1)	Build a monster
Law primary, East Lothian	p5 (3)	Build a monster
Law primary, East Lothian	p7 (4)	Designer Babies
Davidson Mains primary, Edinburgh	p5 (2)	Build a monster
Davidson Mains primary, Edinburgh	p7 (3)	Designer Babies
South Morningside primary, Edinburgh	p5 (3)	Build a monster
Dalmeny primary, Edinburgh	p4 (1)	Build a monster
Dalmeny primary, Edinburgh	p6 (1)	Build a monster
Sciennes primary, Edinburgh	p7 (3)	Designer Babies
Prestonfield primary, Edinburgh	p4 (1)	Build a monster
Prestonfield primary, Edinburgh	p5 (1)	Build a monster
Prestonfield primary, Edinburgh	p6 (2)	Build a monster
Prestonfield primary, Edinburgh	p7 (1)	Designer Babies
Burdiehouse primary, Edinburgh	p5 (1)	Build a monster
Burdiehouse primary, Edinburgh	p6 (1)	Designer Babies
Burdiehouse primary, Edinburgh	p7 (1)	Designer Babies
Craigour Park primary, Edinburgh	p5 (2)	Build a monster
Craigour Park primary, Edinburgh	p6 (1)	Designer Babies
Craigour Park primary, Edinburgh	p7 (2)	Designer Babies
Wardie primary, Edinburgh	p4 (2)	Build a monster
Wardie primary, Edinburgh	p5 (2)	Build a monster
Wardie primary, Edinburgh	p6 (2)	Designer Babies
Wardie primary, Edinburgh	p7 (2)	Designer Babies
Granton primary, Edinburgh	p4 (1)	Build a monster
Granton primary, Edinburgh	p5 (1)	Build a monster
Granton primary, Edinburgh	p6 (2)	Designer Babies
Granton primary, Edinburgh	p7 (1)	Designer Babies
Niddrie primary, Edinburgh	p7 (1)	Designer Babies
Royston primary, Edinburgh	p4 (1)	Build a monster
Royston primary, Edinburgh	p5 (1)	Build a monster
Royston primary, Edinburgh	p6 (1)	Designer Babies
Royston primary, Edinburgh	p7 (1)	Designer Babies
Dalry primary, Edinburgh	p4 (2)	Build a monster
Dalry primary, Edinburgh	p5 (1)	Build a monster
Dalry primary, Edinburgh	p6 (1)	Designer Babies
Dalry primary, Edinburgh	p7 (1)	Designer Babies
Dalry primary, Edinburgh	p7 (1)	Whose DNA is it anyway?
South Morningside primary, Edinburgh	p7 (3)	Whose DNA is it anyway?
Hawthornden primary, Midlothian	p4 (2)	Build a monster
Dalry primary, Edinburgh	p7 (2)	GM'll fix it?
King's park primary, Midlothian	p4 (2)	Build a monster
King's park primary, Midlothian	p6 (2)	Designer Babies
Comely park primary, Falkirk	p4 (2)	Build a monster
Comely park primary, Falkirk	p5 (2)	Build a monster
Abronhill primary, Cumbernauld (ODE)	p6 (1)	GM'll fix it?

Secondary schools (57):

Tynecastle secondary, Edinburgh	S1 (6)	Designer Babies
Firrhill secondary, Edinburgh	S1 (11)	Designer Babies
Boroughmuir secondary, Edinburgh	S1 (10)	Designer Babies
Tynecastle secondary, Edinburgh	S1 (6)	Whose DNA is it anyway?
James Gillespie secondary, Edinburgh	S1 (10)	Designer Babies
St Joseph's college, Dumfries	S1 (8)	Designer Babies
Maxwelltown High, Dumfries	S1 (4)	Designer Babies
Moffat academy, Dumfries	S1 (2)	Designer Babies

Non-school groups (11):

12 th Midlothian scout group	mixed (1)	Whose DNA is it anyway?
Edinburgh Science festival	mixed (10)	Build a monster