



Belly Bugs Primary School Pilot

Evaluation Report

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Executive Summary

Caja was commissioned by Sunderland City Council to conduct an independent evaluation of the Belly Bugs Primary School Pilot, with the goal of understanding the impact, identifying any gaps in the delivery and assessment, and providing recommendations, not only for the improvement of the programme's delivery, but also to inform future interventions in maintaining a healthy weight and reducing health inequalities in the area. Such goals are imperative for realising Sunderland City Council's vision that everyone in Sunderland will have healthy, happy lives with no one left behind, as highlighted in Sunderland Healthy City Plan 2020 – 2030.

The evaluation adopted a mixed methods approach consisting of a combination of primary research, including pupil and teacher questionnaires and discussion groups, as well as secondary sources, such as obtaining food records from the Sunderland City Council's school meals service. Adopting a mixed methods approach provided a more comprehensive and rounded insight into the areas of interest while balancing out the limitations of different methods and enhancing confidence in the findings.

Overall, the Belly Bugs primary school pilot was a success. School staff and pupils had an overall positive experience with the pilot, despite the challenges faced due to the tight timelines and already significant curriculum workload. The timing of the pilot played an important role in how the Belly Bugs programme was implemented, with the level of engagement widely varied between participating schools. The pilot's main goal of enhancing pupil knowledge around their gut microbiome and the importance of healthy eating as well as encouraging them to make healthier choices has, to a large extent, also been achieved. Suggestions on how to further improve the Belly Bugs programme and recommendations for further engagement from Sunderland City Council towards supporting healthy eating initiatives are discussed at the end of this report.

1. Introduction

1.1 Purpose of this report

Caja Ltd is a research consultancy based at Keele University Science Park, specialising in research, service design, optimisation, and transformation, through the use of behavioural science and data analytics. The company has extensive experience working with Local Authorities (LA) and the wider public sector, to deliver robust behavioural insights projects including research, design, deployment and evaluation of behavioural change interventions as well as workforce training and education through its Behavioural Science Academy.

Caja was commissioned by Sunderland City Council (SCC) to conduct an independent evaluation of the Belly Bugs Primary School Pilot, with the goal of understanding the impact, identifying any gaps in delivery and assessment, and providing recommendations, not only for the improvement of the programme's delivery, but also to inform future interventions in maintaining a healthy weight and reducing health inequalities in the area. Such goals are imperative for realising the SCC vision that everyone in Sunderland will have healthy, happy lives with no one left behind, as highlighted in Sunderland Healthy City Plan 2020 – 2030¹.

This report is the result of collaborative working between Caja, Public Health and other relevant bodies within SCC and the team behind the Belly Bugs programme, as well as participating schools who dedicated a considerable amount of time out of their busy schedules to run the Belly Bugs programme and participate in the evaluation process.

This report will start by examining the importance of healthy eating and education around nutrition for children, provide background information around the impact of obesity in England and Sunderland and the actions taken to tackle them. It will then introduce the Belly Bugs programme and define this evaluation's aims, objectives, and outcomes, followed by methods employed to materialise them. Next, the findings of this process are presented and discussed, followed by recommendations

both for the future delivery of the Belly Bugs programme as well as for the public health teams in Sunderland City Council. Additional information, including questionnaires and interview guides used for the evaluation can be found in the appendix.

1.2 The importance of healthy eating for children

It's well established that a healthy and balanced diet is imperative for good health and longevity. Eating a well-balanced diet that includes a variety of nutrient-dense foods while reducing the intake of unhealthier options, drinking adequate amounts of water and exercising regularly can reduce the risks for serious health problems, boost the immune and metabolic system and promote mental health^{2,3,4}. Even for people with long-term conditions, a balanced diet can prevent further health complications and help them better manage their conditions⁵.

The importance of a healthy diet starts before life even begins. There is consistent evidence that a woman's nutrition, and overall weight, before and during pregnancy as well as during lactation, contributes to the overall health and development of the newborn⁶. Breastfeeding is also essential in protecting against childhood illnesses and infections and reducing sudden infant death syndrome³. Good nutrition continues to play an imperative role during early childhood, a time of rapid growth and development during which an optimal diet can foster a healthy and strong body as well as cognitive functions⁷.

However, a recent UNICEF report highlights that the prevalence of overweight among children and adolescents is rising almost everywhere in the world, with 40 million of under-five (6% of this age group) and 340 million children between 5-19 years of age (18% of this age group) living with overweight⁸. Even more alarming is the latest data from the World Obesity Atlas⁹, which suggests a rise in obesity prevalence in the general population and particularly amongst children, as a result of the COVID-19 pandemic. The report also highlights that if the current trend is to

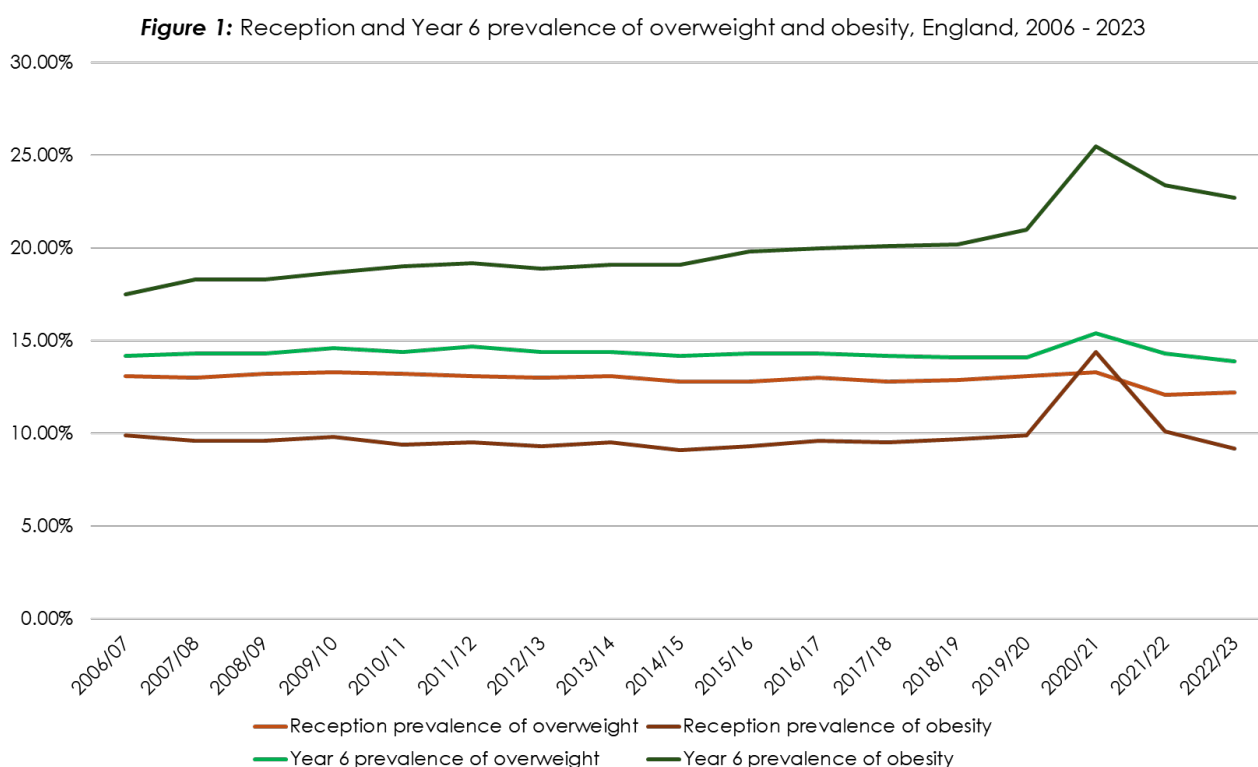
continue, the rising prevalence of obesity is to be steepest among children and adolescents (5-19 years), rising from 10% in 2020 to 20% in 2035 for boys and from 8% to 18% for girls. The impact of such rises in obesity prevalence can have consequences that extend beyond the health and overall wellbeing of a population. Researchers have estimated that the economic impact of overweight and obesity, including healthcare costs for treating these conditions as well as the effect they have on economic productivity, will rise from \$1.96 trillion in 2020 to more than \$4 trillion in 2035 ^{10,11}.

One of the fundamental contributing factors identified in the literature for the rise in overweight and obesity prevalence is the interaction between individual characteristics, which might include physiological processes and preferences, and what is termed as obesogenic environments, which refers to the role environmental factors play in determining an individual's nutrition choices and level of physical activity¹². More and more children, nowadays, will grow up in such environments, where the availability, affordability, and marketing of unhealthier food options in combination with a more sedentary lifestyle and increased screen time will encourage weight gain and, ultimately, obesity¹³. Moreover, and with an increasing number of parents being at work, more children now spend longer periods in childcare and in environments outside their home where they will consume a large amount of their dietary intake. That puts extra emphasis in such settings not only to ensure the quality of the food provided, but also to promote healthy nutrition, balanced diets, and an active lifestyle with the goal of building good eating habits and patterns in the early years of their life¹⁴.

1.3 Childhood Obesity and Overweight in England and Sunderland

Tackling overweight and obesity in England remains one the most important long-term health challenges, particularly for children. Although the recently released National Child Measurement Programme (NCMP) data show some positive downwards trends, some indicators still remain higher than pre pandemic levels

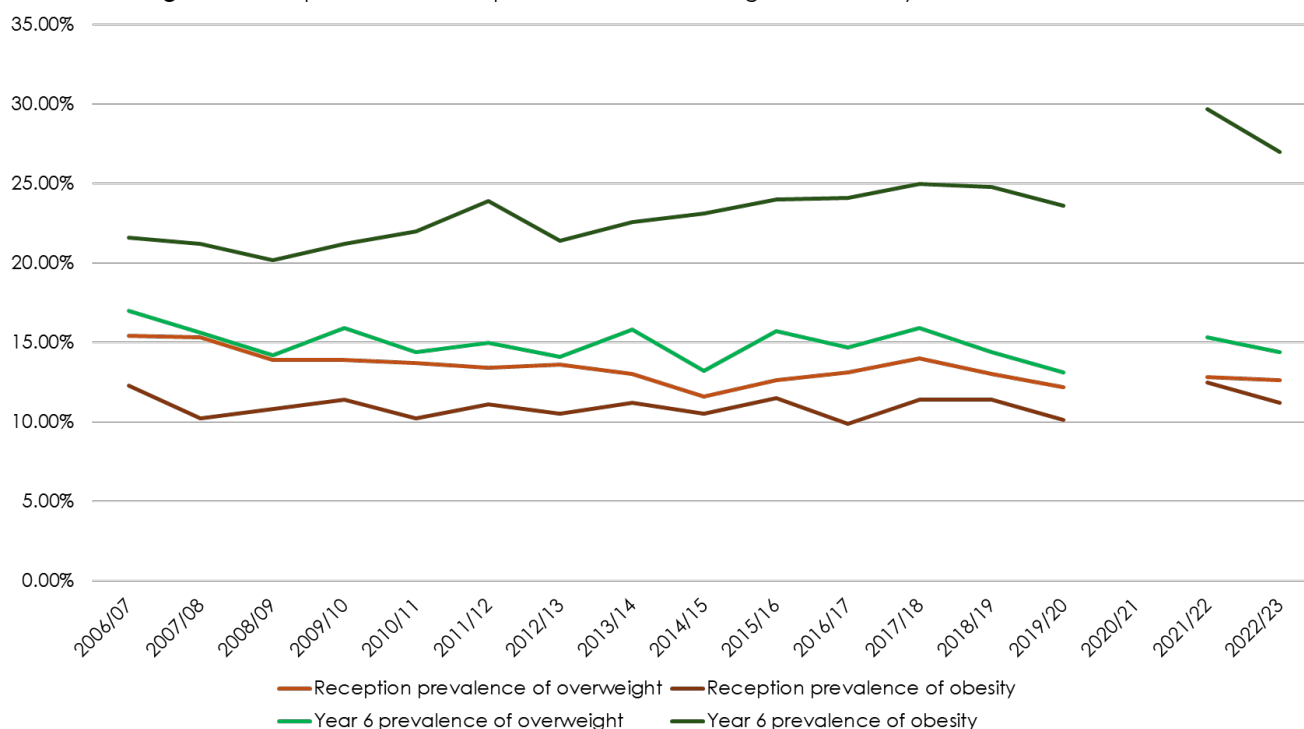
(Figure 1). Reception prevalence of overweight (4-5 years) increased slightly to 12.2% while obesity prevalence (including severe obesity) for the same age group fell from 10.1% last year to 9.2%. At the same time, Year 6 prevalence of overweight (10-11 years) fell by 0.4% to 13.9%, while Year 6 prevalence of obesity (including severe obesity) also fell slightly to 22.7%, although still remaining higher than pre-pandemic levels.



Data for Sunderland also indicated a positive downward trend, but there is still room for improvement, particularly when considering regional and national comparisons as well as pre pandemic levels in the area (Figure 2). Reception prevalence of overweight (4-5 years) decreased slightly, to 12.6%, which is lower than the regional (13.9%) but close to the national (12.2%) percentage, while the same age group also saw a reduction in obesity prevalence (including severe obesity), to 11.2%, which is similar to regional (11.3%) but higher than the national (9.2%) percentage and still remains higher than pre-pandemic levels. At the same time, Year 6 prevalence of overweight (10-11 years) also fell to 14.4%, which is slightly higher than regional

(14.1%) and national (13.9%) levels, while Year 6 prevalence of obesity (including severe obesity) was reduced to 27%, however it remains higher than the regional (25.8%) and national (22.7%) level.

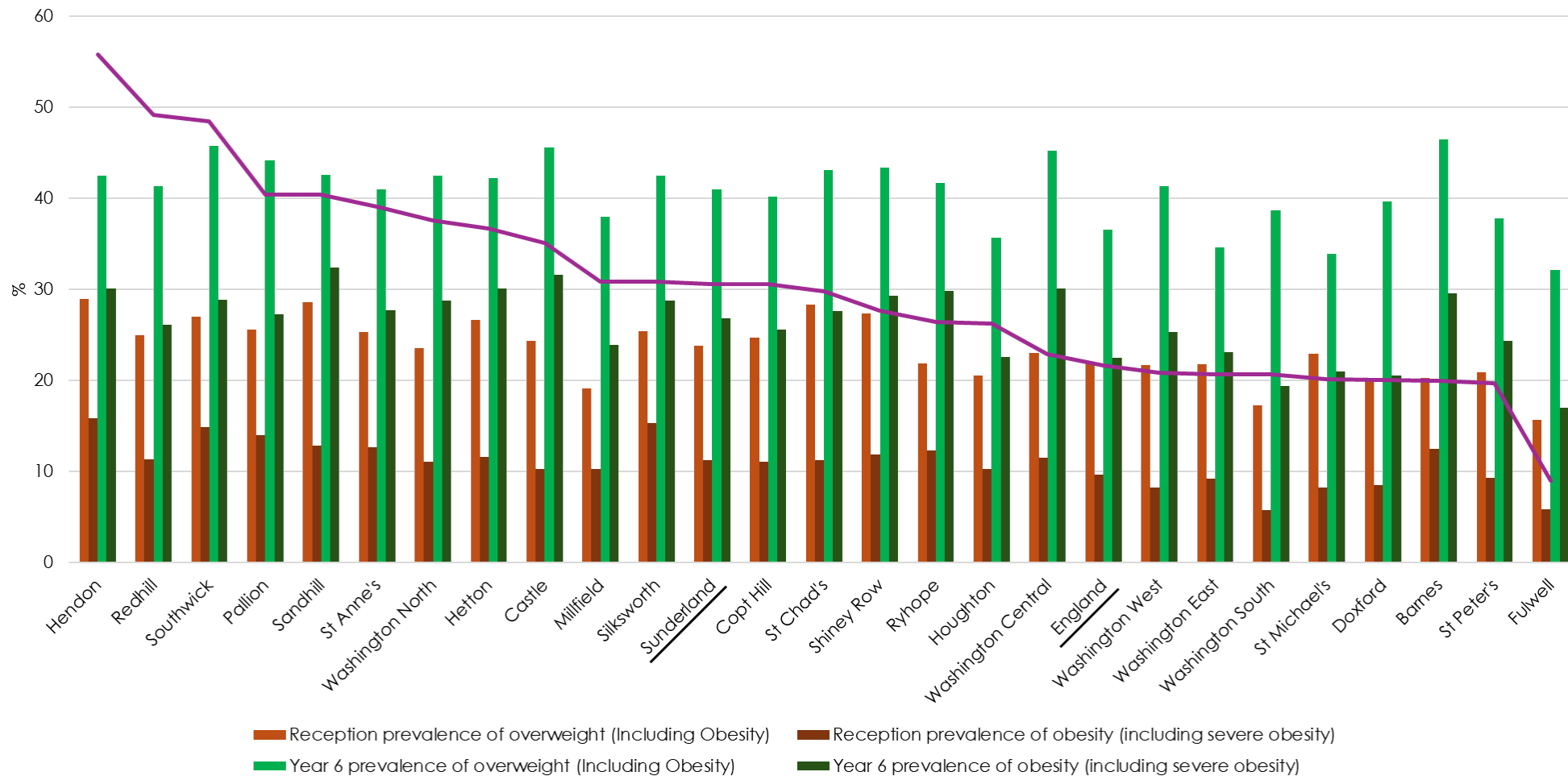
Figure 2: Reception and Year 6 prevalence of overweight and obesity, Sunderland, 2006 - 2023



Source: National Child Measurement Programme (NCMP) Data Fingertips

Another important element identified in the NCMP data was the effect of deprivation on obesity prevalence. At a national level, obesity prevalence for children living in the most deprived areas was twice as high compared to those living in the least deprived areas. For Reception children that obesity prevalence gap was at 6.6% (12.4% to 5.8%) while for Year 6 children it was 17.1% (30.2% compared to 13.1%). A similar image can be seen across Sunderland. Breaking down the NCMP data at the ward level (Figure 3) reveals that wards with higher multiple deprivation index score recorded higher overweight (including obesity) and obesity (including severe obesity) prevalence between 2021-23 for Reception. However, when it comes to the same metrics for Year 6, we can observe a different pattern, where even wards with lower deprivation record relatively high levels of overweight and obesity prevalence.

Figure 3: Reception & Year 6 Overweight and Obesity Prevalence 2021-23



Source: National Child Measurement Programme (NCMP) Data Fingertips

These trends in overweight and obesity prevalence across Sunderland can also be seen in the responses recorded in the last three Health Related Behaviour Surveys. In 2019, 25% of Year 4 and Year 6 pupils reported having chips/roast potatoes, 29% crisps and 32% sweets and chocolates on most days. In 2021, these number increased to 28%, 39% and 34%, respectively, only to fall back slightly in the 2023 version with 27% reporting having chips/roast potatoes, 35% crisps and 32% sweets and chocolates on most days. Although in the 2019 survey 46% of Year 4 and Year 6 reported eating fresh fruit, 48% dairy produce and 34% vegetables on most days, with the 2021 survey recording similar numbers, 47%, 48% and 33%, respectively, the 2023 survey recorded a slight reduction across all measures with 44% of Year 4 and Year 6 pupils reporting eat fresh fruit, 37% dairy produce and 30% vegetables on most days.

As mentioned earlier in this report, the Joint Strategic Needs Assessment for SCC¹⁵ recognised that social determinants and poverty can create health inequalities that will consequently lead to poor health. Tackling this in line with the Sunderland Healthy City Plan 2020 – 2030¹⁶, requires an informative, preventative, and multifaceted approach through the life course, which starts with laying the foundation of a healthy life from pre-conception to young adulthood (Starting Well), provide people with the opportunity to live a healthy life (Living Well) and ensure people can live a healthy old age (Ageing Well). Such an ambitious goal cannot be achieved through a single intervention. It requires a pluralistic and sustained “whole system approach” that will place health in the centre of all policies and actions across individual, environmental, and societal levels and involving multiple sectors.

Within such an approach, and as part of a preventative strategy to support primary and secondary schools in their endeavour to reduce levels of children living with overweight and obesity and maintain a healthy weight, the SCC Healthy Weight Steering Group, supported the opportunity for primary schools to participate in the Belly Bugs pilot.

1.4 Introduction to the Belly Bugs Programme

The Belly Bugs Project offers education around healthy eating, behaviour change and wellbeing through informing children of the fundamentals of healthy eating by introducing them to the fascinating world of their gut microbiome, and the impact that children's food choices have on these microbes, which scientists agree is key to general health and well-being. Belly Bugs encourages children to make informed food choices to benefit their own health.

With increasing concern about children living with obesity, poor diet, and mental health, introducing children as early as possible to their Belly Bugs will encourage them to eat more fruit and vegetables before they start to reject these healthy foods in the face of the inevitable sugar and junk-food onslaught. Teaching kids that they have a gang of unique Belly Bugs inside them that they need to care for, while at the same time, exposing them to practical lessons in growing, cooking, and tasting fruit & vegetables will help them make better, more informed nutritional choices as they grow up. In addition, Belly Bugs teaches the vital importance of enough exercise and sleep and how these affect their Belly Bugs and, consequently, their own well-being.

The Belly Bugs story is told with the help of Billie Pickle, an endlessly curious 8-year-old tomboy who's fascinated by science and can't understand why her classmates think it's boring. Pupils start their journey by learning about their Belly Bugs and Rumbledom, the magical world where they live. There are 8 Belly Bugs, 4 female and 4 male (Figure 4), all with completely different personalities and jobs, mimicking the roles of our gut microbes. As they progress through the pilot, children learn all about their gut microbes and gut microbiome, through current, understandable scientific evidence. By the end of the pilot, pupils will (and hopefully teachers and families) be aware that cultivating a diverse and thriving community of gut microbes is the single most important thing they can do for their health and well-being.

Figure 4. The Belly Bugs



Today, governments, doctors, nutritionists, scientists, and teachers all agree that, when it comes to getting the nutrition message across to children, nothing has really worked. The concept of Billie Pickle and her Belly Bugs is different in that it goes much further and is much more personal than anything tried before by putting kids in control. Children will develop the deepest of relationships with their Belly Bugs because they actually do feed and water them (much like a real pet), creating a lifelong love and understanding of food. And it's not just obesity. Scientists are now discovering that issues with stress, mood and general well-being are caused by what we put into and cultivate in our gut.

The Belly Bugs School Programme is a free and fun teaching resource with all the plans available to introduce children, from pre-school to year 6, to their Belly Bugs (gut microbes). There is an 8-week programme of weekly sessions, whereby all the planning clearly sets out the Aims, Activities, areas for Assessment, with access to all the printable/online resources required. All lessons highlight the Teacher Assessment Framework for each subject and are cross curricular including Science, Literacy, Maths, Art and PSHE (Health and Wellbeing.) Materials also include menu posters for main meals and other imagery that can be displayed around school as well as several other activities, such as a range of Belly Bugs songs for assembly.

By the end of the pilot, pupils should achieve four knowledge goals:

1. Children will know that looking after their Belly Bugs means a healthy body and mind.
2. They will know that eating a variety of different coloured fruit and vegetables will feed their Belly Bugs who help keep us healthy and happy.
3. They will know that each person's microbiome is individual and different and determined by what we eat and how much we exercise and sleep.
4. They will know the importance of swapping junk food for healthy food and to question food companies that fill their food with Sugar Monsters and Junk Punks.

1.5 Evaluation Aims and Objectives

The **evaluation** will establish:

- What has been the impact of the intervention on participating pupils and
- Provide future recommendations to inform decisions on whether to continue to roll out the Belly Bug resources to other schools in Sunderland.

The main **aims** of this evaluation are:

- Understanding the qualitative and quantitative impacts of the Belly Bugs Pilot

- Informing the SCC through thematic analysis, how the intervention is currently working as a resource to enable primary school children to understand the importance of making healthy food choices in school and
- Identifying key recommendations for future interventions to address maintaining a healthy weight and tackling health inequalities in Sunderland. This would include, however not limited to:
 - o Maximising opportunities to build up evidence for the need and effectiveness of promoting gut health in primary schools,
 - o Future work with educational settings to foster place-based relationships,
 - o Investing in more sustainable and effective approaches to maintaining a healthy weight and reducing health inequalities.

The main **objectives** of this evaluation are:

- Exploring teachers' views about the acceptability of delivering the Belly Bugs pilot and perspectives around how the resources helped normalise choosing healthier food options for children.
- Identifying whether having a Belly Bugs resource has influenced the wider food context in school (e.g., the opportunity to change school meal menus, access to healthy food at breaks and lunch time).
- To understand the impact the Belly Bugs pilot has had for pupils:
 - o Identifying how they can improve their gut health by choosing healthier foods.
 - o Enabled to choose healthier food options in school.
 - o Identifying factors that hinder choosing healthy food options in school and in what way the Belly Bugs resource could be adapted to meet those challenges.
- To understand how the Belly Bugs pilot has added value, locally, to support maintaining a healthy weight in Sunderland.
- Provide recommendations for future interventions.

2. Evaluation Methodology

2.1 The Belly Bugs Pilot

SCC offered the opportunity to primary schools in Sunderland to participate in the Belly Bugs Pilot. Out of all the schools that expressed interest, seven moved forward with implementing the programme and participating in the pilot and subsequent evaluation process (Table 1.) Only one school (Fatfield) opted for implementing the pilot across the entire schools, with the rest opting for either one or two years.

Table 1: Belly Bugs Pilot Participating Schools

School	Ward	Participating Years/Classes
Barnes Juniors	Barnes	Year 3 (3 Classes)
Broadway Juniors	Barnes	Year 4 (4 Classes)
Farringdon Academy	St Chad's	Year 3 & Year 4 (4 Classes)
Fatfield Academy	Washington East	Whole School (7 Classes)
Hetton Lyons	Hetton	Year 1 & Year 3 (4 Classes)
Hetton Primary	Hetton	Year 3 (1 Class)
Hudson Road Primary	Hendon	Year 2 (2 Classes)

After participating schools were confirmed, a series of introductory meetings were run by the Belly Bugs team. Those meetings introduced schools to the Belly Bugs programme, it's content and structure, as well as all the materials and teacher's plans available to them. The introductory pack schools received also included a pilot checklist with specific programme milestones. As mentioned, the duration of the pilot was 8 weeks, starting the week commencing Monday 09 October 2023 and concluding the week commencing Monday 04 December 2023 (schools were closed during the week commencing Monday 23 October for the Autumn Half Term Holidays).

2.2 Evaluation Design and Methods

Based on the aim and objectives set at the beginning of the document, the design of the evaluation was formed around addressing three main elements:

- The effectiveness of the Belly Bugs pilot in enhancing the knowledge of healthy eating.
- Whether this newly found knowledge prompted any behavioural changes.
- The school environment role in either fostering or hindering those behavioural changes.

Overall, we adopted a mixed methods approach consisting of a combination of primary research, including pupil and teacher questionnaires and discussion groups, as well as secondary sources, such as obtaining food records from the SCC school meals service. Adopting such a mixed method approach provided not only more comprehensive and rounded insights into our areas of interest but also balanced out the limitations of different methods and enhanced confidence in the findings.

It was important at the initial stage to establish a baseline of pre-pilot knowledge and behaviour around healthy eating, which in the absence of control groups, enabled a before-after control impact assessment. In order to achieve that, we first looked at the available data for Sunderland, including the latest Health Related Behaviour Survey as well as NCMP data discussed earlier in this report. We then modified the existing Belly Bugs pupil's questionnaire, which children had to complete at the beginning (and the end) of the pilot. At the same time, and after liaising with the SCC school meal service, we obtained food production sheets from each of the participating schools, starting at the first week of the pilot, with the goal of being able to monitor any changes in food choices.

Having established these initial baselines, mostly utilising quantitative methods, we examined the implementation and delivery of the programme as well as its outcomes. Semi-structured interviews and discussion groups with school staff were utilised to measure agreement with the usefulness/value of aspects of the

intervention and the barriers/frictions encountered. These also reviewed whether the pilot was delivered as intended and how consistently it was delivered across the different schools. At the same time, semi structured discussion groups were also conducted with participating pupils, in order to explore their experience with the Belly Bugs pilot, their level of engagement and whether the programme has increased their knowledge around healthy eating and prompted to change, or at least expand, their eating patterns and behaviours.

In order to guide the structuring of the questions, and our overall key lines of enquiry, for these interview guides, we utilised existing literature around healthy nutrition interventions for children as well as attitudes, perceptions and knowledge of educators, school staff, catering staff, and parents^{17,18,19}. We also employed the well-established COM-B model of behaviour change (which suggest that three components play a pivotal role in producing, and therefore changing, behaviour, namely capability, opportunity, and motivation²⁰) to further enhance our line of questioning and ensure we extract potential responses that highlight any challenges tied to capability, opportunity, or motivation when it comes to making or facilitating healthy food choices. The full interview guides for both school staff as well as pupils can be found in the appendix.

Teachers who were directly involved in delivering the Belly Bugs programme also had to complete a very brief questionnaire at the end of the pilot. That allowed for all teaching staff to provide feedback in a standardised format and allowed for those not able to participate in the discussion groups to also state their opinions. A final element in designing the evaluation of the Belly Bugs pilot was obtaining the views and perceptions of participating parents. Although the initial design suggested extending the discussions groups to include them, due to potential difficulties in recruiting sufficient numbers, we opted for a short online survey, guided by the same principles and literature as the rest of our assessment methods.

2.3 Evaluation Participants

An important element for the comprehensive assessment of the Belly Bugs pilot was identifying, confirming, and engaging with all potential participant groups provided by SCC, particularly given the wide reach of the pilot. There is a wide variety of stakeholder mapping approaches, but given that Belly Bugs is a programme aimed primarily at young children, healthy food choices is a multivariate topic, and the objectives of this project expand on interconnected levels and actors, the best way to map and visualise all these different levels and interactions is through Bronfenbrenner's Ecological Systems Theory which, in general, views a child's development as a complex system of relationships affected by multiple levels of the surrounding environment, from immediate family and school settings to broad cultural values, laws, and customs²¹.

Figure 5. Bronfenbrenner's Ecological Systems Theory



Figure from Guy-Evans(2024)²²

The figure above is an overview of this theory, which has been implemented in a variety of different areas, including, nutrition and healthy eating, and provides a good visualisation of both the stakeholders involved in this process of developing

healthier food choices for children as well as the influence each of those stakeholders has in this process, which lessens as we move away from the centre of the circle. In the case of this evaluation, and as discussed in the previous section, we focus on the child and its immediate microsystem which covers its peers, school staff involving teachers and teaching assistants, headteachers and cooks as well as parents.

All participating schools were contacted via email at the early stages of the pilot in order to set up the best way possible to organise the qualitative data collection element of the evaluation (discussions groups), while the pupil and teacher questionnaires were emailed to each school at the beginning of the pilot. For the parent's survey, two flyers with a QR code to the online survey were created and sent to schools to forward. Parents were offered a free Belly Bugs recipe booklet as a "thank you" for their participation. In order to help schools facilitate the evaluation process and given that the end of the pilot coincided with Christmas, all schools were offered the opportunity to conduct their evaluation either online or face-to-face.

In total, 589 responses were recorded in the pupil pre-pilot questionnaire, with 559 recorded for the post-pilot questionnaire. In addition, 15 teachers returned their questionnaires at the end of the pilot. A total of 37 pupils participated in discussion groups from all Years and classes, while 17 school staff took part in separate discussion groups including 3 headteachers, 10 teachers, 3 teaching assistants and 1 school cook. Unfortunately, and despite our and schools' best efforts, only 2 parents returned their online survey. Informed consent was also obtained from all participants before any data collection commenced. In the case of pupils, as no personal or identifiable information was recorded at any time of the evaluation, a letter was sent to parents at the beginning of the pilot informing them about all the relevant processes and giving the option to opt out. For teaching staff, as discussion groups were recorded, informed consent was obtained from all participants prior to the discussion.



Table 2. Number of participants for each element of the Belly Bugs evaluation

School	Pre- Questionnaire	Post- Questionnaire	Teacher Questionnaire	Pupil Discussion Groups	Staff Discussion Groups
Barnes Juniors	74	74	1	-	1 Teacher (Y2)
Broadway Juniors	66	69	1	6	2 Teacher (Y4) Teacher (Y4)
Farringdon Academy	104	104	1	6	5 Headteacher Teacher (Y3) Teacher (Y4) Teaching Assis. (Y4) Teaching Assis (Y3)
Fatfield Academy	180	152	7	12	2 Reading Lead /PSHE (Y4) Teaching Assis (Y3)
Hetton Lyons	110	100	3	7	2 Teacher (Y3) Teacher (Y1)
Hetton Primary	16	18	-	3	2 Headteacher Teacher (Y3)
Hudson Road Primary	39	42	2	3	3 Headteacher Teacher (Y2) Cook

2.4 Data analysis

All questionnaire and quantitative elements of the evaluation were analysed using descriptive statistics while discussion groups were analysed using a six-step thematic analysis including:

- **Familiarisation:** Data from the activities described above were collated and transcripts from the discussion groups were formalised into a consistent format.
- **Coding:** Once familiar with the data, a coding strategy was developed. Although insights were derived from our key lines of enquiry, we also adopted an inductive approach in which we allowed the data to guide coding (and ultimately theme) creation.
- **Generating Themes:** Similar and related codes were grouped into broader themes. Data was then filtered, focusing only on the most prevalent and important outputs, and discarding codes that are less relevant or have a lesser impact on wider issues.
- **Reviewing Themes:** Agreed themes were re-tested against clean versions of each transcript to ensure accuracy and relevance.
- **Defining and Naming Themes:** Prior to writing up the findings, we finalised consistent names and definitions for the themes emerging from the data.
- **Writing Up:** The next section of this report (findings) will discuss the themes generated from this process.

3. Findings

3.1 Pupil Discussion Groups

From the 6 discussion groups with children, 3 were conducted online and 3 face-to-face. Overall, children were enthusiastic and eager to talk about the Belly Bugs and what they had been learning, although that varied between pupils. The thematic analysis revealed four themes:

1. Acquired knowledge from the Belly Bugs Programme.
2. Belly Bugs character preferences.
3. Food behaviour and eating habits.
4. Belly Bugs outside the classroom.

Each of these themes is described and exemplified below with quotes from the transcripts (in blue). Some of the quotes reflect the views of multiple pupils who took part in the discussion groups.

Acquired knowledge from the Belly Bugs Programme

Pupils of all years seem to have a good understanding of the Belly Bugs programme, the main story line, and the different characters involved, with almost all contributing their own perspective during the discussions. The element of eating more fruit and vegetables to help the Belly Bugs and keep them healthy was a prominent view amongst pupils. Some distinctive quotes that encapsulate this element include:

"We learned that we need to eat a lot of fruit and vegetables to keep our Belly Bugs healthy".

"Our Belly Bugs have specific jobs to do, and we need to eat vegetables to keep them healthy".

"We need to eat more fruit like bananas and apples, and we need to eat more vegetables".

"Our Belly Bugs need more fibre and vitamins to be happy and keep us healthy".

Another popular element during the discussion groups, and something closely connected to the previous element of eating more fruits and vegetables, was the concept of producing Goo Batteries for powering the Rainbowtron and providing energy for their Belly Bugs:

"We learned that we need to eat healthy foods, like porridge and fruit, to make more batteries and power the Rainbowtron".

"The Belly Bugs keep us healthy, and we need to give them a lot of colourful foods to keep the Rainbowtron working".

"We need to eat more rainbow food so the Belly Bugs can create more Goo Batteries for the Rainbowtron".

"We learned what they (Belly Bugs) do and how they help the Rainbowtron with the batteries to keep the lights on".

The concept of the Perfect Poo as well as the Fertilator also seems to grab pupils' attention with comments like:

"The Belly Bugs help our belly get the perfect poo".

"It's important to take care of our Belly Bugs because they take care of us, and they need to power the Rainbowtron and stay healthy to have the perfect poo".

"I eat more protein now to help me get the perfect poo".

"Belly Bugs help our belly get the perfect poo".

Sugar Monsters and Junk Punks were also concepts that resonated with children and all of them seem to understand the impact that they have on their bodies and what they need to do to minimise it:

"We can't eat too much sugar and sweets because the Sugar Monsters will get strong, and the Belly Bugs will not have a place to live".

"Take aways are not good for us and now that I know about the Belly Bugs and the Junk Punks, I want to have less of them".

"The ads of sweets and burgers are bad for kids and make us want to eat them even more".

"They (Sugar Monsters and Junk Punks) remind me of the zombies in Minecraft".

A few other elements of the Belly Bugs Programme that seem to resonate with some of the participating pupils highlight the importance of drinking water, sleep, exercise and hand washing.

"We need to drink more water to keep our Belly Bugs healthy".

"We need to eat healthy and go to bed early and have more sleep".

"We need to sleep more, and we need to exercise every day".

"We need to eat healthy and wash our hands".

Belly Bugs character preferences

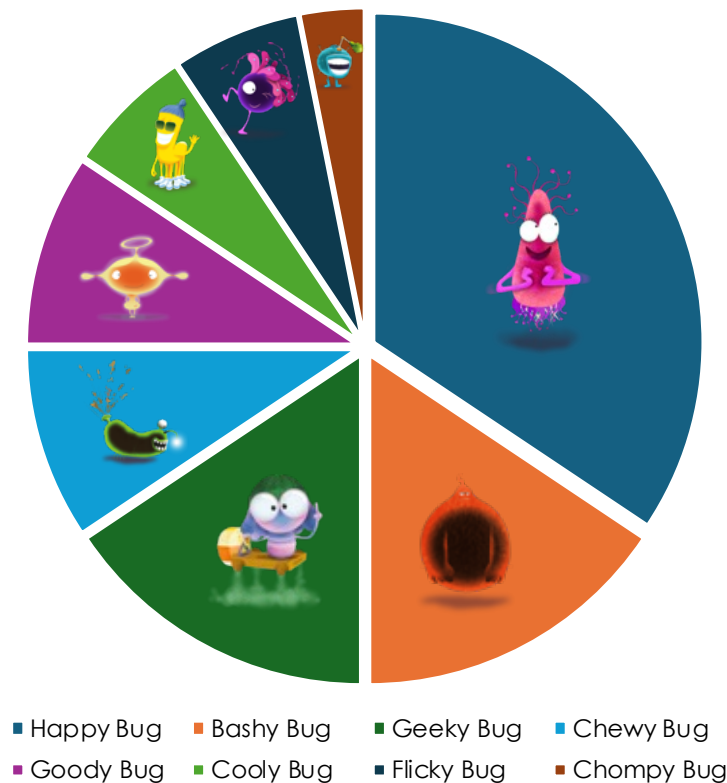
There was a lot of excitement when pupils were asked who their favourite Belly Bug character was, with everyone being eager to state their preference and the reasons

why they liked them. Overall, their reasoning for liking a specific Belly Bug can be grouped into 5 elements.

Perfect Poo/Fertilator:	<i>"I like Bashy Bug because it makes all the poo".</i> <i>"I like Chewy Bug because it talks about farting"</i>
Look like me or people that I know:	<i>"I like Happy Bug because she tries to make other people happy, like me".</i> <i>"I like Geeky Bug because it enjoys science and making stuff, like my dad who is a scientist".</i>
Belly Bugs traits:	<i>"I like Bashy Bug because it's very good and has long range in battles".</i> <i>"I like Goody Bug because it keeps everything organised and takes care of the deli".</i>
How Belly Bugs make them feel:	<i>"I like Happy Bug because it makes people that are sad, have a good time".</i> <i>"I like Happy Bug because it makes me happy and makes me laugh".</i>
Belly Bugs appearance:	<i>"I like Chompy Bug because it looks very funny".</i> <i>"I like Cooly Bug because it looks cool when playing music".</i>

Figure 6 also contains pupils favourite Belly Bugs. One third of pupils said that Happy Bug was their favourite with Bashy and Geeky both coming second. Chewy and Goody Bug both came third, followed by Cooly, Flicky and, finally, Chompy.

Figure 6: Pupils' Favourite Belly Bug Characters



Food behaviour and eating habits

The Belly Bugs programme seems to have a positive effect on pupils' self-reported eating behaviour and habits. There were of course, some examples of pupils already eating a healthy diet, particularly from those who were involved in sports:

"I love broccoli and try to eat it almost every day".

"I play football and I like to eat a lot of fruits and vegetables".

"I play football and my coach says it's important to eat healthy and a lot of fruits".

For most pupils, the programme had a positive effect and encouraged them to have more fruit and vegetables:

"I now eat more fruit and vegetables".

"I eat more, at least 8 fruit a week".

"I now eat at least 1 fruit a day".

"I eat more carrots and apples now".

What was interesting, is that the programme also encouraged a lot of pupils to try more fruit and vegetables, in some cases for the very first time. For some, the available recipes on the Belly Bugs website played a positive role and got their parents engaged in the process:

"I tried grapes for the first time and I liked them a lot and also gave one to my dog".

(This comment sparked a discussion in the group on how dogs also have Belly Bugs and how they need our help to take care of them).

"I have tried loads of new recipes from the website with my mom and we like them a lot".

"Yesterday, I tried broccoli for the first time with my chicken curry".

"I tried tomatoes for the very first time the other day, but I didn't like them a lot".

Most pupils were also happy with the food provision at their school, although in several cases they wished for a wider variety of foods. Some pupils on packed lunch also mentioned that they now try to bring more fruit with them:

"Yes, I like the food a lot and it's much better than the previous school I was at".

"We have a lot of fruit and vegetables, and we also have salad".

"The cook has put a lot of work to make the dinner hall look nice and I like how we have so much variety in our salads and in our vegetables".

"I would like to have a wider variety of fruit; we only have apples, oranges and bananas".

Belly Bugs outside the classroom

The final theme of the pupil discussion groups involves the effect the Belly Bugs pilot had on pupils outside the classroom and the school environment. Participating pupils unanimously agreed that they enjoyed learning about the Belly Bugs and that they want to keep learning about them, while also mentioning the effect the programme had on the way they view food:

"I think of them a lot; when I have a snack, I think of the Belly Bugs and if it's healthy for them and when I want sweets or chocolate, I think how much to eat".

"I want to start learning about the Belly Bugs again, because they don't tell us what to do and what we should and should not eat, but they are positive and want us to try different foods that we enjoy".

"We want to learn more about the Belly Bugs outside of school and we would like to be able to read more about them".

"I like the Bellycopter and I would like to buy a toy".

"I like that the Belly Bugs are so positive, and they are not judgemental about us and what we eat".

3.2 School Staff Discussion Groups

From the 7 discussion groups conducted with school staff, 4 were conducted online while 3 were conducted face to face. As mentioned earlier, the discussion groups involved different school staff including headteachers, teachers, teaching assistants and cooking staff. In cases where some of the school staff could not be present during the discussion groups, some of their comments and views about the Belly Bugs programme, in general, and the 8-week pilot, in particular, were conveyed by

participating staff. In some cases, staff also conveyed the views and comments made by some parents:

Overall, school staff had a positive view around the Belly Bugs programme, particularly liking the visual elements of the materials as well as the story line, something that, according to their view, acted as a “hook” for children. Most of the staff also suggested some tangible changes in children’s attitudes, particularly towards their willingness to try new foods. Staff also discussed some of the challenges they faced during the pilot, especially in terms of timing and incorporating the programme within the existing curriculum, as well as in terms of some of the programme’s materials. The thematic analysis revealed 8 themes:

1. Belly Bugs programme and materials
2. The 8-week implementation pilot
3. Rest of school engagement
4. Acquired knowledge and changes in behaviour
5. Outside factors
6. Experience with similar intervention programmes
7. The role of the local council
8. Suggestions for improving the Belly Bugs Programme

Each of these themes is described and exemplified below with quotes from the transcripts (in blue).

Belly Bugs Programme and Materials

Overall, school staff seemed to enjoy the Belly Bugs programme, its storyline as well as the materials provided, something that they also reported was evident in children’s experience with the programme:

“I do have to say that the children were really engaged in it. They really were. And I know the previous teacher said about, you know, the silliness of it. But that hooked them in, and I would need a bit of a hook to get them engaged in their learning. I

think that it did grab them, and they could at least go from there, which they did. But they really liked the silly names and the characters and all of that. Which is the point, isn't it? To get them hooked in as a vehicle for their learning, which did work."

(Farringdon Academy, Year 3 Teacher)

"I think from a teaching perspective, it was probably the initial story, when the characters were explained, what they did and what their functions were and how they helped the body. I think that was the point where it hit home for them and they could kind of put two and two together and think: oh so if I eat that, this is what will happen, I'll be healthier in this way"

(Barnes Juniors, Year 3 Teacher)

"So, from a class teacher's perspective, it's been quite a positive pilot. It's been really positive seeing lots of enjoyment out of the children. Lots of engagement with it and it's been kind of quite easy to use as a teacher and understand what to do. I would say I can really see an impact from it and I could see an impact quite quickly. A very positive experience."

(Hudson Road, Year 2 Teacher)

"Well, first, I think the actual idea is very good. I think it's quite a genius idea. The kids fully engaged with it. I think it's excellent and there was plenty of resources available on the website and the characters, the colour, all of that is fabulous".

(Broadway Juniors, Year 4 Teacher)

At the same time, however, school staff also reported on some more challenging elements of the materials, particularly around age suitability, vocabulary, and more complex "scientific topics", as well as the overall amount of information in them, which for some, was overwhelming:

"The children have enjoyed that aspect of it (Belly Bugs book). I did find some of the terminology to be a little bit much for Year 3 and we had a conversation last night

between myself and another teacher and Year 4 were struggling with some of the vocabulary in it; the scientific vocabulary. But they enjoyed the characters and trying to understand the new aspects of what would probably be an awkward subject to talk about. But in a quite a fun way, yeah. “

(Farringdon Academy, Year 3 Teacher)

“I do also feel that it was probably better suited to younger children, and I don't know if it was just my class. They enjoyed it, but I think it was more geared towards KS1, but I did think it was very well put together and the stories, the songs; it was clever the way that they put it all across. But, some of the stories just seemed a little bit young for them and a few laughed at them; kind of said: oh, is this for us?. I think even they thought it was a bit more geared towards younger children.

(Barnes Juniors, Year 3 Teacher)

“I've had to adapt it quite a lot. We've got quite a low attainment cohort in year three. So, a lot of it had to be adapted. I found that some of the videos, while they were really informative, we had to watch them about three or four times because there were so much there. For Year 3 they needed a lot of support to do them because the scientific language was brand new for them. So yes, some of it was really difficult. Some of it was kind of an activity that wouldn't be used in school but would be really good to reinforce it if from a homework perspective.

(Hudson Road, Year 3 Teacher)

I think it's very mixed across school. So, within early years and KS1 the children engaged with the characters, and they liked the colourfulness of the characters. But the content is way beyond their level. Whereas in KS2 they've found the content being sort of pitched just right. Also, looking at feedback from members of staff, I think that was where it was. I think KS1, if we have more time, we could adapt it more so that we could spend more time on it. But I do think from the feedback that I've been given, KS2 was the pitch, really.

(Fatfield Academy, Year 4 Teacher)

The 8-week implementation pilot

As with the Belly Bugs materials, although most school staff enjoyed the teaching about the Belly Bugs, the actual 8-week implementation pilot did pose challenges for them, not only in terms of timing/planning but also due to the fact that the last week of the pilot coincided with Christmas and other activities.

"It's been really good, and I must admit I was dubious because I thought it was a bit too much. I don't know if they're going to like this. I don't know if it's going to engage them, but I was wrong. It did. It really has engaged and interested them, and it's done what you wanted it to. It's introduced them into something, given them the confidence to try it. Yeah. So, it's worked really well."

(Hudson Road, Headteacher)

"Time comes into it. Fitting it in and see if it was taught in science, how much actual time would you give to that part of it. There's so much to cover. I was planning most of it and you kept thinking; you didn't want to dip into some of the stuff on the website because you assumed it would come later on in the plans. But then, as I reached the end, it didn't. So, then I thought we've got all of this stuff still to use. So that's when we've started just adapting it to suit our own needs. Because there's quite a lot on the website that isn't mentioned in any of the plans or in any of the planning at all."

(Broadway Juniors, Year 4 Teacher)

"The biggest challenge I think was time. Because obviously we had to run it alongside our existing curriculum. And so, from that point of view, that was probably the main challenge. I know that some teachers, the majority of teachers, have finished it. But some teachers haven't, because they had other things that they needed to get done this term."

(Fatfield Academy, Year 4 Teacher)

"I kind of appreciate that it's a pilot and it was all kind of condensed, and it was a short period of time. But looking at the sessions it would be a much more effective programme if there was something like 8 sessions. If there was one every half term, because some of the later sessions we didn't get to do them. I looked at them. It was things like making a pumpkin kind of dip, kind of toasted bread, which is lovely. And had we understood the whole programme, probably, we would have saved our pumpkins from Halloween, we would have scraped the seeds, and the children would have experienced that whole planting, germination etc. It could have been so much bigger and then we could have come back to it".

(Hetton Primary, Year 3 Teacher)

"I think the biggest challenge from my point of view is just timetabling, because obviously you try to fit it within your week where you're teaching maths and English and history and everything else. And I think that was the biggest challenge. I think the time frame potentially, if it had been a bit longer, it would have been potentially a little bit easier. And in terms of balancing everything, I'd say that was the biggest challenge from my point of view."

(Hudson Road, Year 2 Teacher)

Another important element in terms of the implementation of the Belly Bugs programme was that some schools choose to do it as part of the curriculum while others did it as a standalone activity, a decision linked to the fact that relevant curriculum subjects (e.g., science, digestion etc) were not taught yet. There was also variation in other aspects of the pilot, such as which activities schools chose to do, how (if at all) they display relevant posters or whether they provided any homework:

"The first issue we had, was that the menus didn't match up. That was a bit chaotic because I had posters and I was showing the children, but that wasn't matching what they were eating. So, there was a little bit of confusion there, but then we did get the correct posters and we kind of talked to the children about them. But I felt it was a lot. It was a lot in terms of looking at every week, getting all the different

menus and sorting them, and I feel like that was just a little bit, like I said, a bit chaotic. There's so much going on in school, but we did find time to do the story and we did look at the website and everything and we're really went through it with the children and explained what it was all about."

(Barnes Juniors, Year 3 Teacher)

"So, I feel like it's been an add-on, it hasn't fitted in with our curriculum. It's been done in addition to the curriculum, which at times becomes a bit of a chore because, for example, ideally it will be a science topic, but our topic at the minute is electricity, so it doesn't fit at all, and our science topic after Christmas is digestion. It would fit better if we've done it after Christmas, but then again, we teach the all the body parts with the real names, even down like the rectum and the anus. And obviously Belly Bugs doesn't do that at all. It's completely different".

(Broadway Juniors, Year 4 Teacher)

"So, we've done it, because obviously of the time frames of the pilot, we've done it as standalone lessons. So, what we've done is that I've had spoken to the science lead and a lot of the technical vocabulary from year four, they don't start looking at that sort of vocabulary until the spring term and the science curriculum. So we did say if we were going to do it again, we would maybe either move our science curriculum around a little bit and fit it in more with the digestion system unit, so that it linked better to the children's prior understanding rather than having to do everything as a standalone and as sort of as a brand new learning point.

(Fatfield Academy, Year 4 Teacher)

I would say for busy teachers there was an awful lot that we had to get our heads around. Yes, there was a PowerPoint, but it didn't really form a lesson in the way that we would deliver a lesson. You have a starting point, but there was still brand new, and I didn't really know what was going to be coming up. There was a lot of work to do. I think for teachers it wasn't as easy as: here is a programme, run it. There was kind of almost too much choice. There was a lot of PDF activities, and I

was scrolling through them all and thinking some of them, in terms of teaching and learning, didn't hit what I would have wanted them to".

(Hetton Primary, Year 3 Teacher)

Rest of School engagement

Since for most participating schools, only specific Years/classes participated in the Belly Bugs pilot, one of the elements that came up during the discussion groups was the involvement of the rest of the school (teaching staff, cooking staff, non-participating pupils) during the duration of the pilot:

"The people in the kitchen were aware of it, and I think they'd had some kind of contact with their line manager. So, I spoke to the head cook and I made sure they knew what the menus were and what was on there. In terms of other pupils, I don't know. I think the only reason is, we are a very big school and we're spread out over different buildings. So, year 3 are kind of pretty much alone in our bit of the school and we all have dinners at separate times. The children won't have breaks with other children; they have Year 3 breaks, Year 3 dinners and everything's very much standalone."

(Barnes Juniors, Year 3 Teacher)

"Yes. We did a whole school assembly, first of all, to launch it and then, we showed the posters. And the posters were out and about, and they changed depending on what we were serving that day. And as I was saying before, I've had some feedback from the cook. I think over the last four weeks the variety of salads that have been put on offer and, you know, it seems a bit more. I don't know if it is because they know that we're taking part in Belly Bugs, but it seems to have come about as a very similar time. But it's been very well received as well."

(Fatfield Academy, Year 4 Teacher)

"The kitchen staff have had a meeting with the Zoe, and I think our head teacher has had some conversations as well. But outside of the year groups in terms of

teaching the children, other staff haven't engaged. They know what's going on because everybody's been like: oh, what you're doing? But nobody's going into depth with it. We didn't put up displays but have big floor books where we could evidence what we've done and what graphs and things like that".

(Hetton Lyons, Year 3 Teacher)

"The kitchen, our school cook, was told about the project and there were certain things that she had to do. She had to provide more options; there's always a salad option on our salad trolley, but she was asked to offer more linked to the whole rainbow plate food and the children wanting to take and try the different colours. And I think when the project initially started and if I was in the hall at lunch, I was like: oh, what colours have you got? What's missing? Or do you want to go and try and find that colour? Oh look, I've got a green. They were quite excited by that."

(Hetton Primary, Headteacher)

Yeah. I think especially within the dinner hall itself, there's lots of children asking questions about what was going on because obviously we had the posters up. And we changed how we did the posters, as well. So, they are on a big display board right next to the servery now. And I think that had a lot of impact because you see it as you're going in to get dinner. And it has provoked questions, hasn't it? Like what is it? Why are they doing that? Can I do it?

(Hudson Road, Headteacher)

We've had some siblings asking about it! So, the children are within my class, but their siblings are coming to the door and asking. And what I did is a classroom display. It is right next to my door. So, at the door the parents, they've been asking about it and saying: oh, they've mentioned this at home! Asking what it is and kind of getting involved that way. So that's been really effective.

(Hudson Road, Year 2 Teacher)

"Not too much, but we've got the posters in the dining hall. So, when the children are coming in and getting the dinners, I'm asking them to go and tell us which

poster there is for the dinner that they have had on that day. It's like a game. So, when they come in for the dinners there, they go to the posters and try and find which one is the one that they have for the dinner that day."

(Hudson Road, Cook)

Acquired knowledge and changes in behaviour

Overall school staff reported positive changes in pupils both in terms of acquiring new knowledge around healthy eating as well as changes in their eating behaviour, at least around trying new, healthier options. It's also important to highlight these positive changes seemed to be Year/age dependent:

"Yeah, definitely. I think they were aware of the healthy foods, but then we're just starting the Belly Bugs and we started it alongside the science unit of food and keeping yourself healthy, and getting nutrients, vitamins and minerals and things like that. I think the Belly Bugs help them really understand that food gives you these minerals, the new healthy foods, and in which foods the vitamins and minerals were. But it kind of put it together."

(Barnes Juniors, Year 3 Teacher)

"We've got photographs of children eating at home, pictures they drew, some children had drawn the rainbow and then they draw what they've eaten for each colour of the rainbow. You could tell from some of the emails that the parents have got involved as well. But the kids have certainly talked about it. One of the things that came up was a fig in my class; one child mentioned that they had a fig and the other children didn't know what a fig was, so I tried to show them what a fig was online and showed them some stuff around it, and then later a child said to his mom can we buy some figs. It is making a difference".

(Broadway Juniors, Year 4 Teacher)

"It tended to be more so directly after the lesson, rather than on a lunchtime or otherwise. One incident, was a reception child said something about: oh I'm going

to feed my Belly Bugs with those fruit and veg. But it tended to be more just after the lesson. I don't think in KS1; I think a lot of it did go over their heads and the concept, that core concept, I don't think has been thoroughly engaged within and sort of embedded in their brains. I think the humour, the colourfulness, the characters, the visualization, that's all there. But that thorough understanding, I don't think was truly gained from KS1 children. I teach Year 4 and the science lead teaches Year 3 and we've, as I've already said, a lot of it went over my kid's head. However, if I had done it after I'd done the digestion system, I think they would have learned a lot more because the Year 5 who I taught last year they had all of that knowledge about the digestive system and they enjoyed the unit more and got more out of it than my Year 4 at this point."

(Fatfield Academy, Year 4 Teacher)

"I've had comments from parents, so I had a man say: what have you done with my child; he asked for an apple when he got home. We've been in technology, we are making healthy pizzas, but we linked it to Belly Bugs, and they've gone home and then they've made healthy pizzas at home as well. And so, yeah, I've had comments from parents that the children have been talking about it at home. I know that when it was the lesson where the children were trying the healthy foods and at the beginning of the lesson, some of them were quite sceptical. But then by the end they'd found things that they didn't think they liked that they did now. I don't know if that'll then transfer and carry over, but certainly within that lesson, there was progress in what the children were trying that they wouldn't necessarily have had before".

(Hetton Lyons, Year 1 Teacher)

"I think that one of the big things I've noticed, is the display that they were talking about with all the different characters outside the dining hall. Because we've got such a large school and one small dining hall, and they line up outside, they can see it as they're lining up. So, then discussions of being with other year groups about what the characters are and what it is. I know some of the kids, particularly year 3

and 4, as they've been queuing to make their choices have been talking about the different characters and what they relate to in terms of what they're going to pick when they get there. Not all of them, but some of the children have consciously done that as they've gone through."

(Farringdon Academy, Headteacher)

"I've had a few parents at the door saying: Oh, the reading and they have tried this last night and they've never tried this before; or: they came home, and they asked me to eat some radishes and things like that. So, we have seen its impact definitely outside of the classroom. But yes, it has impacted on what they order because the children are eating much wider range of foods; it's noticeable and they are eating more as well".

(Hudson Road, Headteacher)

"The other thing we're doing is the salad bar, they're taking the salad and that started from the very first session. As soon as the children went in Debs from lunch, which you will speak to you a bit later, came to me and said: they all came and ordered salad straight away. Have you started the bugs? And I said yes, I have. But they've actually sustained that. So, it's not just that one off excitement, they are sustaining it and carrying it on, yeah. So that's been really good".

(Hudson Road, Year 2 Teacher)

"When they are coming in, they are picking the salads, now they're asking for the vegetables, whereas before they wouldn't, and they seem more happy and they are in everything. Not so much a difference in dinners because the parents do it. The parents pick the dinners for them. It's only the side options. What's not on the Evolve System. So obviously the bread, the salad, the fruit, there is a difference in that because there's a bigger uptake and now whereas before I would put about say 70 portions or 80 portions of salad on and I would still have about 40 left. Now I've got about 5 or 10 portions left, so they are eating a lot more and they are enjoying it as well. I was quite surprised because we used to have a salad bar. I

would put like sweet corn coleslaw, cucumber, tomatoes, lettuce and 9 times out of 10 it was only the sweet corn and the cucumber that they would take. Now I do a mixed salad in a big pot, and they are loving it, they are taking it and eating it."

(Hudson Road, Cook)

Outside factors

Another theme that came up during the school staff discussion group, and one that can have an effect beyond Bronfenbrenner's school microsystem discussed earlier, is the effect of outside factors (e.g., cost of living, deprivation, inflation, parental attitudes) on healthy food availability both in terms of the school as well as the family environment:

"Well, you got to ask yourself why they are on a packed lunch? The reason is because they are given too much choice. I've had one parent in who said my child will only eat chicken nuggets or chips. Do they eat fruit? No, they don't like fruit. Do they eat veg? No, they don't like veg. I think they just provide a packed lunch with food that they eat, so as to know that they are eating."

(Broadway Juniors, Year 4 Teacher)

"And again, we've got a lot packed lunches and they have been talking about trying different things and it does come down to sometimes money. For example, in our school, before COVID, we were sitting on 38% free school meals. We're now sitting on 54%. So, there's a lot more people taking up the offer of free school meals and a lot of that, I would say, maybe a slightly fussy eaters would have packed lunch. But I know parents struggle in terms of what to put in because of, you know, it's cheaper to buy in quantity and it's not always the healthiest of choices for them. We also have high levels of deprivation in our area, as well. So, one of the things I would say as a school, we notice about our children is the low level of language and vocabulary they have as they enter school. You wouldn't find that in another school in a more affluent area with less free school meals. They don't have a problem with some of that language where we do. So, it's not necessarily out to

Belly Bugs not being pitched right, but because of where we are in our struggles ourselves, that can have an impact.

(Farringdon Academy, Headteacher)

"I think for me it would be kind of more targeting parents now, because when we were doing the evaluation, one of the questions was how often do you eat things like crisps, biscuits, cakes and things. And one little girl said: well, it's not my fault; me mum puts them in my packed lunch every day. So, I think now would be getting that message across to parents a bit more. So that's our next step as a school, working with our local football club and they're going to be coming in in the springtime to do healthy meal preparation with parents as a parent workshop".

(Hetton Lyons, Year 1 Teacher)

"I think in primary school, it's really difficult and it's really difficult for the context that we work in. Our children understand the right food choices, but it's not in their control. Our families are low-income families; fresh fruit and vegetables and fresh meat are really expensive. So, whereas the children understand about diet, and they do, we do it lots and lots. They don't choose what's going to be cooked for them that evening. And we know that our families are largely eating frozen food, which isn't the best nutritionally. And they would not necessarily be using frozen vegetables, it will be literally a beige dinner. So, I think we can kind of plug it till the cows come home. But are we going to really make an impact? No, because the audience is wrong unless there's a Belly Bugs parent program that runs alongside it".

(Hetton Primary, Year 3 Teacher)

Like with everything, costs went up. Food costs went up. Labour costs went up so our school meals should really have gone up. But I think if we charge the parents anymore, they would be expecting a lot more quantity for the children. I mean, we joked and said, oh, they'll be expecting a starter, a main and a dessert if we charge them anymore. But when our children move from year 2 to year 3, when free school meals are only if you're eligible. That's where we lose some of our children

because it's cheaper to provide a packed lunch, but it's not always the right sort of packed lunch. And they are not getting a hot meal. So that's tricky for us.

(Hetton Primary, Headteacher)

Experience with similar intervention programmes

Schools' experience with past healthy nutrition, or similar programmes, also varied with some having extensive experience in initiatives trying to promote healthy eating, while for others, Belly Bugs was their first exposure to such programmes:

"No, not that I'm aware of. I think there's been some PE things that they've done, things like Change4Life. That kind of thing that is being done in school, but as far as I know, nothing like this has been done before".

(Barnes Junior, Year 3 Teacher)

"We talk a lot about healthy bodies, and we've had Change4Life, and we have workshops every autumn term, they have actually just been in. So, our children sort of do know a lot about being healthy. And the senior leaders in school do a weekly assembly and, in some terms, we have a look at healthy lifestyles as part of that.

And again, in our PSHE curriculum we look at the healthy lifestyles as well."

(Fatfield Academy, Year 4 Teacher)

"With within PSHE lessons, no sorry DT, we followed a scheme which was nutritional eating, but it wasn't so much about the workings of the body. It wasn't scientific. It was just to inform children of nutritional foods and eating healthier. Whereas this kind of went in depth as to why we need to eat healthy."

(Farringdon Academe, Year 3 Teacher)

"We've done lots of that in the past and we continue to do that. But I do think it's something that schools would have to embrace wholeheartedly and beyond the program itself. I mean, if we've done, say, food taste in DT or we've done food

tasting in science, we've got to consider the financial impact. Then we're probably not going to be able to afford to do another whole class food tasting as part of Belly Bugs."

(Hetton Primary, Year 3 Teacher)

"We work with a company who works with children and their parents and families. They have done cooking sessions where the child and the parent comes along, they make something together, then they either take it home or they, given the ingredients to make it at home. So, lots of places in Sunderland are trying to offer that more because you know you might only have homes that have a microwave and they've never prepared fresh vegetables before. I don't think we're fighting a losing battle with the children. I think they take on everything through the passion that it's delivered in. It's just we would need the parent. We would need the parents on board as well, and kind of a big offer for them."

(Hetton Primary, Headteacher)

"We've tried a whole range of different things before, some just ourselves and some from outside. But some of the health promotion ones like, what's the Sunderland City one called... Change4Life. With that it's very small target group and you just don't get the follow up. They'll either do it with the class and then it doesn't continue to anything, or they'll do it with a small group of children, and it doesn't turn into anything. It just doesn't get the payback. Where with this. We've seen the sort of sustained improvement following on from it."

(Hudson Road, Headteacher)

The role of the local council

The role that the Sunderland City Council currently plays around school nutrition and could play in terms of fostering and further promoting healthy eating interventions was also a theme that came up during the discussion groups. Most participants were happy with the current level of service offered by the SCC school catering,

particularly considering rising costs, although they also highlighted areas of improvement, such as parent education:

"I think it's pretty good. They could maybe get some questionnaires out as to what kind of foods the children like because our cooks said that they have a few requests or there should note certain children don't like certain things. So maybe get a bit more of a voice from them. But I do feel, in general, it's pretty good. Like there's a good selection. You know, and on special days the kitchen staff promote different things. Halloween they might have a vegetable stew or something. They do different things like that, which makes it good and fun for the children".

(Barnes Juniors, Year 3 Teacher)

"I do think from what I've seen, they do try to do a bit in terms of encouraging children to try different menus that are on different themes, all that kind of thing. And I do know, and particularly during COVID, there was a lot available to families. It was menus and different things that they were encouraged to take part in and little recipes and things like that. So, obviously we have an award system within Sunderland local authority. So, you've got your healthy awards, you are encouraged to kind of apply for different awards like the anti-bullying and there is a healthy schools award as well. That's part of that".

(Farrington Academy, Headteacher)

"I think it would really, it would come down the cost, you know, like I've said, those families who have got two or three children in KS2, who would have to pay for school meals. So, you're looking at, I mean, I don't even know how much it is. That means you're about £40 a week. I think it would all come down to cost and subsidising school meals further or widening the criteria for those who are eligible to apply for free school meals."

(Fatfield Academy, Year 4 Teacher)

"I think maybe providing workshops for parents. Definitely. Because like I said, we are taking part after the holidays with our local football club. But places are really scarce and because of the location of our school, it's difficult to get funding for it because some of our postcodes fall within a different county and the workshop goes off the child's home postcode so we can't get funding for the children who fall within Durham County you only get funding from the football club if they fall within the Sunderland postcode."

(Hetton Lyons, Year 1 Teacher)

"I think I would like juniors to be able to get fruit. I think if we could keep that going because then you've got this absolute head of steam about Year 2 that is really enjoying a wide variety of things at snack time and then they go in Year 3 and all of a sudden that stops. And we've tried doing a snack thing of our own where you have like a tuck shop where you buy stuff, but it's just people haven't got the money to bring in to do it. And when we've looked at buying stuff, even from the wholesalers, it's just too expensive. So, if that could be sustained, if there was something behind it, that would be really, really helpful. The other thing is around working with parents and carers, perhaps because they've seen the display. They've asked about it and that's great, but there are still an awful lot of families where they can't cook. They didn't do cookery at school because it was taught different way. And they're not very sure about how to use some of these things at home. So, sort of recipe cards or a little booklet they could go home or a link to videos or something like that. Hey, go on YouTube, Tik Tok and there's a video there of somebody doing something. They can sit and watch at home and that will give people the confidence to try stuff that might be really useful if we want the carry it away from school."

(Hudson Primary, Headteacher)

Suggestions for improving the Belly Bugs Programme

The final theme emerging from the discussion groups is suggestions school staff made on improving the Belly Bugs programme. It's important to highlight that because of

the variation in implementing the pilot, different schools highlighted different elements. Additionally, in many cases the recommendation for improvement had to do with the pilot (e.g., timing) and not the programme itself:

"I think maybe it went on a little bit too long. I felt like the novelty was great at first, but it quickly kind of wear off; well, not quickly, would have been two or three weeks or whatever. It wasn't as exciting anymore and I feel like if it should have been a little bit shorter. But no, to be honest, overall, I think it was a good program, I really do".

(Barnes Juniors, Year 3 Teacher)

"I'll tell you what, the people of Belly Bugs should do. They need to partner up with somebody like Purple Mash. Lots of schools use the whole digital platform where children log in, they have their own area. A unit in Purple Mash or another software or internet-based product that they can do the work on. We all get iPads now. The governments give us loads of laptops. It's a central resource and that's the way forward. We can go in and see what they've done, and we could mark it. Belly Bugs won't work by itself because you're going to have to produce books. But if it's embedded in something that already exists in schools, and I'm plugging Purple Mash here, that's where they should go with this. Here, we want an area of your server, get us in.

(Broadway Juniors, Year 4 Teacher)

"Maybe it's just being more mindful of the length of the lessons. So again, it comes back to time, and I know that's an issue. In in all schools, the curriculum is so tight that sometimes lessons just need to be stripped back a little bit. And I know the staff have worked really hard to strip them back so that there's still work, and the message is still getting across and the knowledge is still being taught, but I think that's just something to be mindful of when planning for it in the future."

(Hetton Lyons, Year 1 Teacher)

"I think we'll then be able to look at the needs of each group and the needs of the children and the parents within each age group to then take what we need from Belly Bugs rather than just diving into the whole thing. And then panicking about the time. We would be able to collect what we need".

(Hetton Lyons, Year 4 Teacher)

"I think it's about refining some of the materials so that they are really much more accessible for different age groups. I think if this is a KS2 pilot, a Year 3 autumn child is very different to a Year 6 summer child. So it's just kind of getting the balance of literature right for them. So yes, we had to adapt it quite a lot for year 3."

(Hetton Primary, Year 3 Teacher)

I think it would have been helpful if there was all the PDFs, there was all of the movie clips and whatever you needed to watch, together. But to have something in front of you to have that like the initial story altogether so they could flick through it. Yeah, just to put it all together, almost in like a book. Yeah, a lovely quality book. Because that is what we try and push here. Love of books and other reading. Just to have it because it would make the most lovely picture. A book would hit lots of areas across the English curriculum. And we don't always want them staring at a screen. That's what they do on at home.

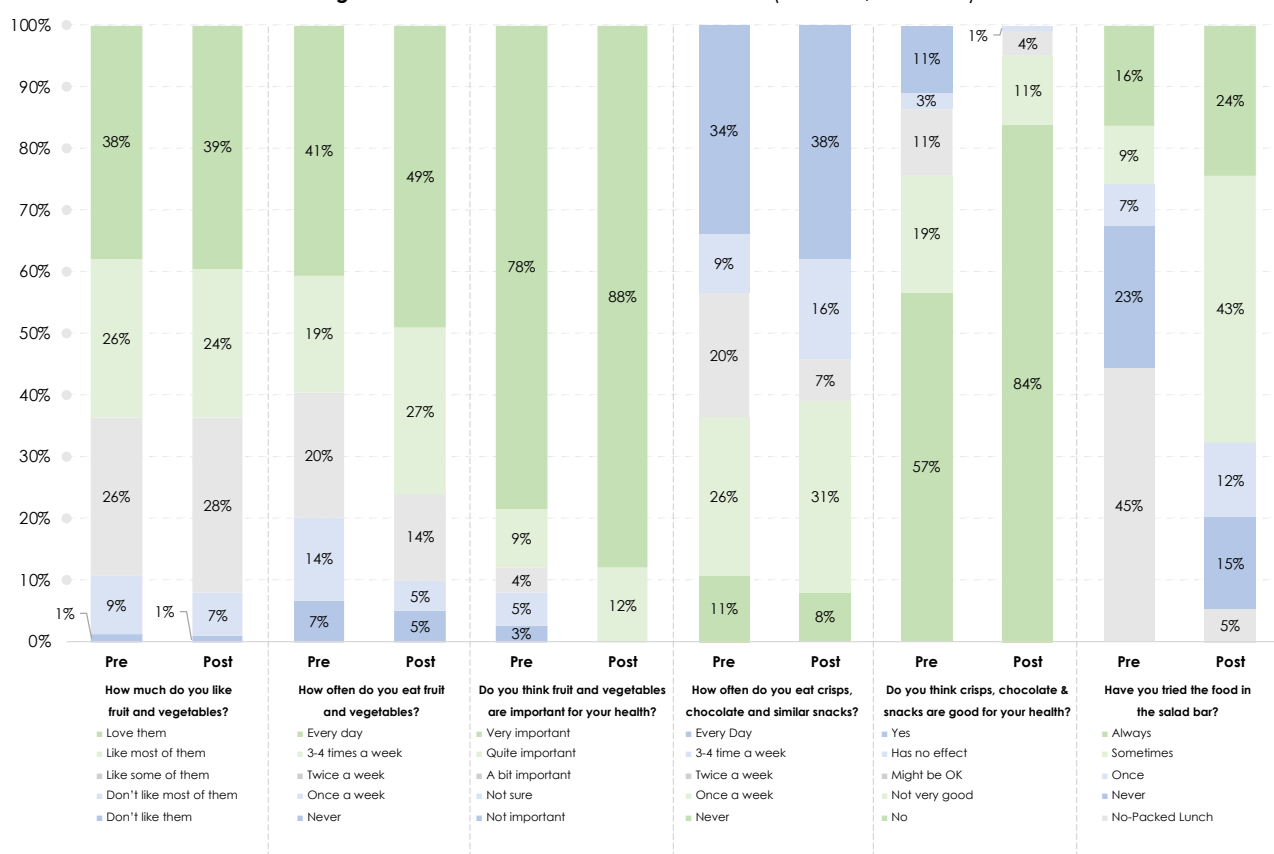
(Hetton Primary, Headteacher)

3.3 Pupils Questionnaires

As mentioned in the methodology section of this report, schools received the pupil questionnaires as part of their Belly Bugs introductory pack. The pre-pilot questionnaires were distributed to pupils at the beginning of the pilot while the post-pilot questionnaires were distributed at the end/last week of the pilot. Both contained the exact same questions except for the post-pilot questionnaire, which contain two additional questions on whether pupils enjoyed learning about the Belly Bugs and whether they will try to eat more fruit and vegetables to help their Belly Bugs. Pre and post results for each of the participating schools are presented below.

Barnes Junior

Figure 7: Barnes Juniors Pre-Post Questionnaire (Pre N=74/Post N=74)

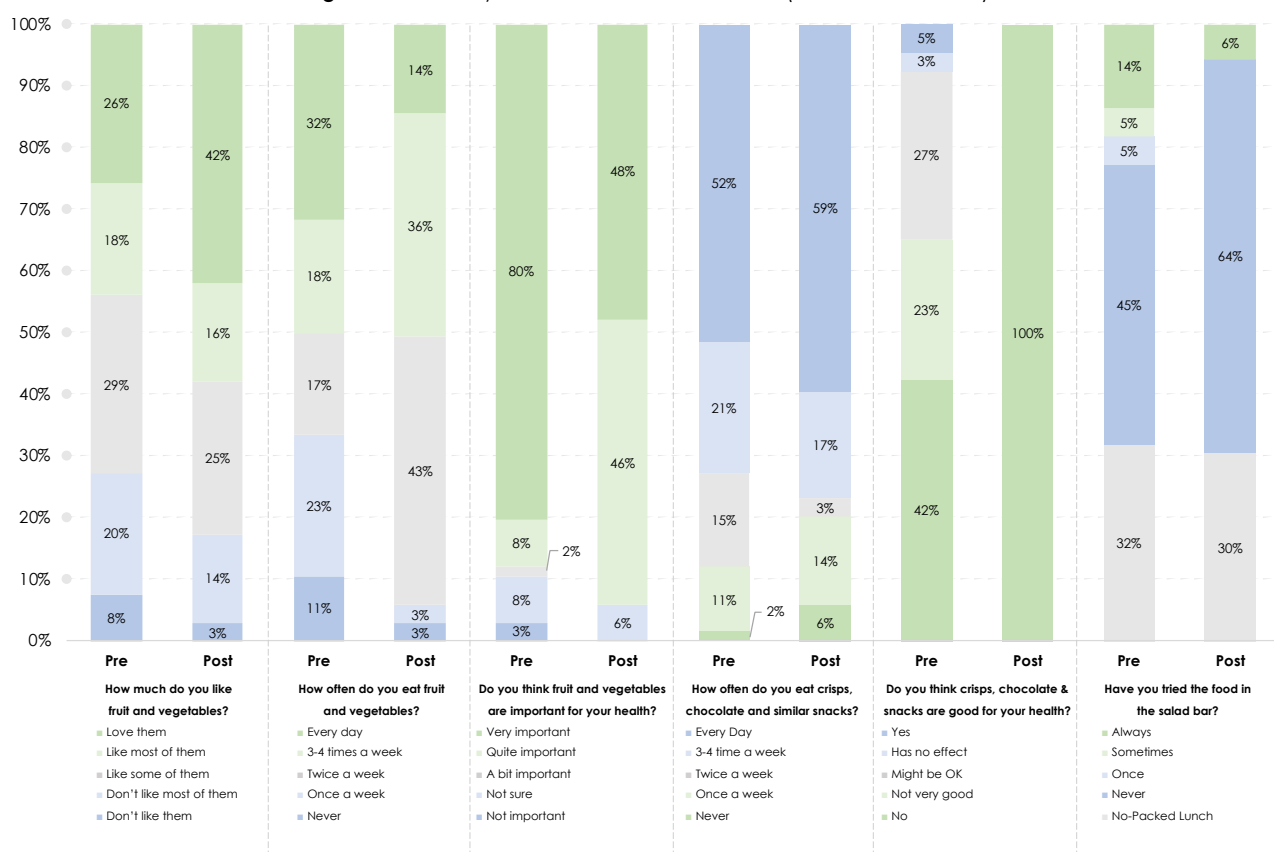


There were no differences on how much pupils liked fruit and vegetables. There was, however, a clear increase in pupils reporting eating fruit and vegetables more often after the pilot and although their importance in pupils' minds was already high, it was further solidified. There were no major shifts on how much crisps, chocolate (and

similar snacks) pupils reported eating, although there was an increase in understanding that they are not good for their health. At the same time, Barnes Junior pupils recorded a substantial increase in trying the salad bar compared to pre-pilot.

Broadway Junior

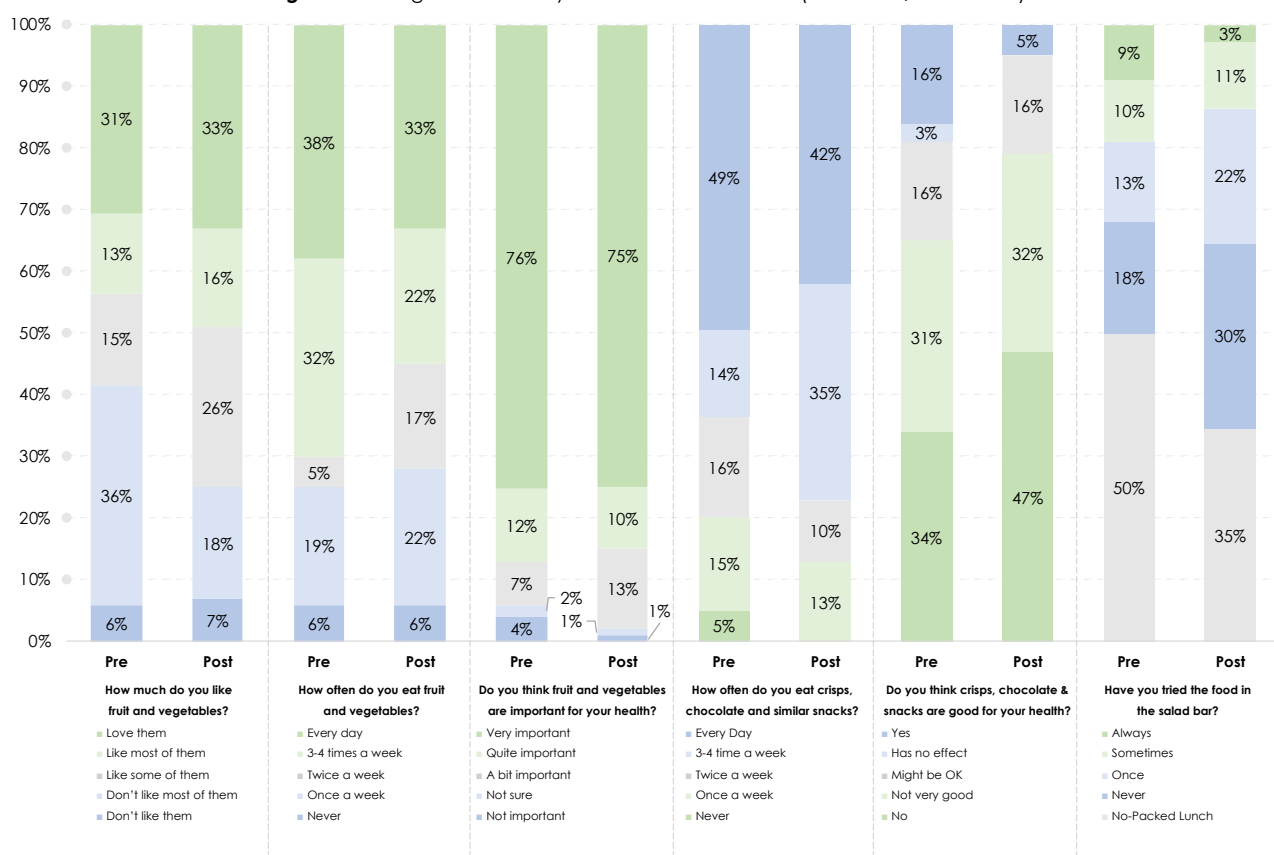
Figure 8: Broadway Junior Pre-Post Questionnaire (Pre N=66/Post N=69)



Broadway Junior pupils recorded an increase on how much they like fruit and vegetables post pilot, as well as a substantial increase on how often they eat them, while their view of how important they are remained high. Although their reported frequency of eating crisps and chocolate remained somewhat the same, they are now all reporting that such foods are not good for their health. At the same time, the number of pupils reporting having tried the salad bar slightly decreased.

Farringdon Academy

Figure 9: Farringdon Academy Pre-Post Questionnaire (Pre N=104/Post N=104)

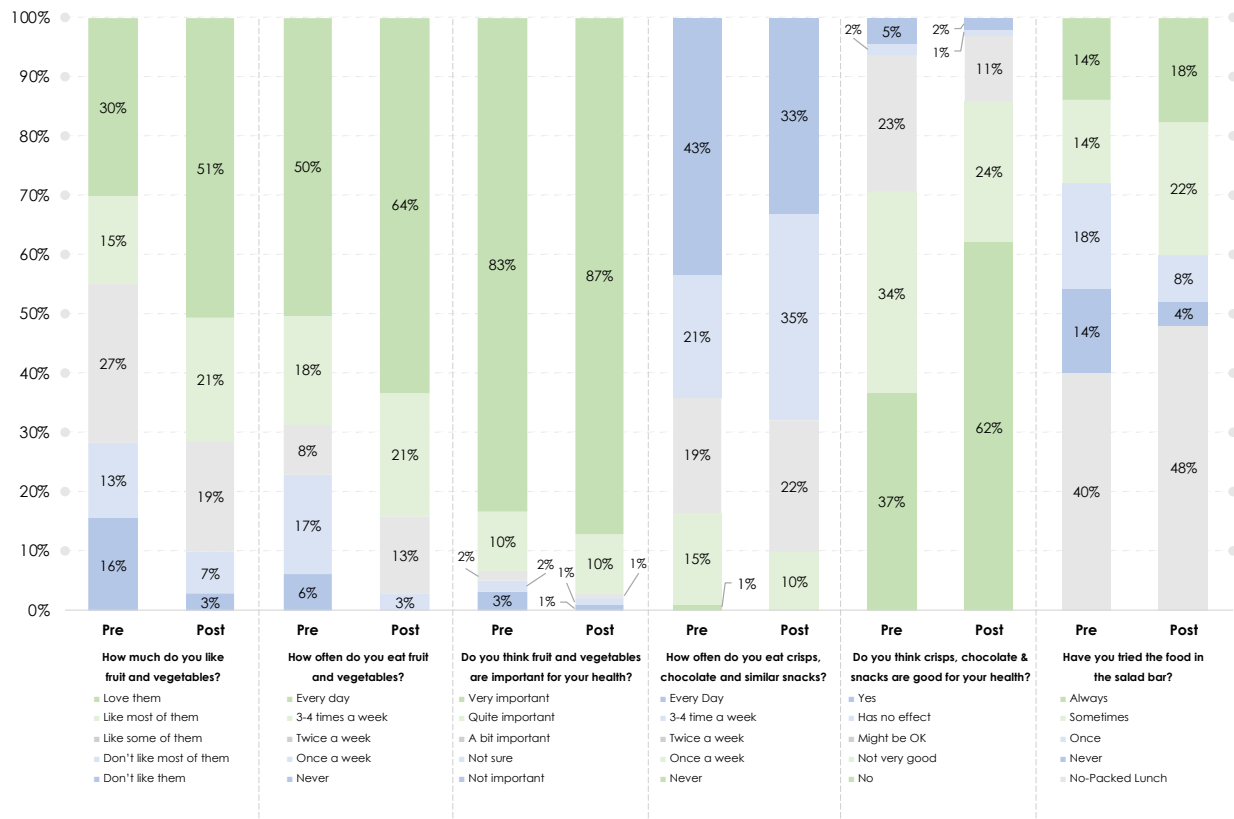


Farringdon Academy pupils recorded a noticeable increase in how much they like fruit and vegetables post pilot, however the reported frequency of eating them, remained relatively unchanged, as did their already high perceived importance of them. The frequency of eating crisps, chocolate and similar snacks also remained relatively unchanged, although more pupils now understand that such foods might not be good for their health. Overall, salad bar score remained to similar levels.

Fatfield Academy

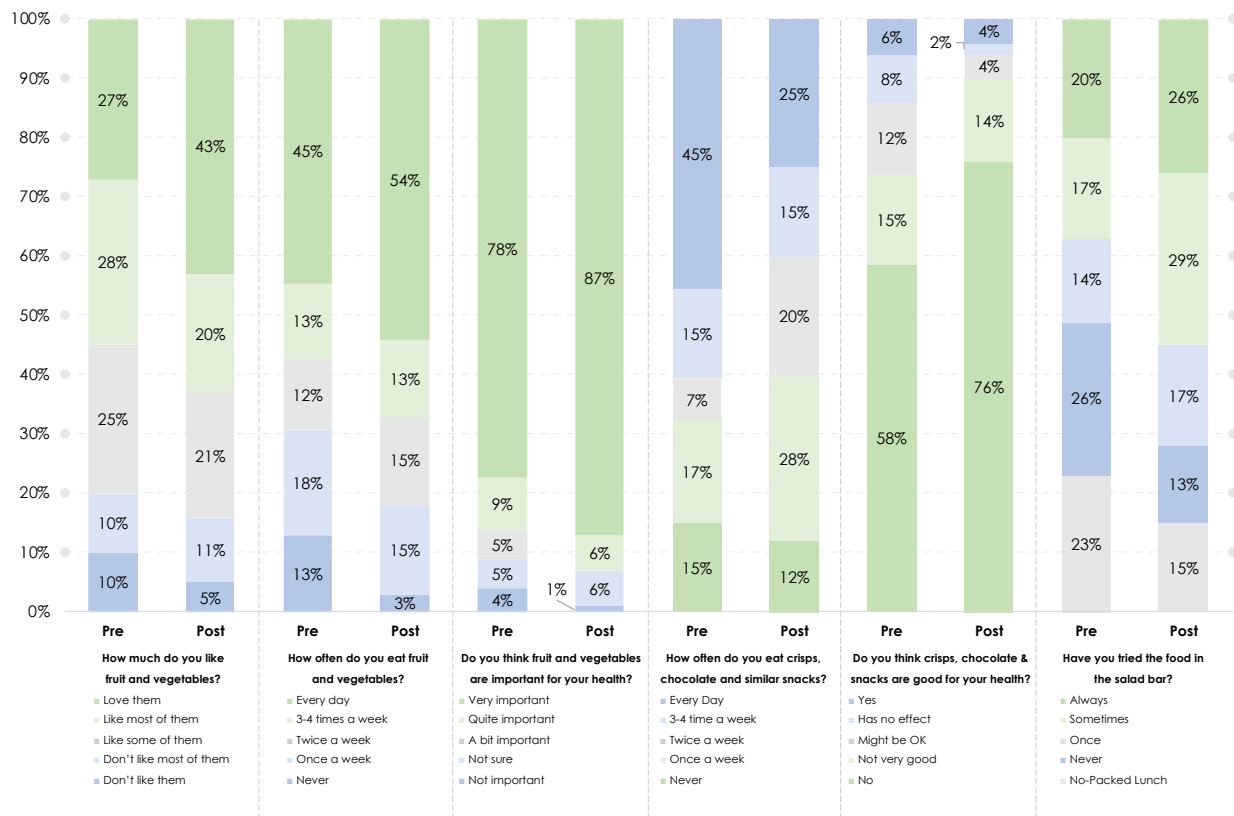
Pupils recorded substantial higher scores on how much they like fruit and vegetables after the pilot, while there was also a considerable increase in the reported frequency of consuming them, although their already high importance remained similar. There was a slight decrease in the frequency of consuming crisps, chocolates and similar snacks and an increase in pupils understanding about their negative impact on health. The frequency of trying the salad bar also seemed to increase after the pilot.

Figure 10: Fatfield Academy Pre-Post Questionnaire (Pre N=180/Post N=152)



Hetton Lyons

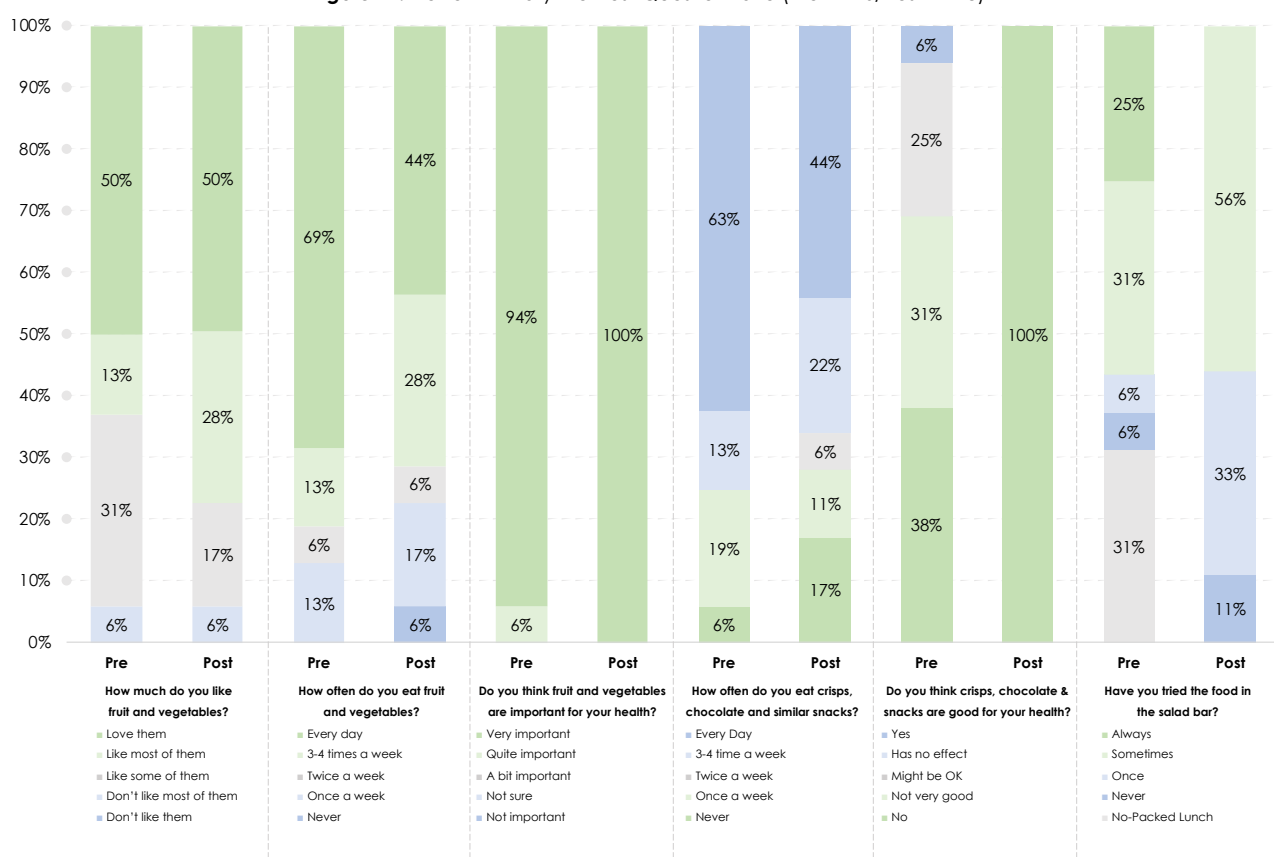
Figure 11: Hetton Lyons Pre-Post Questionnaire (Pre N=110/Post N=100)



Hetton Lyons pupils recorded a noticeable increase in how much they liked fruit and vegetables post pilot, as well as an increase in the reported frequency of consuming them and their perceived importance. Pupils also reported a reduced frequency of consuming crisps, chocolate and similar snacks, and an increased understanding of their health impact, while there was also an increase in those who have tried the salad bar post pilot.

Hetton Primary

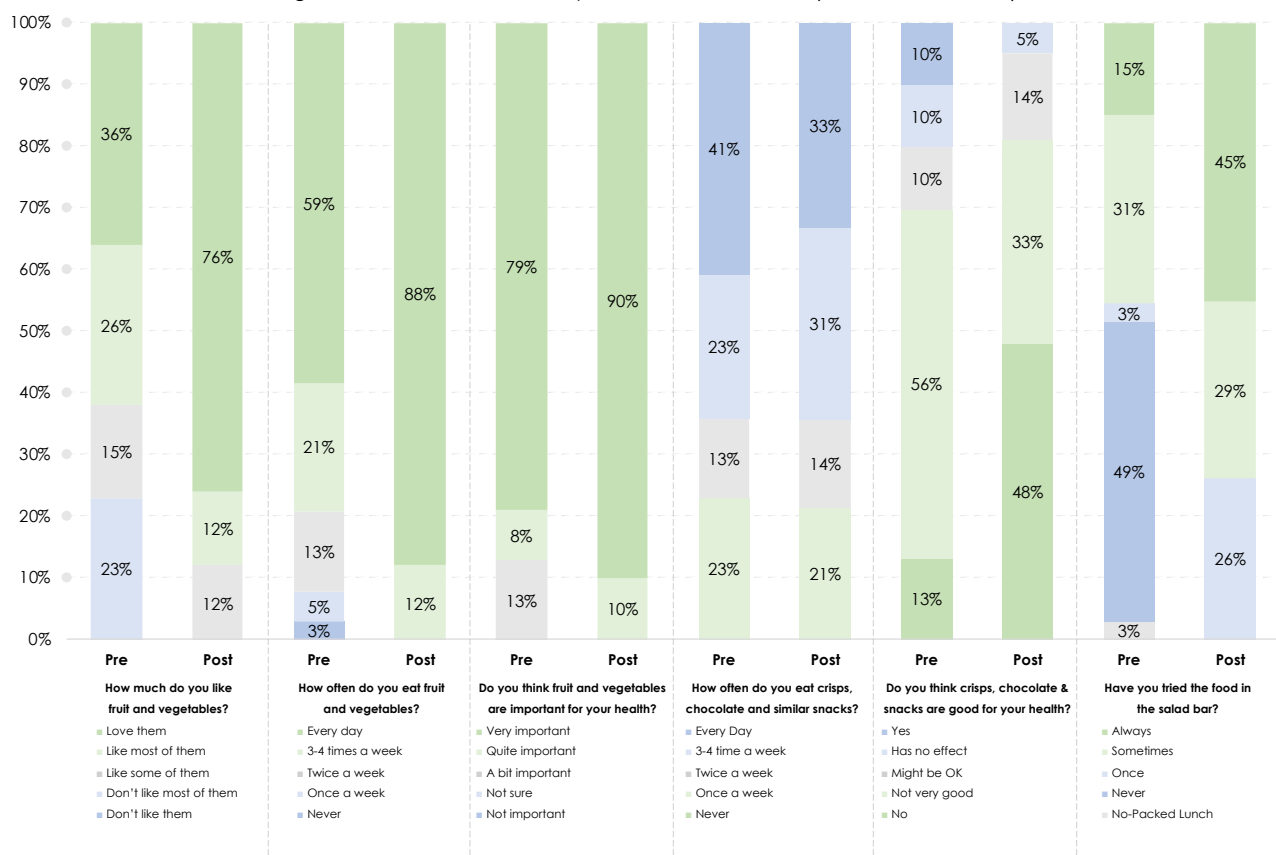
Figure 12: Hetton Primary Pre-Post Questionnaire (Pre N=16/Post N=18)



Pupils at Hetton Primary recorded a slightly higher liking for fruit and vegetables post pilot while their reported consumption frequency remained relatively the same as did the already high scores for their health importance. The reported consumption frequency of crisps, chocolate and similar snacks slightly reduced post pilot while there is now a clear understanding of the impact such foods have to health. The reported use of the salad bar also increased after the pilot.

Hudson Road Primary

Figure 13: Hudson Road Primary Pre-Post Questionnaire (Pre N=39/Post N=42)



Hudson Road pupils reported a substantial increase in how much they like fruit and vegetables, as well as an increase in the reported consumption frequency, with the perceived importance of such food becoming even more clear. At the same time, their reported daily consumption of crisps, chocolate and similar snacks slightly reduced while the understanding of the effect such foods have on their health increased. All participating pupils are now reporting that they tried the salad bar at least once, with the number of pupils trying it more regularly further increasing.

Additional Post-Pilot Questionnaire Elements

As mentioned earlier, the post pilot questionnaire contained two additional questions on whether pupils enjoyed learning about the Belly Bugs and whether they will try to eat more fruit and vegetables from now on. The answers to these additional questions for each school are summarised in Figure 14 and 15, respectively.

Overall, the vast majority of pupils enjoyed the Belly Bugs programme during the 8-week pilot, with only Fatfield Academy, who ran the pilot from Reception to Year 6, and Broadway Junior (Year 4) recording somewhat more moderate but still largely positive scores. At the same time, the vast majority of pupils across all schools suggested that they will now try to eat more fruit and vegetables to help their Belly Bugs.

Figure 14: Did you enjoy learning about the Belly Bugs?

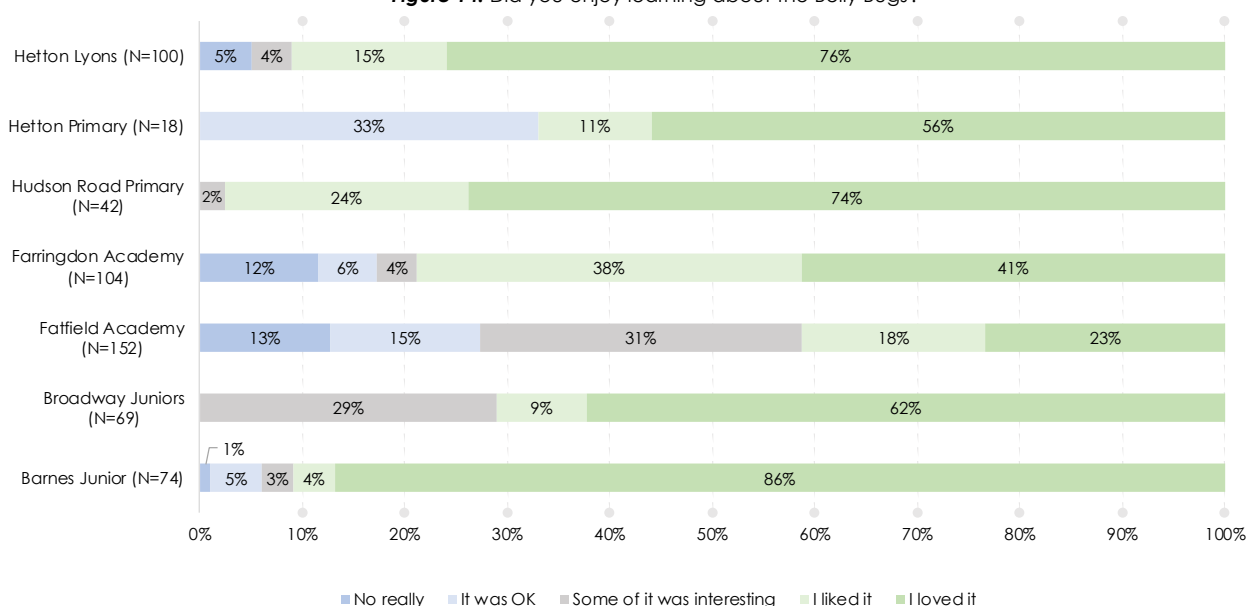
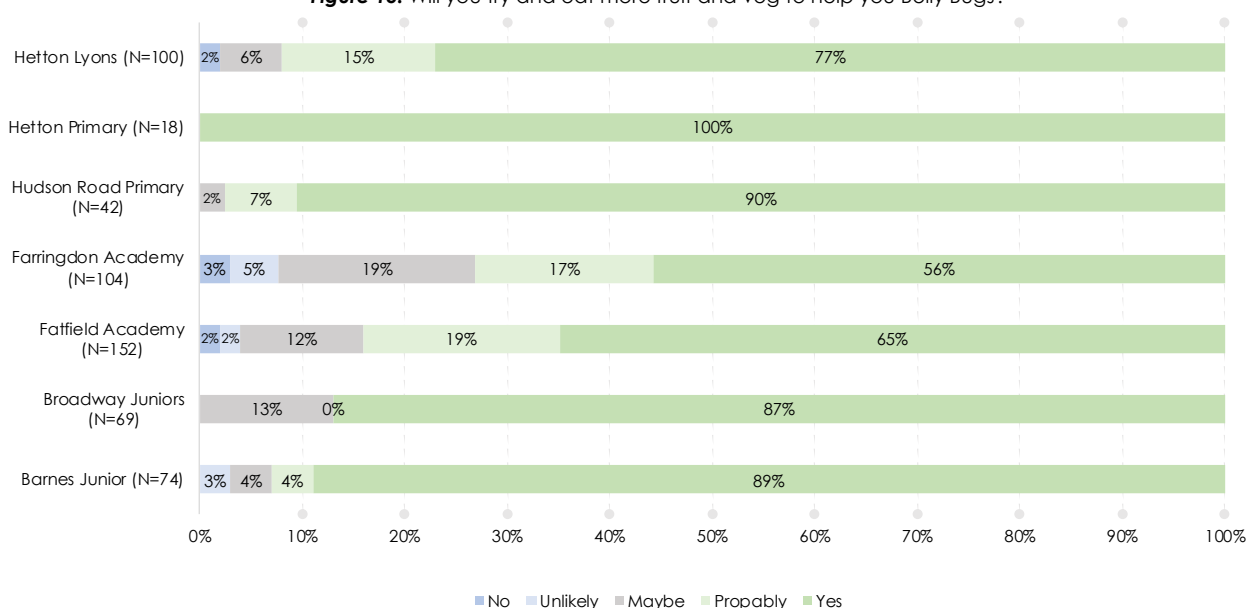


Figure 15: Will you try and eat more fruit and veg to help you Belly Bugs?

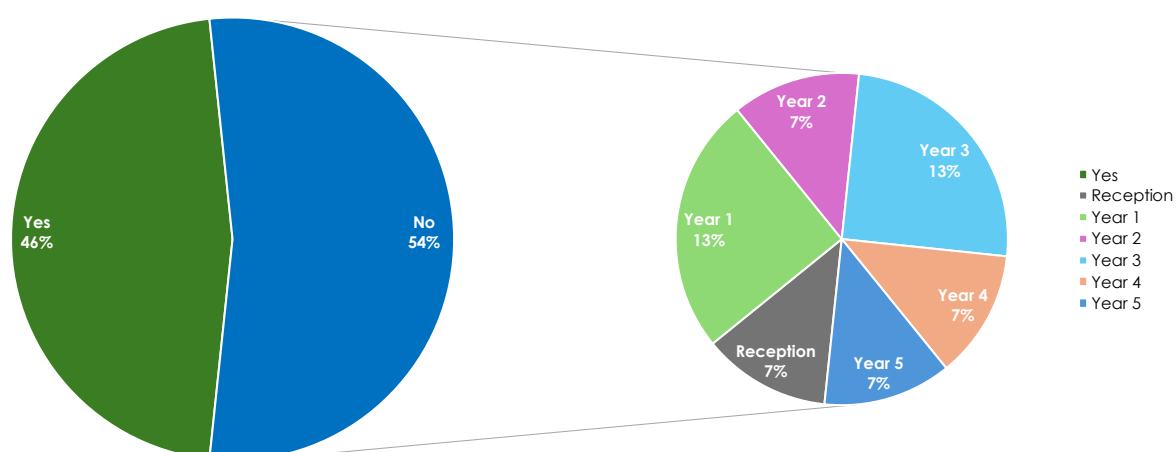


3.4 Teacher Questionnaires

As mentioned earlier in this report, teachers who were directly involved in delivering the Belly Bugs programme had to complete a brief questionnaire at the end of the pilot, which allowed even teaching staff who were not able to participate in the discussion groups to also state their views and perspectives. The figures below included teaching staff answers to the binary format questions, including additional comments made for each of them.

Question 1 - Was the content appropriate for their age?

Figure 16: Question 1 - Was the content appropriate for their age (including differentiated work)? (N=15)



Year 1 Teacher: *"The vocabulary was far too advanced for my year group. Yet, some tasks were too simple (e.g. Tracing over letters to complete description of BBs). This task especially didn't show me the children's understanding as they simply just traced then coloured in a BB."*

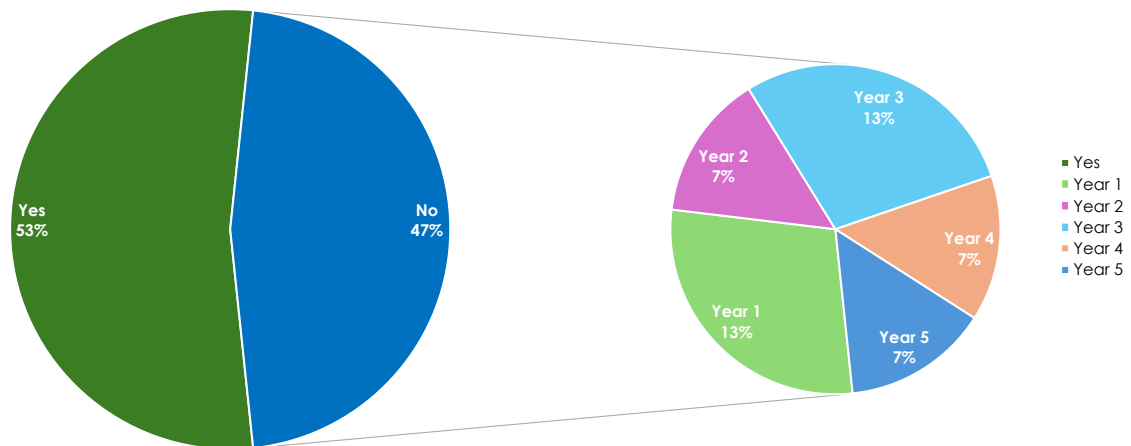
Year 2 Teacher: *"The content was well suited to Year 2"*

Year 3 Teacher: *"The children enjoyed the story and the activities"*

Year 6 Teacher: *"The activities were fine for Year 6 but required a lot of preparation"*

Question 2 - Did you complete all the lessons?

Figure 17: Question 2 - Did you complete all the lessons? (N=15)



Year 1 Teacher: *"There was too much content and even the initial story of Billy needed to be spread across two lessons"*

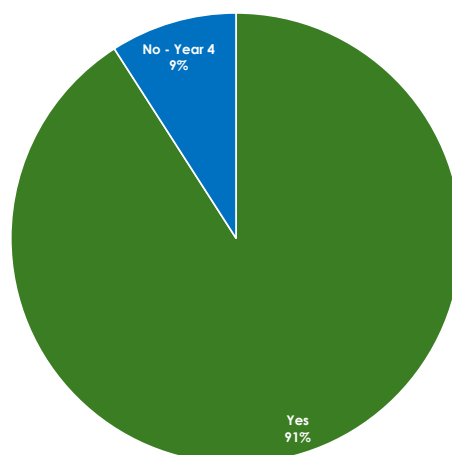
Year 2 Teacher: *"Yes, but not always as fully planned as children didn't understand and we had our normal curriculum to tag alongside this"*

Year 4 Teacher: *"Yes, although some sessions were combined and shortened to enable us to teach the current PSHCE units of work"*

Year 6 Teacher: *"There was too much content"*

Question 3 - Did you show the school dinner posters in the morning and put them up in the dinner hall?

Figure 18: Question 3 - Did you show the school dinner posters in the morning and put them up in the dinner hall? (N=12)



Year 1 Teacher: *"The posters were not shown in the morning; however they were present in the lunch hall during lunch time"*

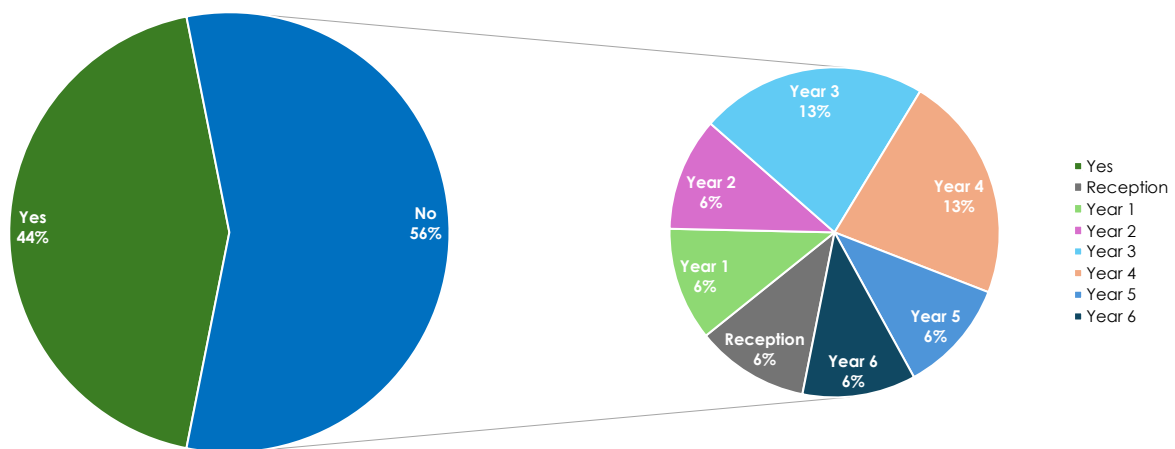
Year 2 Teacher: *"Yes, a display was added to the school lunch hall"*

Year 3 Teacher: *"Yes, although some menus weren't correct at first"*

Year 6 Teacher: *"Launched in whole assembly and posters displayed around the serving hatch"*

Question 4 – Did the children do all the homework?

Figure 19: Question 4 – Did the children do all the homework? (N=12)



Year 1 Teacher: *"We had to prioritise other subjects for homework tasks."*

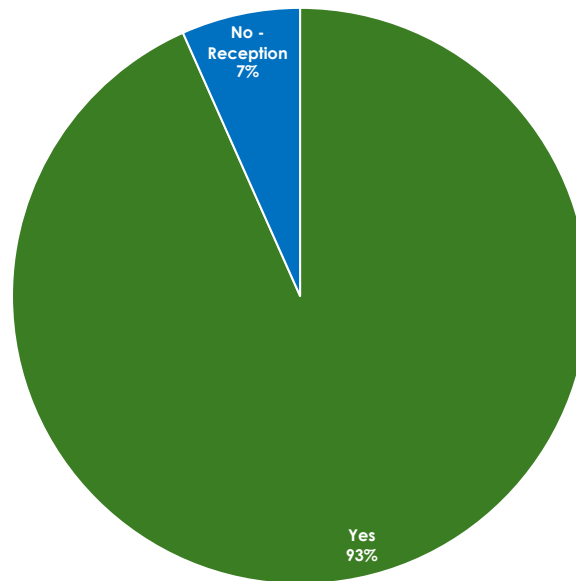
Year 2 Teacher: *"Some tasks would have been difficult for our families to complete at home"*

Year 2 Teacher: *"A number of children did - around 75%"*

Year 6 Teacher: *Core subjects take priority for homework in school following what the children have been learning that week"*

Question 5 - Did the children enjoy the lessons?

Figure 20: Question 5 - Did the children enjoy the lessons? (N=12)



Reception Teacher: *"Some children were distressed at the thought of having bugs in their tummy"*

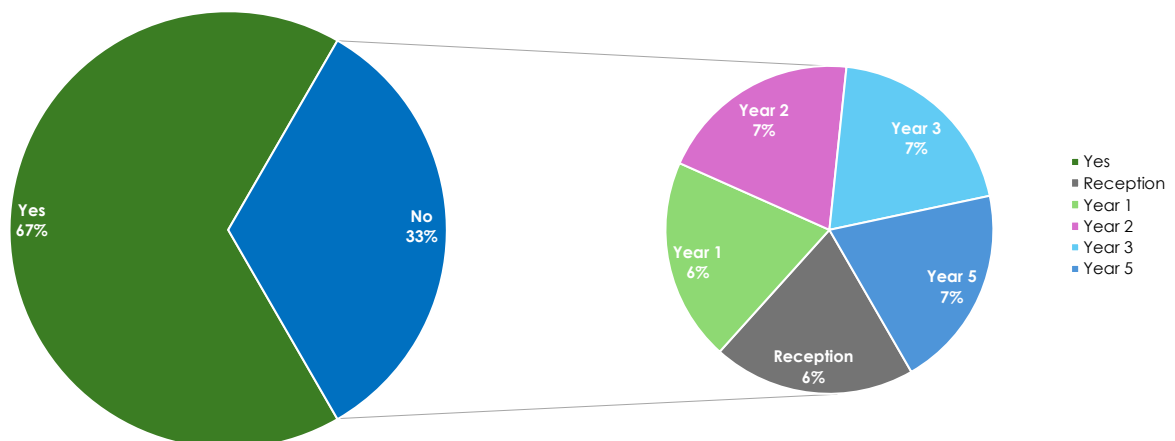
Year 1 Teacher: *"I believe children did due to how humorous they found it"*

Year 3 Teacher: *"They most liked trying new foods"*

Year 5 Teacher: *"Enjoyed the creative aspect but was very text heavy"*

Question 6 - Did you enjoy teaching the lessons?

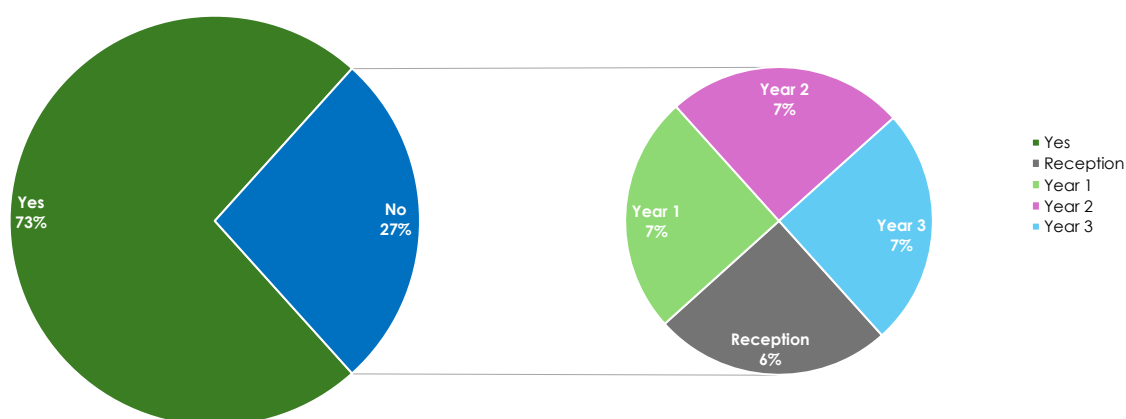
Figure 21: Question 6 - Did you enjoy teaching the lessons? (N=15)



Year 1 Teacher:	<i>"Great program, put together well and progressed well (but complicated in parts)"</i>
Year 2 Teacher:	<i>The children enjoyed the lessons, so were well engaged with the resources"</i>
Year 4 Teacher:	<i>"Yes, however, because the content was pitched too high, it meant a lot of extra work for me as a teacher to share key vocabulary as they have yet covered this"</i>
Year 5 Teacher:	<i>"Yes, but website is difficult to navigate and lots of preparation needed for some lessons"</i>

Questions 7 - Do you think that most of the children understood the aims of the lessons?

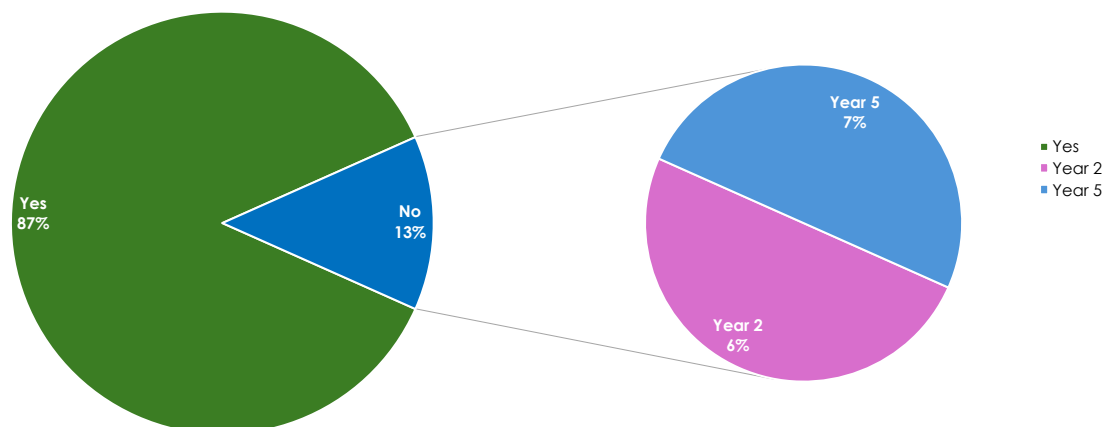
Figure 22: Questions 7 - Do you think that most of the children understood the aims of the lesson?
(N=15)



Year 1 Teacher:	<i>"I believe no due to the tricky vocabulary and the different concepts/machines being too abstract and confusing to understand"</i>
Year 2 Teacher:	<i>"The children completed each session. It was clear they had met and understood the lessons objectives"</i>
Year 3 Teacher:	<i>"Some understood; however, content was quite high for most of our Year 3 children"</i>
Year 3 Teacher:	<i>"Loved hands on sessions/trying new foods/growing etc"</i>
Year 4 Teacher:	<i>"Yes, but lessons would need to be reinforced"</i>

Question 8 - Do you think the children are now more interested in making healthy food choices?

Figure 23: Question 8 - Do you think the children are now more interested in making healthy food choices?
(N=15)



Reception Teacher: *"They enjoyed the salad bar and engaged with the idea of eating all colour foods"*

Year 2 Teacher: *"Each week more children chose veg and salad with their school lunches"*

Year 3 Teacher: *"Children are keen to make healthy choices and understand the importance of eating lots of fruit and veg"*

Year 3 Teacher: *"The children are more aware of healthy food choices and these contribute to overall good health"*

Year 6 Teacher: *"We do a lot of work in DT in Year 6 around healthy eating and choices, so it supplemented well"*

Q9 - How would you sum up the children's' engagement with BB?

Year 3 Teacher: *"Very detailed but better aimed at KS1"*

Year 4 Teacher: *"It was a good scheme. Needs to be in line with science topic so forward planning is required. Time allocation into schools' busy timetable"*

Year 3 Teacher: *"Children engaged with the concept of Belly Bugs and enjoyed the lessons"*

Reception Teacher:	<i>"They liked the visuals, but the content is too complex for reception to engage with"</i>
Year 2 Teacher:	<i>"Could have been better as they liked the pictures but took a lot to get them to understand"</i>
Year 3 Teacher:	<i>"They enjoyed the characters and the story, however, they struggled at times to understand the underlying meanings relating to bacteria and digestion"</i>
Year 4 Teacher:	<i>"They enjoyed the characters and the colourful slides for the stories. I think that it was a lot for children to take on prior to learning about digestion in science. If this had come after the science unit in spring, I feel the children would have gotten more out of it and been able to work more independently. "</i>
Year 5 Teacher:	<i>"Children enjoyed the different perspective of Belly Bugs but found the content hard to understand. Children enjoyed the tasks, but they required adapting."</i>
Year 6 Teacher:	<i>"Mixed reviews from children, some good resources but hard to prepare"</i>
Year 1 Teacher:	<i>"Most on tasks once slightly adopted"</i>
Year 3 Teacher:	<i>"The children have really enjoyed the lessons and have been engaged throughout; it linked well with our D+T healthy eating topic"</i>
Year 3 Teacher:	<i>"Really good engagement enjoyed session where they tasted and did drawings to represent. Not sure if this would be suited to a little older child due to content/vocabulary/"</i>
Year 2 Teacher:	<i>"Children engaged well and loved the story elements. Parents reported children discussing their learning at home"</i>
Year 2 Teacher:	<i>"Excellent, however in order to have more impact over time, I would spread the programme over a longer period of time"</i>

3.5 Participating Schools' Food Records

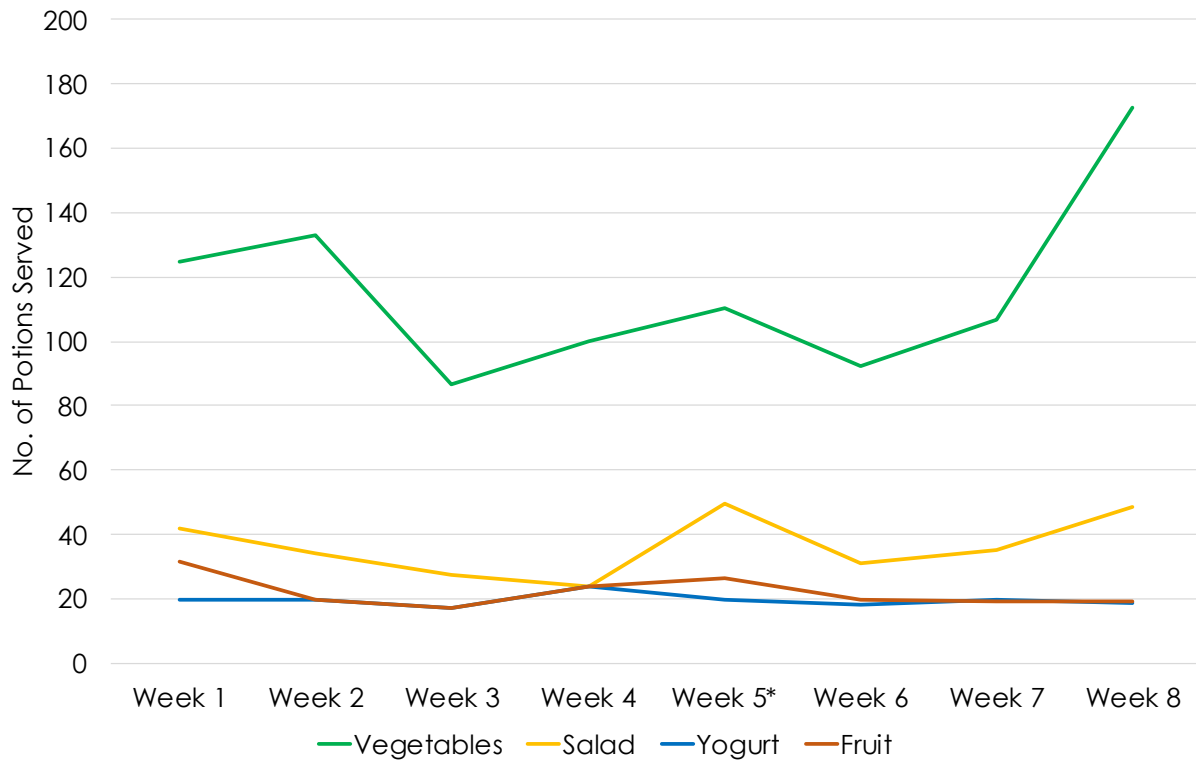
The initial plan for this evaluation was to obtain production sheets only for the participating Years/Classes from each school, with the goal of being able to monitor any changes in food choices made. However, after liaising with SCC school meal service, we realised that this would be impossible due to the extra workload it would require both from kitchen staff to separately record each Year/Class as well as from the school meal service team to collate and electronically record all that information.

Hence, we opted for getting food records for the entire school for the 8 weeks that the Belly Bugs pilot lasted. Again, we faced the issue that although all schools are part of the same three-week menu rotation, not every school follows that rotation. There were several differences (e.g., special days/changes due to school closure) that did not allow us to consistently measure specific food choices throughout the pilot period. If we also take into account that, as discussed, there was a mix in the consistency in terms of menu poster display from participating schools, with some displaying them, some partially doing so and some not displaying them at all, it becomes clear using food records to gauge changes in food choices as a result of the Belly Bugs pilot would not be a reliable and valid measure.

Considering these circumstances, we tracked the food options within each menu that were consistent for all schools throughout the duration of the pilot. These were, vegetables, salad, fruit (outside of dessert), and yogurt. Although these options can give us an indication of pupil food choices, it's important to interpret them with caution, based on the caveats discussed, and based on the fact that in all schools, it is parents who make the food choices for children.

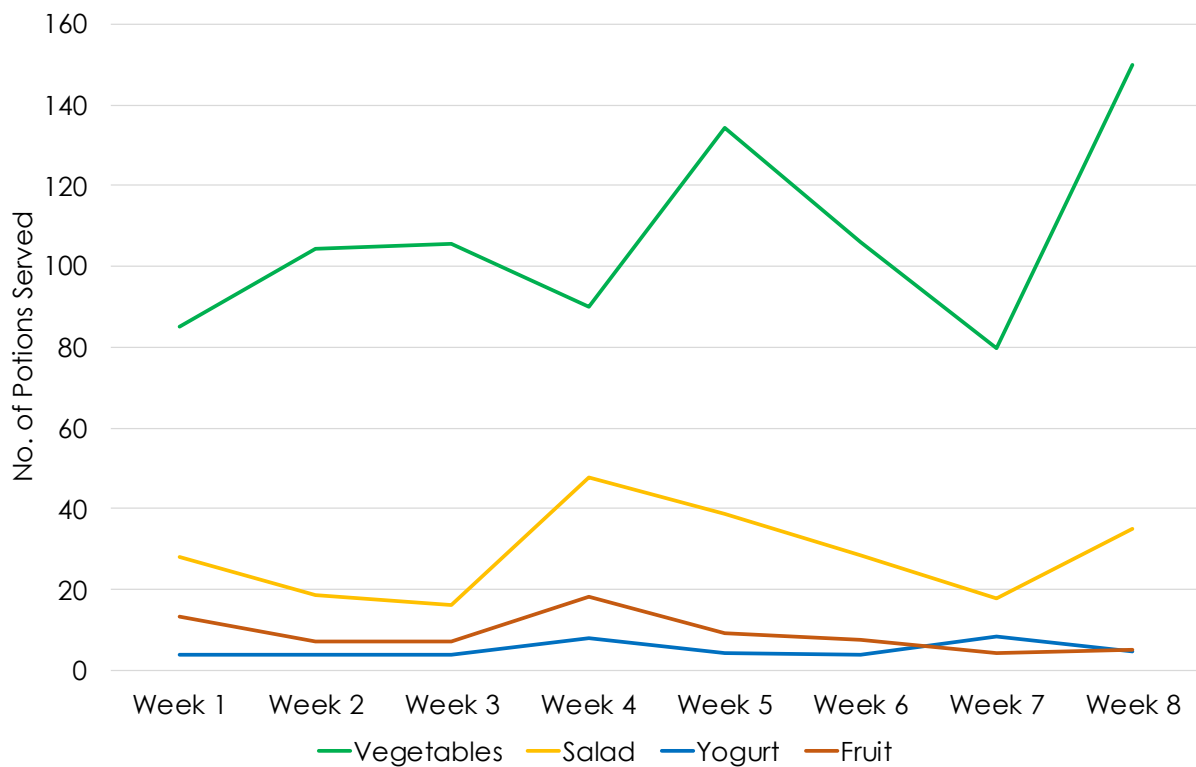
Barnes Junior

Figure 24: Barnes Juniors Food Records – Pilot Duration (AVG)



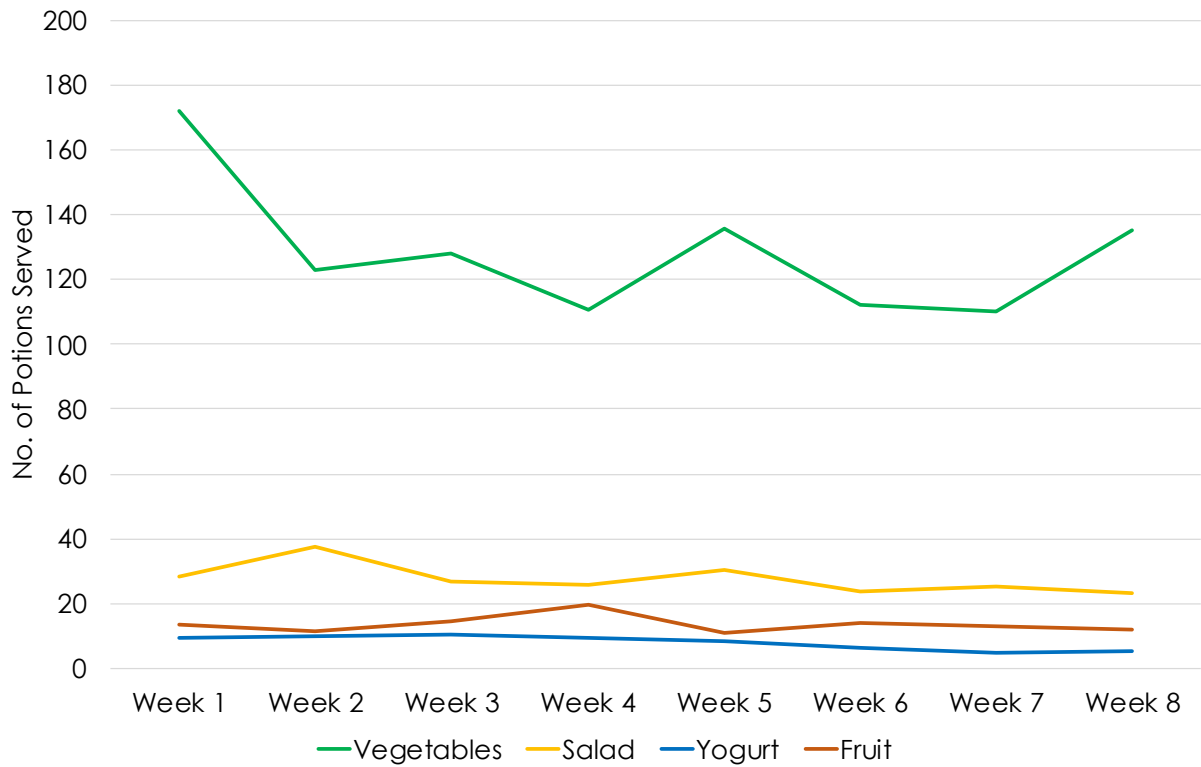
Broadway Junior

Figure 25: Broadway Juniors Food Records – Pilot Duration (AVG)



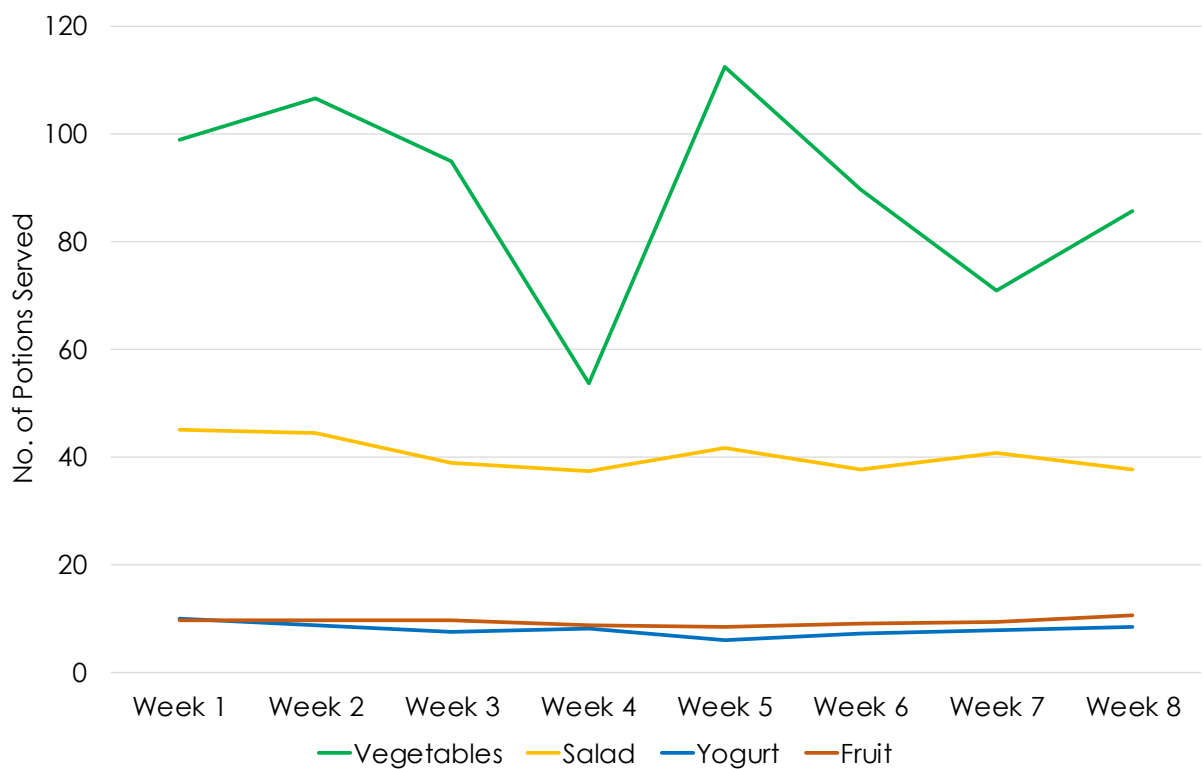
Farringdon Academy

Figure 26: Farringdon Academy Food Records – Pilot Duration (AVG)



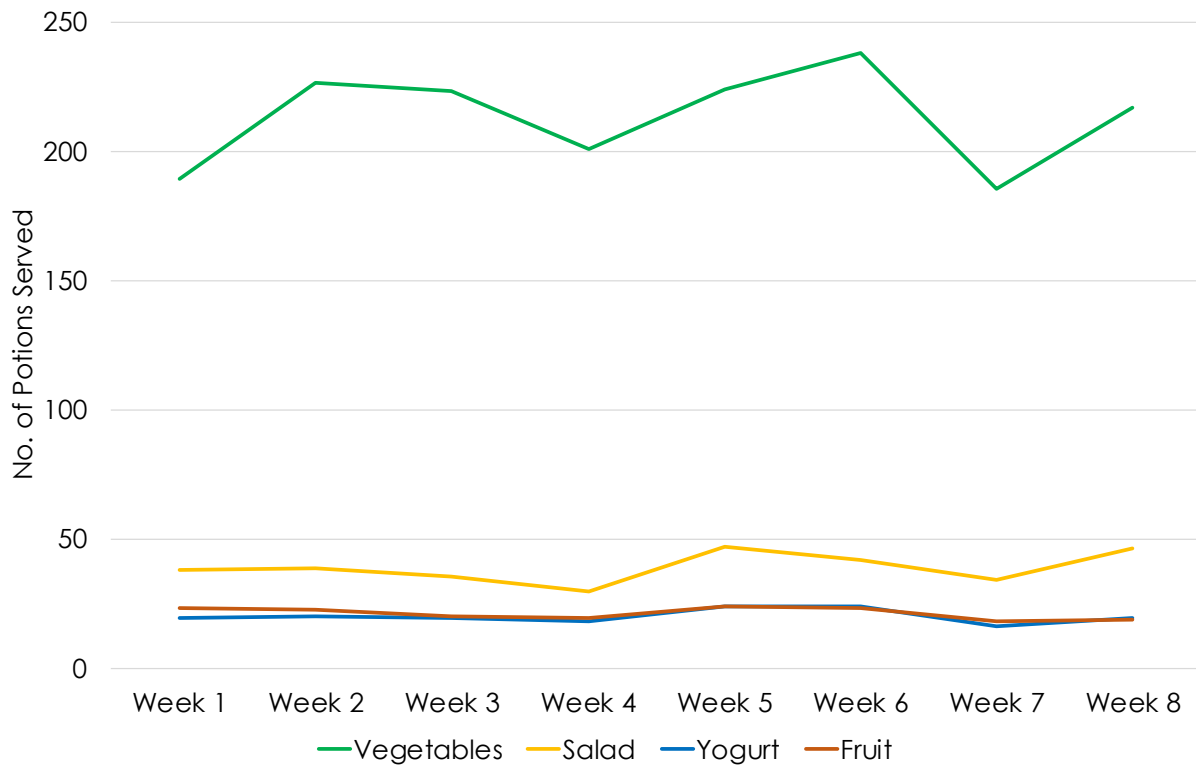
Fatfield Academy

Figure 27: Fatfield Academy Food Records – Pilot Duration (AVG)



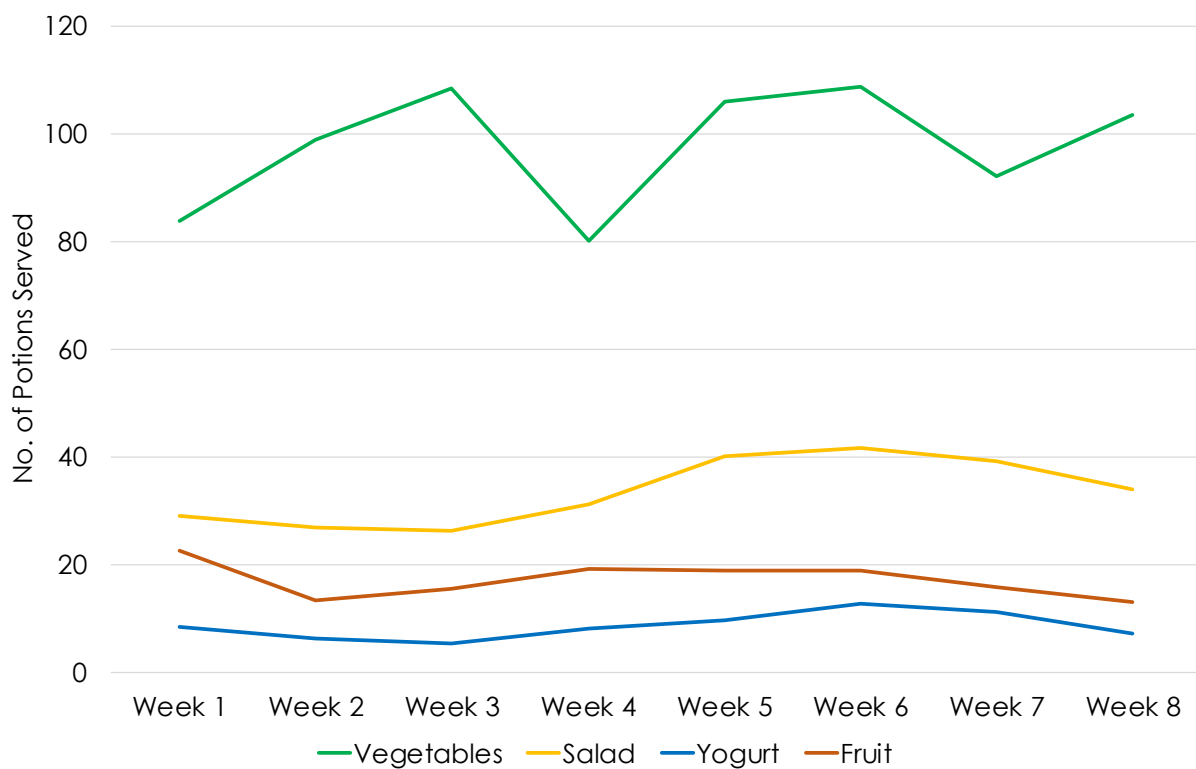
Hetton Lyons

Figure 28: Hetton Lyons Food Records – Pilot Duration (AVG)



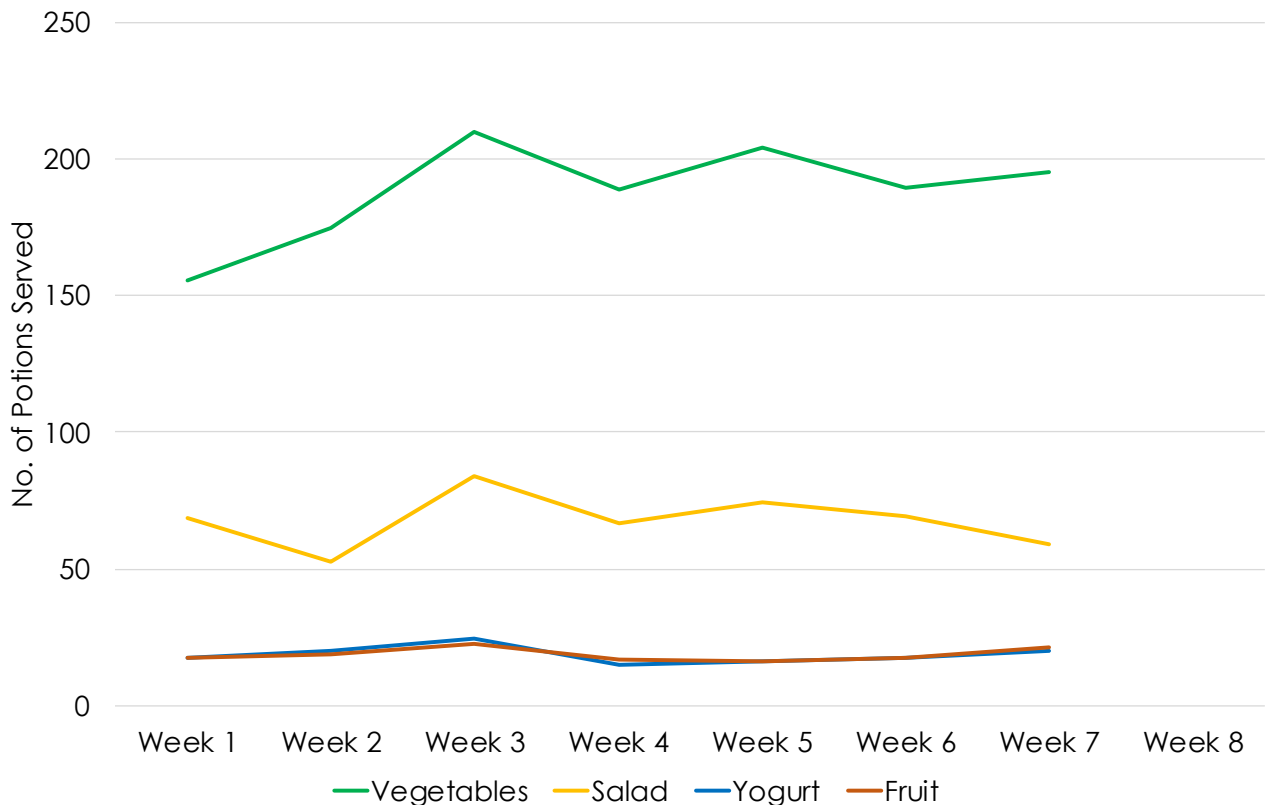
Hetton Primary

Figure 29: Hetton Primary Food Records – Pilot Duration (AVG)



Hudson Road Primary

Figure 30: Hudson Road Primary Food Records – Pilot Duration (AVG)



3.6 Parents Survey

As mentioned in the methodology section of the report, we opted for a short survey to gauge the attitudes and perspectives of parents around family nutritional habits, healthy eating and potentially, any exposure they might have to the Belly Bugs programme. Unfortunately, and despite the best effort from school staff to distribute the parent recruitment flyers, we received only two completed surveys. Since the sample size of the survey is extremely small, we have not included any of the results in this report.

It's interesting to highlight, however, that both parents had positive attitudes around healthy eating, they both suggested the importance of their children eating fruit and vegetables daily, while minimising the consumption of crisps, chocolates, and similar snacks. At the same time, only one of them was familiar with Belly Bugs because their child mentioned it when doing some homework.

4. Discussion and Conclusions

Having spent a considerable amount of time collecting all the different data streams for this evaluation and looking at the findings presented in the previous chapter, one can safely assume that, overall, the Belly Bugs primary school pilot was a success. School staff and pupils had an overall positive experience with the pilot, despite the challenges faced due to the tight timelines and already significant workload.

The vast majority of teaching staff agreed about the high quality of the resources, particularly praising the animation of the characters and how relatable they were to most children, as well as the overall storyline. There were, however, questions of how age appropriate some of them were, particularly around the vocabulary and scientific language, as well as some of the concepts. Another challenging point for teachers was the number of materials available, which in some cases, and due to their limited amount of time, overwhelmed teachers and did not allow them to fully implement the programme. Both these points varied between schools and years and as mentioned in one of the discussion groups, children in areas with high deprivation might enter schools with a lower level of language and vocabulary which will, unavoidably, affect their overall experience and understanding of the programme.

The timing of the pilot played an important role in how the Belly Bugs programme was implemented. A few schools chose to have it as a standalone activity because it simply didn't align with what they were doing at that moment in time. In schools where pupils were already taught, or were being taught, science units around healthy eating or the digestive system, the educational element of the programme seems to be much more prominent, since they could understand and follow the vocabulary and key concepts. As one headteacher suggested in her final comments, having Belly Bugs as a permanent resource and deciding when and where to fit it in to align with a corresponding topic in the curriculum, will allow you to get the maximum results out of it. This could also be achieved by simply allowing school staff more time to better plan their existing lessons to incorporate Belly Bugs.

Overall school engagement also widely varied between participating schools. In some cases, Belly Bugs was delivered as a completely standalone activity in one Year, with little interaction and/or involvement from the rest of the school (especially cooking staff) and with very few displays going up, while other schools adopted a much more holistic approach, in which everyone from the headteacher to the teaching staff to the cook were involved and supported the pilot, in some cases, by also enhancing the school menus and providing more healthy options. Evidently, the latter approach elicited much more enthusiasm about Belly Bugs, something that was reflected both in the school staff as well as the pupil perspectives.

Ultimately, the goal of the pilot was to both enhance pupils' knowledge around their gut microbiome and the importance of healthy eating, as well as encourage them to make healthier choices and, to a large extent, this has also been achieved. We presented multiple quotes from the school staff discussion groups on how pupils are now much more aware of the food choices they and others around them make. Multiple staff reported children trying foods for the very first time and sparking discussion in the classroom about their experience, while others also reported parents mentioning the same pattern at home. The post pilot questionnaires also reveal an improved knowledge and understanding across all schools as well as an improved intention towards healthier eating in most cases, as did some of the food records recorded, although these should be interpreted with caution.

The limited experience, for most schools, in implementing similar interventions around healthy eating and nutrition, and factors outside school were also highlighted during the discussion groups. In particular, parental influence in pupil food choices and overall nutritional attitudes was a common theme among school staff, the importance of which can “make or break” any gains, educational or behavioural, that pupils acquired during the pilot. In recognising that significant influence, some schools are trying to organise activities in order to engage families in cooking healthier meals, with some even suggesting a Belly Bugs specifically for parents!

Most schools were happy with the support received by Sunderland City Council, particularly during COVID, as well as with the catering service, which they reported has maintained the quality of food despite inflation and rising costs. There were suggestions around supporting families that are most in need, as well as extending free school meals, or at least elements of them, beyond Year 2, something that schools feel unable to do due to limited budgets. Another area SCC could provide further support, according to school staff, is parents education around healthy nutrition and preparing healthy home-cooked meals, an aspect that can significantly enhance not only parents', but also children's knowledge of nutritious food.

School staff also expressed their views of how the Belly Bugs programme and its implementation could be improved. From reducing and/or streamlining the amount of materials, to simplifying some of the language, and from collaborating with digital education platforms for easy access and integration with school systems, to preparing materials, and even a whole programme, for parents. Schools staff truly tried to engage with the Belly Bugs programme and propose ways to make it work better for them as well as for pupils.

At the methodology section of this report, we talked about how we utilised the COM-B model of behavioural change to inform our key lines of enquiry for this evaluation. The COM-B model suggests that three factors, namely, capability (referring to a person's knowledge, skills and abilities to engage in a behaviour), opportunity (referring to external factors that make the behaviour possible), and motivation (referring to the internal process that influence decision making), are determining one's behaviour and can ultimately facilitate behavioural change. The Belly Bugs pilot did a great job in enhancing pupils' knowledge and understanding of healthy eating, while the connection children had with the characters enhanced their internal motivation of taking care of them. It's also key for schools to fully engage in such initiatives, as providing the opportunity and a supporting environment that promotes and champions good, healthy food choices, can truly make a difference and contribute to Sunderland's Healthy City goals.

5. Recommendations

Belly Bugs Programme and Future Implementations

- Revising and simplifying materials, particularly around vocabulary and scientific concepts, will ensure that future Belly Bugs implementations are more accessible to a range of learning levels, as this is something that schools found challenging and hindered their programme progression. This could include reducing the number of educational materials available and potentially restructuring the teacher's pack, session plans, and guidelines to make it easier for them to follow and/or provide guidance for adapting the resources/lesson plans to meet the needs of the various participants in classes/year groups, in addition to the existing key stages planning.
- The Belly Bugs programme seems to have the potential to spark children's imaginations, create conversation and engagement around food and healthy eating, make them try new foods and ultimately, change their eating habits. It's important, however, to highlight that the extent to which it achieves one, some or all the above, largely depends on each school's level of involvement with the programme. In that light, future Belly Bug implementations in educational settings should ensure key staff who will facilitate the programme attend the necessary introductory sessions, and fully understand the expected level of commitment involved in its delivery.
- Digital access could also play an important role in the success of future Belly Bugs programmes. For example, although the website is easy to navigate and contains multiple streams of information, the teachers' area doesn't allow staff to view the materials online but requires downloading them instead. Although an easy process, it adds an extra layer of effort in their already busy workdays. This could simply be improved by adding the option to navigate the materials online. Another suggestion from the staff was incorporating Belly Bugs with digital education platforms, such as Purple Mash, which will allow them to monitor homework and pupils' engagement and progression.
- Future pilots of the Belly Bugs programme need to ensure that the timescale of implementation accounts for the planning and preparing time within an

academic year and the delivery of weekly sessions within term time. Timing considerations were prominent amongst school staff and can play a significant role in their engagement with the programme and its overall success. Additionally, the Belly Bugs team could consider creating a shorter version of the programme, that teacher can deploy as a standalone activity, without having to incorporate it in their existing curriculum.

Sunderland City Council Initiatives

- Most schools reported an overall positive experience with the SCC school meal service. At the same time, they also mentioned the need to further support pupils and families, particularly those over Year 2. SCC is already sharing existing support schemes with schools and can encourage them to further promote these initiatives with families in need. Additional support could also have a financial element and provide funding for free school meal expansion across primary schools (e.g., free school meal extension in London) but given the current economic climate and challenges faced by local authorities it could also take other forms. A number of schools have breakfast and after school clubs, either through a national scheme or supported locally, and all schools are encouraged to access HAF programmes. Such initiatives/schemes can be further promoted so all schools can take advantage of them.
- It might also be useful to enable schools to provide free healthy snacks to pupils by engaging and involving local businesses and retailers in such schemes. Some schools tried to provide free healthy snacks to pupils but the cost of doing so, even buying at wholesale prices, was restrictive. Several schools have access to fruit and vegetables for snacks from a range of sources and sharing practice with each other and potentially linking into the Food Partnership agenda is a possibility worth exploring.
- Other elements that could be done at a relatively low cost would be supporting schools in trying new ideas and initiatives. Food tasting sessions, herb gardens, and similar activities can provide great educational value and, if done in collaboration

with the local community and business, can also foster stronger relationships and support networks. There are existing offers for schools, for example through what was C4LS - Healthy Lifestyles Programme, and these can be further promoted.

- A final element, and something that was prominent in the discussion groups was providing educational support for parents and families. Children's education is only one element of creating good, sustainable healthy eating habits and behaviours and supporting families to encourage that is equally important. Some schools are already trying such initiatives by inviting local football clubs to talk, encourage, and demonstrate healthy eating and meal preparation. There is a wide-ranging offer from SCC, including the Food & Nutrition Charter Mark, HAF, Healthy Lifestyles, school nursing offers and national promotions which can be centrally promoted and easily accessed through a website.

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7. Appendix

Pupil Discussion Group Question Guides

- Can you please tell me what did you learn about the Belly Bugs?
- Who is your favourite Belly Bug?
- Do you remember why it's important to look after of our Belly Bugs?
- Do you remember what we need to do to help our Belly Bugs?
- What about the Sugar Monster and Junk Punks? What can you tell me about them?
- Do you want to keep learning more about the Belly Bugs when you are outside school?
- How much fruit and vegetables do you eat now that you know about your Belly Bugs?
- How much crisps, chocolate and other snack like that do you eat now that you know about your Belly Bugs?
- What's your favourite snack?
- What do you think about the food you have at school? Do you like it?

School Staff Discussion Group Question Guides

School Staff

- What is your overall opinion about the Belly Bugs pilot?
- What challenges did you face in implementing the Belly Bugs pilot?
- Do you think the provided materials were adequate and age appropriate?
- Has the rest of the school staff engaged with the Belly Bugs Pilot? e.g., cooks etc?
- Did you see any interest in Belly Bugs from other pupils not involved in the pilot?
- To what extent do you think the knowledge pupils acquired through belly bugs is transferable outside the classroom?
- Do you think that whether a pupil has packed lunch or not, played any role participation in the Belly bugs programme?
- What do you think was the strongest element of the Belly Bugs programme?
- What do you think was the weakest element of the Belly Bugs programme?
- Do you have any suggestions to improve the Belly Bugs programme?

Additional Questions

- Have there been any changes to school policies on food provision?
- Does inflation and the rising costs of products play a role in the quality and variety of food provision?
- Do you think any further changes/improvements need to be made to school food provision?
- Are there any initiatives delivered in your school regarding diet healthy eating or physical activity (apart from Belly Bugs)?
- Do you think there is anything your local council can do to promote healthy nutrition or improve meal provision in your school?

Kitchen Staff:

- How healthy do you think the food provided at your school is?
- Do children like the food and drinks provided? (Most and least popular foods and drinks)

- Have any major changes been made to food provision in the couple of years?
- Have these changes to school food provision had any effect on the children?
- Does inflation and the rising costs of products play a role in the quality and variety of food provision?
- Were you involved in the Belly Bugs pilot?
- Have you heard or seen any materials related to the Belly Bugs pilot that was running over the past months here at your school?
- What do you think of it?
- Have you observed any changes in the pupils' (Year 2) food choices as a result of the Belly Bugs pilot?
- What do you think should be done to promote healthier food choices for pupils?
- Do you think any further changes/improvements need to be made to school food provision?

Additional Questions

- Do you think any further changes/improvements need to be made to school food provision?
- Are there any initiatives delivered in your school regarding diet healthy eating or physical activity (apart from Belly Bugs)?
- Do you think there is anything your local council can do to promote healthy nutrition or improve meal provision at school?

Pupils Pre-Pilot Questionnaire

Date: _____

School Name: _____

Year group: _____

Total number of children: _____

1. How much do you like fruit and vegetables?



I don't like
them



I don't like most
of them



I like some
of them



I like most of
them



I love them

2. How often do you eat fruit and vegetables a week?



Never



I eat them once a
week



I eat them twice
a week



I eat them three
or four times a
week



Every day

3. Do you think fruit and vegetables are important for your health?



Not
important



Not sure



A bit
important



Quite
important



Very
important

Year group: _____

School Name: _____

4. How often do you eat crisps, chocolate and similar snacks?



I don't eat them



I eat them once a week



I eat them twice a week



I eat them three or four times a week



I eat them everyday

5. Do you think crisps, chocolate and similar snacks are good for your health?



yes



Has no effect



Might be ok



Not very good



No

6. Have you tried the food in the salad bar?



No, I have packed lunch



Never tried it



Tried it once



Have it sometimes



Always have some.

Pupils Post-Pilot Questionnaire

Date: _____

School Name: _____

Year group: _____

Total number of children: _____

1. How much do you like fruit and vegetables?



I don't like them



I don't like most of them



I like some of them



I like most of them



I love them

2. How often do you eat fruit and vegetables a week?



Never



I eat them once a week



I eat them twice a week



I eat them three or four times a week



Every day

3. Do you think fruit and vegetables are important for your health?



Not important



Not sure



A bit important



Quite important



Very important

Year group: _____

School Name: _____

4. How often do you eat crisps, chocolate and similar snacks?



I don't eat them



I eat them once a week



I eat them twice a week



I eat them three or four times a week



I eat them everyday

5. Do you think crisps, chocolate and similar snacks are good for your health?



yes



Has no effect



Might be ok



Not very good



No

6. Have you tried the food in the salad bar?



No, I have packed lunch



Never tried it



Tried it once



Have it sometimes



Always have some.

7. Did you enjoy learning about your Belly Bugs?



Not really



It was ok



Some of it was interesting



I liked it



I loved it

8. Will you try and eat more fruit and vegetables to help your Belly Bugs?



No



Unlikely



Maybe



Probably



Yes

Teachers Post-Pilot Questionnaire

1. What age/year group are your children? _____

2. Was the content appropriate for their age (including differentiated work)? **Yes/No**

Comment: _____

3. Did you complete all the lessons? If not, why (e.g. Too much content)? **Yes/No**

Comment: _____

4. Did you show the school dinner posters in the morning and put them up in the dinner hall? **Yes/No**

Comment: _____

5. Did the children do all the homework? If not why? **Yes/No**

Comment: _____

6. Did the children enjoy the lessons? **Yes/No**

Comment: _____

7. Did you enjoy teaching the lessons? **Yes/No**

Comment: _____

8. Do you think most of the children understood the aims of each lesson? **Yes/No**

Comment: _____

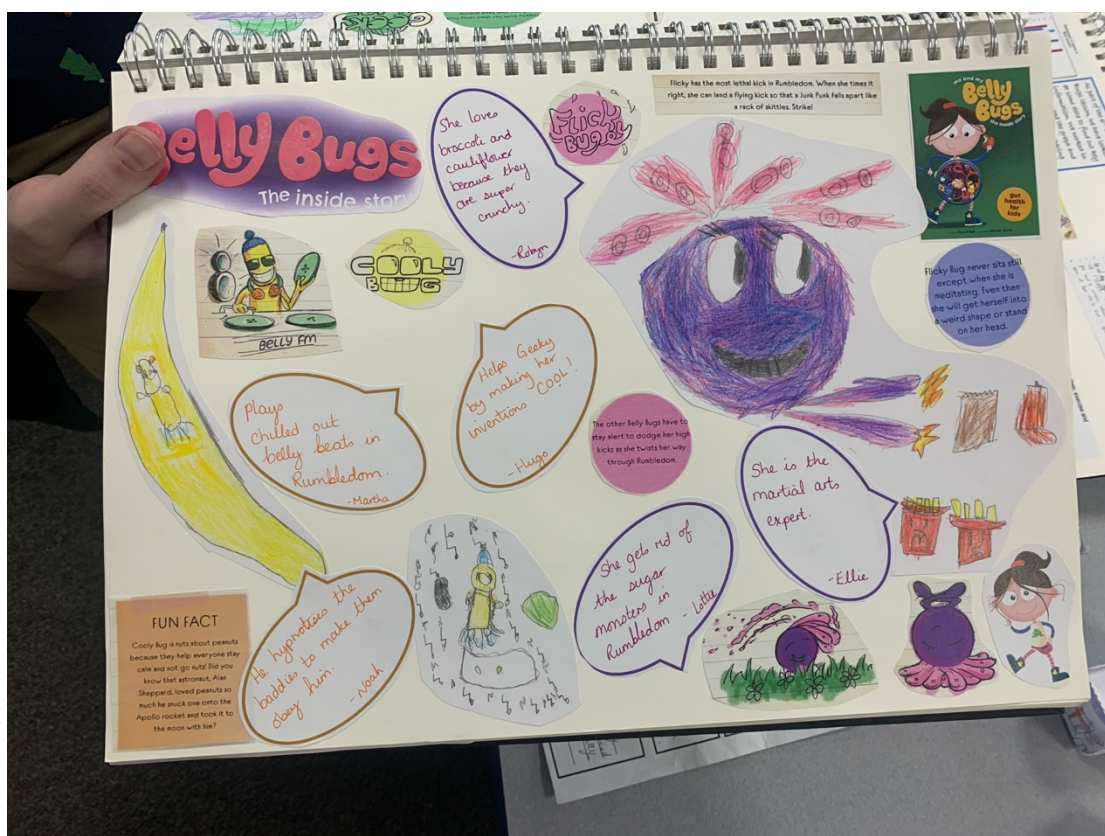
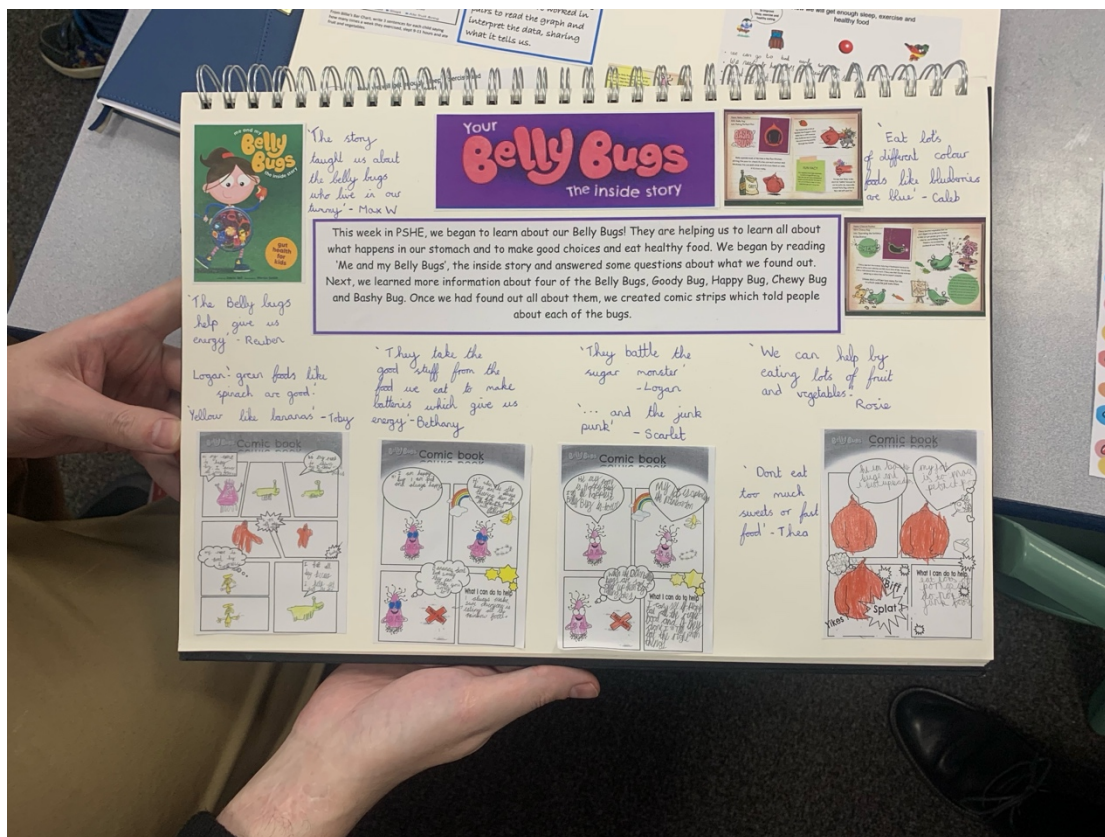
9. Do you think the children are now more interested in making healthy food choices? **Yes/No**

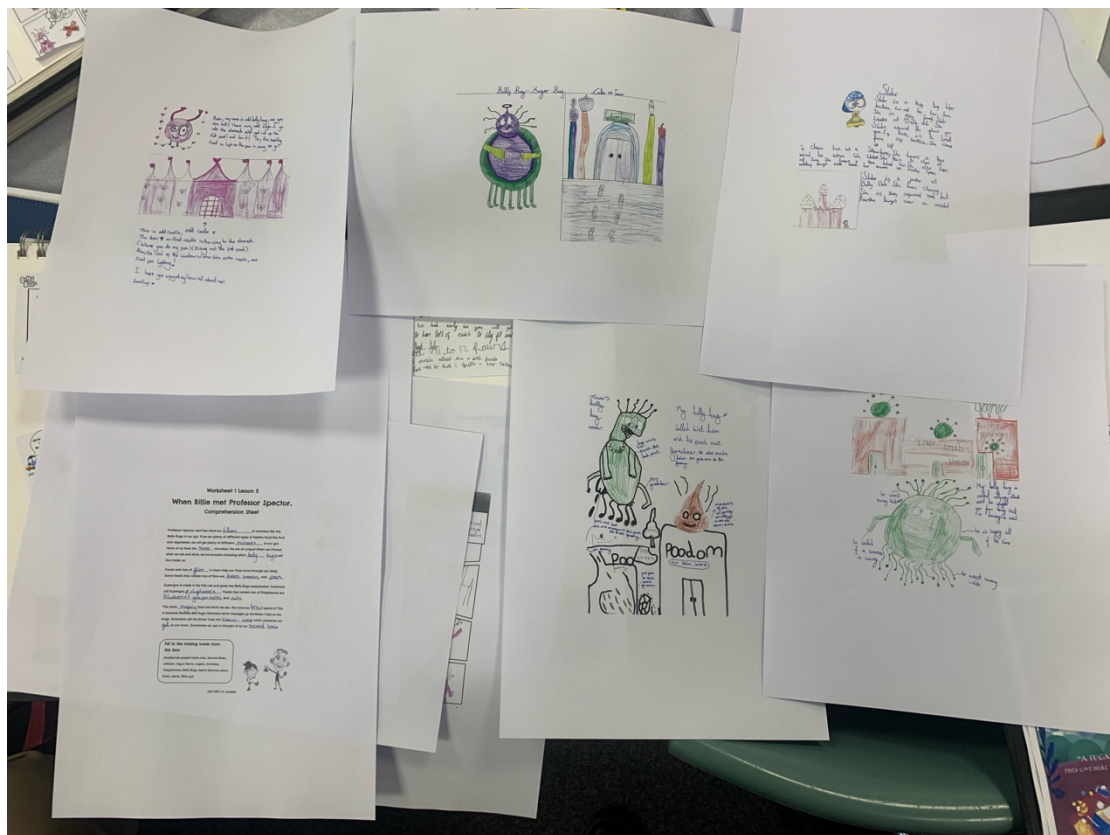
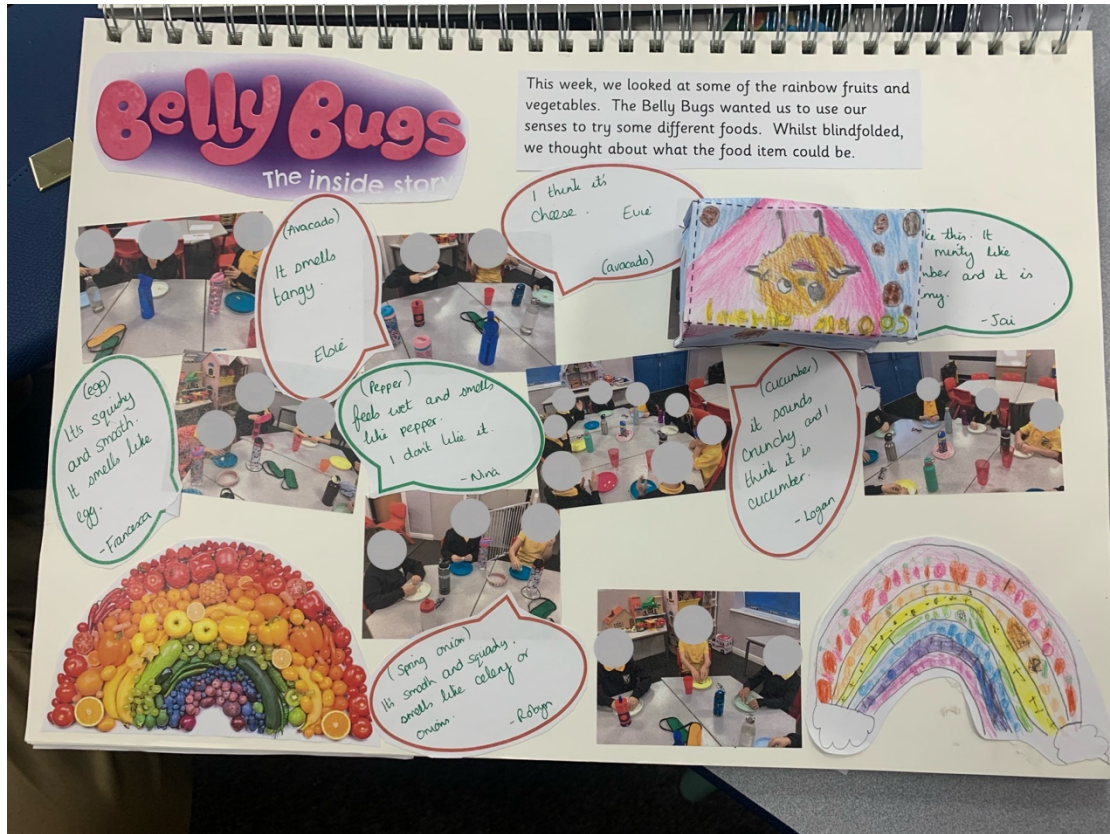
Comment: _____

10. How would you sum up the children's engagement with the Belly Bugs?

Comment: _____

Schools Belly Bugs Floor books





Pupil Emails

Read Email Favourite ☆

 From: Nel 

 To: Mrs Giles

Subject: RE:

Message:

Hello Mrs Giles

This week I have had frozen strawberries, raspberries and bluberries as I love them. I also ate red grapes, tomatoes, red apples and tangerines. In our house we always have some fresh fruits as we try to eat healthy.

Nel 

Hi,

As you know, we've been learning all about our Belly Bugs in school recently. You can have a look on this website to find out more <https://bellybugs.co.uk/>

Your homework task this week is to think about eating the 'Rainbow of foods'. I'd like you to reply to this email and tell me what foods you have eaten this week that are every colour of the rainbow! Try to eat something of EVERY colour! I look forward to reading your replies. You could even attach a photo of you eating your healthy food!

I can't wait to read your replies! Have a good week



Read Email Favourite ☆

 From: Leo 

 To: Mrs Giles

Subject: RE:

Message:

On the morning I had a apple at dinner time I had a banana at tea time I had a pear

Hi,

As you know, we've been learning all about our Belly Bugs in school recently. You can have a look on this website to find out more <https://bellybugs.co.uk/>

Your homework task this week is to think about eating the 'Rainbow of foods'. I'd like you to reply to this email and tell me what foods you have eaten this week that are every colour of the rainbow! Try to eat something of EVERY colour! I look forward to reading your replies. You could even attach a photo of you eating your healthy food!

Read Email Favourite ☆

 From: Xander 

 To: Mrs Giles

Subject: RE:

Message:

Good evening,

I would like you to know that me and mam took the car to Aldi and bought some different kinds of foods. We found red apples, a green avocado and some lemons which are yellow.



Belly Bugs Primary School Pilot

Evaluation Report

Belly Bugs is a registered trademark of Rumblings Ltd.

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