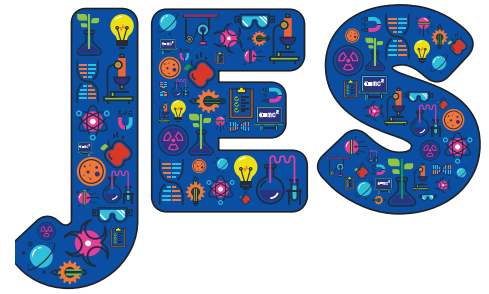# 'What a Coronacoaster!'

Navigating primary science education in primary schools during the ongoing COVID-19 pandemic: EYFS and primary school teacher perspectives on the affective and pedagogical impacts of the pandemic

● Amanda McCrory

Abstract

The literature in science education highlights the important role of children learning conceptual science via enquiry, through age-appropriate pedagogies, to engage them in active, collaborative learning opportunities. Given the recent closure of schools and the global pandemic of COVID-19, how have primary schools been providing science education for the children they serve? The perspectives of ten EYFS and primary school teachers from schools in North and East London, England were investigated. The purpose was to gain in-the-moment insights regarding the teaching and learning of science in primary schools during the ongoing COVID-19 pandemic, an understanding of the questions some primary-aged children have asked about the virus, and teachers' perceptions about the affective impacts of the pandemic on them.

Data were collected via semi-structured online interviews between April and May 2020, during the enforced lockdown in England. Analysis of the interview transcripts utilised the five phases of thematic analysis approach and grounded theory. Seven distinct themes emerged from this: (1) Active learning and scientific enquiry; (2) Challenges for teachers and for children's learning; (3) Assessment; (4) The status of science and expertise; (5) Viruses and staying safe; (6) Anxiety and sense of value as a teacher. Outcomes suggest that teachers have been planning for children's science education using activities to promote science understanding via active learning – where possible – as well as an ever-growing database of online resources; however, issues regarding the equity of children's access to these resources, as well as concerns regarding what children are actually learning due to challenges in assessment, are clear. In addition, the perceived elevation of the status of science in schools as well as an emphasis on science expertise have been highlighted as a positive outcome.

Children's questions centre around conceptual understanding of what viruses are, as well as concerns regarding keeping safe and family members dying; however, for some, robust school practices relating to hygiene and forums that promote children's agency to ask questions helpfully address these. Lastly, the uncertainties that have arisen from the effects of the pandemic – aptly referred to as a 'Coronacoaster' of emotions by one participant – highlight how the contradictory guidance given by the British Government, and the media as a whole, has impacted negatively on teachers' levels of anxiety and sense of value as a teacher in society.

Keywords: COVID-19 pandemic, primary science education, teacher perspectives, socio-scientific issues, pedagogy, mental health, wellbeing

Introduction

The COVID-19 pandemic has brought unprecedented challenges, profoundly affecting the lives of millions of people globally (WHO, 2020). The rapidly changing nature of this pandemic and of the scientific advice available is a challenge for governments and science specialists to negotiate, let alone the public. This pandemic has been and is increasingly affecting either directly (by contracting the virus) or indirectly (by dealing with the social, emotional and economic

impact of the virus) all teachers and their students, in all settings globally.

Science is neither separate from society nor indeed from politics: children do not exist in a vacuum. The prevalence and impact of media in all its forms, on every aspect of modern life, cannot be underestimated and thus children are constantly being subjected to issues in society that may concern them and, indeed, challenge their thinking (Woolley, 2010). Furthermore, children are exposed to many scientific issues and situations via their families, school and wider community, which might galvanise or indeed frighten them, with some educators arguing strongly that schools and teachers have a duty of care to address issues that have a negative effect on children. Arguably, there are many children who wish to take an active part in solving these issues (McCrory & Worthington, 2018).

This has never been more evident than with the recent meteoric rise of young climate activist Greta Thunberg and the very positive impact she has made, not only on the sphere of politics but also on the lives of thousands of young people (Asmelash, 2019), clearly demonstrated via the 2019 climate strike protests held around the world. Yet, one of the main reasons that children give for not choosing science as a career option is lack of interest, enjoyment and perceived non-relevance to their lives, as well as not having a clear understanding of the value that science can have in a future career (Palmer *et al*, 2017); *ergo*, there seems a paradox at play here, which should not escape science educators and those responsible for curriculum design.

To research the effect of COVID-19 on the science education that primary schools provide, as well as the health and wellbeing of teachers and students during this pandemic, is to take seriously a broad conceptualisation of the aims of education, one that includes attempting to ensure that students flourish (Reiss & White, 2014). Schools are also establishments in which subjects are taught to give students access to 'powerful knowledge', which otherwise they would be far less likely to be able to access (Young, 2018; Guile *et al*, 2017). Related to this, researchers and others have called for subjects to re-examine the bases of their curricula, including their aims, content and pedagogy and to consider each subject's contribution to epistemic literacy.

This move has been especially strong in the sciences (Harlen *et al*, 2010). The COVID-19 pandemic therefore brings sharply into focus many of the principal aims of science education.

Science pedagogy in primary schools and socio-scientific issues

The COVID-19 pandemic is an unparalleled situation that has clear implications for science education, one of the main aims of which is to foster *all* students' appreciation of the epistemology of science (Lin & Chan, 2017). The context offers students the opportunity to become scientifically literate and to understand the nature of science; to enable them to participate more effectively in civic and cultural affairs, as well as to make personal decisions and informed judgements regarding social issues using knowledge and understanding of scientific concepts and processes (Archer *et al*, 2015).

An education to promote epistemic literacy does not begin in secondary schools, far from it – children interpret and start to make sense of the world around them from the day they are born, establishing the foundations of their scientific knowledge and understanding of the world in their home and communities prior to formal schooling (Tunnicliffe, 2020). The National Curriculum for Science in England and Wales (2013) recognises this; it is no coincidence that science in the Early Years Foundation Stage (EYFS) Statutory Framework (2014) focuses on young children 'understanding the world' via learning about people and communities, the world and technology.

Children's natural curiosity about the world around them is then built upon in Key Stages 1 and 2 (ages 5-7 and 7-11), marrying the formal requirements of the National Curriculum for Science (2013) with children's everyday experiences and interests, using direct experiences as well as a myriad of pedagogical approaches such as storybooks to develop conceptual understanding (Russell & McGuigan, 2016). Therefore, high quality science education in English primary schools has the potential to '*provide the foundations for understanding the world through the specific disciplines of biology, chemistry and physics… ensuring that pupils understand that science has changed our lives with pupils being encouraged to*

recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena' (DfE, 2015: 1)*. Given the situation in which we all find ourselves with the pandemic and the stark effect that it is having on our lives, this statement from the Department for Education could not be more pertinent.

The COVID-19 pandemic is a socio-scientific issue of monumental proportion affecting all schoolchildren regardless of age and key stage. Socio-scientific issues are complex, socially relevant real-world problems, which are informed by science, but also include ethical and other dimensions (Sadler *et al,* 2016). Debates regarding the teaching of science via socio-scientific issues in primary schools have centred around concerns regarding the conceptual understanding of science needed by children to negotiate socio-scientific issues, as well as their place in the primary curriculum; the authenticity of socio-scientific issues being discussed and their age-appropriateness; and the pedagogical and science subject knowledge of primary teachers who teach these issues (Levinson, 2006; Evargarou *et al,* 2011; Sadler *et al,* 2019).

More recent research has focused on addressing these concerns by taking an additive rather than deficit model to primary science teaching. Strong recommendations have emerged for how primary schools can take a socio-scientific approach to teaching primary science and the positive impact that this can have on children's understanding of science concepts (McCrory, 2017), their scientific literacy, the development of their science capabilities for citizenship (Bull, 2015) and impact on their engagement in science (Hodson, 2013; Zeidler, 2014), by giving children an opportunity to address issues in science that affect and interest them (McCrory, 2017). Giving children the opportunity to generate their own lines of enquiry from their own questions promotes *a sense of agency* as well as encouraging a *diversity of opinions,* as children identify the interests and concerns of stakeholders in any given socio-scientific issue, thus uncovering the myriad of positions and opinions regarding the best solution for all involved. This in itself, argue Gormley *et al* (2019), offers children a chance to use and examine the quality of 'evidence and data' as well as the possible existence of bias to critique the arguments

presented, therefore providing children with opportunities to develop an understanding of the complexities of the issue at hand, as well as promoting an understanding of the nature of science.

In addition, research projects such as the Promoting Attainment of Responsible Research Innovation in Science Education (PARRISE, 2017) demonstrate how Socio-scientific Inquiry-Based Learning (SSIBL) can also emphasise *social justice,* as it promotes civic involvement in scientific research and innovation via activities in both primary and secondary schools. Despite the exciting and interesting research focusing on the teaching and learning of socio-scientific issues in primary schools, this remains nonetheless an under-researched area within the field of primary science education (McCrory & Worthington, 2018). The impact of the COVID-19 virus might very well change this, as teachers and curriculum designers respond to the learning needs of *all* children as they grapple with the reality of living a new 'normal' both during and after this pandemic. To deny children the opportunity to raise their questions about society in schools is to remove its role in education – information is important, but being able to understand and then use and apply that information is even more so (Woolley, 2010). When the in-the-moment information is complex, contradictory and even confusing, and the reliability of worldwide reporting on COVID-19 questionable, it is undeniably the role of research and education to support schools and communities to navigate this.

Purpose of research

Schools with their teachers constitute the core public service that makes a difference to the lives of their students. It is teachers who see students every day, form key relationships and, along with their families, know them best. Teachers require an understanding of their students' mental health needs and have a role in intervening when students manifest anxieties or other mental health issues (DoH/DfE, 2017). In 2019, Harding *et al* reported that better teacher wellbeing was associated with better student wellbeing and lower psychological distress. Given the range of emotions raised by COVID-19, and the relentless role that the media

have played in focusing on growing concerns regarding the impact of learning loss on a generation of children (Green, 2020), as well as the potential impact of school closures widening the disadvantage gap for children (Children's Commissioner, DfE, 2020), all teachers are being faced with questions from peers, students and students' families regarding the virus, which might very well be compounded by affective impacts of the mental health and wellbeing of teachers and students alike. This context must be antecedent therefore to important questions for all who are concerned with students' education and wellbeing.

Research questions

The purpose of this research therefore was to gain insights into how teachers and science leaders in primary schools have been providing science education for their students both pre- and during the enforced lockdown in England. In addition, this research sought to discover what questions children have had regarding the virus and how teachers have responded to these, to better understand the affective impacts of the pandemic on teacher wellbeing via the following research questions:

1. How do EYFS and primary school teachers report changing, if at all, the content of their teaching and/or their pedagogy to facilitate science education for their students during COVID-19?

2. What do EYFS and primary school teachers say have been the questions that students have asked in relation to COVID-19?

3. What do EYFS and primary school teachers say have been the affective impacts of the COVID-19 pandemic on them?

Research design

The interpretivist paradigm is the theoretical perspective that underpins this research given that *'Social actors negotiate meanings about their world therefore social reality consists of their attempts to interpret it'* (Briggs *et al*, 2012: 35). The interpretations of EYFS and primary teachers actually experiencing the COVID-19 pandemic

whilst providing science education for the students whom they teach are considered in order to explore phenomena from their individual perspectives (Gray, 2014). With the belief that social reality is constructed by people's thoughts and actions (Denscombe, 2014), a qualitative approach was therefore taken in this research. As each participant will be experiencing the pandemic differently, a wide range of perspectives was anticipated.

Sample and context

The perspectives of 10 EYFS and primary school teachers from schools in North and East London (7 female and 3 male from across EYFS, Key Stages 1 and 2) were investigated via a grounded theory approach. Two teachers were also school science leads and one teacher worked in a special educational needs setting (nursery to 19-year olds). This approach was taken in order to derive a general abstract theory of a process, action or interaction derived from the views of participants (Creswell, 2018), as well as to explain the phenomenon being studied (Birks & Mills, 2010).

Data collection and ethics

Qualitative research often seeks to obtain deeper insights into practices of specific samples rather than to discover generalisable patterns of larger data sets (Gray, 2014). Purposive sampling was used to select samples of teachers who were most likely to produce data relevant to EYFS and primary science education and who were accessible for interview during the pandemic (Cohen *et al*, 2013).

Accessible information sheets detailing the aims of the research project were e-mailed to a network of schools in North and South London with which the researcher had prior connections. Prior to this, ethical approval was sought and granted by UCL Institute of Education and participants were reassured of this. Potential participants were informed of the voluntary nature of taking part and that they were under no obligation to do so. The research purpose, methods and possible uses, in this case in a journal article, were made clear to the participants. Participants were also assured of anonymity – that neither they, nor their schools, would be identifiable, as all data collected would be anonymised and kept in line with GDPR policy as prescribed by UCL Institute of Education.

Participants were then asked to sign a form giving informed consent and reassured that they could withdraw at any time without fear of reproach (BERA, 2018).

To ensure confidentiality, all participants undertook a 1:1, face-to-face, semi-structured interview via Microsoft Teams, which lasted approximately one hour and was recorded. In addition, the researcher took notes throughout each interview, recording data via coded names for each participant to ensure anonymity (Cohen *et al*, 2014). Semi-structured interviews were chosen based on their flexibility, allowing the researcher to probe new questions spontaneously when a participant gave an unexpected or interesting answer (Gray, 2014). Participants were given the option of switching their camera on or off during the interview, if they felt this would make them more comfortable during the process. Interview questions were sent to participants prior to interviews taking place to ensure ongoing ethical consent (BERA, 2018) and to give participants time to consider if there were any questions that they would like to omit from the interview.

Participants were reminded at the beginning of each interview that they did not need to answer any questions that they felt to be inappropriate – this was especially important given the nature of some of the research questions focusing on the affective impacts of COVID-19. In addition, participants were reassured that they could take breaks from the interview if they needed to; given that all participants were interviewed whilst at home during the lockdown, with many attending to their families and children, recognition of this was important given the unusual social conditions that a lockdown brings, and this option as a course of action served to reassure participants and put them at their ease.

Data analysis
Video recordings and interview responses were transcribed and then coded for themes using inductive thematic analysis, as this was conversant with grounded theory (Braund & Clarke, 2006). Furthermore, the five phases of thematic coding analysis as proposed by Robson (2011) was adopted. Initial coding and categorisation of data is a way of identifying pertinent words and labelling

them accordingly (Birks & Mills, 2010). The transcripts from each participant were coded to illuminate significant and repeating words or themes via clusters. The data were then analysed again to enable the researcher to actualise and identify the core themes emerging from the data (Birks & Mills, 2010). Themes that were not consistent with patterns generated from the data were still acknowledged (Creswell, 2018).

Findings and discussion
From the thematic analysis, six main themes emerged in relation to the research questions posited: (1) Active learning and scientific enquiry; (2) Challenges for teachers and for children's learning; (3) Assessment; (4) The status of science and expertise; (5) Viruses and staying safe; and (6) Anxiety and sense of value as a teacher.

Research question 1: How do EYFS and primary school teachers report changing, if at all, the content of their teaching and/or their pedagogy to facilitate science education for their students during COVID-19?

❐ *Theme 1: Active learning and scientific enquiry*

All participants highlighted the importance of active learning opportunities for children when learning about science and that this was an important and embedded part of their pedagogy for science teaching – in particular, children learning science via enquiry to develop their conceptual understanding (Russell & McGuigan, 2016; McCrory, 2017). Early years practitioners specifically talked about their concerns for not wanting children to '*sit in front of computers all day long'* (Participant 2).

Figure 1 (see p.11) demonstrates this: activities are based around children working with an adult and child-initiated activities where possible.

All participants reported that they were planning weekly activities based around scientific concepts from the National Curriculum (2013), via activities such as cooking (baking) and horticulture, and nature walks for children to do when they went out for exercise during the lockdown – using process skills such as '*observation, recording, asking*

Figure 1. Example of EYFS Home School Learning – a week of activities for children to do at home, centred around the EYFS curriculum (author: Participant 2).

Here are some home learning activities:

1. **Explain that you will be spending time at home for a while.** The Government has decided that the safest place for everyone to be is at home. So this means that they will not see their teachers or friends at school for a little while but they will still do some school work at home. Try to make a basic routine for them. We have a suggested one but edit and amend to suit your needs. https://theautismeducator.ie/wp-content/uploads/2020/03/The-Corona-Virus-Fr ee-Printable-.pdf Ask if they have any questions.	2. **Can you make an alien puppet?**
3. **Discuss what COVID-19 is** Here is a great resource which explains what it is in child friendly language. Stress that currently most people are at low risk of catching the virus, and even if they do most people's symptoms are not serious. https://www.mindheart.co/descargables Ask if they have any questions. Reassure them that they are in the safest place.	4. **Listen and learn the planet rap. Can you make your own planet song?** https://www.youtube.com/watch?v=mVMTDjKDbws
5. **Discuss handwashing** Explain why it is important for everyone to wash their hands and how it keeps us healthy. Here is a catchy handwashing video. https://www.youtube.com/watch?v=825gGELjB98 Can you make your own hand washing video and upload it to tapestry?	6. **Can you make a junk model alien?**
7. **Discuss having a worry** Watch Miss Butler reading *Ruby's Worry*. Ask if the children have any worries. Try to rationalise some of their thoughts and feelings reassuring them that currently most people are at low risk of catching the virus, and even if they do most people's symptoms are not serious. Talk about a worry you have had and share it with your child.	8. **Pick your two favourite planets and listen to them from Gustav Holst - The Planets** https://www.youtube.com/watch?v=UmOTMkoCCkM Once you have listened to your two planets once listen to each one again, this time drawing a picture in response to the music. Is the music fast or slow? How does it make you feel? Do they use quiet or loud notes?
9. **Play Snakes and Ladders with your family.** If you don't have a printer make your own Snakes and Ladders board. You can use a coin as a counter or make your own one from paper. If you don't have a dice at home use an online dice. https://www.twinkl.co.uk/resource/t-n-668-snakes-and-ladders-1-20	10. **Can you find out about what astronauts wear and make their space suits?**

PE - Please do one activity a day and practise your favourite two on the final two days.

Joe Wicks Activity 1 https://youtu.be/d3LPrhIov-w	Cosmic Yoga - Space Picnic https://youtu.be/d85dw-AcAaU	Go Noodle - Banana Banana Meatball https://youtu.be/BQ9q4U2P3ig

questions, measuring, classifying' (Participant 6). Model-making, listening to songs, reading storybooks and then writing scientific reports, as well as watching videoclips online – using the Internet to research 'scientists and their work' – (Participant 7) were also high on the agenda. Participant 2 stressed that she started to record videos of herself undertaking science experiments to share with the children in her EYFS class at home, because she wanted to ensure that it was 'age appropriate', linked to what she knew 'were the interests of the pupils in her class, appropriate to her pupils' learning needs' (Pollard et al, 2014), and she felt that her pupils would be more likely to engage with the video, 'watch, listen and learn', if she was in the video herself, as they 'knew her and could relate to her'.

Online resources such as Kitchen science (see Figure 2) were highlighted 'as incredibly helpful', as Participant 8 stated: 'This resource has been a lifesaver. It has really clear instructions, including safety information and, most importantly, explains the science and has discussion points so I didn't need to add any more questions for the children to discuss at home. Everyday materials found in the home were the focus for resources. Also, they have links to videos on the Science Museum, which use cartoons and historical objects with explanations to show how they were used'.

❑ Theme 2: Challenges for teachers and children's learning

Participants reported that one of the biggest issues encountered was time constraints and working longer days; this was compounded if participants also had their own children to look after or vulnerable family members to take care of. Although planning generally seemed to be shared across year groups, and participants were, in the main, working from home (only 2 participants reported attending school to teach key workers' children), participants felt that everything took so much longer to put together. Participant 7 noted that 'When writing instructions for activities, it is just taking absolutely ages to write detailed instructions for parents. In my school we e-mail everything directly to parents with all resources, so putting all of the resources together takes time'.

In addition, trying to ensure that what was being planned met the needs of children, taking into account the 'demographic of the children being taught' (Participant 3) was also time-consuming. Participant 7 added: 'I work in a special school. I have 7 children who are aged between 4 and 7; they are all pre-verbal and working within the EYFS framework. Their needs are social and emotional and so interaction between me and them is very difficult to get across via technology. There needs to be an exaggeration of how you present yourself; you need to be lively and this has been difficult to maintain.'

Figure 2. Kitchen science activities – Science Museum London.

Children's access to schoolwork via online platforms was also a concern, especially for those children who are disadvantaged, and there were concerns when planning activities whether children would have '*the basic resources at home to undertake the activity*' (Participant 1), reflecting the claims made by Green (2020) that COVID-19 has potentially widened the disadvantage gap for children. Although resources such as additional laptops and 4G Internet for disadvantaged children were promised by the Government (DfE, April 2020), Year 10 (age 15) and children aged between 0-19 with a social worker were prioritised, with primary schools only very recently being able to access this resource. Participant 9 noted that, to try and combat this, parents in his school were encouraged to pick up a weekly activity pack for their children: '*This has not been ideal but the school undertook a risk assessment in line with government policy on social distancing during the lockdown, which meant that some children were receiving schoolwork at least.*'

❏ *Theme 3: Assessment*

Participants reported that that they were concerned with the element of the 'unknown', meaning that it was difficult to gauge whether or not learning (in any form) was happening at home and what indeed that looked like, even with routines in place such as engaging with and using 'Tapestry' https://tapestry.info/; 'Google Classroom' https://edu.google.com/products/classroom/?modal_active=none#%2Fready-to-go; or 'London Grid for Learning' https://www.lgfl.net/default.aspx.

Participants stated that schools were able to see if pupils/parents were logging on to access resources or upload videos/pictures of their children's home-school activities, but that uptake of this was low, on average around 30%, and responses were varied, '*sometimes just photos with no annotations*' (Participant 5), and that there was no directive from leadership to undertake assessment of what children were doing at home during this period other than when participants spoke to parents/children during weekly check-ins. Therefore, participants expressed concerns about what will happen when students return to school in September, given the inequities at play regarding children's access to school planning and the prioritisation of maths, English and phonics.

❏ *Theme 4: The status of science and expertise*

25% of participants noted that, for the first three to four weeks of lockdown, maths and English activities were prioritised, followed by other areas of the curriculum, reflecting ongoing concerns regarding the status of science in primary schools. This perception was reinforced by Participant 6, whose school has been using the Government recommended Oak Academy resource https://www.thenational.academy/ and who was frustrated that science was stated as a non-core subject, reinforcing the perception that science in primary schools had lost its status (Wellcome, 2014).

Science leads also reflected that there was a positive outcome for them in relation to the monitoring of science in school. They could respond in real time, daily, to queries about science from staff and they could easily see online what was being planned for pupils. There seemed to be a more collaborative approach to the planning of science, and online CPD opportunities for staff regarding the teaching and learning of science, as well as scientific knowledge, was made available and, on the whole, welcomed, with staff encouraged to engage. In this case, Headteachers were supportive of staff finding time each week to undertake CPD activities that would impact on their practice; however, as Participant 7 noted: '*Yes, we are given time each week for CPD but we are expected to keep a log and evidence what we have been doing, which in itself is not supportive. The micromanaging seems to me to be counter-productive and not necessary, especially at the moment – we have enough to cope with*'.

Being an 'expert in science' was also highlighted as incredibly important by 60% of participants, reflecting research by the Wellcome Trust (2014). As Participant 6 noted: '*My background in medical biochemistry and love of reading science research papers came into play. Everyone came to me to ask my advice and I was easily able to explain to the children, pre-lockdown, what a virus is and how it spreads, by drawing diagrams on my whiteboard.*' Participant 2 noted that, although she had no background in studying science at a higher level, '*I have GCSE combined science*'; it was her love for science and engagement with the news and reports from research such as that from the World Health Organisation that meant she could take the lead at

school and discuss the situation of the pandemic as it developed. This, she noted, gave her a sense of validation and value in the school community, but also was really important because, at the time, her school did not have a science lead. This reflects the arguments made by McCrory and Worthington (2018) that being a successful teacher of science in primary schools does not necessarily mean that teachers need to have science degrees, although this is advantageous as we can see from the comments made by Participant 6: a passion to learn and engagement with science, to relate it to the real world and our lives, and to keep up-to-date with science subject knowledge as well as pedagogical content knowledge for teaching science effectively, are what matter.

Research question 2: What do EYFS and primary school teachers say have been the questions that students have asked in relation to COVID-19?

❏ *Theme 5: Viruses and keeping safe*

Thinking back to just before the lockdown started and when children were in school, participants reflected on the questions that the children were asking. It would seem that, on the whole, children were full of questions about the virus, demonstrating 'epistemic curiosity' (Chin & Osborne, 2010): from 'what it is, where it came from, how it spreads, how it grows, whether it is alive or dead, can anyone catch it'; to questions that demonstrate inconsistencies between pupils' knowledge and new knowledge, which engender 'cognitive dissonance' and, at times, concern for family members: 'Mum and dad are old so will they catch the virus and die?; Will the virus just get bigger and bigger and roll down the road after us?' (Festinger, 1957). It is clear that questions raised by pupils activate their prior knowledge, focus their learning efforts, and help them to elaborate on their scientific knowledge, but also demonstrate how they are trying to assimilate all that they are hearing about the virus.

Participant 6 added that, as a science lead, she led training with staff who needed support to understand the biology of viruses but also how to appropriately teach about them to primary-aged children. She also reflected that '*Taking a socio-*

scientific approach to teaching children about viruses and this pandemic would have been really effective and would fit in with the curriculum. But this approach is not embedded in my school; it is something we could look at when the children return to school.'

It is also clear that children's anxieties and concerns about death and dying were at the forefront of their questions, with participants noting that children were given plenty of opportunities via circle time, reading stories and question time in lessons to ask questions. Woolley (2010) advises that, although these types of questions might make teachers feel awkward, it is important to address them honestly and acknowledge that we don't have all the answers; if this indeed is the case, giving reassurance informed by the facts is key, as is listening. It is important to acknowledge the children's emotions and help them to feel safe and secure. Participant 6 noted: '*As a teacher we have a duty of care to our children to discuss issues even if they make us feel uncomfortable*'. This sentiment was reflected by all participants.

Participants also noted that children were concerned with how to stay safe and not catch the virus. Participant 2 stated that '*Embedded hygiene practices really helped here. I have focused on hand washing in class, using tissues to wipe and blow noses and put straight into the bin so washing hands for longer was just an extension really of what the children are used to.*'
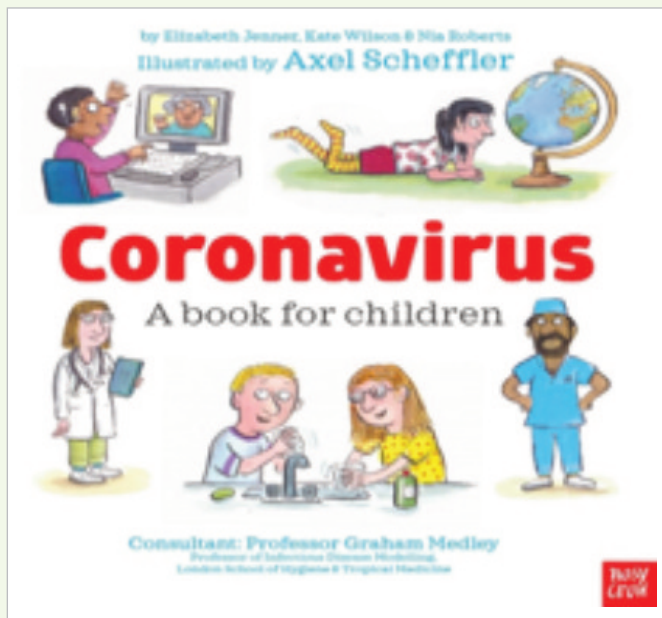
Participants also used activities such as 'Glitter germs' (https://www.parenthub.com.au/kids/glitter-germs/) or 'Pepper water' (https://www.youtube.com/watch?v=uvG6uBq-dVo), which both demonstrate how important it is to wash hands thoroughly, as well as showing how creative primary teachers of science are (Cutting & Kelly, 2014).

All participants reported that they were grateful to be able to access free online resources and books for children to read at home that discussed the science of COVID-19 in child-friendly ways, and which had positive and diverse representations of scientists (Figure 3) and addressed children's worries (Figure 4) (see p. 15).
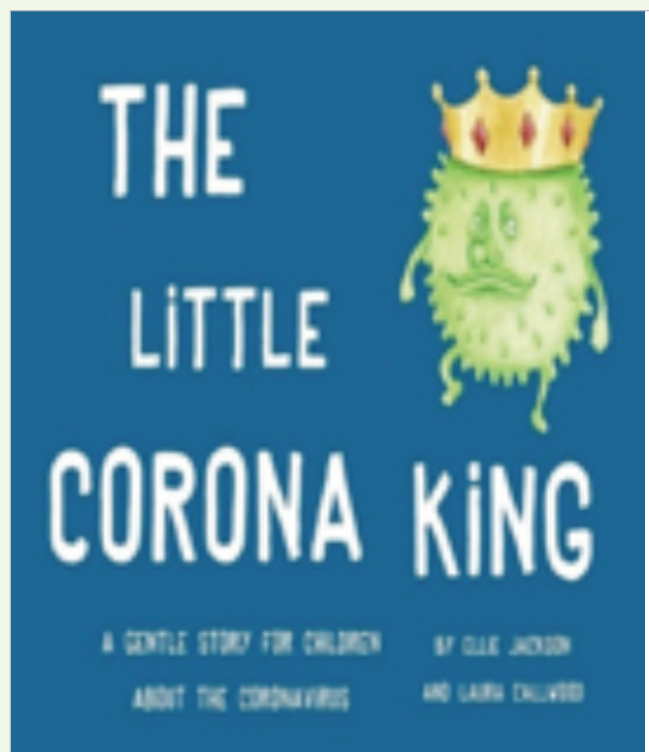
Figure 3. *Coronavirus – A Book for Children* by Elisabeth Jenner, Kate Wilson and Nia Roberts. https://nosycrowcoronavirus.s3-eu-west-1.amazonaws.com/Coronavirus ABookForChildren.pdf?fbclid=IwAR0j-1x R1CapoWj5gG0cVgMNAk3Ma3f7Suim3AYcggC a2shvHyYYIS7Qbc

Figure 4. *The Little Corona King* by Ellie Jackson and Laura Collwood. https://littlecoronaking.com/

Research question 3: What do EYFS and primary school teachers say have been the affective impacts of the COVID-19 pandemic on them?

❏ *Theme 6: Anxiety and sense of value as a teacher*

90% of the sample reported varying degrees of anxiety in response to the 'unknown' nature of the virus and, for those who revealed that they had existing mental health conditions (40% of the sample), they reported that social distancing and lockdown exacerbated their conditions. Long working hours, difficulties in sleeping, ruminating and overthinking, have resulted in '*hypervigilance*' – feeling in a state of increased alertness – for some, and a lack of access to NHS services added to this, although there was recognition that the service that some GPs were offering via telephone or video call consultations (Health Service NHS X: https://www.nhsx.nhs.uk/) was supportive and a positive response to the needs of people during the pandemic.

A small percentage of the sample (20%) noted that they lived alone. This created, for one participant, a sense of '*isolation*' and '*a feeling of being disconnected from colleagues and the world*' but, for the other, '*having time to myself, peace and quiet to work without the rush of travelling to work – or fear that I will catch the virus on the tube, has been a comfort*'. All participants did note that they felt their Senior Leadership Team had been very supportive of their mental health and wellbeing; checking in weekly with them as well as providing links to online support and local authority services. Participant 2 added:'*My school already provides a weekly therapy session for all staff, as they recognise that there has been a rise in mental health needs of teachers; but during this time, the school therapist has kept in even closer contact with all staff, which has been reassuring.*'

This reflects the outcomes of research by Jerrim and Allen (2020), which focused on the wellbeing and rise in mental health needs of teachers and found that 1/20 teachers in England are reporting a long-lasting mental health problem. They noted that, although there was an increase in mental health issues being reported and treated amongst teachers, they argue that this could be because

teachers are more willing to talk about and seek help for such issues. However, they also note that – similar to the commitment that has been made to track teachers' workloads – more needs to be done to monitor and improve the mental health and wellbeing of the teaching profession.

In addition, participants felt that Government guidance for schools has been '*contradictory and unhelpful'* and that there '*was a middle-class assumption that schools had more resources than they actually did'* (Participant 9). Negative media surrounding the role of teachers has also been a frustration: Participant 5 noted that '*In a system where I already feel that my professionalism has been de-valued, reading articles and listening to reports that vilify me and my colleagues has been really hard to take'*. This echoes recent research by the *TES* (Lough, 2020), which found that teachers and staff in schools feel that they have not been listened to by the Government during this time.

Limitations of the research

Limitations of this study could be attributed to the sample size, but this research makes no claims to 'generalise' findings to the teaching population (Gray, 2014), taking instead a qualitative approach to illuminate the *in-situ* experiences of ten EYFS and primary teachers during the COVID-19 pandemic. It is also important to recognise that not all the themes discussed necessarily reflect all the participants' views, which could account for another possible limitation. Thematic data analysis was undertaken strictly using the approach as advocated by Robson (2011), in light of the literature and research questions, and this rigorous process served to negate, as much as possible, researcher bias (Braund & Clarke, 2006).

Conclusion

In conclusion, during this very challenging time, it is evident from this research that planning for the ongoing science education of primary-aged children has not only been merely possible, but has utilised – where possible – sound pedagogical strategies akin to effective primary science provision. It is also clear what some of the benefits of using quality online materials, about science in general and the COVID-19 virus in particular, can bring to primary-aged children learning science. It

is heartening to see that the status of science, school science and its connectedness to our lives has been highlighted positively. Children are interested in real-life socio-scientific issues, and further research examining effective pedagogical approaches to teach pertinent authentic issues in science, in an age-appropriate way across the primary age-range, is needed – if nothing else, the COVID-19 pandemic has highlighted how important this is.

In addition, issues with assessment and accessibility to learning opportunities for *all* children are a real concern, as is the additional pressures that teachers have been under, and continue to experience, during this pandemic, which has had an impact on their mental health and wellbeing, although support from senior leadership in schools regarding this has been and is very welcome. Most notably, given that there has been a longstanding issue with recruitment and retention in teaching, the frustrations and anger expressed by some here at being vilified by the media and Government, and how this impacts further on what is seen as the de-professionalisation of teaching, are important to highlight; further research is needed to gauge deeper insights into what the current issues are and how these can be addressed. Given also that parents have just spent the last four months at home with their children as *de-facto* teachers, further research would also be fruitful to gain their insights into the value that teachers have given during the COVID-19 pandemic and, more generally, bring to their children's science and wider education.

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