



‘Don’t hog, share and just let your imagination flow’: lessons from structured and unstructured loose parts play in middle primary school classrooms

Kym Simoncini¹ · Katy Meeuwissen²

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Abstract

Despite the many benefits of play, within primary school, play is often reduced to lunch breaks, particularly as children move to higher grades. Loose parts play affords children opportunities to develop imagination and 21st-century skills (collaboration, communication, creativity and critical thinking). As part of a larger project, two Year 4 classes in an Australian primary school (two teachers and 46 children, aged 9–10 years) engaged in one hour of structured or unstructured loose parts play during class time for eight weeks using a Nüdel Kart (loose parts play cart). Children in the structured play group were set challenges and taught creative attitudes and processes. Data was collected through children’s surveys and focus groups and teacher interviews. Children and teachers were overwhelmingly positive about the play sessions. Children enjoyed the opportunities for construction, social skills and creativity, while teachers focused on inclusion and social skills. Future classroom practice recommendations include integrating both play types and meeting creativity and social and emotional curriculum requirements through loose parts play.

Keywords Loose parts play · Structured play · Unstructured play · Primary school · Social skills · Creativity

Introduction

While play-based learning is widely held as best practice in early childhood education, play is typically not used as a pedagogical approach in school, as play and learning are viewed as separate and often opposing constructs. Despite this, a

✉ Kym Simoncini
Kym.simoncini@qut.edu.au

¹ School of Early Childhood and Inclusive Education, Queensland University of Technology, Brisbane, Australia

² Faculty of Education, University of Canberra, Canberra, Australia

growing body of literature demonstrates the benefits of play in supporting learning (Allee-Herndon & Roberts, 2021; O'Sullivan & Ring, 2018; Parker et al., 2022). Whereas much research has explored play-based learning within early childhood settings prior to formal schooling, much less focus has centred on the implementation of play as a pedagogical tool in primary schools (Nicolopoulou, 2010; O'Sullivan & Ring, 2018; Parker et al., 2022). The study reported here explores Year 4 teachers' and children's experiences and perceptions of an eight-week one-hour loose parts play program and how loose parts play can fulfil curriculum requirements. Loose parts are natural or man-made materials that can be moved and used in multiple ways (e.g., pine cones, boxes, plastic tubes, fabric etc.). Children engaged in free/unstructured play or guided/structured play according to their class allocation.

Play within school

Play-based learning within primary schools has traditionally been implemented in the lower or early childhood years (K–2) and is largely absent from the middle and upper years. In these years, play is seen as separate from learning and typically only occurs during lunch breaks or as a reward when learning is complete (Parker et al., 2022). According to these authors, dichotomizing play and learning negates the idea that play is educational and that children can learn through play. So too, it diminishes play's potential as an effective pedagogical approach. Pushdown of the curriculum has meant play-based learning is also disappearing from the lower years of primary school (Barblett et al., 2016; Nicolopoulou, 2010). To combat these trends, a growing number of researchers and educators are advocating for play in schools.

Different theories of play within education settings have been proposed in recent years. One theory is that play and learning exist on a continuum with child-directed play and adult-directed learning at opposite ends (Weisberg et al., 2016; Wood, 2010). Child-directed play or free play is defined as 'child directed, voluntary, and flexible and often involves pretend play' (Pyle & Danniels, 2017, p. 275) or where children 'exercise choice, control, and imagination with little direct intervention from adults, and no pressure for products or outcomes' (Wood, 2010, p. 28). In terms of learning, free play is based on constructivist views of learning, in which the learner engages with the environment around them and actively builds upon prior knowledge, using the new experiences (Yu et al., 2018). However, it should be noted that, within an educational context, no play is ever truly 'free', it is always controlled, to some extent, by adults. Adults specify what resources are available, the time allocated to play, the extent to which autonomy and choice are offered and the boundaries and expectations that are placed upon the play and accompanying behaviours (Wood, 2014).

Guided play is considered 'midway between direct instruction and free play' (Weisberg, et al., 2013, p. 104). Like play in general, there is no universal definition of guided play. A commonly cited definition is 'learning experiences that combine the child-directed nature of free play with a focus on learning outcomes and adult mentorship' (Weisberg et al., 2016, p. 177). These authors contend that adult guidance is necessary to meet specific goals. They argue that guided play has two forms:

one where adults design the environment to meet the learning goal while allowing children autonomy within the environment; or two, when adults observe child-directed activities and ask questions or make comments to extend children's interests. Wood (2010) uses the term 'structured play' whereby 'adult directed activities may engage children in playful ways with curriculum content: there may be some elements of imagination, but with limited choice and control for children' (p. 29). This form of learning aligns with Vygotsky's (1978) concepts of scaffolding and the Zone of Proximal development, where the adult supports the child's learning, allowing them to do things not possible by themselves.

More nuanced conceptualisations of play-based learning include Pyle and Daniel's (2017) continuum of play-based learning, which positions free play, inquiry play, collaboratively designed play, playful learning and learning through games sequentially along a continuum. Free play aligns with previous descriptions, while inquiry play describes play that is child-initiated and is extended by teachers who integrate related curriculum goals. In collaboratively designed play, there is shared control of the play with children and teachers collectively designing the play environment, and the teacher extends the children's play. The final two play types are controlled by the teacher. Playful learning refers to integrating academic skills in play contexts to allow for academic skill development that may not occur naturally within play, while learning through games is the most adult-directed type of play-based learning, whereby teachers use games to meet curriculum goals.

An alternative way of considering play and learning is *Learning through play*, as proposed Zosh and colleagues (2017). They argue that learning through play happens during free play and more structured play and that five characteristics describe the interface between play and learning. According to these authors.

'optimal learning through play happens when the activity (1) is experienced as joyful, (2) helps children find meaning in what they are doing or learning, (3) involves active, engaged, minds-on thinking, (4) involves iterative thinking (e.g., experimentation, hypothesis testing), and (5) involves social interaction (the most powerful resource available to humans—other people)' (p. 16).

The current study utilised unstructured and structured play to meet curriculum requirements with Year 4 students. Structured play comprised playful learning and learning through games as defined by Pyle and Daniels (2017). Both unstructured play and structured play sessions imbued the characteristics of playful learning experiences (joyful, meaningful, actively engaging, iterative and socially interactive) (Zosh et al., 2017).

Curriculum requirements

In Australia, the Australian Curriculum (AC) (Australian Curriculum, Assessment & Reporting Authority [ACARA], 2023a.) dictates what all Australian children should learn from Foundation (the year before Grade 1) to Grade 10. The AC does not stipulate the pedagogies to be used to teach the required knowledge, understandings

and skills. The AC is guided by the Alice Springs (Mparntwe) Declaration on Educational Goals for Young Australians (Education Council, 2019) Goal 2 that ‘All young Australians become confident and creative individuals, successful lifelong learners, and active and informed members of the community’ (p. 6). The AC has three dimensions comprising: learning areas, general capabilities and cross-curriculum priorities, with general capabilities a sharp focus of the current study. General capabilities equip children with the knowledge, skills, behaviours and dispositions to live and work successfully (ACARA, 2023b). The capabilities include Critical and Creative Thinking, Digital literacy, Ethical understanding, Intercultural understanding, Literacy, Numeracy and Personal and Social capability. The capabilities are taught through the learning areas rather than in isolation. This study focused on the Critical and Creative Thinking. It forms part of a larger project that explored children’s creativity through the learning area of mathematics using loose parts.

Loose parts

Loose parts refer to materials that can be used in multiple ways. Nicholson (1972) first described the Loose parts theory, arguing that ‘in any environment, both the degree of inventiveness and creativity, and the possibility of discovery, are directly proportional to the number and kind of variables in it’ (p. 6). More recent definitions of loose parts include ‘materials with no set direction that can be used independently or with other materials’ (Nell, 2013, p. 2) and ‘any collection of fully movable elements that inspire a person to pick up, re-arrange or create new configurations, even realities, one piece or multiple pieces at a time. Loose parts require the hand and mind to work in concert; they are catalysts to inquiry’ (Sutton, 2011, p 409). Loose parts can be natural or manufactured and may include, for example, water, sand, sticks, rocks, boxes, tyres, buckets, and crates. Loose parts and open-ended materials are used interchangeably in the literature (Houser et al., 2016) and are considered essential components of a high-quality play environment (Frost, 1989) that create rich and diverse play experiences (Flannigan & Dietze, 2017).

Loose parts have been successfully introduced in early childhood and primary school settings, largely emerging from playwork practice (Gibson et al., 2017). Research in early childhood settings has been more prolific due to the historical emphasis on play-based learning in prior-to-school settings. Research has shown that children engage in more varied play behaviours in environments with loose parts (Maxwell et al., 2008). In primary school settings, loose parts have predominantly been used during recess and lunchtime to increase physical activity (Bundy et al., 2017; Engelen et al., 2013), to enhance social interactions (Mahoney et al., 2017) and to improve creativity (Hyndman et al., 2018). A recent study in Portugal investigating how different loose parts were used by Years 3 and 4 children during lunchtime found that children used the different loose parts (tarpaulin/fabrics, cardboard boxes, plastic crates and plastic tubes) equally and that there were no gender differences in what materials the children played with (Pereira et al., 2023).

A recent Australian study (Mackley et al., 2022) investigated the use of loose parts with Year 5 students during class time. The researchers used video observations,

photos and observational notes to investigate the object and outcome of loose parts play. They argued that loose parts play fostered collaborative competencies and are pedagogically appropriate tools to build 21st-century collaboration and teamwork skills.

To our knowledge, no study has considered children's perceptions of loose parts play during school time. This article explores children's and teachers' experiences and perceptions of the loose parts play sessions and whether there were differences between the two groups (structured vs unstructured play). Given the paucity of studies investigating loose parts play in middle primary, we had no hypothesis beyond that we expected children to enjoy the sessions.

Method

Sample

The study was conducted at a local government primary school in the Australian Capital Territory, Australia. The school is part of the Affiliated Schools Partnership with the University of Canberra. Two teachers and 46 children participated in the study. There were more females ($n=28$) than males.

Measures

Children's survey

A single A4 page was used in the child surveys. The page contained a table with six equal parts (two columns and three rows). The questions were written at the top of each box with space for the children to write, draw or have their responses scribed by an adult. The questions were adapted from the (author). The questions focused on student experiences: 'What five words best describe your time during the play sessions? What was the best thing about the play sessions? What was the worst thing about the play sessions? What was the best thing you made during the play session and why?' Learning opportunities: 'What did you learn from the play sessions that you do not learn in school?' and quality of the project: 'How could we make the play sessions better?'.

Children's focus groups

Focus group questions probed deeper into children's experiences. The questions started with 'Is there anything else you would like to say about the play sessions or Nüdel Kart?' and 'Tell us about your enjoyment and creativity over the weeks' and then followed the children's lead.

Teacher interviews

Teachers were interviewed after each session. Interviews lasted between five and ten minutes, and teachers were asked to reflect on what they had observed during the session.

Procedure

Ethics approval was granted by the university's ethics committee (Approval 11,785). Consent was sought from teachers, child participants and their families.

The school principal assigned the two classes to either unstructured or structured play sessions. Each class participated in eight one-hour play sessions between August and October 2022. The sessions were held in the school hall after lunch on different days. A Nüdel Kart and Rover Kart were used for the project. These Karts are 'deconstructable, mobile play carts that can be reconfigured in endless ways to encourage self-directed learning' (Nüdel Kart, 2021). The Nüdel Kart contains 340 pieces of geometric objects, fabric and wheels designed for a class of up to 30 children. The Rover Kart has 140 pieces and was designed for smaller groups. The Rover Kart was introduced in Week 3, while the Nüdel Kart was used from Week 1. Classroom teachers were always present during the play sessions however, mostly observed the play sessions. They gave no instructions to the children. The unstructured play sessions had limited adult input. The children were told that they could learn while playing and do whatever they wanted with the pieces, but needed to stay within the hall area. The children were encouraged to try to create different things each week. In Weeks 5, 6 and 8, the researcher removed the portable wheels, and the baseboard with wheels was not to be used as a vehicle.

In contrast, the structured group engaged in guided play sessions that focused on creativity and mathematics aligned with the Australian Mathematics Curriculum facilitated by an early childhood preservice teacher from a local university. The sessions typically utilised the following format: a play-based warm-up game or task, and a creativity challenge. Table 1 outlines the teaching focus and creativity challenge for each week. The creativity challenges were guided through teacher questioning, experimentation and feedback. Students were exposed to creative terminologies (metalinguage) such as curiosity, openness, imagination, risk-taking, idea generation, iteration, and prototyping.

Children worked in small groups to complete the tasks. During the tasks, the researcher and preservice teacher facilitator asked the children prompting questions and gave feedback using creative terminology that had been explicitly taught. Examples of questions and feedback include: 'I can see your curiosity in what you have made—what made you curious?', 'I like what you have produced so far—what are some ways you might improve your ideas?' and 'You have shown great patience and resilience in making your x—what ideas have other students tried that could make your x better?'.

Table 1 Teaching focus and creativity challenges over the sessions

Week	Teaching focus	Creativity challenge
1	Creative thinking	Making a rocket
2	Divergent thinking and the creative environment	Making 2D and 3D shapes
3	Affordances	Make a toy with moveable parts
4	Curiosity, divergent thinking, iteration, and prototyping	Create a symmetrical insect/animal with moveable parts
5	Risk taking and prototyping	Delivering a sacred object a specific distance and raising it to a set height without touching it with hands
6	Tolerance for ambiguity and convergent thinking	Delivering the sacred object Part 2 (new and improved version)
7	Critical thinking, idea generation and convergent thinking	Create a playground
8	Creative thinking reflection	Recreate a rocket

Two weeks after the play sessions, the researchers visited the two classes and showed photos from the sessions in a slideshow. The researchers then asked the children to complete a survey. Most children wrote their answers, and the researchers read aloud the children's responses to check that the researcher understood the written text. A small number of children gave verbal responses, which were transcribed.

After the surveys had been completed, the teachers randomly chose two groups of children (one male group and one female group) to speak to the researchers in a focus group. Four focus groups (two from each class) were conducted in total. The focus groups lasted approximately 15–20 min and were audio-recorded and transcribed.

Data analysis

Data analysis employed a thematic approach where key themes emerged from the data and functioned as analytical categories (Fereday & Muir-Cochrane, 2006). Multi-iterative and non-linear processes, including Cresswell's (2017) strategies of organising data, reading through data, beginning coding, generating categories and/or themes based on coding, deciding how themes will be presented and interpreting the data were used. The analysis of data engendered four broad organising themes:

1. Construction
2. Social skills
3. Creativity
4. Ways forward for loose parts play in schools

Results

Construction

According to the children's surveys, more than half of the children (13/22 in the unstructured group and 18/24 in the structured group) expressed that construction was the best thing about the sessions. Construction included all references to building, creating and making things. The word *building* was used most frequently by the structured group ($n=12$) while the unstructured group used *making* most frequently ($n=7$). Illustrative examples include 'You could build lots of stuff', 'Building cars and vehicles', and 'Creating different things like the hospital and the obstacle course.'

Children often included other themes in conjunction with construction. These themes related to playing with friends, working with others, having fun, and having the freedom to choose what to do. For example, 'You got to work together to build things', 'You got to build stuff and have fun', 'You could make whatever you wanted and play games with your friends,' and 'We could play and build without rules.' 'Freedom to choose' was only mentioned by children in the unstructured group. In

the unstructured focus group, two females related how they had 'power' and 'choice' to make things.

When asked what they learned from the sessions that they do not learn in school, *building* was the top response (13/22 in the unstructured group and 16/24 in the structured group). Again, children's responses often comprised construction with another theme. Examples included 'How to build really big stuff and how to be more creative', 'I learnt teamwork, building and creativity' and 'How to build things in a group.'

Social skills

Unsurprisingly, children enjoyed the opportunity to play and work with others. According to the children's survey responses, *friends* or *working with others* was the second-best thing about the project, with six children in the unstructured group and seven children in the structured group reporting it.

The teachers also noted positive outcomes for social skills as a result of the play sessions. The teacher of the unstructured group noted that the children played with peers outside of their friendship group during the sessions. The teacher from the structured group commented on how children with diverse needs were able to socialise with their peers. She commented.

I was really fascinated by my students who do have a learning difficulty ... they seemed to shine in today's lesson ... because I think they were able to speak together, communicate in their own language, and giving them more freedom and chance to speak

The structured group teacher also noted that children who were typically quiet became more social during the play sessions.

I have seen a lot more students come out of their shell. By that I mean particularly my reserved ones, who tend to just sit there quietly and just observe, they actually started to take a bit of risk, which was very interesting.

Similarly, the teacher in the unstructured group reported that, over the course of the project, children who did not engage in typical classroom activities participated in the loose parts play sessions first, as observers and followers, and later contributed their own ideas and initiated play actions. The loose parts sessions enabled social interactions that general curriculum areas did not.

An unexpected finding was that a lack of social skills (e.g., hogging, stealing, not sharing) was considered the worst aspect of the play sessions for more than half of the unstructured group (12/22). During the second week, the children used additional resources from the hall, including balls and plastic containers, to create a cat house. This encouraged other children to set up other trestle tables, and the children began to create shops and trade Nüdel Kart pieces. The baseboard became a trading vehicle that moved between shops and collected and negotiated more pieces. One child collected a box of eight to ten pieces, put it under the table, and sat in front of it to 'guard' them and was unwilling to share

or create using them. Bean bags and tennis balls were collected around the hall and became currency to buy pieces. The shops were not ‘selling’, so the children began to steal. More than half the class was involved in the hunting, hoarding and stealing. The teacher reported having a debriefing discussion in class the next day as the children were upset at how the session had deteriorated with the hoarding and currency. The children decided not to have currency in future sessions. Examples of responses related to poor social skills from the unstructured group included, ‘People weren’t sharing sometimes and hogging when I didn’t have my stuff’, ‘The time when everyone was greedy and there was stealing, currency and hoarding’ and ‘When everyone was fighting over everything and when I didn’t have the thing I needed’.

Creativity

Interestingly, when asked to write five words that best described the play sessions, the unstructured group ($n=12$) used the word *creative* more frequently than the structured group ($n=5$). Three children from the unstructured group also named *creativity* the best thing about the sessions. While creativity per se was not mentioned by any child in the structured group, five children wrote about the *challenges* as the best thing. The challenges required the children to be creative. Both groups equally thought that creativity was something they learned through the sessions but not during school (6/22 and 7/24 for the unstructured and structured groups, respectively). Examples of responses of what they learned included ‘How to be creative and how to keep on trying different stuff on your creation to find the right one that you like’, ‘How to use one object in all different ways’ and ‘That you can make anything you want with your imagination.’

During the focus groups, children noted how they thought their creativity had increased over the duration of the play sessions. One of the female students in the unstructured group said.

When we started, we weren’t that creative. We were just using what we do at break times. We were playing, we were making tiny campfires and everything. And then, and as the weeks went past, we started getting more creative and making bigger things.

Another female student in the same group followed, explaining how their play expanded.

With the Sail Boy boat, we had a box and then we were like, ‘Well, we can’t just have a box to sit in.’ Boats move. We can’t make an engine so, we need paddles. We’ve got paddles and attach them and then we need more room cause more people were joining. We got another box, attached it, made more things, ... we had the bag attached to the boat and we had all this pieces in there. We thought, like, ‘We just have all this stuff, what are we going to do with it now?’ So, we started selling it to people and then we opened a fish and chip shop next to it.

The male students in the structured group spoke about how they would encourage other children new to loose parts to experiment with their creativity:

Try out ideas even if you don't think they'd work because they could work and you've got no idea and it could work better than one of your other ideas so, just try all of your ideas. (Boy 1).

Boy 2: Try and build on your ideas and change them and build on the old one and build on the new one. And try and link them, like how they worked and how they didn't and try and improve them both. (Boy 2).

Interestingly, the children in the structured group generally did not use the creativity terminology to which they had been exposed during the sessions. Only three children used these terms in their survey or during the focus groups.

Children, teachers and researchers all noted constraints to creativity. In the unstructured group, wheels were considered to limit creativity. Both the teacher and researcher noted much greater creativity when the wheels were no longer available in Week 5 and decided to ask the children how they found the session. Without any prompting, the children said there was more creativity and gave examples of what they made and played. The children agreed that the wheels would be removed the following week to enable more creativity in the play. In Week 7, the wheels were brought back into the play at the request of some children, and the teacher and researcher noted a decrease in creativity and types of play. The children also recognised this, as they predicted the final week would not include wheels. Several children in the group wrote about wheels in their survey responses. Five children reported wheels as the worst thing about the sessions, and half of the group suggested no wheels when asked how we could improve the sessions. Examples of the former quote included 'when they just used the wheels to wheel themselves around' and 'When there were wheels and no-one was creative.'

The structured group considered time and equipment as constraints. They reported not having enough equipment as the worst thing (13/24) and not having enough time (6/24) as the worst thing. In contrast, only three children made mention of these things in the unstructured group as the worst thing. However, both groups indicated that having more equipment and time would improve the play sessions (15 and 11 responses, respectively).

Ways forward for loose parts play in schools

Children and teachers were both overwhelmingly positive about the play sessions. Not surprisingly, children found the sessions enjoyable. *Fun* was the most frequently used word children used when asked, 'What five words best describe your time during the play sessions?' All children in the unstructured loose parts play and 22 out of the 24 in the structured group indicated *fun* in their survey. As noted previously, children reported having fun with friends while making things in their surveys.

Children had ideas on how loose parts play should continue within schools. When asked, during the focus groups, what advice they would give other students using the loose parts, two quotes from the focus groups best summarised the children's

ideas: ‘Don’t hog, share and just let your imagination flow’ (female student from the unstructured group) and ‘Use a good sense of fun when you’re building and team-work’ (male student from the structured group).

When children were asked if they would like to either have unstructured play or set challenges, there was a range of responses. Understandably, children often indicated that the mode they had experienced was superior to that experienced by the other group. For example, one of the females in the unstructured group said.

I probably wouldn’t like it [challenges] as much because your mind can’t just flow. I mean, it can in some places, but you, kind of, just make a rocket ship. You can’t make an instrument or something that your mind was set on doing beforehand.

Likewise, when asked if they would like some challenges, a male from the unstructured group said, ‘No, because I like just coming up with ideas myself and the freedom. Making up stuff on the way to building it.’

However, other children could see the benefits of having both unstructured play and structured play. A female child in the structured group said, ‘I would do free play and challenges because in challenges you learn new skills, but you can’t really use them on different things. So free play, you would be able to use those skills and help make different things.’ Similarly, a male child from the structured group commented,

I think a bit of both because if you just did challenges then, it would become a bit boring because you wouldn’t be able to, say you have this idea when you come in, then you get the challenge, you can’t really use your idea because the challenge is that you have to do that.

Both teachers believed that the program was worthwhile and should be continued. The teachers spoke about how the sessions were inclusive and enabled all students in their class to be successful in their learning. The structured group teacher related how.

They all felt like they were included in the activity, and they could all partake ... particularly my other students who are performing significantly below their grade level, they were able to participate in the lesson and it was lovely to see.

The teachers commented how children had opportunities to shine during the play sessions, tacitly saying that general curriculum studies did not afford the same opportunities.

The teacher of the unstructured group indicated that a combination of both types of play would be most beneficial going forward. The teacher was aware that the other group was being set challenges and tasks. Her advice for others was ‘start with what we’ve been doing for a smaller amount of time, and then move into that structured play and just see the changes, see the growth, see what they come up with.’ She explained her reasoning by saying,

I think we’ve well and truly done the free play and it’s been awesome, but I think now is time to move on to something else... I think the beauty of them

being saturated in the parts, they know the parts really well. So, if they're assigned a task to create a rocket, they're like, 'Ah, I know the piece. We know what fits in together, We know what ties together.' I think it would be easier for them than just work going in blindly with a bunch of stuff.

Discussion

The results from this study show that both students and teachers perceived benefits of loose parts play within the classroom. They reported that the play sessions afforded opportunities for construction, social skills and creativity. Our findings are consistent with loose parts research conducted in out-of-school hours care (Gorrie & Udah, 2020), where themes of collaboration, creativity and construction emerged from educators' observations of children's play. These authors argued that greater educator understanding of the theory of loose parts in children's play would promote children's development and well-being and extend their play experiences. In contrast, we argue that loose parts play can meet curriculum requirements and create inclusive environments where all children can succeed regardless of ability.

Interestingly, the children believed that the sessions afforded opportunities for construction, something they felt regular school did not offer. Engineering has traditionally been absent in primary school curriculums despite recent calls for it to be included more rigorously within STEM education (English & King, 2016). Studies have shown that primary-aged children are capable of engaging in engineering projects (English & King, 2016; English et al., 2017), but that teachers have difficulty integrating engineering within STEM and require training (Ekiz-Kiran & Aydin-Gunbatar, 2021). While Design and Technology is a discrete subject within the Technologies learning area in the Australian Curriculum (ACARA, 2023), the children in this study did not connect their experiences with loose parts to the curriculum.

The Design and Technology curriculum lends itself to loose parts play. The rationale for the subject is that.

Design and Technologies gives students authentic learning challenges that foster curiosity, confidence, persistence, innovation, creativity, respect and cooperation. It motivates young people and engages them in learning experiences that are transferable to family and home, constructive leisure activities, community contribution and the world of work (ACARA, 2023c).

According to the aims and structure of the Design and Technology curriculum, engineering principles and systems should be taught within knowledge and understanding, while generating and designing and collaborating and managing should be taught within processes and production skills (ACARA, 2023c). In the structured group, children worked together to create innovative solutions to the set tasks, aligning with the Technologies curriculum. Future projects should include challenge tasks so that curriculum requirements are met during the session. The findings also suggest that teachers need to make explicit links to the curriculum so that children are aware of the learning. Similarly, more attention to the metalanguage is needed as

children did not transfer new terminology learned during the sessions to the survey or focus groups.

Both children and teachers reported social skills and creativity as benefits. Our study provides some evidence that loose parts play in primary school can increase children's creativity. We were unable to locate other studies in primary schools that have focused on play and creativity. In terms of social skills, the findings from this study align with Mackley and colleagues (2022) research that showed loose parts foster social capabilities. These authors report that the provisions of loose parts play in upper primary school settings was a pedagogically appropriate method for fostering collaboration (Mackley et al., 2022). Interestingly, these authors reported three main types of sociodramatic play (trading, bartering and advertising). The first two were evident in the unstructured group's play; however, they were viewed negatively by both the teacher and students. The teacher wanted to remove tables to stop shop play while trading with currency was negatively perceived by the children.

Collaboration is a key future-focused skill in the 21st-century skills framework (OECD, 2008). Findings from our study indicate that both students and teachers reported that loose parts play improved students' collaboration and negotiation skills. We argue that loose parts play presents teachers and children with excellent opportunities for teaching social skills, which aligns with the Personal and Social Capability of the Australian Curriculum. Sharing finite resources, working with others to create something and playing, in general, require many skills that children may require support to practice and acquire. As noted in the results children in the unstructured group turned to the teacher frequently to solve issues related to sharing and negotiation. Post-play session discussions could tease out successful and unsuccessful strategies for play entry, sharing and negotiation. Conversations, role play and teaching related social skills based on play experiences are much more authentic than scripted lessons or preset social skills programs that lack context. While we have referred to the Australian Curriculum, other countries have similar curriculum mandates related to social competencies (e.g., Canada, New Zealand, the Czech Republic, Estonia) (OECD, n.d).

Opportunities for construction, social skills and creativity were reported by children and teachers from both the structured and unstructured groups suggesting that benefits accrue from both types of play. Furthermore, the findings clearly showed that Zosh and colleagues' (2017) characteristics of learning through play were present in the play sessions. Both groups' play sessions were joyful, had meaning, were minds-on and iterative and socially interactive. While the structured group contained more obvious elements of iterative processes, the children in the unstructured group believed their play was iterative and included experimentation and hypothesis testing. Importantly, the sessions were considered to be inclusive by both teachers. That is, teachers believed the play sessions included all children socially and enabled them to be successful. This is important as while schools have become more inclusive over the recent years, more traditional curriculum activities are not attainable by some students.

Based on our findings, we argue that both play types have a place in middle primary school classrooms, despite previous research focusing predominately on unstructured or free loose parts play within primary school settings (Mackley et al.,

2022; Pereira et al., 2023). While free play is considered by some as the 'gold standard of play ... it is not always sufficient when there is a pedagogical goal at stake' (Zosh et al., 2022, p. 10). While we advocate for structured play in the form of challenges to meet curriculum requirements, we strongly argue for unstructured play to remain a component of loose parts play in schools. Playing with loose parts is an important play type to which many children are not exposed in their everyday lives. There is considerable research showing how play is disappearing from children's lives, and we must protect the remaining opportunities (Dickey et al., 2016).

We recommend that researchers or others wanting to embed loose parts play into the curriculum carefully plan the sessions with time assigned for free play, warm-up challenges, explicit teaching of language and processes and group tasks. Additionally, we recommend holding professional development with school staff outlining how play sessions can meet curriculum mandates in tandem with the benefits of play for children's learning and development.

Limitations and future directions

This study was conducted in one school only. Classes from other schools with different children may have generated different results. Future research should include a larger and more diverse sample of children. Children's creativity and social competence should be measured using validated instruments to provide more robust evidence to schools that loose parts play can help meet curriculum mandates. Deeper exploration into trading and bartering practices during loose parts play could be conducted to better understand how they impact social learning and competencies. Similarly, future research might investigate children's perceptions of inclusion and curriculum success with loose parts during school time.

Conclusion

This study makes an important contribution to the literature in both focusing on play sessions within middle primary school, a neglected research area, and including children's voices. We argue that one hour of loose parts play per week affords opportunities for construction, social skills and creativity while ably meeting curriculum requirements related to design and technology and social and creativity general capabilities. Moreover, loose parts play sessions afford novel play opportunities for many children. We argue that future classroom-based play sessions in middle primary school should include both structured and unstructured play in the form of group challenges and free play with loose parts.

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Data availability Data may be requested from the corresponding author.

Declarations

Competing interests The authors report there are no competing interests to declare.

Ethical Approval Ethics approval was granted by the University of Canberra (11785). Consent was sought from teachers, student participants and their families.

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Kym Simoncini Kym is an Associate Professor of Early Childhood and Primary Education. She worked in primary schools in Australia and England before moving to higher education. Her research interests are play, teacher training and professional development.

Katy Meeuwissen Katy is a Doctoral Lecturer in Early Childhood and Primary Education. She had extensive experience teaching in early childhood and primary school settings before commencing further studies and taking a position in Higher Education. Her research interests are play and teachers' conceptualisations of play and play-based learning.