

Evaluation of the Mobile Family Science Laboratory

Kay H Yeoman¹ and Rachel Jarrold²

¹School of Biological Sciences, University of East Anglia, Norfolk

²Wymondham High School, Norfolk

Introduction

Science communication is complex and challenging as it is multidisciplinary and involves communicating to a diverse public. During the last thirty years we have moved away from a deficit model of communication, where the public is seen as scientifically illiterate, or deficient in understanding, to a two-way engagement model where new science and technology is discussed with citizens and where their view is valued and recorded.

Most of us receive the majority of our formal science education in the school environment, so it's important that this is an experience which generates interest and excitement which will have a knock-on effect on future learning and engagement with science. Extracurricular science, such as that provided by Science Centres, Museums and school clubs, also needs to be of a high standard. The work presented here details the impact of The Mobile Family Science Laboratory (MFSL), funded by The Wellcome Trust. The MFSL was an exciting way for children and adults of all ages and abilities to interact with biomedically related science. The mobile laboratory travelled around Norfolk running school and public events. Individuals and families had the opportunity to visit and take part in hands-on science as well as our specially developed art in science activities. People were also able to become involved in discussion and debate over topical issues related to science.

Evaluation Method

The evaluation was kept simple and was the same for all the school and public events. The format was a postcard with the child questionnaire on one side and the parent questionnaire on the other. The evaluation was anonymous. The tear off slip with the address was removed and could be used to enter the prize draw for the event. The postcode information was used to determine the demographic.

The parents were asked three questions

1. Did your child have fun with these activities? (yes:no)
2. On a scale of 1-5 (where 1 is poor and 5 is excellent) did you enjoy the event?
3. Would you take your child to a similar event again? (yes:no:don't know)

The children were asked four questions

1. What did you think of our activities? (fantastic, good, alright, boring, terrible).
2. Do you think science is fun? (yes:no:don't know)
3. Has today made you think about science differently? (yes:no:don't know)
4. What are the three most amazing things you learnt?

Results

During the project we developed a number of engagement activities designed for public and schools, which were evaluated using a questionnaire and participant observation. A list of events is provided in table 1 below.

Event Title	Location	Date
Human Sciences Day (public event)	Acle High School	October 2007
Totally Amazing Me	Norwich Inspire Discovery Centre	March 2008
Avenue Junior School Science Fair	Avenue Junior School	June 2008
Genetic transformation	Hammonds High School, Swaffham	July 2008
The Skin You're in	Norwich Castle Museum	March 2008
Forensic science day	Norwich Boys School	June 2008 and 9
DNA Necklaces	Recreation Road Infant School	April 2008
Cells Alive 2008	The Forum in Norwich	September 2008
Forensic Science Day (public event)	Acle High School	October 2008
Ingenious Investigators	Norwich Castle Museum	March 2009
DNA	City of Norwich High School	November 2008
Your Food Under the microscope	Food Fortnight The Quay Kings Lynn	November 2009
Avenue Junior School Science Club Your Visible and Invisible Body	Avenue Junior School	February-March 2009
Cells Alive 2009	The Forum in Norwich	September 2009
Science Saturday	The Forum in Norwich	March 2010
Colours	Norwich Inspire Discovery Centre	March 2010
Avenue Junior School Science Clubs (three separate clubs)	Avenue Junior School	February-July 2010
DNA and Change	Hethersett High School	February 2009
The Human Senses	Heartease Junior School	November 2009
Meet your cells Cells	Heartease Junior School	December 2009
Science Club	Frettenham Partnership School	April 2010
Forensic Science Day	Heartease Junior School	June 2010
Meet your Microbes	Edgar Sewter Primary School	July 2010
Student Convention	John Innes Centre	Feb 2009
Student Convention	John Innes Centre	Feb 2010

Evaluation of Public Events

The public events attracted approximately 13, 600 visitors, the evaluation return rate was approximately 3.4%, a low percentage, but still reflected 460 individual returns.

When asked the question ‘Did your child have fun with these activities?’ 100% responded yes. Parents were asked on a scale of 1-5 (where 1 was poor and 5 was excellent) how much they had enjoyed the events. The average response was 4.65, the percentage distribution is shown in figure 1.

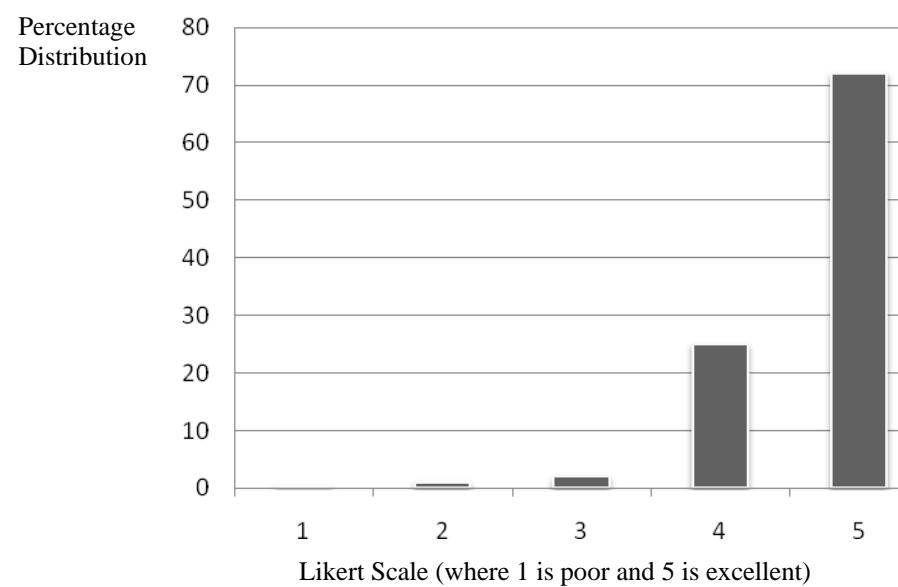


Figure 1 Distribution of responses to the question ‘How much did you enjoy the event?’ on a Likert Scale of 1-5 (where 1 was poor and 5 was excellent)

Of the children attending the public events, 76% said that they thought the activities were fantastic, 96% said that they thought science was fun and 75% said that the event had made them think differently about science (figure 2).

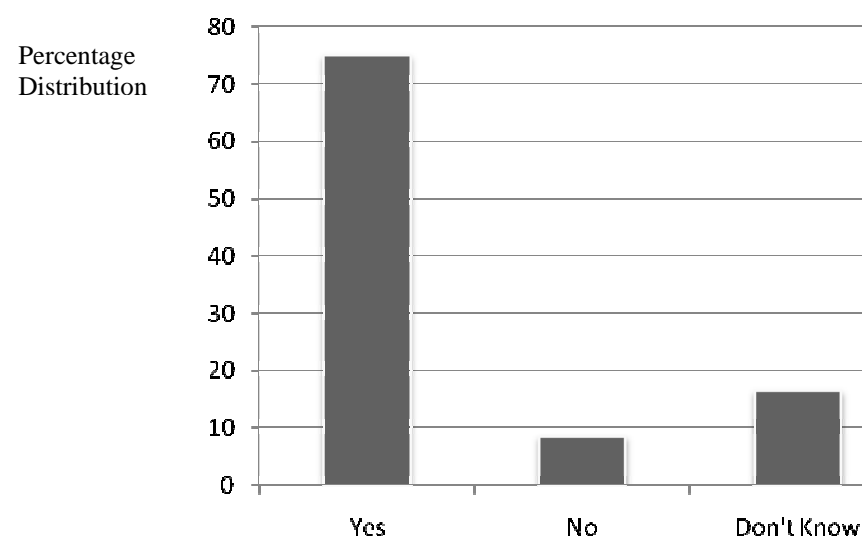


Figure 2 Percentage Distribution of responses when children were asked the question ‘Has today made you think about science differently?’

The public events elicited these responses from parents.

“What a fantastic way to introduce children (and adults!!) to science. There was such a variety of activities and experiments. The young girls we brought enjoyed the experiments, in fact everything which was demonstrated and/or explained by UEA students. Wonderful teachers of science.”

“Had a fantastic time at the event on Saturday. My son really enjoyed all the activities and learnt a lot too, which always helps. Thanks to everyone for their hard work and look forward to something similar in the future. I think this is a great way to get kids involved and show them that science is fun. Very different from what I had available to me when I was young.”

“For children having tactile activities to draw in their attention combined with informally showing them worked really well”

When asked the question, ‘What are the three most amazing things you learnt?’ the children responded with many different comments, a selected few are shown in table 2.

Table 2 Children’s responses to the question ‘What are the three most amazing things you learnt?’

What are the three most amazing things you learnt?

Skin is the largest organ of the body
How many touch receptors are in your fingers
Lactobacilli are good bacteria
How many genes make up a human
Different layers of the skin
Cancer cells can travel through the blood
How many times your heart beats
How the skeleton fits together
Skin is a living tissue
Germs grow and multiply
How long the intestines are
Women have a wider pelvis
How to extract DNA
How to use a microscope
What DNA codes for
Blue stilton has a fungus
What a cell looks like
The names of our bones
How complicated DNA is
Science is fun!

Evaluation of School Events

The school events were held in a variety of city and rural schools for all Key Stages of the science curriculum and they were evaluated using the same questionnaire.

Approximately 850 children took part in these activities, which included science clubs and science activity days and workshops. Of the children attending the school events, 76% said that they thought the activities were fantastic (figure 3), 78% said that they

thought science was fun and 76% said that the event had made them think differently about science

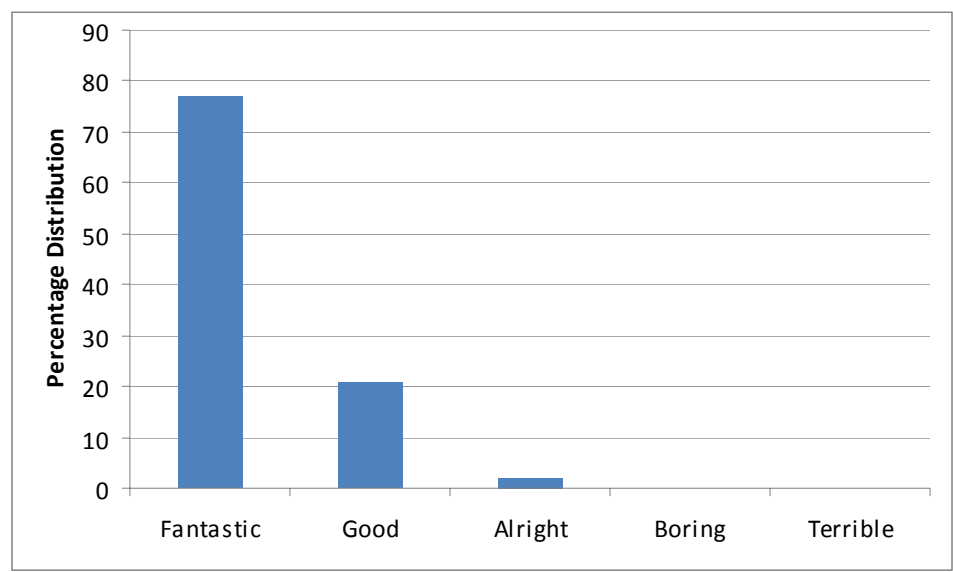


Figure 3 Distribution of responses to the question ‘How much did you enjoy the event?’ on a Likert Scale.

Table 3 Some of the children’s responses to the question ‘What are the three most amazing things you learnt?’

What are the three most amazing things you learnt?
That you get diseases if you don't have a balanced diet
If one DNA base changed the whole body could go wrong
We learnt where the organs were and what they looked like
How bacteria grow and expand
How UV can be harmful to DNA
The sun cream blocks UV light
That you can take DNA out of the body
That you should only use antibiotics when you need to
That DNA is stored in the nucleus
How easily bacteria can spread
That DNA can be stored on a chip
There are thousands of cells multiplying all the time
That bacteria have different shapes
I found that there were lots of different cells everywhere in the body
There is a cell which can change into any cell
So many different blood cells in your body

The science clubs elicited these responses from parents;

“Making science teaching creative and fun at an early stage is crucial. This is a very good start.”

“Science in primary schools is rather dry, as they lack the facilities of the bigger high schools. Jamie has been enthused by the club and now considers science to be interesting and something he would like to continue doing. Thanks very much for the time & effort you give to making Science in schools more interesting for children, which also has a very positive effect on their understanding and therefore learning.”

“My son, Charlie, has been enjoying the club every week and has really been engaged with the session content. It has enlightened his view of science and he is now very interested in all the areas that you have looked at which is a very different child than the one in January who hated science and didn't see the point in doing the subject at school!”

“This is just to let you know that my son Mikey has really been inspired by your Science club at Avenues. Thank you very much for putting this on. He particularly loved the work with DNA and animal/plant cells. He tells me it's brilliant it was so hands on and now he wants to be scientist when he grows up!

I would add that it's fantastic to bring the work of real university scientists into Junior schools - it has helped so much with his understanding of DNA and cells (and mine) and he found it very exciting.”

Discussion

It is very interesting to note that children enjoy science interventions within the school environment, either as part of their school time or as an extracurricular club, as much as they do public events with their families. This is a very important observation and to our knowledge the first time this has been reported. It indicates that in terms of engagement strategy there is no advantage of one method over the other. It is my observation that children are highly appreciative of the effort made on their behalf and this makes it very rewarding to teach them. The success of the public events was down to the following elements in no order of importance:

- Well designed activities catering to different learning styles, especially kinaesthetic learning.
- Allowing children to be creative, taking items home to allow for discussion.
- The dedication and talent of the undergraduate and postgraduate students in communicating science to the public.

The biggest difference between the public and school events, was when children were asked if they thought science was ‘fun’, 96% of children responded yes to this question during a public event, as opposed to 76% in a school event. We suspect this reflects the capture of information from children, who take part in the compulsory science activity days, but would not normally want to attend a public science event.

Family Centred Learning

During the course of running the public events we had the opportunity to observe how families interact with each other and the activity within a public setting. This has led

us to establish the following model of family centred learning (figure 4). In this model the activity (represented by the inverted triangle) caters for three learning styles, verbal, visual and kinaesthetic. Whilst taking part in the activity, there is a three-way dialogue between the facilitator, the child and the adult (or carer).

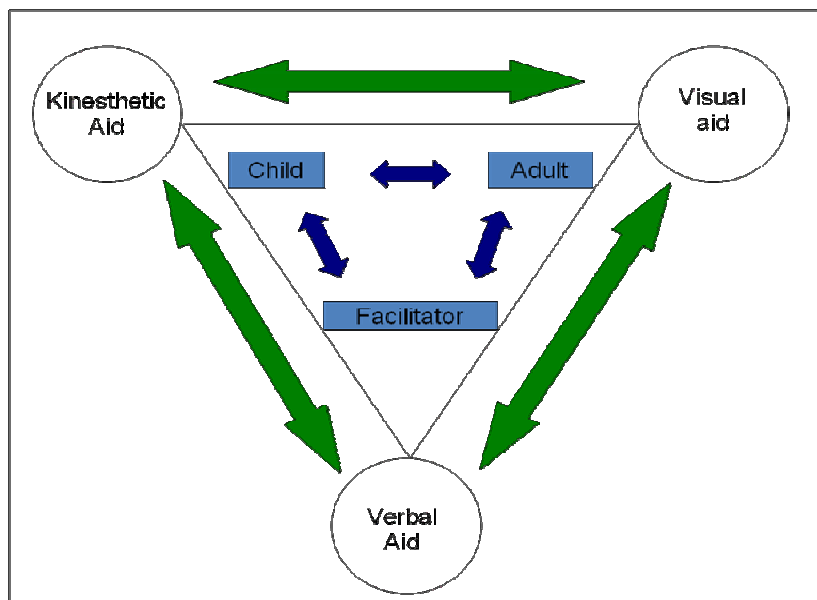


Figure 4 A model of family centred learning

The Future

We firmly believe in the importance of family learning, we can provide events which give an opportunity for thought and discussion. We also develop activities which involve doing science and taking something home which can be discussed as a family. There is growing evidence of the importance of extracurricular science activities, either within the school setting, or in other outside organisations in encouraging children to participate in and enjoy science. Extracurricular activities offer academically gifted pupils ways of stretching themselves and also provides less academically able pupils a way to achieve. Unsurprisingly, therefore, research has shown that extracurricular activities are associated with many positive outcomes, such as increased academic achievement, greater life aspirations and higher levels of self-esteem. We feel that this project can be extended further, firstly by increasing impact by offering a loan scheme of equipment and resources and secondly by establishing The Wellcome Trust Passport to Science. This scheme will enable primary school children to collect stamps when they take part in science related activities, which they will be able to trade-in for a medal and certificate, thus providing a way where sustained involvement with extracurricular science is recognised and rewarded. Other passport to science schemes have existed but none of them linked stamps to graded awards through a scientist at a University. The prestigious partner organisations also add to the unique angle and we have the opportunity to establish a very special scheme which has the potential to be a model of national importance.