CHILDREN'S WORKING THEORIES ABOUT COVID-19 IN AOTEAROA NEW ZEALAND

Kahuroa, R., Mitchell, L., Ng, O., & Johns, T. (2021). Children's working theories about COVID-19 in Aotearoa New Zealand. *European Early Childhood Education Research Journal, 29*(1), 1-15. https://doi.org/10.1080/1350293X.2021.1872672

Raella Kahuroa, Linda Mitchell, Olivia Ng and Terina Johns

Abstract

As the COVID-19 virus has spread worldwide, much attention has been paid to its impact on the health and wellbeing of adults, with less attention to how the virus has impacted on young children. This article draws on documentation and video data from a kindergarten in Aotearoa New Zealand. It discusses the working theories of 4 year-old children whose teachers encouraged them to draw, construct images, explain and tell stories about their experiences, ideas and feelings about the virus. A main argument is that children's working theories about the virus, knowledge of the virus and sense of personal control over keeping themselves safe developed over time. Arts-based and storytelling pedagogy were central in enabling children to communicate with others, to be understood themselves and to extend their own understanding.

Introduction

The COVID-19 pandemic that spread worldwide from early 2020, has had a major impact on the lives of families and young children (Pascal, Bertram, Cullinane, & Holt-White, 2020). In Aotearoa New Zealand, early childhood education (ECE) services have played a crucial role in responding quickly to support workers, families and children when the virus spread to this country. They provided education and care for children of essential workers during lockdowns, communicated with families and staff, offered distance learning opportunities when children were unable to attend ECE, and brokered access to social, health and financial support for families who needed it. Attention was paid to staff wellbeing and professional development. Teachers made the ECE environment safe for children's return (Mitchell, Meagher-Lundberg, & Wells, 2020). Within this Aotearoa New Zealand context, while the actions of government have been well documented on official sites, and impacts for adult wellbeing have been researched (Ministry of Health, 2020), less attention has been paid to the experiences of children and the role that ECE can play in supporting them to make sense of the events that have occurred during COVID-19 and the changes to their lives. This article discusses the working theories of young children, who were encouraged by their early childhood teachers to express and explore their experiences, ideas and feelings about the COVID-19 virus through arts, drawing, storytelling.

Government responses to the pandemic in Aotearoa New Zealand

COVID-19 was first identified in Aotearoa New Zealand in January 2020. By March, when several "clusters" of cases had been identified, the government introduced an Alert System designed "to manage and minimise the risk of COVID-19 in New Zealand" (New Zealand Government, 2020). The aim was to act quickly to eliminate COVID-19. During 2020, Alert Level 4, in place from 25 March to 27 April, was a "Lockdown" where people were instructed to stay at home in their "bubble" of designated members (usually family) other than for essential personal movement. All ECE services were closed, although the government

permitted home-based carers to provide care for children of essential workers. Alert Level 3 (27 April to 13 May) was a restricted Lockdown. The "bubble" could be expanded slightly and ECE services were able to open for children of parents who had to go to work and had no other arrangements, and for essential workers. All children were to have access to distance learning. At Alert Level 2, (from 13 May to 8 June) all early childhood services were able to open, with strict hygiene requirements and plans to transition children back. Alert Level 1 (from 8 June to 12 August) was portrayed as "business as usual" for ECE services but with continued hygiene and cleaning requirements. Further Alert Levels were implemented in August (Level 3 for the city of Auckland from 12 to 30 August (where research for this article was undertaken) and Level 2 for the rest of the country. Since then, the country has moved down Alert Levels, with Auckland moving at a slower rate, until from 8 October, the whole country is at Level 1. Young children over this time experienced very altered lives, living in a "bubble" with only those in their household, having severe restrictions on their movement and being unable to attend ECE.

Government advertising and some events occurring over this time were observed closely by children in our study, and are referred to in their drawings and discussions. All government advertising included a yellow and white design with the logo 'Unite against COVID-19'. Practices recommended by government were staying in your bubble (mandatory during lockdowns), washing your hands for 20 seconds, coughing/sneezing into your elbow, and wearing a mask (from August, mask-wearing became mandatory on public transport for Level 2 and above). From the first Alert Level and on most days, a government politician (usually Prime Minister Jacinda Ardern) and a top Ministry of Health official (usually the Director General of Health, Ashley Bloomfield) made a televised announcement reporting on any new COVID-19 cases, whether these were transmitted from within the community or came from other countries and other matters. They washed their hands as they entered and each stood at a separate podium in parliament building, backed by the Aotearoa New Zealand flag (a red, white and blue Union Jack on a blue background with four stars of the Southern Cross). Another practice, paralleling a worldwide initiative, was for teddy bears to be put in house windows so that in their permitted neighbourhood walks during lockdowns, children could go on a 'bear hunt'.

Research context

This article is based on pedagogical work and research undertaken from May to August 2020 and again in September 2020 during the Alert Levels 2 and 1 in a community-based kindergarten when most of the children had come back to the centre. The kindergarten is located in Auckland, Aotearoa New Zealand's largest city, and licensed for 40 children aged between 2 and 5 years in an ethnically diverse community. Many families are immigrants from China and other Asian countries. The centre has developed a localised curriculum that weaves together faith, an Enviroschools kaupapa (philosophy), and the principles of Reggio Emilia. Its aims include supporting children as active, sensory learners and encouraging their exploration, sense of wonder, imagination, collaboration, critical thinking, theorising, dialogue, reflection, negotiation and problem-solving.

Like all early childhood centres, this kindergarten implements Te Whāriki, the national early childhood curriculum of Aotearoa New Zealand. Created with sector-wide consultation, Te Whāriki takes a sociocultural approach, where the importance of family, community and local context are foregrounded, and where social, emotional and cultural learning, as well as academic learning, are recognised. Te Whāriki was published in 1996 (Ministry of Education, 1996), with a revision published in 2017 (Ministry of Education, 2017).

Working theories are described in Te Whāriki (2017, p. 23) as follows:

> *Working theories* are the evolving ideas and understandings that children develop as they use their existing knowledge to try to make sense of new experiences. Children are most likely to generate and refine working theories

> in learning environments where uncertainty is valued, inquiry is modelled, and making meaning is the goal.

Hedges defines working theories as "creative links between existing and new experiences" that strengthen children's knowledge and understanding of the world around them, including in areas of deep interest to them (Hedges, 2014, p. 38). These strengthening connections make working theories a sense-making venture between experiences and understanding (Peters & Davis, 2011). Working theories are the explanatory connections between experiences and understandings that children use to make sense of the world (Hedges, 2011), revealed through children's interactions, and through their self-narratives as they theorise their experiences (Hedges & Cooper, 2016). As the word "working" suggests, working theories are not about obtaining absolute knowledge (Hargraves, 2014). Instead, these theories are tentative, prone to frequent revision and testing, providing children with the opportunity to refine or even reject their preliminary theories (Hedges, 2014). Working theories have been studied in various contexts in Aoteroa New Zealand (Areljung & Kelly-Ware, 2016; Hargraves, 2014; Hedges, 2011, 2014; Hedges & Cooper, 2016; Peters & Davis, 2011), and continue to be positioned as one of the two principle outcomes of Te Whāriki (Hargraves, 2014; Hedges, 2014).

Methodology

The theoretical framework underpinning the project is the idea of "funds of knowledge", described by Moll, Amanti, Neff, and Gonzalez (1992) as "historically accumulated and culturally developed bodies of knowledge and skills essential for household or individual functioning and wellbeing" (p. 133). The concept of funds of knowledge acknowledges the richness of experiences associated with community and family participation (Chesworth, 2016). Gaining understanding of "funds of knowledge" is especially valuable in working with immigrant children because it enables teachers to appreciate the resources, skills and knowledge that these families possess, and to harness these in pedagogical work. Furthermore, Joves, Siques and Esteban-Guitart (2015) demonstrate the value of complementing a "funds of knowledge" approach that focuses on household knowledge and skills with a "funds of identity" approach that recognises the interests, knowledge and skills of children themselves. "Funds of identity" may be derived from family funds of knowledge and other experiences that are significant to the child. In our research, teachers found out about both funds of knowledge and funds of identity for particular children, using arts-based and storytelling methods.

We have also used the framework of working theories to unpack children's sense-making experiences around COVID-19. Working theories are made visible through the portions of dialogue that are then analysed to identify how children are making meaning. In some of the data, this sense-making takes place collectively, with a teacher and small groups of children. In other data, the work is comparative, as the child's theories are compared between the data collected after each of the two lockdowns.

Research ethics approval was obtained from the University of Waikato Faculty of Education research ethics committee, and consent was obtained from the children's parents. Permission included gathering examples of children's work, excerpts from teacher documentation, photographs, and transcribed recordings of small group discussions. Children were told about the project and invited to take part and give their assent.

All the child participants were four years old at the time the data was collected. The selection of participants on this occasion was confined to those children who had, firstly, participated in both the first and second phases of data collection, and secondly, also chosen to share stories about the lockdown on both occasions. These criteria resulted in a small pool of eligible

participants, most of whom were included in this article. The participants' work used in this article was typical of stories shared in either phase.

Given the unique stresses of COVID-19, teachers worked closely with children to both hear their stories and to support any distress that might have occurred through the telling of those stories. No distress emerged in conjunction with this paper, likely supported by a low infection and death rate in Aotearoa New Zealand. If any child had become upset, the data collection for that group would have immediately ceased, enabling the teacher to support the child.

Methods

Two teachers participated as teacher researchers and co-authors, Olivia Ng and Tina Johns. They worked separately with small groups of children using arts-based and storytelling methods to elicit children's views and experiences of COVID-19. In the first phase, (June to August 2020 when children returned to kindergarten after the first lockdown), teachers documented children's discussions and photographed their artwork.

In the second phase (September 2020), after the second lockdown, the teachers continued unpacking children's thinking using the same methods. Videorecorded data captured Tina and Olivia revisiting the children's work with them, with the discussions transcribed. This video data was collected by one of the academic researchers, Raella Kahuroa. Tina used the story stones again, while Olivia revisited pictures and stories with children that they had previously drawn and told.

The method for each process is discussed next.

First method: Story stones for storytelling

In the first phase, teacher researcher Tina Johns created story stones, illustrating emotions, events and images likely to be experienced by many children during the Level 3 and 4 lockdown periods, and including unfinished statements/ questions. Drawings included going for walks, riding a bike, animals, baking, other children, toys, family, a love heart, and a teddy bear in a window. Drawings of emotions were of facial expressions of angry, happy, sad and excited. Unfinished statements included 'What I did while I was away from kindy', and 'Sometimes I feel". .' (Figure 1). She then used these story stones as catalysts for discussion with small groups of children. The aim was to enable children to express their working theories, emotions and understanding of the times through storytelling. The discussions were documented and photographs taken.

Figure 1. The original story stones created by the teacher

In the second phase, after children returned to the kindergarten following the Auckland Level 3 lockdown in August 2020, teachers discussed what had been happening with the children and decided to add further story stones to the collection and remove some stones. This time, small groups of children were involved in the process of preparing and creating the stones, as well as contributing to the theme and picture each new stone would represent. These new stones included drawings depicting a face mask, a shopping trolley, the COVID-19 yellow and white stripes, a magnified drawing of the coronavirus, rainy weather (since the second lockdown occurred during winter), the Aotearoa New Zealand flag, and an illustration of the Prime Minister, Jacinda Ardern, addressing the country on TV. After some discussion about their emotions over this time, children agreed that, in addition to the previous feelings, they should also add a stone depicting a "silly face".

Second method: Drawing, loose parts play and storytelling

Teacher researcher Olivia Ng used children's arts-based approaches and storytelling for researching with the children about their understanding, funds of knowledge and working theories of COVID-19. She worked in the studio (a separate space in the kindergarten, with plentiful art supplies and work table) with small groups of children, inviting them to draw pictures in response to her open-ended questions. Questions included asking why children had to stay home in their "bubble" during the lockdowns, what they did in their bubbles, what the virus looks like and does, how they feel about the virus, and what they notice in their community. Children went back and forth between verbal dialogue and representations. After the second lockdown, the children were offered the opportunity to rethink their earlier theories.

Drawing was central to the children's investigation, but it was also a jumping-off point for work with other art media, such as painting, clay sculpting and using "loose parts", which uses found objects and materials to create artwork (Vecchi, 2010).

Children's Working Theories about COVID-19

Life in lockdown created unexpected life experiences for children and their families. After each lockdown, the storytelling and arts-based approaches supported children to make sense of time spent in their "bubble" with families. This sense-making work enabled children to share a variety of working theories about the virus and their home experiences. In this article, children's working theories about COVID-19 are illustrated with examples from four children.

The story stones

Using the story stones as a catalyst for children's storytelling was a powerful tool for gaining an understanding of children's experiences, emotions, and funds of knowledge about COVID-19. Children recalled, articulated and expressed their experiences at home, recognised their own emotions, and the emotions of others.

Telling their stories after the first lockdown, then revising these using the additional stones after the second lockdown, provided a platform for children to edit their stories. It also gave teachers insight into the progression of the children's working theories and emotions.

Teachers asked open-ended questions and listened to children in their verbal and nonverbal modes of communication. Rinaldi (2001, p. 2) explained that listening "enriches both those who listen and those who produce the message, thereby removing anonymity and giving children visibility, while playing an important part in achieving the search for meaning". Similarly McLeod, Wright, McCall and Fujii (2017, p. 933) write that listening is one of the crucial steps in creating "a pedagogical space that contributes to children's engagement. Where

they can express themselves, and follow through their own independent choices and ideas to make sense of their learning".

The following is a progression of stories of two children, Grayson and Charlie, after the first and second lockdowns.

Grayson's first story (teacher written record):

> I stuck a teddy in my window. I saw Jacqui [teacher] on the computer. I baked muffins with my mum and my sister and I put chocolate in them. They were so yummy we ate them all. I played with my cat, Basher and feed him and also played hot wheels and trains in my lounge. I went for a bike ride with mum and baby, Roman but not Anna. Sometimes I was happy at my house. I have flowers in my garden. I love my family – my sister, Harlow, me and mum and Roman! I was busy playing with my train set, cars and aeroplanes at home. Because of the virus I needed to stay home with my sister, Mum and Romi. I was scared of the virus because it made people very sick.

Figure 2. Grayson using story stones to tell stories

Grayson's second story (video transcript):

Tina, Grayson, Charlie and another child sat together on the mat with the story stones in a box next to Tina. Tina invited the children to revisit their earlier stories. Below are excerpts from Grayson's stories:

> I felt happy, happy, happy and angry a bit – because I wanted to go to the park. I missed Derek at kindy.
>
> I watched TV and my mum listened to the lady on TV – her name's "Cinta Urdin" [Jacinda Ardern]. She told us to wear a mask on the bus. I have one too.
>
> *[When Tina reminds Grayson that in his first story he said he was scared]:*
>
> I wasn't scared, I was brave.
>
> I was sad because Charlie and Blake were my friends.
>
> *[When Tina asks 'why would you be sad about that?']*
>
> Because I miss Blake and Charlie.

After listening to Charlie talk about his emotions using story stones (below), and after Tina commented on Charlie's many emotions, Grayson said: "It's all mixed together."

Comparing Grayson's first and second stories, the first story revealed the fear that Grayson felt about the virus and his reasons for that - "it made people sick". His story focused on the activities he did only with family members in his "bubble" at home and on his bike rides with family outside the home. Grayson's second story was more complex. He commented on people outside his "bubble", including Jacinda Ardern, the Prime Minister of Aotearoa New Zealand, and her advice on wearing masks. He talked about missing his friends, and his reasons for his

mixed emotions. Unlike the first story where he was less knowledgeable about measures to resist catching the virus and expressed being "scared", he now decided he was brave. He was empathetic to Charlie's emotions, identifying his "mixed" emotions.

Charlie's first story (teacher written record)

> Once upon a time I was away from kindy. I was happy with my mum and dad and brother. I put a teddy in my window and I loved my flowers. I did some baking with daddy.

Charlie's second story (video transcript)

> Tina: Charlie what would you like to tell us this time when you were at home?
>
> Charlie: We play Lego.
>
> Tina, Yes, of course.
>
> Charlie: Miss my friends. It was raining. When we went shopping we wear masks and felt silly and silly and silly!

After some general talking, Charlie picked up the angry stone.

> Charlie: And I felt angry.
>
> Tina: I'm sorry to hear that. Why did you feel angry?
>
> Charlie: Because I just wanted to go to kindy.
>
> Tina: Oh! That does make you angry when you can't go to places where you want to see your friends.

The children briefly talk all at once.

> Charlie: I felt angry and then I felt sad.
>
> Tina: Why did you feel sad Charlie?
>
> Charlie: Because I wanted to go to the museum.
>
> Tina: And what happened? Couldn't you go?
>
> Charlie: No.
>
> Tina: Why?
>
> Charlie: Because you had to wear masks. Didn't have any kids' masks.
>
> Tina: No kids' masks?
>
> Charlie: We'll get some one day.

Tina talks briefly with Grayson

> Charlie: And we scootered down - I walked and scootered down to mummy's old kindy. It's close to our house so you walk there. I felt happy, cause I wanted to play Lego all day.

Charlie chooses a stone depicting the Prime Minister.

> Tina: Oh! What's this?
>
> Charlie: And mummy listen to Jacinda Ardern. . . .
>
> Tina: Who's she?
>
> Charlie: She's the Prime Minister.

Tina: Oh! What does a prime minister do?

Charlie: Talk about the virus and about lockdown.

Charlie's first story simply involved activities done with his family. He was happy. His second story reflected a more knowledgeable approach. He expressed several emotions (missing friends, feeling silly, angry, happy), and the reasons why he felt the way he did. He was more informed about the pandemic, the Prime Minister and "rules" for the current state of the country.

Commentary

Pelo (2007) argues that through representing ideas and theories, children make their thinking visible to both themselves and others, and are able to collaborate in co-constructing understandings. Comparing Grayson and Charlie's lockdown stories using the story stones, this process became apparent. During the first lockdown, both children expressed similar emotions of being happy at home with their families and engaging in enjoyable activities. Only Grayson spoke of the virus.

A notable progression was identified within the children's sequential stories. The children were aware of mixed emotions and felt confident to express them. Their stories reflected a growth in their funds of knowledge and that they were more informed about current events surrounding the pandemic in Aotearoa New Zealand. They recognised the distinctive yellow and white stripes representing the symbols for COVID-19 (they added representation of this to the story stones), were able to identify the Prime Minister, Jacinda Ardern, and were familiar with her daily COVID-19 media updates. Te Whāriki (2017, p. 23) states that "as children gain experience and knowledge, their working theories become more connected, applicable and useful and, at times, more creative and imaginative". This was evident in the children's stories. They were able to formulate their evolved working theories about the Prime Minister's role and reasons why masks needed to be worn in public places. They were able to articulate reasons for staying home and what they needed to do if they were in public places.

Arts-based approaches

Artwork, facilitated by teacher prompts and open-ended questions, provided opportunities for children to communicate their understanding and feelings about COVID-19 and their experiences during lockdowns. As Kraehe and Brown (2011) state, "when learners achieve meaningful insights through the interaction of artful production and reflection, arts practices then become authentic aesthetic experiences" (p. 490). This was the case here, where the artwork acted as a focus for communication about the metaphorical concept of "bubbles", the nature of COVID-19, and children's emotions and experiences. These concepts would have been difficult to explain verbally, but were clear in their visual renderings.

The following is progression of the art and storytelling of two children, Caleb and Emily, after the first and second lockdowns. The teacher, Olivia, has gathered in the studio with a small group of four children that includes Caleb and Emily.

Caleb's first drawing and talk

Caleb and Olivia discussed lockdown experiences including who was in his bubble.

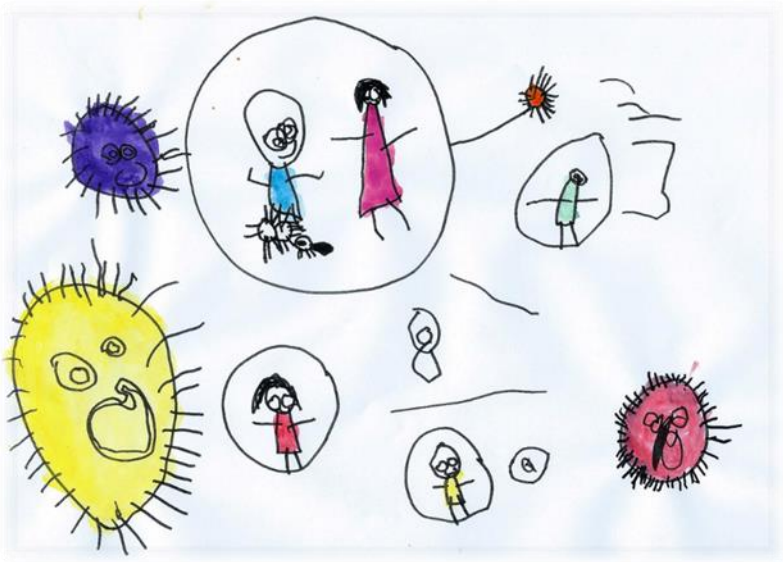
Figure 3. Caleb's drawing of his bubble after the first lockdown

Of this first drawing, completed after the first lockdown, Caleb explained:

> These circles are the "bubbles". My sister, brother and I am in a bubble. Because the drawing of this bubble is not big enough so I want to draw another bubble for my daddy and mummy but we are in the same bubble at home. These black marks are the viruses. These viruses stay outside of the bubbles. They cannot go inside our bubbles and hurt us. COVID-19 made people sick and which made me felt worry and sad during the lockdown. We needed to stay with our bubbles so the virus could not hurt us. I was happy with my own bubble.

Caleb's explanation of his picture makes visible his theory about the Aotearoa New Zealand term "bubble". The bubble term employed by the government was metaphorical. However, here Caleb drew on his funds of knowledge about physical bubbles to order to conduct sense-making about the metaphorical use of the term. This sense-making was represented in his picture as physical bubbles drawn around the members of his family who were in his metaphorical bubble, even though in his accompanying story he speaks of the bubble concept metaphorically. The virus was depicted by simple black whirligigs, with one having a shaft and pointed end that is pressed against the bubble, but according to Caleb, unable get in.

Figure 4. Caleb's drawing of his bubble after the second lockdown



In his second drawing, Caleb commented that

> People stayed with their bubble during the lockdown. I stayed with my own bubble so I was not scared of the virus. If we stayed with our own bubble these viruses couldn't hurt us. Viruses looked so happy because they made people sick. They were spiky and naughty. They were outside of our houses and waited for us to go outside so they could hurt us.

Caleb was still using his physical understanding of bubbles to inform his metaphorical understanding of the nationwide concept. He has also expanded his use of the metaphorical bubble to include "people" in general (all in their own bubbles), whereas in the first account, the bubble story focused solely on the experiences of himself and his family.

In this second picture, his working theories about the virus itself have also developed. In this drawing and story Caleb anthropomorphises the virus (Epley, Waytz, & Cacioppo, 2007), implying that the virus has emotions (happiness) and the ability to act consciously (being naughty, waiting to hurt us). Hedges (citing Inagaki and Hatano, 2014, p. 42) notes that children use their rich knowledge about humans to reveal a personification-based understanding of the living world, allowing them to make educated guesses about other entities.

The physical representation of the virus also changed significantly between drawings. From simple black whirligig marks in the first rendition, the virus evolved to being defined with spikes and being much larger in size (even comparable to the bubbles themselves). Each virus image was also given a face, an idea that correlated with Caleb's anthropomorphic interpretation.

Emily

Like Caleb, Emily had two perspectives on COVID-19. Her initial ideas were gathered as part of a small group who created an image of the virus using "loose parts" play. Emily said:

> Germs and viruses have eyes and mouths like us. They can see us and they have feelings too. Germs and viruses are happy if they make people sick … Viruses and germs have the same colour. Light green is their colour.

Figure 5. The image of the virus created using loose parts play

After the second lockdown, Emily revisited her thinking in a group discussion.

Olivia:	You can't see virus. Do you think the virus can see us?
Emily:	Yes
Olivia:	How do they see us?
Emily:	From their little eyes
Olivia:	So virus got eyes?
Emily:	And when they little we can't see them, when they small they can see us.

There is consistency here between Emily's working theories. In her first theory she specifically sought to add a face to the group model; in her second theory she continues this idea by talking specifically about eyes. Like Caleb, she has adopted an anthropomorphic approach within her working theory, by giving the virus human characteristics. She also showed an understanding of proportion, noting that people are unable to see the virus due to the virus's small size, although the virus could see us.

In a later part of the same conversation, Emily returned again to the virus, this time discussing it in relation to germs. This excerpt includes Amelia and Grayson.

Olivia:	Why did the virus want to come back to New Zealand?
Grayson:	Because it's happy
Amelia:	Because it loves us
Olivia:	But they hurts us as well. They makes us sick.
Amelia:	I know, but they think that's nice
Olivia:	They can be nice too. Really? Will they be nice to us?
Emily:	Some is good, some is bad.
Amelia:	Yes, that's germs. My mum told me some germs are nice and some germs are mean.
Emily:	The germs inside the tummy is good. But these are bad germs.

Emily continued exploring her working theory about the virus by introducing the ideas of good and bad. Given that her comments follow discussion by her peers about the virus having feelings, it is possible that she means good and bad in a moral sense, rather than with regards to health, although this is not clear.

Commentary

The different modes of visual art and storytelling offered different affordances for communication that in combination enabled children to express their experiences, perspectives and feelings in greater depth. Knight et al. (2016, p. 333) state that "drawing offers opportunity for drawers to declare their ideas, theories, and thinking on the issues; thinking is therefore made more available because dialogue is often linked to a drawing intention". Through drawing, children could quickly capture an idea, such as their understanding of the metaphorical bubble talked about by the Prime Minister, the impenetrability of the bubble when the virus came near, and their ideas about what the virus looked like. Drawing was combined in these episodes with explanatory storytelling. Storytelling enabled the child to give a fuller explanation of what the drawing meant to them, such as the attribution to the virus of human features and emotions. Asking children to reflect upon their documented drawings and stories was a powerful means for children to take the next steps to find their own answers to their questions. Teachers and children working together to examine, discuss and share ideas also enhanced children's learning, because they came into contact with different views that expanded their own.

Conclusion

Children's ability to revisit their working theories through storytelling became a powerful sense-making tool for children, enabling both the exploration of children's emotions, and also children's developing understanding of COVID-19 as both of these evolved over time. Comparisons between the first and second storytelling instances show a deepening complexity in children's thinking, evident through children articulating their emotions more clearly, and also conducting extensive sense-making of the virus itself through an anthropomorphic lens. Attributing human features and intentions to a non-human virus supported the children's ability to make sense of the virus's actions (Epley et al., 2007). An increased understanding of the country context also seemed to create a sense of personal control through children being able to name what they were experiencing, and identifying family and community measures to keep themselves safe.

The methods used at this kindergarten of storytelling, drawing and making images with 'loose parts' were attractive to young children and enabled them to communicate their experiences, ideas and emotions in different ways, using different senses. Story stones, illustrating emotions, events and images, were used as powerful prompts for children to conduct inquiry and generate new meaningful understanding about their experiences and emotions (Quintero, 2018). Drawing and making images were also powerful forms of communication about children's views of the nature and appearance of the COVID-19 virus, conceptual ideas, their everyday experiences during lockdown and in their communities, and emotional states. The children's drawings and constructed images were used by teachers as a catalyst for storytelling. In combination, these communication modes enabled others to go beyond their assumptions of what the child's drawing or image was about. Without explanatory stories, the complexity, depth of thinking and meaning intended by the child would not have been readily apparent. In this kindergarten, arts-based pedagogy was supported by a rich array of arts resources, including well-maintained drawing and painting supplies, paper, clay, construction materials, and opportunity for children to find resources in the environment for construction and collage.

The role of teachers and peers in the collaborative development of working theories (Hedges, 2014) in this work was significant. Having an opportunity to share working theories about the virus and its effects with a teacher or in a group generated opportunities for collaborative working theories to emerge. This was evident in two of the transcribed discussions, firstly between Tina and Charlie, and secondly, between Grayson, Amelia, Emily and Charlie. Children's working theories in both instances were not expressed in completed form in the first instance. Charlie's working theory emerged through several conversational turns with Tina,

where he responded to her questions. With the group of children, all contributed ideas in response to Olivia's questions. This later example allowed children to draw on diverse funds of knowledge and experience, and contribute different ideas to what became a group working theory.

The COVID-19 virus has provoked worry and anxiety for many adults and children. While early childhood teachers are not counsellors or therapists, the opportunities provided through drawing and storytelling enabled children to communicate their ideas, feelings and experiences in a supportive environment and to learn from others. Similarly, Bateman, Danby and Howard (2013) found the experiences of children engaging in pretend play episodes and with their Learning Story books, after the earthquake in their City of Christchurch, helped the children to play out and come to terms with traumatic experiences. The progression in development of children's working theories over time and their increasing knowledge about the world, suggests children were being supported to make sense of the events that occurred during Covid-19 and the changes to their lives.

References

Areljung, S., & Kelly-Ware, J. (2016). Navigating the risky terrain of children's working theories. *Early Years, 37*(4), 370-385. doi:10.1080/09575146.2016.1191441

Chesworth, L. (2016). A funds of knowledge approach to examining play interests: Listening to children's and parents' perspectives. *International Journal of Early Years Education, 24*(3), 294-308. doi:10.1080/09669760.2016.1188370

Epley, N., Waytz, A., & Cacioppo, J. T. (2007). On seeing human: A three-factor theory of anthropomorphism. *Psychological Review, 114*(4), 864-886. doi:10.1037/0033-295X.114.4.864

Hargraves, V. (2014). Complex possibilities: 'Working theories' as an outcome for the early childhood curriculum. *Contemporary Issues in Early Childhood, 15*(4), 319-328. doi:10.2304/ciec.2014.15.4.319

Hedges, H. (2011). Connecting 'snippets of knowledge': Teachers' understandings of the concept of working theories. *Early Years, 31*(3), 271-284. doi:10.1080/09575146.2011.606206

Hedges, H. (2014). Young children's 'working theories': Building and connecting understandings. *Journal of Early Childhood Research, 12*(1), 35-49. doi:10.1177/1476718X13515417

Hedges, H., & Cooper, M. (2016). Collaborative meaning-making using video footage: Teachers and researchers analyse children's working theories about friendship. *European Early Childhood Education Research Journal, 25*(3), 398-411. doi:10.1080/1350293x.2016.1252153

Joves, P., Siques, C., & Esteban-Guitart, M. (2015). The incorpo ration of funds of knowledge and funds of identity of students and their families into educational practice. A case study from Catalonia, Spain. *Teaching and Teacher Education, 49*, 68-77. doi: http://dx.doi.org/10.1016/j.tate.2015.03.001

Knight, L., Zollo, L., McArdle, F., Cumming, T., Bone , J., Ridgway, A., . . . Li, L. (2016). Drawing out critical thinking: testing the methodological value of drawing collaboratively. *European Early Childhood Research Journal, 24*(2), 320-337. Retrieved from 10.1080/1350293X.2016.1143270

Kraehe, A. A., & Brown, K. D. (2011). Awakening teachers' capabilities for social justice with/in arts-based inquiries. *Equity and Excellence in Education, 44*(4), 488-511. doi:10.1080/10665684.2011.610682

McLeod, N., Wright, D., McCall, K., & Fujii , M. (2017). Visual rhythms: facilitating young children' s creative engagement at Tate Liverpool. *European Early Childhood Education Research Journal, 25*(6), 930-944. doi:10.1080/1350293X.2017.1380888

Ministry of Education. (1996). *Te Whāriki*. Retrieved from https://www.education.govt.nz/assets/Documents/Early-Childhood/Te-Whariki-1996.pdf

Ministry of Education. (2017). *Te Whāriki. He Whāriki mātauranga mō ngā mokopuna o AotearoaEarly childhood curriculum*. Retrieved from https://www.education.govt.nz/assets/Documents/Early-Childhood/ELS-Te-Whariki-Early-Childhood-Curriculum-ENG-Web.pdf

Ministry of Health. (2020). COVID-19 Health and Wellbeing Survey. Retrieved from https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-novel-coronavirus-resources-and-tools/covid-19-health-and-wellbeing-survey

Mitchell, L., Meagher-Lundberg, P., & Wells, C. (2020). Survey on the impact of Covid-19 on the ECE sector in Aotearoa New Zealand: Challenges and opportunities. Retrieved from https://www.waikato.ac.nz/wmier/centres-and-units/early-years-research/where-have-we-published

Moll, L. C., Amanti, C., Neff, D., & Gonzalez, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory Into Practice, 31*(2), 132-141. doi:10.1080/00405849209543534

New Zealand Government. (2020). Alert system overview. Retrieved from https://covid19.govt.nz/covid-19/alert-system/alert-system-overview/

Pascal, C., Bertram, T., Cullinane, C., & Holt-White, E. (2020). *COVID-19 and social mobility impact brief #4: Early years* (S. Trust Ed.). London: Sutton Trust.

Pelo, A. (2007). *The language of arts: inquiry-based studio practices in early childhood settings*. US: Redleaf Press.

Peters, S., & Davis, K. (2011). Fostering children's working theories: Pedagogic issues and dilemmas in New Zealand. *Early Years, 31*(1), 5-17. doi:10.1080/09575146.2010.549107

Quintero, E. P. (2018). Multifaceted storying among children and preservice teacher bricoleurs. In J. M. Iorio & W. Parnell (Eds.), *Meaning Making in Early Childhood Research: Pedagogies and the Personal* (1 ed.). Milton: Milton: Routledge.

Rinaldi, C. (2001). The pedagogy of listening: The listening perspective from Reggio Emilia. *Innovations in Early Childhood: The International Reggio Exchange, 8*(4), 1-4. Retrieved from https://static1.squarespace.com/static/526fe9aee4b0c53fa3c845e0/t/540fce31e4b00c94d884e002/1410321969279/Pedagody+of+Listening+-+Rinaldi+-+Fall+2001.pdf

Vecchi, V. (2010). *Art and creativity in Reggio Emilia; exploring the role and potential of ateliers in early childhood education*. US: Routledge.

Acknowledgements

Our thanks to director Jacqui Lees for her support and leadership, and to the kindergarten children and their families, for their participation.