

Primary School Children's Responses to Food waste at School

Abstract:

Purpose: This paper seeks to understand children's responses to food waste in school by exploring children's view on food waste and empowering them to discuss and develop their own solutions.

Design/methodology/approach: Using creative problem-solving approach and photo voice technique, we conducted focus group discussions with 28 primary school children in the UK.

Findings: Children have a clear understanding of the consequences of food waste for individuals, society, and the environment. They displayed negative emotions concerning food waste and responded positively to the possibility of food recycling. Their solutions to reduce food waste will require multiple stakeholder engagement, including self-regulation, peer-monitoring, teacher supervision and family support. However, rather than relying on intervention schemes that require significant adult involvement, children placed a heavy emphasis on self-regulation, playing an active role in addressing food waste in school.

Originality: This research extends previous understanding, by showing children as agentic consumers that can shape food waste solutions in school. These findings are of use to primary teachers and local education authorities, to aid children in developing their own solutions to reduce food waste in their own schools.

1. Introduction:

The issue of food waste has become a political priority in many developed countries (van Herpen et al. 2019). Statistics show that a total of 68,000 tonnes is generated by primary schools in England and 28,000 tonnes by secondary schools, giving a total food waste weight of 96,000 tonnes per annual (WRAP, 2020). Existing literature attributes the cause of food waste in schools to broad categories defined as: food related (palatability and accessibility); child related (taste preferences and satiation); and programme-related (duration, food service policies and coordination) (Blondin et al. 2015). Many interventions were offered to address food waste in school, including: food education (teaching children about food nutrition and waste), food-related interventions (improving food palatability and presentation), canteen intervention (measuring and readjusting portion size or weight), and programme-related interventions (giving more time to lunch, scheduling recess before lunch). However, children's voice is often dismissed from the discussions (Reynolds 2018).

Existing works tend to assume that young children's eating behaviour was predominately influenced by taste preference and satiety/satiation (Blondin et al. 2015). As such, these previous food waste reduction efforts focused on equipping adults, especially parents, with the tools to expand children's food repertoire (Connell et al. 2016; Daniel 2016), and school teachers, to educate children about food nutrition and facilitate the canteen-based interventions (e.g. García-Herrero et al., 2019; Steen et al., 2018; Derqui et al., 2018). These studies did not realise that nowadays children have an important role to play in the discussion of food waste because practices are transmitted both ways: children learn from adults as well as teach them (Larson and Chandler 2010; O'Neill and Buckley 2018). Ignoring children's voice in the discussion of food waste problem at schools is unwise, as it overlooks the opportunity of raising children's awareness of their societal role as sensible consumers or empowering children as solution generators in response to food waste at school (Gottardello and Pàmies 2019). To address this knowledge gap, this paper proposes to understand how children respond to food waste in the school setting, as well as their solutions to this problem.

2. Literature Review:

2.1 School food waste

Previous research and government-led food waste intervention schemes have tended to focus on educating families, in particular the parents, in an attempt to improve health and reduce food waste (Mallinson et al. 2016). They discussed how to improve the accuracy of measuring household food waste (van Herpen et al., 2019) and explored how a circular economy is intertwined with morality (Lehtokunnas et al. 2020) to reduce food waste in families. Children's agency is not really acknowledged in such discussions (Reynolds, 2018). Instead children's food waste is often rationalised by parents as unavoidable because "*being a good parent does not involve pressing your children to eat too much*" (Lehtokunnas et al., 2020: 11). As a result, children's voice is dismissed in the needed conversations about food waste, despite child-oriented environmental education can often influence adult knowledge and household behaviour (Damerell et al. 2013).

Similar ignorance of children's voice also occurred in the discussion of food waste at school. Existing literature tends to consider the amount of food that needs to be consumed by children and regards food waste as indicators for nutrition loss (Cohen et al. 2013; Smith and Cunningham-Sabo, 2014). For example, studies show that cooked vegetables were the most wasted food category (between 66%–83%)

during school lunch (Giboreau et al. 2019), while raw vegetables were wasted more than main dishes, starchy products, dairy, fruit, and desserts (Giboreau et al. 2019), showing nutrition deficit in children's diet. Failing to consume a nutrition-balanced diet is detrimental for children and costly to society – according to WRAP (2011), food waste costs schools and colleges around £250m a year.

To address the problem of food waste, several interventions have been discussed, focusing on food education, food interventions, canteen interventions and programme interventions, while treating children as the passive audience, who participate in this process. Food education programmes tend to occur in the classroom where children are taught by their teachers to understand the negative consequences of food waste and regard it as a problem (Steen et al., 2018; Malefors et al., 2021), to study food nutrition and why food should be consumed to avoid nutrition loss (Day et al. 2019; Weber, 2020), to appreciate that fruits and vegetables that are not visually appealing (Makhal et al. 2020). Pedagogic lunches have also been offered as interventions, which operate as a compulsory lesson for children, whereby they discuss nutrition in relation to plate waste during their meal with their teacher (Engström and Carlsson-Kanyama 2004).

Food-related interventions emphasise on identifying foods that are less likely to be wasted based on taste preferences (Marlette et al., 2005) or improving palatability of frequently rejected items (Cohen et al. 2013). For example, Marlette et al. (2005) found that blended food is likely to lead to less waste – potatoes are wasted less in mashed form than as individual fries. Canteen interventions include changing the weight of the plate or adjusting portion size so that unconsumed, unserved, and rejected food could be recycled, given to students as food in the afternoon or given to families in need within the neighbourhood (Boschini et al. 2018; Steen et al. 2018). Food testers are also an effective way in reducing food waste, as students were given a chance to sample the food before ordering (e.g., Weber, 2020; Tromp, 2021). Schwartz (2006) showed that when children are given a choice between fruit or juice when being served, fruit waste was significantly reduced.

Programme-related interventions focus on planning and redesigning the lunch-time programme. For instance, Cohen et al., (2016) found that waste was negatively associated with the amount of time that is given to children during their lunch time. When children were given sufficient time (at least 25 seated minutes), there was a significant increase of entrée, milk, and vegetable consumption. Bergman et al. (2005) also revealed that when recess was scheduled before lunch, children would consume more and

waste less food than the typical scenario of having recess post meal. Children given a choice between foods they are likely to waste less (E.g., Derqui et al., 2018; García-Herrero et al., 2019; Colombo et al., 2020).

2.2 Children as active problem solver

Few studies have explored food waste as a problem for children, as active consumers, who are capable of making informed decisions and providing solutions (Wilkie et al. 2015). Often, children's voice on how the meal is organised is missing (Blondin et al. 2015). Instead, extant research tends to treat children as the passive audience, rather than active and contributing actors, who are capable of developing creative solutions to solve the problem in their own ways (Epstein et al. 2006).

Nevertheless, the role of children as agentic consumers in shaping the family diet is gradually emerging in consumer studies (Bertol et al. 2017), starting from the acquisition of products or brands (Marshall et al. 2014) to children negotiating what and how much to eat at home (Harman and Cappellini 2018) or on holiday (Gram et al. 2018). Children have been recognised as activators of sustainable consumption, shaping parents' shopping, cooking and recycling practices (Larson and Chandler 2010; O'Neill and Buckley 2018). Children have also been defined as competent consumers, able to express complex understanding of the symbolic meaning of food (Marshall and O'Donohoe 2010), and its nutritional value and dietary importance (Tessari et al. 2020). Qualitative studies looking at school meals from children's perspective, show how children were capable in describing their taste and food preferences (Oncini 2020), in expressing their opinions about food quality and quantity (Cardoso et al. 2019), and in articulating their criticism toward the organisation of school meals (Metcalf et al. 2011; Oncini, 2018). Considering children's agency, competence and awareness of sustainable consumption, it is surprising to see that studies investigating food waste at school have omitted involving children as solution providers, in discussing the food waste issue at school. To address this gap, this paper explores how children's voice can contribute to the development of food waste reduction intervention through guided creative-problem solving.

3. Research Methods

3.1 Sample and consent

A primary school in Surrey county based in the south east of England was approached and the school headteacher's support was obtained for the benefit of reducing food waste at this school. This selected

primary school was small in size and located in a suburban area. The percentage of pupils eligible for free school meals was lower (13.1%) than the national average (23%) (GOV.UK, 2020). It had approximately 180 children separated into five school year groups, aged from 4 to 9 years old. The older children (aged 8 and 9) can choose from ordering school lunch or bringing in their own packed lunches. The younger children (aged 4, 5, 6 and 7) were provided with a school lunch, paid for by the UK government. School lunch menus were provided to parents at the beginning of each term and children have the opportunity to choose their daily course from several options, including a meat or fish, a vegetarian choice, jacket potatoes or a cheese/ham sandwich. Children were also given access to a salad bar, where various salads, tomatoes, pasta and bread were offered.

Research shows that children aged 7 and above have the capability to understand and meaningfully communicate within the qualitative interview format (Gibson, 2021), hence only children aged from aged 7 and above were invited to participate in this study. Prior to the commencing of the research, ethics approval was obtained from the lead author's university research ethics committee. A detailed information pack was sent home in children's schoolbag, including the participant information sheet that illustrated the research objectives and proposed research methods, a sample list of questions for the proposed focus group discussions (hereafter FGDs), and a parental consent form with a return slip. Out of the ninety children (aged from 7 to 9) that were sent the information pack, twenty-eight children returned their parental consent forms and were invited to take part in the FGDs (a response rate of 31%). Out of the twenty-eight children, eleven were girls and seventeen were boys. Most of the children came from the older year group - thirteen children were 9 years old, nine children were 8 years old, whilst six children were 7 years old. The children all knew one another and therefore were very comfortable in sharing their opinions.

3.2 Data collection

FGDs were employed to uncover children's views and explore their opinions for its suitability with children (Horner 2000). FGDs allow children to discuss their ideas with peer company, imitating the setting of their class-room discussions. Within the FGDs, the method of creative-problem solving was employed, where children were supported with directed goal formulation, and facilitated with idea exploration, solution development and actions. Creative problem-solving offers a powerful set of tools for productive thinking, which can be used successfully by children (Treffinger, 1995).

The twenty-eight children were placed into four groups of approximately seven children. Each FGD group lasted around an average of 45 minutes in length. The FGDs were facilitated by one of the authors, who have obtained valid DBS (Disclosure and Barring Service) check prior to the interviews. A research assistant was also recruited to help take notes and set up the audio-recording. One of the School's teaching assistants was also present to offer reassurance to the children so that they would feel comfortable with the research team.

To explore children's understanding of food waste and facilitate the creative problem-solving approach, a scenario was developed, with the support of the primary school teachers, to ensure that it was applicable to children in their school setting. As shown in Table 1, the focus group discussion was centred on a school lunch-time scenario. Children discussed the behaviour of Ali (a purposely chosen gender neutral name) and the impact of their behaviour on personal, school, societal and environmental levels.

[Insert Table 1 here]

Photo voice techniques can help children talk about abstract concepts such as attitude to waste, propensity to waste, self-regulation, and sensible eating in relation to portion size, which children often struggle to articulate (Wang and Burris 1997). At the end of the first FGDs, each child was given a disposable camera with 28 films to take home. The authors demonstrated how to use the camera and encouraged the children to take photos of food waste problems and solutions that they noticed over the next two weeks, both at school and at home. The children were also informed that the subsequent FGDs would be centred on their photos. Letting children take photos of their everyday places and practices gives them the agency to make decisions about what to include in or exclude from their photographic records, providing them the independence to control and select the images that are of meaning (Epstein et al. 2006; Barker and Smith 2012). Children were asked to return their cameras after two weeks and their films were developed into prints by the research team, ready for the second FGDs. Because the data collection period overlapped with the Easter break, there was a one-month gap between the first and the second FGDs.

The second FGDs were centred on the discussion of the photos in relation to emotion and moved onto the identification of behavioural controls from the children's perspective that could help prevent food

waste. Children were given their picture prints and told to select three of their favourite photos to share with the group. Table 2 lists the key questions that were addressed in the second FGDs.

[Insert Table 2 here]

In addition, the school's food waste bins were also measured on a daily basis during the research project for data triangulation.

3.3 Data analysis

The qualitative data analysis followed a step-by-step procedure to ensure rigour (Gioia et al. 2013). Firstly, the FGDs were transcribed by the research assistant. Based on the transcription, an initial manual analysis was conducted, using an open coding technique to identify various key themes, leading to the development of the analytic triangle (See Figure 1), which guided the subsequent data analysis. The analytic triangle covers children's cognitive understanding of the food waste in general and their specific food waste problem at school, their emotional reactions to the food waste, as well as their preferred solutions. Following the analytic triangle and through the interpretation of the codes, we adopted a continuum back and forth between the emerging themes and the literature on food waste at school, to organise 1st order concepts into 2nd order (theory-centric) themes and the aggregated dimensions (Ladge et al. 2012).

[Insert Figure 1 here]

4. Findings

The findings consist of three parts. The initial exploration discussed children's attitudes towards food waste, focused on their understanding of food waste in school and their emotional responses to the problem. Children's solutions were also presented, illustrating how they refer to various available resources that could be employed to facilitate food waste reduction at school. To protect children's identity, all the names were modified and quoted as pseudonyms.

4.1 Cognitive understanding of the food waste problem

Our participants could easily relate to the problem of food waste and discuss the consequence of Ali's behaviour. This may be because the scenario is designed around a familiar school setting, with the

support and contributions from teachers. Figure 2 shows participants' discussions were centred at the personal, social and environmental levels.

[Insert Figure 2 here]

At the personal level, participants demonstrate their understanding that over-consuming may lead to nausea, vomiting and putting on weight over time. The younger children tended to focus more on the physical feeling of over-consumption (e.g. feeling sick, too full, uncomfortable, or not able to run fast enough when playing games). Within the school context, all participants agreed that other children would feel sad, upset, annoyed or angry if they did not have enough food because one child put too much onto his/her plate and left little for others. The child who behaved as such may be called names, which in our participants' opinion is not good either, as such name-calling may lead to bullying behaviour at school.

Rain: I think, they [other children] will probably whisper and not be nice to her... they might say that she is greedy...

Carl: Oh I have a nick name, greedy pants!

Rain: They might want the food that she is wasting in the bin.

Carl: But they can't! Because it is already in the bin and they would be upset.

Food waste does not only impact the other children at school, the older participants also mentioned the problem of food waste on others, referring to the poor children and people who do not have enough food beyond the school context. For instance:

Dance: Ali is just wasting food and you are meant to eat your food....

Annie: If you are poor, you do not have anything. But if you are like us, we are quite lucky, compared to the poor people... we are meant to eat our food, not wasting...

Helena: I would feel ashamed, because that's the lesson that we do not put too much food in our plate!

Collectively, Dance, Annie and Helena completed each other's sentence to express their disapproval of Ali's behaviour as described in the scenario. They were aware of the social impact of such behaviour on the others, the poor in the society, as well as those in the other poorer countries, where food supply is still in deficit. Knowing that there is food shortage somewhere else beyond the current school setting

reinforced children's association between food waste and morality, suggesting that moral economy had an influence to not only parent's but also children's understanding of food waste. This extends the work of Lehtokunnas et al. (2020) by showing that rather than simply treating children as the problem-makers that lead to unpredictable food waste, they can be involved as agentic solution-providers.

Participants also explained why food waste was damaging to the environment because *too much waste will contaminate the water, the land and the earth* (Sara). Some participants pointed out that food waste could be recycled into compost, hence having positive effect to the environment and shared their own experience. However, the older children challenged that the composting process is time-consuming and as such not a practical solution in dealing with a lot of waste.

Helena: When we were in reception, we tried the composting idea. We used to take a little bit out of the bin and we used to bury it, so it turned into the soil. But that didn't work by the time we were in year one. So we just stopped doing it. It didn't work because it took too long... and all the animal lived underneath were starting to die...I think it takes about five years for it to work...

Samuel: I am not quite sure whether compost is good for the ground because the stuff is going to the ground and if you have a lot of waste, it does not work...

To solve the problem of food waste and eliminate its damaging impact to the environment, the concept of circular economy was proposed by participants. However, they also highlighted the practical difficulties that prevented the recycling of food at school and within the wider society. Ideas offered were initiated, improved, as well as challenged by each of the children, which together demonstrated their ownership of the problem.

Tom: Well, food does not have to be wasted. It can be given to other people who don't have food! Hmm... but you are not allowed to share your food at school.

Libby: We are not allowed. Because you don't know if they are allergic to it, if he is giving it to you and you may be sick or allergic to it. Also germs might be on the food [with gesture showing the movement of when being passed around].

Sara: oh oh oh , why not have a special box just put food she doesn't want in it? And imagine if tomorrow is a Saturday, she can just go to the airplane and go can to places, like Africa, because they don't have pipes connect to here. And she can give it to the children who have no food in Africa. She doesn't touch it and just put the food in the special box and the food wouldn't be dirty.

Seb: A special lunch box?

Sara: Yeah [big happy smile] then she could share it to all children that do not have too much food and they will have at least something good to eat!

4.2 Emotional Response:

The discussion of food waste elicited an emotional reaction amongst children. Our participants mentioned various kinds of emotion when discussing food waste. Figure 3 offered an illustration of the key emotional themes, including upset, anger, sadness, shame, and happy. Often the negative emotions were related to seeing food being wasted, their powerless position to redistribute the food to where it was needed and the consequence of food deficit on others. Positive emotions were associated with identifying and developing solutions to reduce food waste and recycling.

[Insert Figure 3 here]

One particular point to note, although children struggled to use complex words or sentences to describe their feelings, the use of photo elicitation technique was particularly useful in helping children to express their feelings and explain the triggers of such emotions (Leitch & Mitchell 2007). For instance, when talking about the photos she chose, Irene mentioned:

Irene: I took a pic of a bin at school because it had a lot of food waste... I felt sad because I see what got wasted... Maybe we can take less from the salad bar... My family also throw away a lot of bread at home. I felt sad about it, we could have used it to feed the ducks or make bread crumbs or pudding.

[Insert Figure 4 here]

Irene expressed her feelings towards the food waste and loss when showing her photo. Her words also suggested a deep understanding of the food waste problem, where waste could have been reduced, if there were creative solutions being developed and facilitated. On the other hand, another child commented on the recycling of waste and expressed a positive emotion associated with recycling because the act of recycling signifies waste-reduction.

Hugo: This is a picture of our recycling bin at home. I am quite happy when I took the photo. This picture is also related to waste but showing that waste is being recycled... We could recycle more waste and not dump rubbish in the bin.

[Insert Figure 5 here]

4.3 Solutions to food waste

Our participants were keen and active problem solvers. They proposed with various suggestions to solve the food waste problem at school, tapping into different resources that they can relate to or draw upon. Overall, these include self-regulations, peer monitoring, school's supervision and support from families (Figure 6). Against previous food waste literature that assume that young children's food consumption is dominated by satiation and preference (Blondin et al. 2015), our participants reveal that they were capable of creative thinking and self-regulation. For example, Sara explains how self-regulation should work during the food serving process.

Sara: Maybe Ali should just say to herself, oh that's too much and she take her the food that she doesn't need off her plate back to the salad bar, and in that way, no waste!

Vishan: if Ali took loads of pasta and he ate it all then that will go to waste [because he did not need to eat that much] ... He needs to judge how much food is he going to eat because if he takes too much it will go to waste and if he takes too less it will go to waste as well.

Whilst Sara started the conversation of not having too much, Vishan pointed out the importance of portion control. The ability to judge how much food one needs whilst serving is critical to the problem of food waste because once the food is served onto one's plate – there is no way in putting the food back or recycling the food for someone else at school. As such, it is important for children to learn and being able to evaluate how much they eat. For those who are less confident in judging how much they can eat, participants also offered clear advice “*they can start small and come back for more because we need to be considerate to other children*” (Dance). Similar point has been consistently emphasised by the participants.

[Insert Figure 6 here]

Peer monitoring and supporting each other also emerged as a solution to help reduce school food waste. Our participants were keen to tell each other to not to take too much to start with and then go back for second helping. They are happy to set personal examples for the younger children at the school by behaving in a sensible way themselves. They were also happy in telling their siblings to behave in a more sensible way and help them finish the food if needed. For example, Libby explains:

Libby: We can tell all other children to tell Ali. So the teachers can also keep an eye on the other children, not just Ali all the time. The children can watch him and say that is too much food and the teachers can get on with their work and the everyone has enough food.

Although self-regulation and supporting one another were prominent themes, our participants referred to nearby adults as a potential resource that could be involved in helping to solve the food waste problem. Within the school setting, teacher's intervention was required to offer on-the-spot policing, as well as the delivery of relevant food waste education centred on being considerate, sensible and sharing. Vishan suggests:

Vishan: We do need teachers there... because if there is something children really really like, like a chocolate cake... You take as much as you want and then you might get full after few slices, and you still have loads of them on your plate and other children might want to eat some the chocolate slices... So teacher should stop him like 'hey you, have a limit of like two slices'.

Our participants were aware that self-regulation may not always work, as certain highly hedonic foods, such as chocolate cakes, may be too tempting for children to self-regulate and therefore require adult supervision and support. Our participants were also creative in identifying solutions, they've talked about the development of a poster and signs that could be placed at school to help communicate the message and educate fellow children about the appropriate behavioural norm. They were very excited about the idea of having a poster that included their own words on it to promote the portion control message. The poster was later developed by the teachers to support their effort (see Figure 7). Some participants also pointed out the food serving system at school as a barrier to food waste reduction. Whilst some suggested that a more flexible system that considers of children's individual appetite may help reduce food being wasted, others suggested operational change to improve how the salad bar is refilled to support portion control and reduce unnecessary waste. Interestingly, different from previous

interventions, where a significant effort is placed on the canteens through food and programmes (e.g. (Cohen et al. 2013; Boschini et al. 2018); Marlette et al., 2005), children placed more emphasis on regulating themselves, changing their own behaviour, and educating their peers, rather than changing the food serving system.

[Insert Figure 7 here]

Participants also felt that clear communication with parents is important so that they can have a say in their food choice and the amount of food that they would consume. They did not want their parents to pack too much in their lunchbox and requested parents' support in pre-ordering the type of food that they know they would eat from the available school lunch menu. They were quite happy to finish their pack lunch after going home or during after-school clubs, if they couldn't manage to finish the food at school. Some children mention keeping the rest in the fridge so they can eat it later or share with other members of the family.

Helena: My mum and dad sometime put too much, sometimes other children can help to finish things like chocolate, crisps.

Jeff: Tell your mum and dad to don't put too much for you!

Callie: She can just leave it in her lunch box and keep it for after school.

Dance: If you have brother and sister, you can give it to them.

Annie: You can pack your lunch yourself and discuss with your parents.

5. Discussions and implications

Findings from the current study revealed how children are agentic consumers (Oncini 2020) who can clearly express their ideas, feelings, concerns, and solutions about food waste. Food waste at school was recognised as a problem by children, who seem to have experienced it at home and at school. In the school setting the commonly agreed solution to food waste was at individual level. Being a competent child, self-regulation was a concept that, although never explicitly mentioned by participants, was clearly present in their narratives. Awareness of the organisation of lunchtime in their school and its guiding principles being based on individual choice, children comfortably argued that the main solution of food waste was self-regulation (Larsson et al. 2010).

Self-control seemed to be the strategy that children praised and valued as both an individual and a social quality, since it implied being considerate of others' needs (having food for all) and being aware of the societal and environmental consequences of food waste. A self-regulated child was, according to participants, a competent actor who had interiorised the regulations of lunch time and can make a well-informed and balanced choice. She or he was a successful child in making the right choice for oneself and one's community. Failing to tame hedonism (overconsumption and selfishness) is considered morally problematic and connected to negative emotions (guilt) and also peer pressure (feeling ashamed in front of peers). Openly judging the non-self-regulated (failed) child was a prominent solution, showing how actions and choices in the school setting are open to public peer scrutiny. There were no attempts to understand the possible reasons of having made an inadequate choice, and severe judgments for failing to make the 'right' choice were common.

The concept of competent child in the school setting has been problematised by some authors (see for example, Ellegaard (2004) who see it as the extension of the neoliberal subject (and consumer) also in the school settings. In the current study, it was reported that the individualised responsibility and the related mantra of 'free choice' have permeated children's narratives (Tessari et al. 2020). Indeed, the children have interiorised the role of being responsible for their own choices, since solutions for the food waste have been designed mainly at individual level. However, it would be too simplistic to see participants' narratives and their solutions as only individualised ones. The quantity of food given to children has been recognised as a problem, with the associated solution of allowing children to ask for seconds. Passing food amongst children was considered against the current food policy and thus disqualified as a solution but could be reconsidered amongst siblings.

Reflecting upon the failed experiences of experimenting with compost also shows how children connect their behaviour during lunch break with other school activities and how they can reflect on their failing attempts to solve food waste. Children also mentioned more complex solutions including sending leftovers to others in need, as way of redistributing food (although the disposed one) at macro level and a way of overcoming social injustice. The aforementioned solutions show how children are agentic actors able to criticise and consider the school policy, albeit in a limited way. Children seem to be aware of the school regulations and their flaws and also of the problems and barriers that such regulations can cause in reducing food waste.

Amongst the solutions, the participants included the role of adults, who were a noticeable absence. As one of the participants says ‘*we do need teachers there*’ to emphasise how children self-regulation does not work without the mediation of adults. The role of adults in children’s narratives is a complex one. While some adults, including teachers, are considered essential to supervise and guide children’s behaviour, other adults are considered responsible for food waste. The pictures taken outside the school reveal how children saw adults as irresponsible and also as subjects to be educated and scrutinised. This is indeed in line with previous works showing how children can scrutinise and evaluate and influence adults’ behaviour (Bertol et al. 2017). The evaluation of the behaviour of adults around them (from the absence of teachers in the school canteen to the evidence of limited recycling done at home) show how children can appreciate food consumption in a very holistic way. Also, it suggests that children should not be the only target of food education at school, school leaders as well as parents should also be included in food waste education (Derqui et al. 2020).

6. Conclusion and directions for future research

This paper provides an understanding of primary school children’s responses to food waste in school. Children displayed a competent understanding of the challenges of managing lunches in the school setting and reducing food waste. Their solutions to reduce food waste will require multiple stakeholder engagement, including self-regulation, peer-support, teacher supervision and family support. However, rather than relying on intervention schemes that require significant adult involvement, children placed a heavy emphasis on self-regulation, playing an active role in addressing food waste in school. Moving beyond from what they put in their own mouths, children see food consumption and waste at school as a problem to be solved considering ‘the social context of food and eating’ (Daniel and Gustafsson 2010). Considering such a well-structured and complex view of lunchtime that participants were able to offer, we suggest that children (not only adults) should be considered as relevant stakeholders in evaluating the organisation and management of lunch at school. As the present study and other works (Bertol et al. 2017; de Cardoso et al. 2019; Oncini 2020) highlight, children have a good understanding of food waste and could provide insightful suggestions on how to solve environmental issues.

The paper does not come without limitations. Although the school teachers have measured the lunchtime food waste bin from February to July 2019 and attempted to track the weight of the waste bin over time, there were many other factors that were not controlled, making the waste measurement data invalid. Firstly, whilst the teacher did not measure food served and food waste per plate, it was difficult to calculate the waste produced by each child. Whilst the older children (year 3 and 4) could access the salad bar freely, it was not clear how it was served per plate; hence it was difficult to calculate what percentage of the food has been wasted by each child. Secondly, whilst sample group's food was mixed with other children's waste in the food waste bin, it was impossible to compare whether there was any significant difference regarding the amount of food being wasted between the sample group and the others. Thirdly, the food quality served at school did vary on a daily basis and had an impact on the amount of food waste. The head teacher reported that when the school chef accidentally burned the roast potatoes, it was unsurprising that the potatoes were discarded by children. Taking these limitations into account, future research is recommended to replicate our study design but taking more control of the other non-child related factors, in order to evaluate the effectiveness of this approach, giving children a voice to discuss and manage food waste by themselves.

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