Evaluation of Science is for Parents Too Course

Centre for Lifelong Learning, University of York
Funded by the Wellcome Trust

Evaluation Report by Sarah West, Research Associate, Stockholm Environment Institute

In 2013, the University of York's Centre for Lifelong Learning ran a course for parents to teach them the science that their primary school-aged children were learning. This was funded by the Wellcome Trust and run at the National Science Learning Centre in York.

This document reports on the evaluation of the course. It summarises the key findings, describes the methods used for the evaluation, gives detailed findings and makes suggestions for improving the course if funding is provided to run it in future.

Key Findings

- All parents said they had spoken about what they had learnt on the course with their children.
- Children whose parents attended the course showed an increase in scientific knowledge throughout the course, with a control group showing no increase in knowledge over the same period.
- Children whose parents attended the course tended to have more positive attitudes towards science after the course than a control group.
- All parents said they would recommend the course to a friend.
- The majority of parents (88%) said they felt more confident talking about science with others.
- 80% of parents said they wanted to attend further science courses after the course.

1. Introduction

Forty-two people were present at the conclusion of the project the Science is For Parents Too courses, hosted by the National Science Learning Centre and run by Alex Brown of the University of York's Centre for Lifelong Learning. Participants attended courses at three different times; Monday morning, Monday evening and Wednesday morning. The course ran for 20 weeks but there was an opportunity for new parents to join after 10 weeks as the project was built on two discrete segments.

The aim of the course was to teach parents the science that their children are learning in key stages 1 and 2. The course used a variety of different methods for teaching, including watching and conducting experiments, field trips, talks from scientists, YouTube videos and a course handbook as well as PowerPoint presentations.

The objectives of the course were to:

1. Increase the scientific knowledge of parents and encourage them to share this learning with their family
2. Create a range of learning materials suitable for a range of abilities, which can be used in other locations
3. Raise the aspirations of parents by bringing them onto the university campus.

The course was particularly aimed at parents who had limited scientific education. Originally the course was advertised to parents whose children attended just two primary schools in York: Westfield Primary School and Clifton With Rawcliffe. However, low levels of engagement from teachers at these schools and consequently, low uptake from parents, led to the course being advertised to a wider range of parents.

2. Methods

A range of qualitative and quantitative methods were used to evaluate the impacts of the project on pupils and parents. At each of the first sessions, the evaluator (Sarah West) attended to introduce herself and explain the evaluation methods. Participants were encouraged to be as honest as possible in their responses, and were given time to ask any questions about the evaluation.

2.1 Parent comments

Formative evaluation, that which takes place during the activity, was used to help Alex (course tutor) identify any issues of concern to participants. This allowed him to make amendments for future weeks.

Participants were all provided with coloured post-it notes and pens, and three flip-chart pages were placed around the room with "Things I've found interesting" "Things I've enjoyed" and "What I'd do differently if I were running it" written on them. Participants were encouraged to write on these whenever they wished to.

Summative evaluation, which usually takes place at the end of the project, was used to assess the impact of the project on participants and pupils. A control group of pupils whose parents were not participating in the project was used. Three methods were used in this evaluation: pre- and post- knowledge and attitude questionnaire with children of attending parents and a control group; questionnaires with parents; and a focus group.

2.2 Pupil questionnaire

The child questionnaire consisted of five multiple-choice questions designed to assess scientific knowledge, and 14 five-point Likert scale questions designed to assess attitudes towards science. These attitudinal questions were a sub-set of those used by Pell and Jarvis (2001) which had been developed for use by primary school aged children. 40 children whose parents attended the course completed the questionnaire before the start of the course and when it finished, and 58 children whose parents did not attend the course acted as a control group from St Wilfred's (Outstanding in Ofsted 2009) and Osbaldwick (Good in Ofsted 2010) primary schools.

Appendix 1 shows the questions included on the questionnaire for pupils.

2.3 Parent questionnaire

The parent questionnaire was designed in conjunction with the Centre for Lifelong Learning to ensure it was relevant for their needs and the questions were easily understood. The questionnaire was mainly open text boxes with some multiple choice answers (with space for comments). It focused on whether the course met their expectations, and whether it had changed their views or habits in any way, and also gave them an opportunity to make any further comments. The questionnaire was handed out at the end of the course with 15 minutes time given for completion. The full questionnaire can be found in Appendix 2.

2.4 Focus group

The focus group questions were also developed in conjunction with Alex, to ensure it gave useful feedback for future courses. Parents from all three courses were asked to say whether they would be available to attend a focus group, but unfortunately only participants from the Wednesday group were able to attend. The focus group lasted 45 minutes.

2.5 Limitations

There were a number of limitations to the study. Of the evaluations that were conducted, the summative evaluation with parents was most enlightening and useful. Only a small number of comments were made during the formative evaluation, with some of the groups not writing comments at all. Interest in completing post-it note comments dropped throughout the course.

The focus group respondents were self-selecting. Unfortunately there were not sufficient numbers of participants able to attend the focus group time, and therefore we had to select based on availability, rather than randomly. This may have biased the participants towards those who felt they had benefited from the course, but the close match between questionnaire and focus group responses suggests that this is not an issue in this case.

3. Findings

3.1 Parent comments

Forty-one comments were made in total by participants, 31 of which were relating to things people had found interesting or enjoyed, and included broad statements such as "*Science is fun* ☺" and more specific comments about things they had learnt, such as "*Drag and terminal velocity - new concepts to me"*.

The interactive elements of the course were frequently mentioned under the enjoyable section, as one person put it "*The practical hands on bit makes it really understandable and enjoyable"*. The practical elements were said to "*help you understand"*. Parents also valued "*Being able to ask questions and then get the answers* from a *kind* and *relaxed* tutor who *explains things well".* The visit to the planetarium was mentioned by two parents as one of the most enjoyable things they had done.

One of the parents said "*I lacked confidence at the start of the experiment but then realised we were as good as everyone else*" and generally the environment was felt to be relaxed and supportive, someone said they "*don't feel scared to ask questions"*.

Only ten comments were made regarding things that could be improved, and one of these included "*Nothing I can think of*". One parent wanted "*Hand outs to take home"*, another requested "*Fun worksheets for the children"*. One suggested that the group experiment didn't work as it unintentionally split the class into younger participants and older participants.

Someone suggested "*I'd like to be able to see the type of questions the children would be asked and if I could now answer them*.", and this is a theme that will be returned to when discussing the findings from the summative evaluation.

3.2 Pupil questionnaire

40 pupils from the test group (whose parents attended the course) completed the initial questionnaire and 26 the final questionnaire, and 54 pupils from the control group completed the initial questionnaire and 58 the final questionnaire.

3.2.1 Knowledge

Five questions designed to test pupils' scientific knowledge were asked before and after the course. Pupils from the test group got a mean of 3.15 ± 0.14 questions correct before the course, compared to the control group who got 2.30 ± 0.23 questions correct. After the course, the test group had a mean of 3.7 ± 0.25, but the control group had dropped slightly to 2.10 ± 0.16 questions correct. Figure 1 shows that the percentage of children getting the correct answer varied depending on the question asked. Questions 1, 2 and 3 were based on experiments carried out in the class. Questions 4 and 5 were based on knowledge covered during the course.

Questions 2 and 3 showed a large increase in the percentage of children getting the correct answer for the test group, but there were few other differences between the pre- and post-knowledge scores. The difference in scores for Questions 2 and 3 indicates that these experiments were taken home and showed to the children. Questions 4 and 5 showed little change in knowledge, suggesting that experiments are more successful for disseminating knowledge at home than other teaching methods.

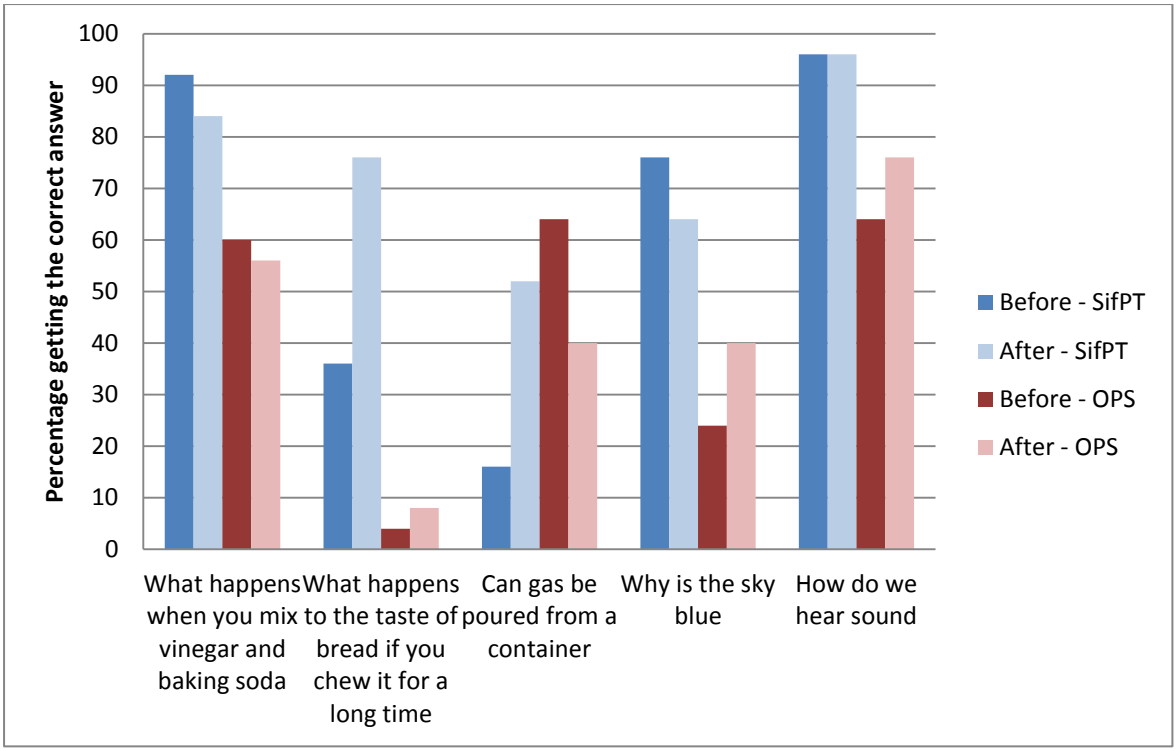


Figure 1 The percentage of pupils choosing the correct multiple choice answer in the knowledge questions. SifPT = Test group (Science is for Parents Too), OPS = Control group

3.2.2 Attitudes

Fourteen questions designed to assess pupils' attitudes towards science were asked before and after the course.

Some of these questions showed little discernible trend, but there are some interesting findings. The questionnaire shows a decrease in the enthusiasm for science over the course of the school year for the control group e.g. responses to the questions "I should like to be a scientist", "Science is good for everybody", "I like science more than any other schoolwork", "I should like to be given a science kit as a present" and "I think science is fun" became less positive over the school year. Particularly noticeable is the increase in control pupils saying they disagreed with the statement "I enjoy watching science on TV" (Figure 2). The observed decrease in enthusiasm is less severe – or not observed - in the children whose parents were enrolled on the course. These results suggest that the course has produced a more positive attitude towards science for the children whose parents came on this course.

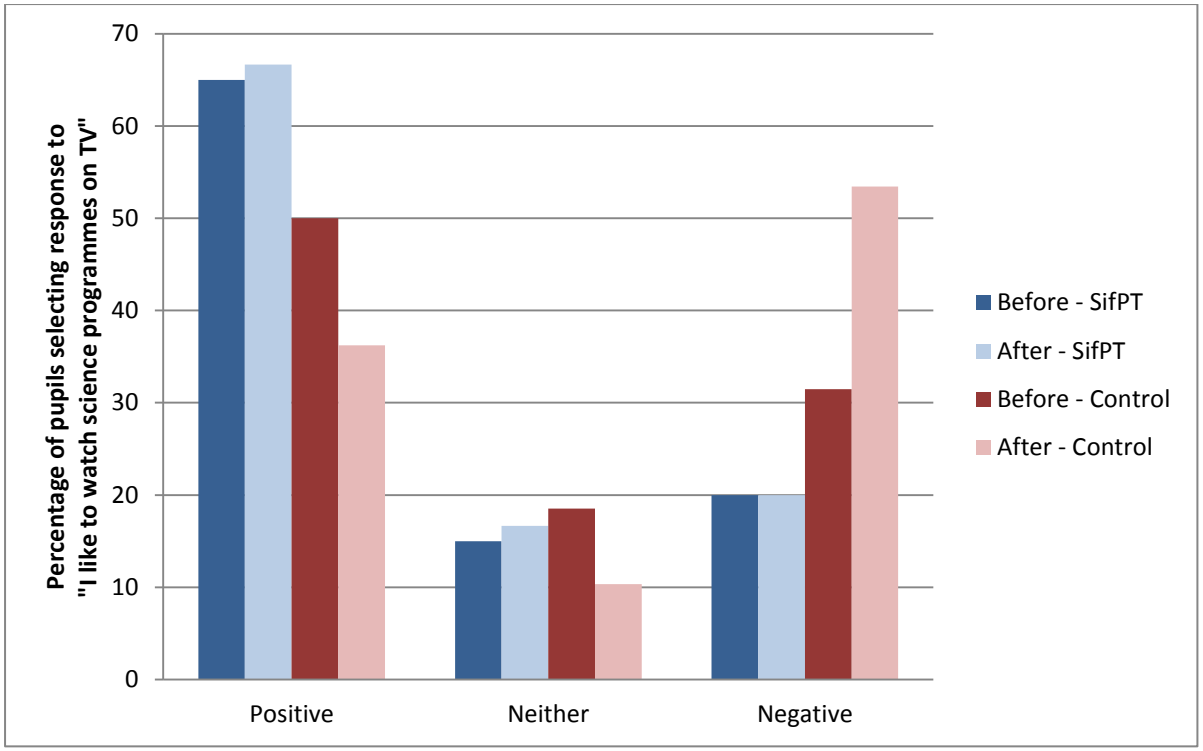


Figure 2 Responses to "I like to watch science on TV"

After the course, a greater proportion of test pupils agreed with the statement “I should like to be a scientist”, whereas a smaller proportion agreed with the statement in the control group suggesting that parents attending the course have been able to continue their children’s enthusiasm for science. This may be partly through parents doing experiments with their children, as more children responded positively to “I often do science experiments at home” after the course, whereas in the test group more children disagreed with this statement after the course (see Appendix 3 for graphs of the responses to the attitude statements).

However, due to the relatively small numbers of pupils completing both the pre- and post-questionnaires, anecdotal evidence from parents may provide greater insight into the attitudes of their children.

3.3 Parent questionnaire

Forty parents completed the questionnaire. The majority of parents heard about the course from a leaflet at school. Several heard about the course from friends and two had attended a taster session at a local primary school. Three received information from the City of York Council’s Family Learning network. All participants said they would recommend the course to a friend, many of them had already done so. This indicates that all participants enjoyed the course and felt it was a good use of their time, but other aspects of the evaluation allow more detailed exploration of the benefits that participants gained.

3.3.1 Motivations

The stated motivations for attending the course varied, 17 said they wanted to learn, seven said they were interested in science, six said they wanted to refresh their knowledge; *“Remind me of my school science so I can explain it better to the children*” and five parents said that they had disliked science at school and wanted to overcome this aversion, There was clearly a large range in the levels of pre-existing knowledge of the parents, for example, when asked if they would like to attend more science courses one respondent wrote “*Yes*

definitely, have a BSc Environmental Biology and Applied Statistics but Physics, Human health and Chemistry - need more knowledge personally", whereas another said they wanted to attend "*Because I failed all my sciences at school and yet I find it interesting and I want to help my sons (5 and 7*)" These differing motivations are important because they help to interpret other findings from the questionnaire.

3.3.2 Course objectives: improving knowledge and attitudes

One of the main objectives of the course was to improve parents' knowledge about science, and this objective has been achieved. Over half of the parents (26) listed improved knowledge as one of the benefits they had gained from the course. A further three felt that the course had increased their knowledge about how science is currently taught in school. Other benefits stated were feeling more confident in talking about science with their children and others e.g. "*more confident in helping them with their science homework*" (19 comments) (see Box 1), learning about experiments that can be carried out at home with children (13 comments). Two parents who were also supply teachers said that they were going to take things they had learnt into school. One wrote "*I took a Year 10 science cover on atoms and isotopes and I was able to do the answers - I couldn't believe it!*" Another parent said that they had taken materials from the course into school. In these cases, young people from outside the family are likely to benefit from the course as well.

Box 1: Feedback from a teacher who had observed a session

"The session was very informative with lots of practical activities for the parents to get involved in. The use of equipment was fantastic with a mix of experiments; from those which were more technical, to those that could be done at home. I enjoyed listening to the discussions between parents and how this would help their children with homework etc. The parents were very enthusiastic and asked lots of questions and the hand-outs helped to reinforce the key concepts and scientific language. The group is also going on a visit to Drax which I think again helps parents to understand 'real life' science and to support their children's learning."

Catherine Quinn, St Wilfred's RC school, York

As well as increasing their knowledge about the aspects of science covered on the course, several parents said that the course had given them knowledge about where to go on the internet for resources when they wanted to know more, e.g. "*Confident in finding out through computers, reading etc."* This is important because it will allow parents to continue their learning when the course has finished. Some parents also wrote about the effects that the course has had on their free choice learning time, e.g. "[the course] *has also encouraged me to read science articles in papers which I used to ignore!*", and "*I have bought books on science and I now have a genuine interest to learn more!"* and another said they "*feel more confident about taking them to science-based museums*". One parent noted that "*My husband bought me a book about physics for my birthday and I could never have imagined being pleased by that before!"*

All parents responded positively to the question "Have you spoken to your children about what you've learnt on the course". A typical response was "*They ask every Monday what I've learnt and if we've done any experiments. I tell them and we do experiments in the school holidays or at weekends*." This suggests that the course is achieving its aim of encouraging parents to talk to their children about science. When asked if the course had helped make parents more or less confident in helping their children with homework, all but one respondent said that they felt more confident, for example, one parent wrote "*I feel more confident in science topics and my daughter and me talked about them. But she's still in year*

3 so she doesn't have much science homework until now". The remaining respondent did not have school-aged children but said that they felt more confident talking to the cub scouts they worked with about science. The majority of respondents (35) said that their confidence in talking to others about science had increased, but five said it had remained "About the same" but gave no details of why they had given this response.

The questionnaire asked whether the course had changed people's attitudes towards science. The majority of parents (24/40) said that it had improved their attitude in some way. Thirteen parents said that it hadn't really changed their attitude, and the majority said that this was because they had previously liked science e.g. "*It reminded me of how much I enjoyed it. Made me think about what simple things I could do with my children to reinforce what they learn at school*". Three parents did not answer. Those who said their attitudes had changed commented that it had made science more accessible and less scary e.g. "*Less scary. From not liking science, now finding it fun.*" and "*Yes definitely, it make me wants to learn. More about life, nature, ecosystems, spaces and so on*."

Parents learning together in one of the NSLC laboratories

3.3.3 Course objectives: creating resources

Parents valued the resources created on the course, with several saying that they had used the VLE (Virtual Learning Environment) materials with their children, shown their children YouTube videos, and some had even recorded the sessions and shared them with their children. Parents would have liked even more experiments and worksheets to take home to do with their family, and several said they would like a more detailed workbook "*Maybe the hand-outs could be made into a workbook with space to add notes during the session so we don't have hand-outs shoved in a book*".

3.3.4 Course objectives: raising aspirations

Several parents specifically mentioned the high quality facilities at the National Science Learning Centre, for example, "*Finally, thanks to the National Science Learning Centre for its fabulous facilities. It was a pleasure to study there*". Two parents mentioned having had high quality talks from "*professionals*" which they really appreciated. This was also a useful opportunity for the researchers themselves to communicate their research to a wider audience. One parent said that they attended because they wanted to *"get back into learning*" and felt that the course had been "*Great for children to know and see us 'studying' / attending a course*". They also wrote that "*Careers have to change when you have children but by attending courses, great way to be inspired*".

When asked if they would like to attend a more advanced science course at the centre, the majority (32/40) responded with Yes, four said Maybe, and one said No, but qualified this with "*Would like to but probably won't have time with work. Was just lucky to have a window to attend this one!"* One parent wrote that "*Yes, I didn't get the best out of school and did not gain my full potential. Any future learning around school hours I would be very interested*."

Parents were also asked if they'd like to attend any other types of courses. Nearly all the parents were keen to do this, Maths and English were particularly popular. Parents were keen to have more courses on things that their children are learning at school, e.g. phonics, maths and English, as they felt that knowing how it is taught now "*would make a big difference when helping with homework*" (see Box 2).

Parents listed a wide range of other benefits from their participation, including social benefits; "*I have thoroughly enjoyed and made new friends*", "*enjoyed the interaction with other parents*", and "*Learn more about English language*".

Box 2: Feedback from a teacher who had attended a session as an observer

Following the session Alex showed me some of the previous lesson plans and homework set. The homework being practical experiments for the parents to carry out with their children that were pertinent to the KS2 syllabus and easy to resource. Alex and I also discussed the idea of setting up an afterschool club to give the parents at Carr the opportunity to see what the 'Science is for Parents Too' course is like and I am sure many would be keen to sign up to future courses.

The whole morning was a pleasure to be part of and the only real problem I can see is being oversubscribed in future sessions. If there was to be something similar in literacy and, in particular, numeracy they would be just as popular I am sure.

Garry Flitcroft, Teacher and Science coordinator at Carr Junior School, York

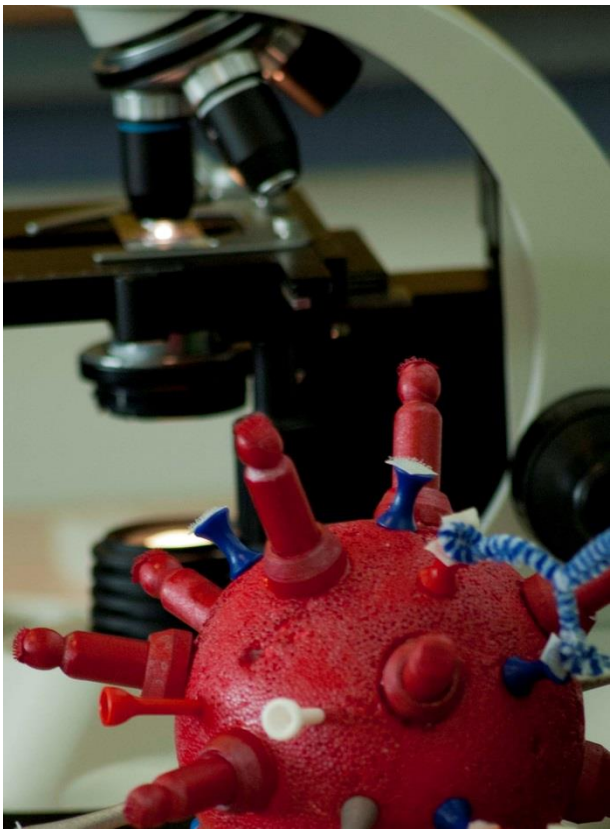
3.4 Focus groups

Seven participants attended the focus group, all women. Three had children at primary school, one had a child at secondary school, and three had children at both primary and secondary school.

When asked what made them want to come on the course, they all talked about wanting to improve their knowledge of science, for example "*I don't particularly like science, I've never liked science…I didn't feel I understood some of it, so I felt it was an opportunity for me to get over that*". A couple of the parents said that they were scared about science from school, and others wanted to refresh their knowledge. One worked as a voluntary teaching assistant and felt it would look good on her CV. Several of the parents said that they wanted to be able to help children with their homework by being able to "*answer their questions confidently*", as "*there are only so many times you can go 'ask your dad about that one'".*

All the participants seemed to have enjoyed the learning experience. One said "*I'm a bit sad really, I go back and say 'guess what I did today?', and I'm just really proud of myself"*. When asked whether they talk to their children about what they've learnt, everyone said that they did, although one parent said that "*Mine are older, I come back and I'm bouncing like this* [jumps up and down in seat]*, and I get 'right, yeah, so?'*"

They all said that the course had increased their confidence, one said that they felt the course had had positive impacts on their children's attitudes towards them as a parent and towards science, and said *"What they have seen though is me not being like, before I was like 'oh, science.' And now I'm like 'yeah, look, I can help, I can have a look', rather than 'let's wait until dad gets home'".* Another parents said she felt it was good for her daughter to see *"that although I'm at home at the moment most days, that I am doing something and it is learning based, and I think that is really important for your children to see that even if you are not working, or you are not in full time employment, that actually you can still learn, even as old as I am (laughter)"*. Another parent agreed with this *"I think it is similar benefit that he sees me doing something, and he wants to be a scientist, and he wants me to go and study science and educate myself properly and be a science teacher, and all sorts of things, so it*



Learning about viruses

is entering his world as a possibility for career development.". Very encouragingly, this lady's son is only 5. One participant has a child doing their GCSEs, and said that her attitude towards science has changed, and this has impacted how she talks to her children about their career options: *"I am more willing and I am more, 'I think I can do that'…and therefore I feel more positive and when we are looking at what paths they might take, you know, I am more of encouraging of science, whereas before I might have thought I'm completely rubbish at it so don't even think of it, it's too hard, or whatever. A more positive outlook"*.

As for the questionnaire respondents, several participants said that they were now noticing science more outside of the course, for example, one parent described how she had taken her son to a science show at the National Railway Museum, whereas *"before I wouldn't think it would be too interesting maybe, or I'd think he is maybe too small, but I've realised he isn't and he gets a lot out of it"*

4. Improvements and Lessons Learned

The focus group and parent questionnaire gave participants an opportunity to talk about how they thought the course could be improved. All at the focus group agreed with a suggestion from one of the parents that a document summarising the national curriculum would be helpful for knowing when their children would cover certain aspects of science, although several acknowledged that this is often down to individual schools or teachers. In addition, the curriculum is being re-written at the moment so this is not feasible. When the curriculum is finalised, parents might appreciate a document summarising it.

Parents also felt they would benefit from a more structured work book; they had been given a book for making notes in, and worksheets, but they would like to have a booklet containing all the worksheets plus space for writing notes on it. They felt this would reduce the amount of time needed to take notes, to allow them to listen more fully.

Attendance at the Monday evening session dropped off when the weather improved, and therefore if future courses are held in the summer, it might not be worth running an evening session. In addition, the evening participants tended to be quite tired, as often they had had a full day at work. Availability of parents in the summer term was sometimes problematic; parents were supporting schools at sports days, on field trips etc, so were often unable to attend field trips and visiting speaker lectures etc.

At the beginning of the course, some parents asked to swap to different sessions as they had work and childcare commitments some weeks. At first, this was not possible as the sessions were not being run in parallel. However, Alex was able to change this and run the sessions in parallel so that parents were able to switch courses, and we recommend that this approach is taken for future courses.

Recruitment of parents was very challenging at first, and although the majority of parents said that they had heard about the course from a leaflet at school, several mentioned that they did not find out about the course until after it had started, and that friends hadn't heard about it at all. We found that the local science co-ordinator and the local authority were very helpful for publicising the course after our targeting of two schools was unsuccessful in the first instance. We feel that getting an enthusiastic teacher who can champion the course and who is willing to put leaflets in children's bags to be taken home to parents is essential for promoting the course.

5. Summary

Despite the initial difficulties with advertising the course to parents, those who attended were very positive in their feedback and said that they would recommend the course to a friend in future. Parents particularly appreciated the teaching style, the venue, the diversity of speakers and field trips, and the experiments that they could take home to do with their children.

The course appears to have had an impact on their family lives generally, with parents feeling more confident about helping their children with science homework, and some taking more interest in science museums and exhibitions. Their children too exhibited more positive attitudes towards science than the control group, and their knowledge of the science that was covered through experiments undertaken at home was increased, which indicates that intergenerational knowledge exchange has taken place as originally intended.

The majority of parents also said they felt more confident talking about science with others, suggesting that the course has influenced other aspects of their lives. Most parents were keen to undertake further courses at the University, and therefore this course may well have sparked an interest in wider learning in addition to the sciences, as well as being successful in cascading learning and attitudes between generations.

6. References

Pell, T., & Jarvis, T. (2001). Developing attitude to science scales for use with children of ages from five to eleven years. International Journal of Science Education, 23(8), 847–862.

Appendix 1: Pupil Questionnaire

Your Name: _____

What I really feel about science

					
1. I should like to be a scientist					
2. Science is good for everybody					
3. You have to be clever to do science					
4. I like science more than any other school work					
5. I often do science experiments at home					
6. Science is just too difficult					
7. We have to do too much work in science					
8. I like to watch science programmes on TV					
9. Science makes me think					
10. I am always reading science stories					
11. I should like to be given a science kit as a present					
12. We do too much science at school					
13. One day, I should like to go to the moon					
14. I think science is fun					

Please turn over for a fun quiz!

Appendix 1

Put a tick by the answer you think is right ✔

1. What happens when you mix vinegar and baking soda?
[a] Nothing
[b] Vinegar turns green
[c] It makes a gas

2. What happens to the taste of bread when you chew it for a long time?
[a] It tastes more salty
[b] It tastes sweeter
[c] Nothing

3. Can gas be poured from a container?
[a] Yes
[b] No

4. Why is the sky blue?
[a] Light scatters from air particles
[b] The sun produces only blue light during the day
[c] The sky reflects the colour of the oceans

5. How do we hear sound?
[a] Vibrations in the air
[b] We feel them
[c] The move like light

Appendix 2: Science is for Parents Too: Feedback questionnaire

Thank you for participating in this course run by the Centre for Lifelong Learning at the National Science Learning Centre. In order to understand your experiences of the course, we would like you to complete this questionnaire. Please be as detailed in your responses as you can. Thank you for your time.

1. Where did you first hear about the course?

2. What made you want to come on the course?

3. Overall, was the course what you expected? Please explain why / why not.

4. Do you think you have benefited from taking part in the course? If so, please list as many benefits as can think of.

5. Has the course changed your views or attitude towards science in any way? If so, how?

Appendix 2

6. Have you spoken to your children about what you've learnt on the course? Please give details.

7. Are your children interested in what you've studied on the course? Please give details.

8. Since the course started, do you feel more or less confident helping your children with science homework? (Please circle and give details below)
More confident
About the same
Less confident
Please give details.

9. Since the course started, do you feel more or less confident talking about science with others? (Please circle and give details below)
More confident
About the same
Less confident
Please give details.

10. Would you recommend the course to a friend?

Appendix 2

11. What do you think we should change for future courses?

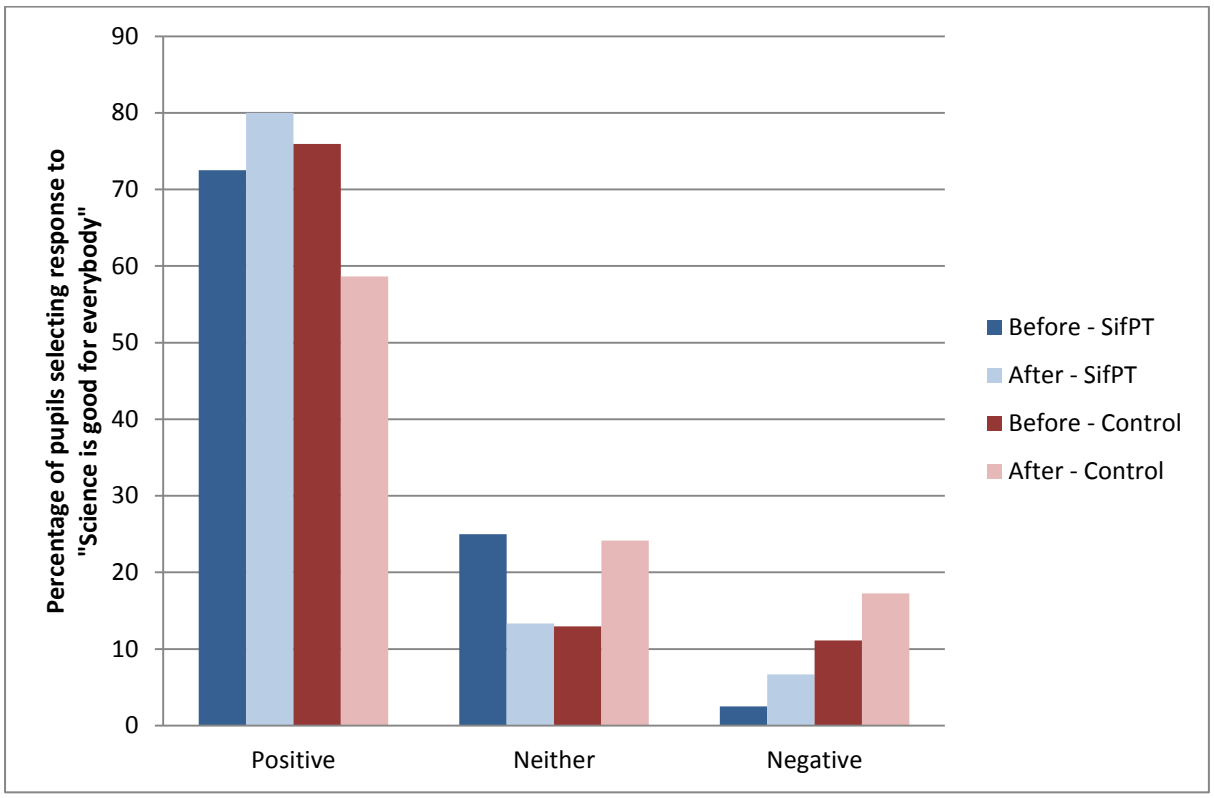
12. Is there anything else you'd like to say about the course?

13. Would you like to do a more advanced science course at the centre?

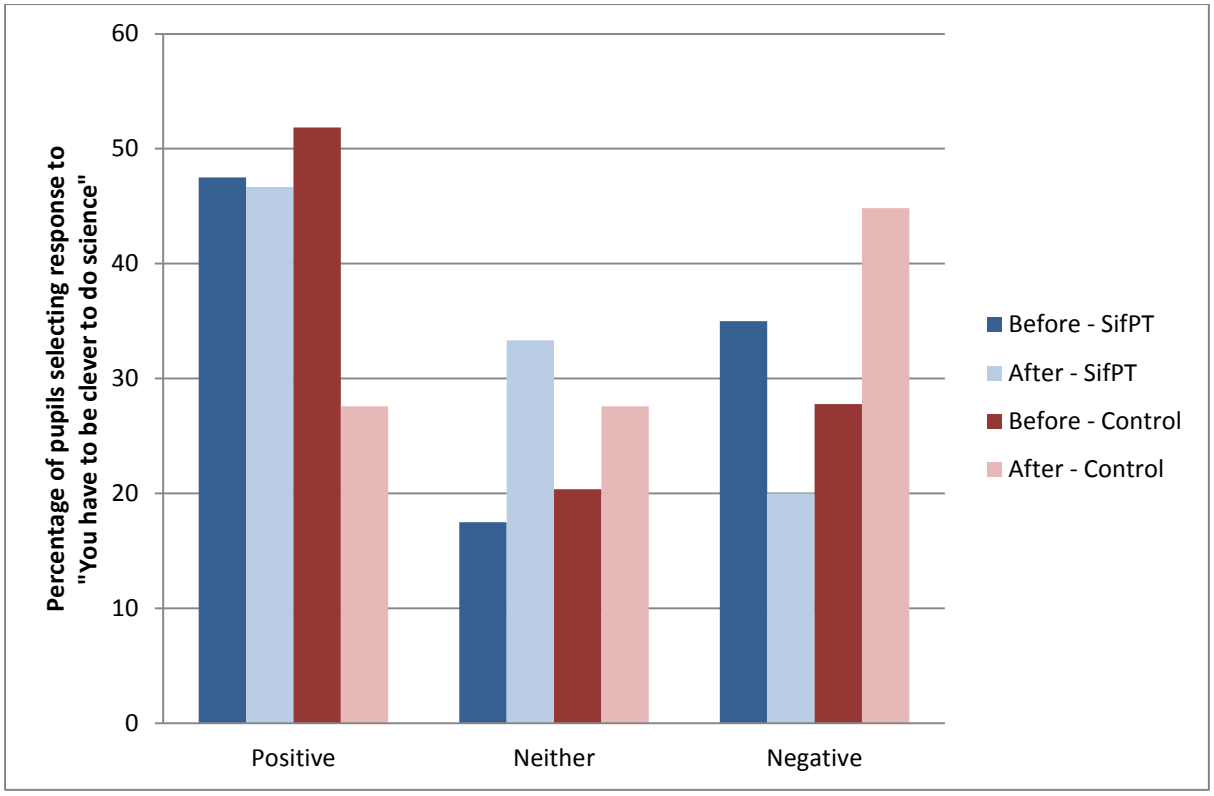
14. Would you be interested in attending similar courses on other topics? Please give details.

Thank you very much for your time, your responses will be used to help develop future courses.

Appendix 3: Responses to attitudinal questions

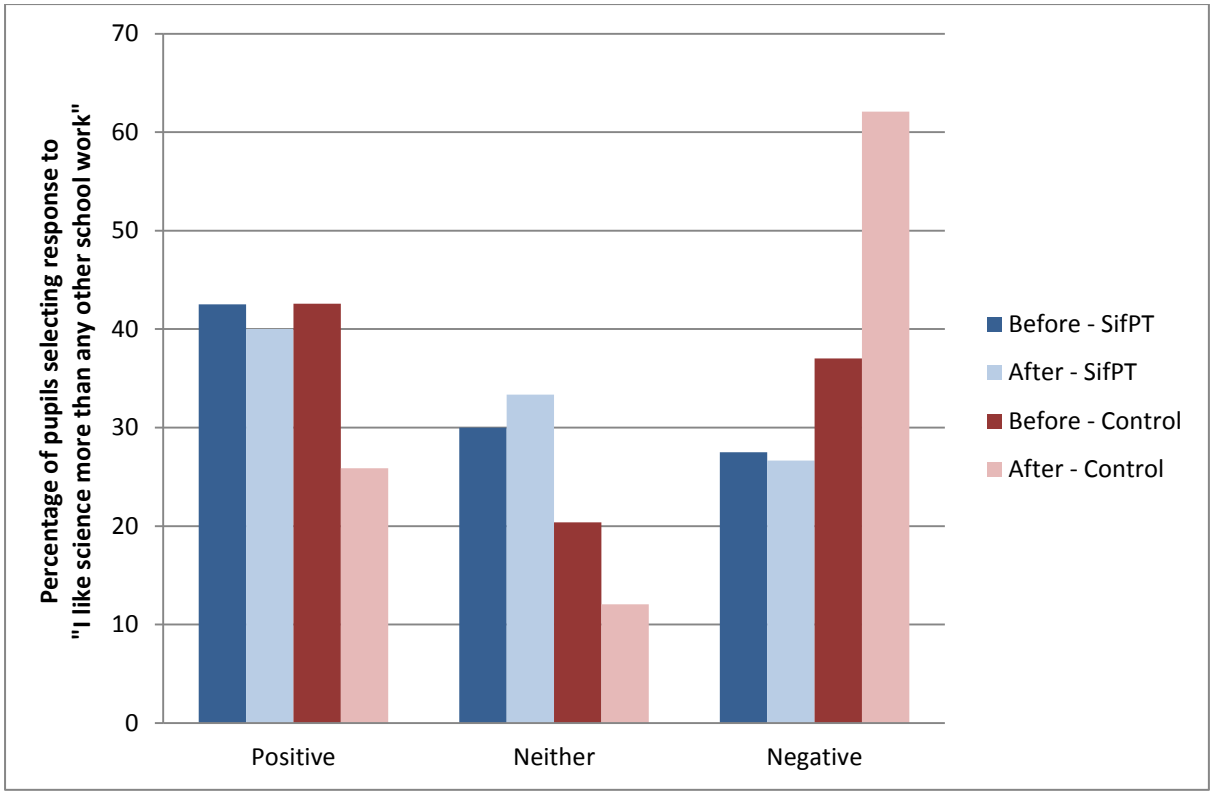


Slight increase in positive comments for test group, larger decrease in positive comments for control group.

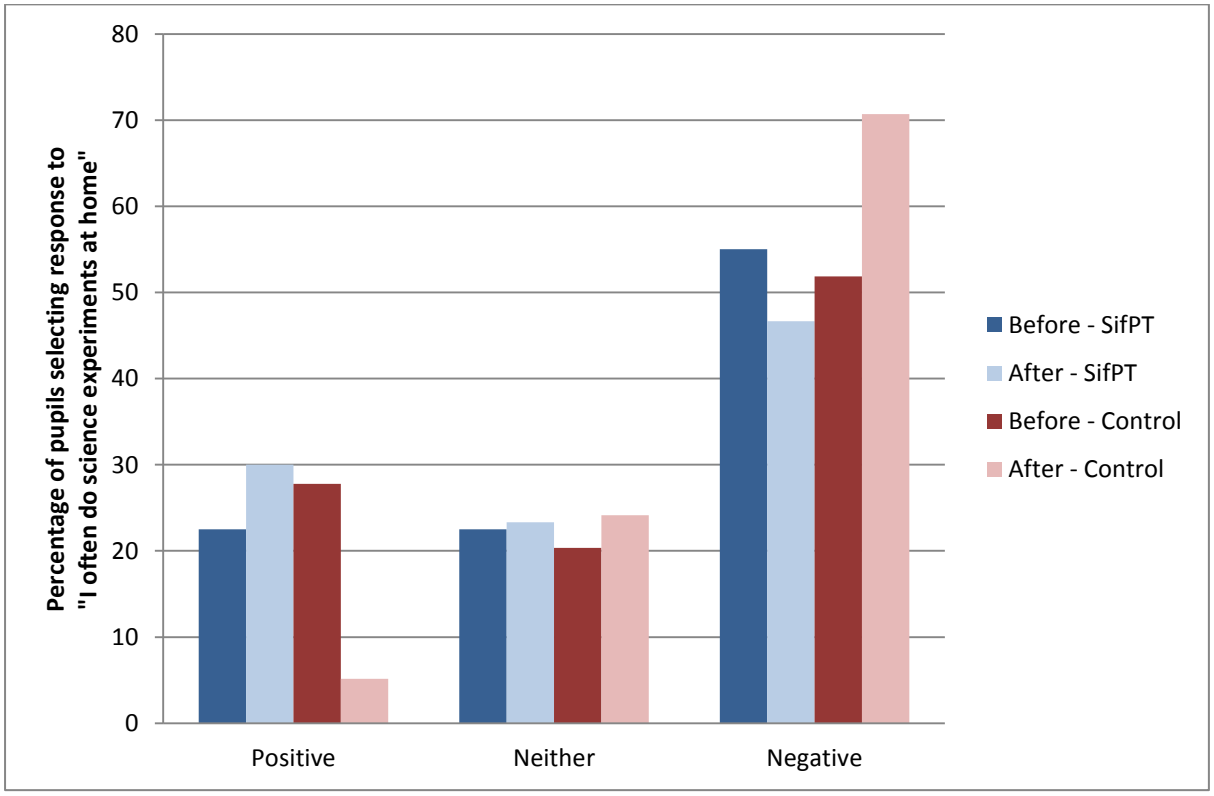


More even spread of responses before and after the course. Decrease in negative responses to the question after the course for the test group, potentially suggesting science is seen as more accessible than previously.

Appendix 3

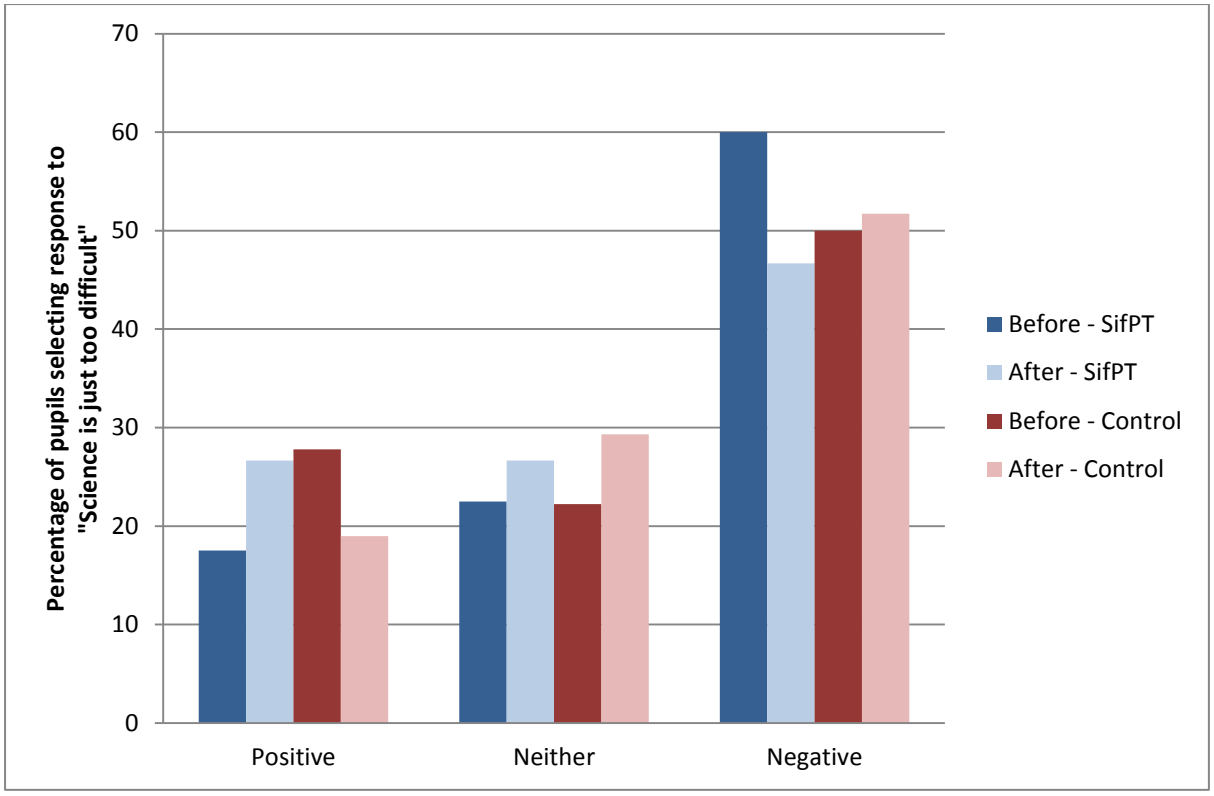


Large decrease in positive responses for the control group, little change for the test group, suggesting enthusiasm for science homework dropped for the control group but did not change for the test group.

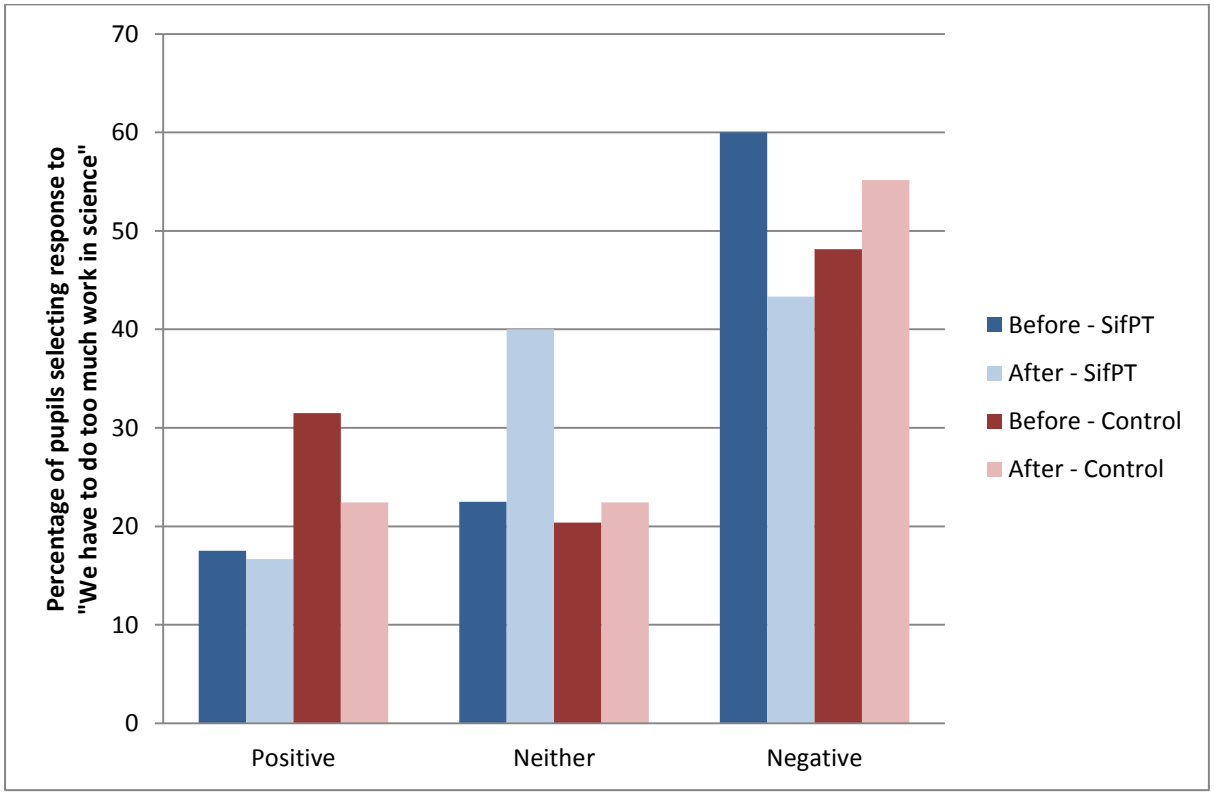


Increase in negative responses for test group, small decrease in negative responses for test group.

Appendix 3

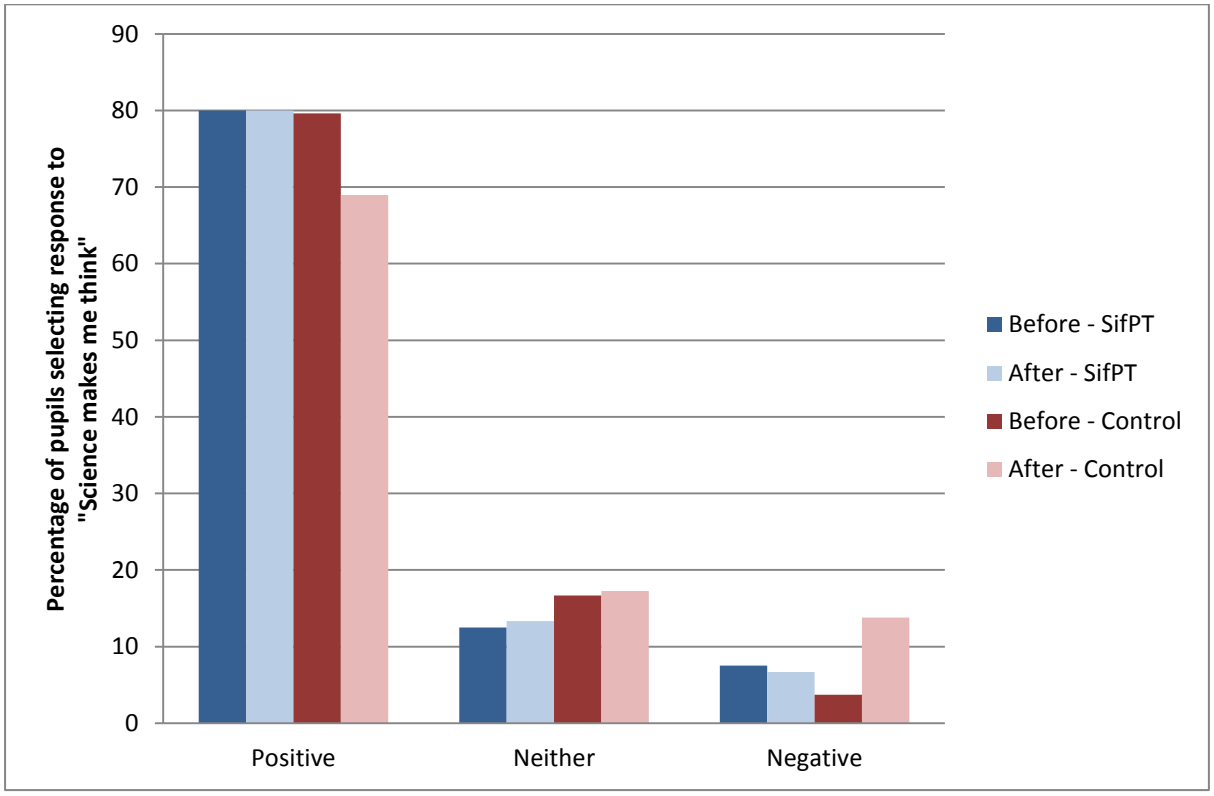


Even spread of responses both before and after, but drop in number of negative responses in test group.

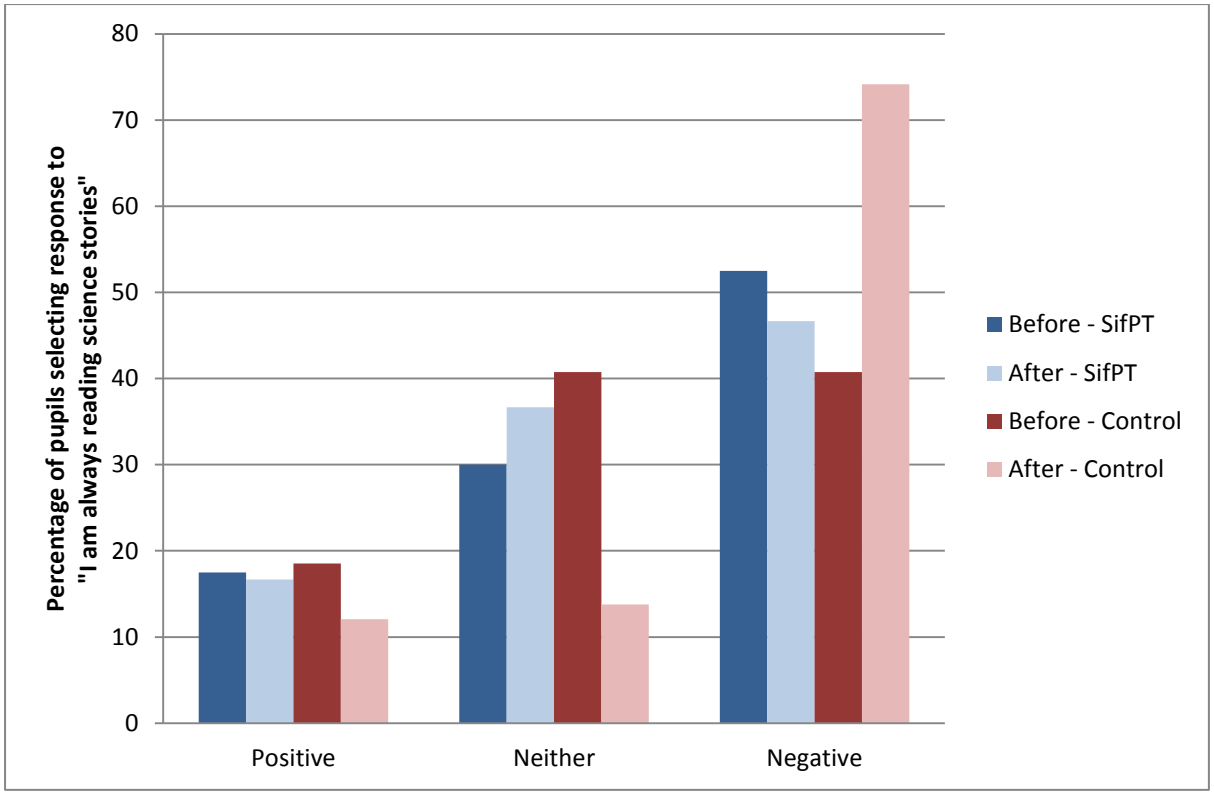


Drop in number of negative responses in test group.

Appendix 3

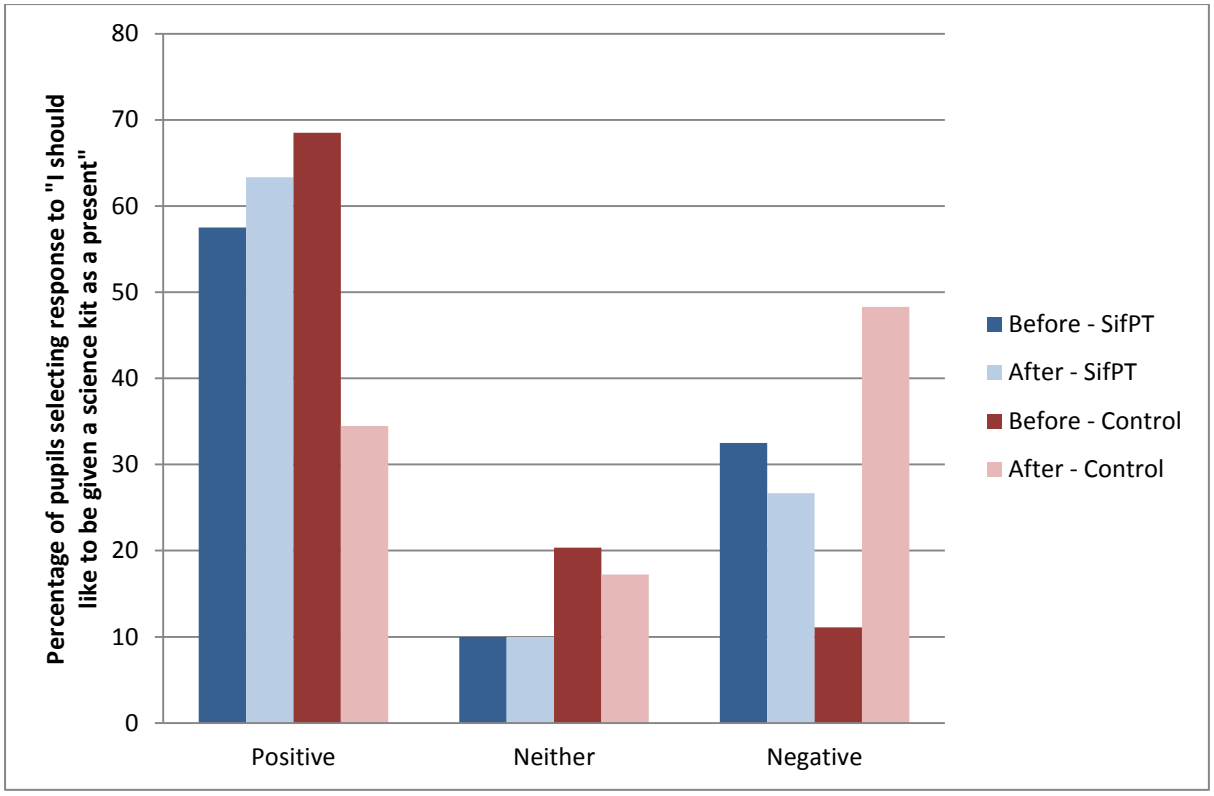


Little change in responses to this question

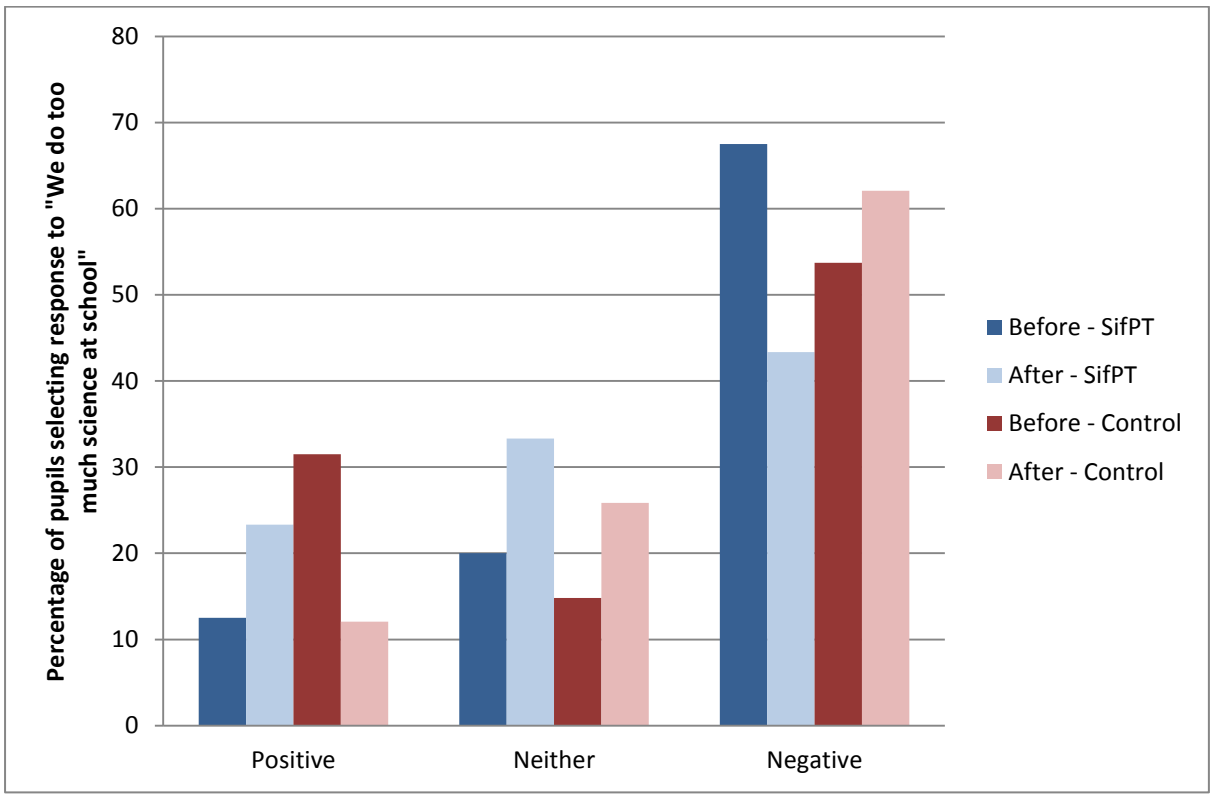


Increase in number of control group responding negatively to this question, slight decrease in test group

Appendix 3

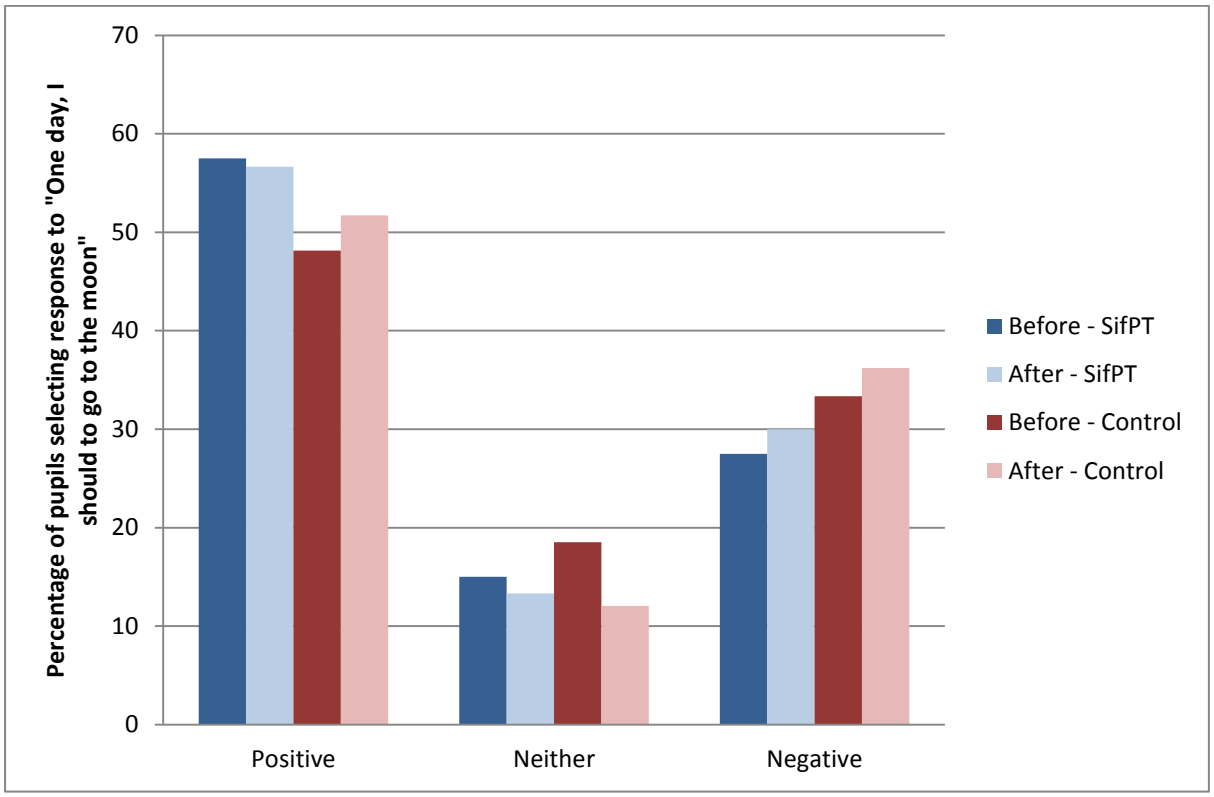


Evidence of a decline in enthusiasm for science in control group (increase in number of negative responses), but this was not seen in the test group.

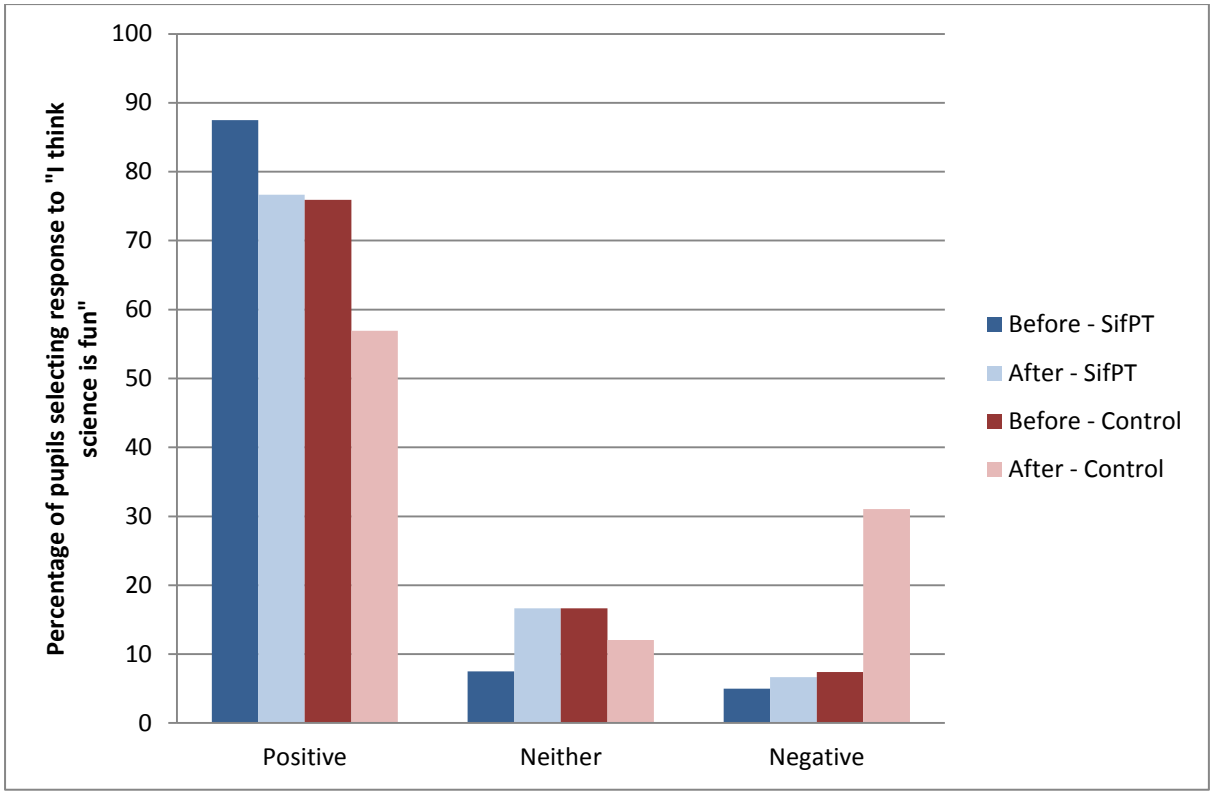


Increase in proportion responding positively to this question in test group, and decrease in control group, which may indicate more negative feelings towards science in school by test group. Alternatively it may reflect changing levels of school science over the period, or confusion over the reversed question.

Appendix 3



Little change in any group over the period, but children generally more positive than negative about this statement.



Decline in enthusiasm for control group, no decline seen in test group.