The Inspirational Schoolyard

Case Study on Child Influence on Climate Adaptation in Child-Caregiver Co-Creation

Name student: Susan Janssen Jouwsma
Email student: sjpw_janssen@yahoo.com
Name supervisor: Dr. J.L. Geiger
Second reader: Dr. C.X. Garzon Lopez
Date: June 20, 2024
Master specialisation: Cultural Geography - Climate Adaptation Governance

Acknowledgement

The subject of influence in co-creation is researched in this thesis, yet the creation of this master thesis was also an influenced co-creation adventure. Combining study with working, plus being a caregiver asked for a lot of flexibility, most of all for my daughter and partner.

A lot of people made this thesis possible. First, my family who, next to creating an environment in which I was able to spend time on study, reading, and writing, brought the right doses of distraction to maintain a healthy social and mental life. Second, my supervisor who kept me on track and in line with the subject while I had the tendency to wander off in other directions. Plus not to forget all the participants, young and a bit older, involved in this research. Without their contribution this thesis had remained an idea. A very grateful *'thank you'* to all the children who built their favourite schoolyard with LEGO. You *'rock'* in designing, more grown-ups should realise this. And although I have been manipulating (we might call it interventions, do not be fooled) adult participants as much as possible using the childrens' input, I am very grateful for their openness and help in gathering insights in how much influence our children have on our behaviour and choices.

When reading this thesis please remember, words might not always be as inclusive as we would like them to be. Where the text refers to caregivers, biological parents, foster parents and all possible family compositions are meant. By using the word caregiver instead of parent I hope to include all family forms in an equal way.

Abstract

This research looks at if children can shape caregivers' perceptions of their residential environments. Using heat stress in the schoolyard as an example, combined with a child-adult co-creation of greening the schoolyard, influence of children over their caregivers is investigated. With mixed exploratory creative qualitative methods for the designing and a quantitative method for finding influence, this thesis hopes to answer the question *“what is the impact of the co-creation of a green schoolyard with regards to climate adaptive behaviour - can co-creation influence caregivers to green their residential environment?”*

Using literature, this thesis explores children's impact on caregivers' attitudes and behaviours, advocating for genuine child participation in co-creation. It emphasises children's potential as active stakeholders in shaping their surroundings, urging a shift from tokenism to empowerment. Results show, although caregivers prioritise practicality and safety, children influence them up to a certain level. The results show an interplay between children's influence and the adult decision-making processes.

Overall, this study underscores the importance of involving children in present and future planning of their daily environments although further research on the influence of children on their caregivers is desirable.

Keywords: Children, Caregivers, Co-creation, Schoolyard, Adaptive Behaviour, LSP, Mindmapping.

Table of content

Introduction

Early childhood years offer opportunities to foster children's understanding and appreciation of their environment. During these early years a lifelong commitment to caring for the natural world is developed (Wilson, 2008). This development is for a large part established during a child's elementary school years. Environmental education offered in the early ages helps children to develop positive attitudes during the following stages of their lives (Wilson 1996 in Günindi, 2012). During these first years of education, the impact children have on their caregivers regarding their living environment should not be underestimated (Knafo & Galansky, 2008; Thomas et al,. 2018). Even very young children have a good understanding of their everyday environment (Harpman, 2002). This sense of place can be described as "*a living ecological relationship between a person and a place' including physical, biological, social, cultural factors*" (Kincheloe et al., 2006 in Kudryavtsev et a.l, 2012).

Adaptation behaviour is said to be influenced by social motivations (van Valkengoed & Steg, L. 2019; Kahn, 1999 in Burke, 2001) such as e.g. looking for approval from others or avoiding social sanctions (Bouman & Steg 2022). Children bring home impressions and inspiration found in their schools' surroundings, most caregivers respond to them. The world view and the agency children take on their world - how they tackle issues in this world - is something adults can learn from (Knafo & Galansky, 2008). Knowledge on, and the attitude towards, the environment by children starts to be shaped in the pre-, and elementary school period (Günindi, 2012). Children know how to alter their home and school environment (Kahn, 1999 in Burke, 2001) for theirs and others benefits. This attitude towards the environment can have a spill over towards caregivers and the residential environment (Margetts & Kashima, 2017). Adaptive behaviour towards a more green residential environment yet having an elementary schoolyard without green, will not inspire a (future) green residential environment (Kellert & Wilson, 1993 in van den Berg et al., 2010; Flax et al., 2020). Greening the schools' yard might sprawl to residential homes. When this sprawl is based on shared information between children and their caregiver, co-creation can occur (Margetts & Kashima, 2017). Co-creation or co-design is seen as a partnership approach that engages community members in a joint design, and implementation process (Sanders & Stappers, 2008 in Pawlowski et al., 2019)

This thesis focuses on the influence children have on their caregivers in greening their residential surroundings. Becoming a caregiver (Thomas et al., 2018; Shrum et al., 2022) plus the influence this has on adults is much researched, the actual influence children have on their caregivers in designing adaptive measurements is under-exposed. The primary goal of this research is to look at how much active influence children have in co-creation for greening the residential environment, and hopes to contribute to understanding the influence of children on their caregivers using inter-generational co-design (Vaughan et al., 2003; Lawson et al., 2018; Spiteri 2020). Can co-creation convince caregivers to shift towards a greener residential environment?

Popular saying states that '*it takes a village to raise a child*'. This thesis argues that children can educate adults on what an adaptive, green, and social environment should and could look like when the child's ideas on, for example, their own schoolyard, are taken central in co-creation.

Literature

This section gives an insight in existing literature to give foundation to the main concepts.

2.1 Elementary schoolyards and heat stress.

A warmer urban environment is known to cause heat stress (IPCC, 2023), especially in urbanised areas. To cool the urban environment, multiple scholars (Gill et al., 2007; Wolf et al., 2020; Maas et al., 2021; Gillerot et al., 2022) recommend more green infrastructure. The interventions of creating cool pavements (e.g. Wang et al., 2021) and urban greening in for example schoolyards, can benefit citizens' health, and promotes community engagement bringing a stronger social cohesion (Flax et al., 2007).

As recognized by the United Nations Convention on the Rights of the Child (UNCRC, 1989), children have the right to live and play in an environment that stimulates a healthy development. The schoolyard is an important and much time spent in place in children's lives. Studies show schools with an open paved playing area experience increasing surface temperatures (Gill et al., 2007). Especially children, at a younger age, are considered to be vulnerable to heat (Hintz et al., 2018; Antoniadis et al., 2020; Sandholz et al., 2021). Elementary education in the Netherlands starts at the age of 4 ending around 12 years. During these years children spend approximately 940 hours a year at school (Inspectie van het Onderwijs, 2024). One third of this time is spent outside in the schoolyard (Antoniadis et al., 2020). Due to the warming of the urban environment (IPCC, 2023) schoolyards experience an increase in temperature, mainly because of their traditional design. During summer, the average perceived temperature on a Dutch traditional schoolyard can rise up to 58 degrees Celsius (Antoniadis et al., 2020) causing heat related stress (Wolf et al., 2020). Reducing the impact of heat on schoolyards is beneficial in preventing heat stress. Yet not only in the schoolyard, a greener urban surrounding has more positive aspects. A more natural environment is also seen positively in reducing

respiratory diseases (Wolf et al., 2020), obesitas, and attention-deficit disorders (Loev, 2006; Wilson, 2007; Wolf et al., 2020) - conditions children are also prone to. Heat does not only have a negative effect on human physical and mental health, it also has negative consequences to social life. Because of warming conditions, children move more indoors and away from physical contact with the natural world (Loev, 2006; Albrecht, 2019). A cooler and greener environment is more inviting to recreate outdoors (Loev, 2006). Natural surroundings do not only stimulate a healthier development, they also provide playful physical environments for young children (Loev, 2006). Play helps to prepare children for what they may do and experience later in life (Wilson, 2007). Playing in a greener environment might also create a positive perspective towards a more green future residential environment (Flax et al., 2020).

Next to climate and health resilient or adaptive measurements, natural surroundings increase the connection of children and adults towards their environment (Loev, 2006, Cosco et al., 2010; Wolf et al., 2020). How the schoolyard looks can create a broader benchmark in people's perspectives on the residential environment (Flax et al., 2020), now and in the future.

2.2 Perception of children towards their living surroundings.

Although schoolyards might be limited in size; they are well distributed throughout neighbourhoods making them important places for children. The schoolyard has a profound influence on how children experience their living environment. Children construct adequate ways of understanding their world and act upon it (Kahn, 1999 in Burke, 2001). This is for example shown in the Dutch youth television show '*Groep 8 aan de Macht*' (transl: Group 8 takes control) (BNN VARA, NPO 3, 2024). In this program, children of a Dutch elementary school are given the power to act on a (local) societal problem. The idea behind the program is to show how '*wicked problems*' are solved when children have active power. Discussed problems have a connection to larger social or environmental topics in society - e.g. littering, speeding, or loss of biodiversity. The solutions thought of by the children show an unrestricted creativity plus a very good sense of place.

The example shows that instead of talking about children's needs in the public environment, the opinion of the child when placed centrally, is beneficial in solving environmental issues. Children explore their surroundings through expanding circles around the places they find important, e.g. home or school (Moore, 1986; Ataol et al., 2019). This makes children active players towards their environment with a strong connection towards that environment from the micro-, and meso system of their own families homes to the macro system of the whole world (see Figure 2).

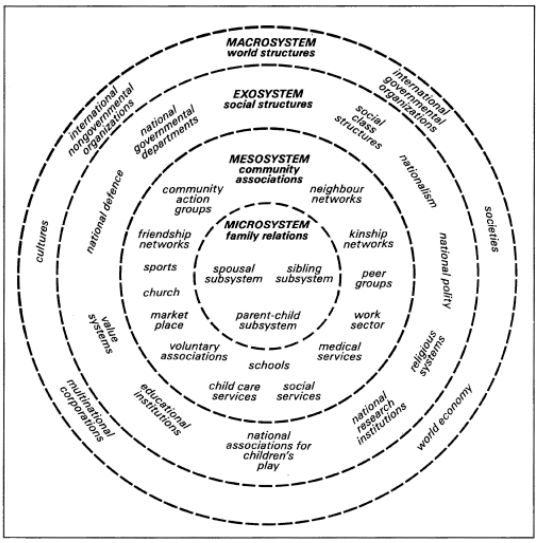


Figure 1: The social ecology of childhood.
(Source: Moore, 1986, p.5)

This idea of connectedness towards a place can be based on where, how, and why children feel connected (Lim & Barton, 2010) up to the level where children experience ownership (Blankman, 2022) towards that place. Figure 2 (Moore, 1986) shows children's social interactions with the rest of the world. Most influential interactions are those with a direct influence over the quality of child-environment interactions on the micro-level; family, together with the meso-level; school and neighbourhood (Moore, 1986). Within these tiers bonds of attention and attachment are strongest (Chawla, 2007). The strongest bond is with primary caregivers. How children perceive their surroundings can explain their sense of place (Harpman, 2002), or even a stewardship (Blankman, 2022) children can experience. Feeling most connected to their residential surroundings and the places they play at (Moore, 1986; Blankman, 2022), the schoolyard is mentioned as the place often visited after school to socialise with peers, or as a playground.

How children perceive their surroundings also influences their way of thinking (Blankman, 2022). Talking '*with the child*' instead of '*talking about the child*' benefits not only the perception of caregivers on their children's views on the home environment, it also makes children active owners and caretakers of this environment (Loev, 2006; Blankman, 2022). Using the perception of children towards, for example their schoolyard in greening programs, gives children responsibilities over their environment (Loev, 2006; Blankman, 2022). Therefore it is important to recognise children as protagonists of their environment, to stress the importance of the views of children on their surroundings (Harpman, 2002; Blankman 2022), including the ability, or willingness, to act on those views by caregivers.

2.3 How caregivers perceive ideas from children

The potential of being a caregiver can be seen as an important window of opportunity to create new habits (Thompson et al., 2011). Research on the influencing effect of having children in the perception

and implementation of a greener lifestyle (Thomas et al., 2018; Shrum et al., 2022) plus speculation on the counter influence by children towards their caregivers (Vaughan et al., 2003; Knafo & Galansky, 2008) show levels of direct and indirect influence. An example of this influence can be found in child focused environmental courses in elementary schools such as the 'Junior Energie Coach' or the 'Junior Klimaat Coach' projects (Ministerie van Volkshuisvesting, 2023) in the Netherlands. These courses do not only teach children an environmental understanding, they also increase caregivers' knowledge, through the active influence of their children. Ideally caregivers behaviour changes due to these kinds of projects in the schools of their children.

Being or becoming a caregiver is associated with greater climate worries yet this is not always connected to perceptions of climate change risk (Ekholm & Olofsson, 2016 in Thomas et al., 2017; Shrum, 2022). By prioritising the focus on the wellbeing of their own child, caregivers make consistent choices (Thomas et al., 2017). However, adults might be protective in discussing '*wicked problems*' with their children, preventing them from future (mental) harm. Some believe the influence of children is small due to age, others believe children do not understand complex societal issues (Knafo & Galanski, 2008; Spiteri, 2020). Therefore the adult takes the role of supervisor in fulfilling the child's needs (Loev, 2006; Wilson, 2007). As long as caregivers fulfil the child's needs for its future welfare or wellbeing, the adult is influencing the child's future perspective. When the child is placed on a pedestal by (overprotective) caregivers the term '*Curling Child*' (Urban Dictionary, 2024) is used. This western European term, with the negative definition of caregivers emphasising strongly on the needs of only their own child by placing its future chances above others, does evoke a certain power in children. When a child is aware of this very direct influence (Knafo & Galansky, 2008), it can use this for other means. For example, the active influence (Knafo & Galansky, 2008) of the child in tackling environmental issues.

Involving children into the development of their schools environment can be seen as beneficial towards caregivers' thoughts on greening the residential surroundings. Where some scholars see children as co-learners (Blankman, 2022), others (Hart, 1992; Lawson et al., 2018; Spiteri, 2020) advocate for child-adult intergenerational learning (IGL). With regards to their future environment, children profoundly understand what is '*good*' and '*bad*' (Hart, 1997; Upitis, 2007; Ghaziani, 2021). Child-driven-intergenerational learning is said to be a key-factor in spurring adult action (Lawson et al., 2018; Spiteri, 2020) however, children are often not actively involved in the designing of their surroundings. Indirect influence is more occurring instead of actual active participation. Although a bidirectional influence is noticed (Spiteri, 2020), children are often only informed or consulted (Arnstein, 1969; Hart, 1997) yet not actively participating in co-creating their environment.

Crucial in the exchange of environmental knowledge, information and beliefs within IGL are psychological elements such as legacy motives, generativity or perceived responsibility (Shurm et al., 2023). Caregivers, teachers and peers are leading in these exchanges as is the environment in which the child spends most of its time (Wilson, 2007; Blankman, 2022). When the role of the adult shifts

from supervisor to guide, teacher or facilitator (Moore, 1986), responsibility for the environment can be shared. As education programs such as the ‘Junior Energie Coach’ project (Ministerie van Volkshuisvesting, 2024) show, children have a profound influence on their caregivers. How this influence is perceived by adults remains vague. Little research is performed on this subject, probably due to (protective) assumptions by adult influence on childrens’ understanding, or the ‘*waste no time*’ syndrome (Loev, 2006 in Wilson, 2007) of adults; focussing only on the future perspectives of children instead of acting in the present regarding their children's future lives.

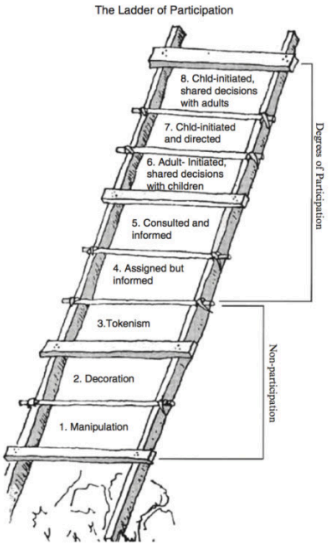
2.4 Intergenerational co-creation of the (semi) public environment

Children are regarded as natural designers; experts in their own environments (Loev, 2006; Wilson, 2007; Ghaziani, 2021). The UN Convention on the Rights of the Child (UNCRC, 1989) evoked an increasing awareness on how to successfully incorporate children in projects that affect them (Ataol et al., 2020). It is important to give children the feeling their initiatives are equally appreciated instead of being used for manipulation or tokenism (Arnstein 1969; Hart, 1997; Ghaziani, 2021). Therefore it is important to investigate what children think (Hart, 1997). However, child-to-parent IGL stays underexposed when it comes to the spatial environment.

Parent-to-child research is mainly focussed on the cultural-, and social influence adults have on the choices and the beliefs of their children (Pagano et al., 2002; Knafo & Galanski, 2008; Lamont et al., 2015). Yet, children are natural environmental change agents. They seem motivated to influence their caregivers in adopting more sustainable behaviour (Spiteri, 2020; Shrum et al., 2023). In reaction caregivers feel compelled to consent to their children’s requests to engage in a green(er) lifestyle (Spiteri, 2020; Shrum et al., 2023). This opens the options for co-creation, especially since children have an unique perspective on solving ‘*wicked problems*’ (Lawson et al., 2018). Research (Pawlowski, 2017) has shown that children are motivated to be involved in the creation of their own surroundings .

An example of a co-creation between adults and children can be found in the efforts by the Cruyff Foundation to create attractive schoolyards. ‘*Schoolplein 14*’ yards are created for children, yet their influence is limited to ‘*consulted or informed*’ in an adult initiated program.

Co-creation approaches are adopted across diverse sectors (Ind & Coates, 2013) however, little is written on child initiated and directed co-creation in planning their direct spatial environment. When applying the ‘*Ladder of Childrens’ Participation*’ (Hart, 1992) (see Figure 3) in the spatial surroundings of the child, a much stronger basis for IGL can be created. Based on Arnstein's participation ladder (1969), the *‘Ladder of Children’s Participation’* promotes a central role of children as active citizens (Hart, 1992). The ladder shows the different levels children can be involved as advocates of their own lives as well as of their surroundings. Hart’s ladder shows the participation levels of children from manipulation - *‘talking about the child’*, forcing children to take on ideas presented by caregivers -, towards child-initiated decision making shared with adults - *‘talking with the child’*.



Roger Hart's original 1992 illustration of the Ladder of Children's Participation from *Children's Participation: From Tokenism to Citizenship*. The model features eight "rungs" that describe the characteristics associated with different levels of decision-making agency, control, or power that can be given to children and youth by adults.

Figure 2: Illustration of Ladder of Children's Participation (Source: Hart, 1997)

Striving for co-creation using the 'Ladder of Children's Participation' means a focus on the top steps (see Figure 2) leaving everything below consulted or informed, out. Using this approach gives children the right to participate in designing their environment and their future (Hart, 1992) leaving the options for decorative non-participation (tokenism) or basic consulting out. In the case of co-creation, children should be seen as equal stakeholders contributing as experts of their own lives (Ghaziani, 2021). When adults predominantly set the agendas with rules or directing the child's activities, the further and future development of the child will not benefit (Wilson, 2007).

Objective and research question

This section focuses on the objective and research question of this study.

3.1 Objective and research question

This research hopes to expose how much spatial designs by children influence their caregivers. This influence is investigated using the schoolyard as inspiration in co-creation to tackle urban heat stress. Can the use of more green on the schoolyard cause a *'spill over'* to the residential environment?

The objective of the study is to find, through literature and a case study, an answer to the main research question; *'What is the impact of co-creation of a green schoolyard with regards to climate adaptive behaviour - can co-creation influence caregivers to green their residential environment?'*

3.2 Sub-questions

The central research question is divided into sub-questions. Starting with an index on the design of schoolyards, 3.2.1, the focus moves towards a smaller scope on perceptions of the schoolyard by children in 3.2.2. The next step, the co-creation of schoolyards, is elaborated on in the last two sub questions; 3.1.3 and 3.1.4. The case study is performed in Leeuwarden. Therefore only the design of Leeuwarder schoolyards is scoped. However, earlier research (Antoniadis et al. 2020) shows an almost global uniformity in schoolyard design.

The methods used in this research are described in the methodology section. Table 1 provides an oversight on which method is used to answer a sub-question.

Number	Sub-question	Method
3.2.1	How do elementary school children design their green schoolyard?	Case study using LEGO Serious Play (LSP) (5.2.1)
3.2.2	How to co-create a green schoolyard?	Case study using mindmapping (5.2.2)
3.2.3	How do caregivers perceive ideas from children and act upon them in the residential environment?	Case study using self-anchoring scaling (5.2.3)

Table 1: Sub-question and research methods

3.2.2 'How do elementary school children design their green schoolyard?'

Being the primary users of the schoolyard, children's ideas on how the schoolyard looks should be leading in the design. For this section of the research children are asked to build their preferred schoolyard using the LEGO Serious Play method. The designs will be used to influence thoughts by caregivers about greening the residential environment, and as inspiration for caregivers to express their ideas on the schoolyard.

The schoolyard is the main setting of everyday life for elementary school children. Through the experienced sense of place, information is brought home to discuss. Caregivers are not necessarily experts on what design elements children (Flax et al., 2020) emphasise on. Many adults rather view the years of childhood as a period devoted to waiting for the child to mature into an adult (Wilson, 2007). In this idea adults often overlook the thought patterns of children. Patterns which are created during play at home and in school. These thought patterns create children's understanding of their experienced environments (Wilson, 2007).

3.3.3 'How to co-create a green schoolyard?'

Do children and caregivers have combined views when it comes to a greener schoolyard, and will these ideas influence caregivers in adjusting their residential environment with more green? This section aims at if and how co-creation can occur.

Co-creation approaches, whether as mindset or method, are adopted as design thinking methodologies (Ind & Coates, 2013) across corporate as well as public sectors. The social interaction in co-creation between involved parties (Pawlowski, 2017; Han & Ahn, 2020) brightens the scope on problems or difficulties. Interaction between children and adults (Knafo & Galanski, 2008) show a distinct difference between active and passive influence. Passive influence is more concerned with the social morale of caregivers. Active influence is obtained by children through their peers, combined with their everyday surroundings (Hart, 1997; Knafo & Galanski, 2008; Günindi, 2012; Han & Ahn, 2020; Chawla, 2001 in Ghaziani, 2021). Children can have an active influence on their caregivers (Knafo & Galanski, 2008). The co-creation of a schoolyard can be considered an active influence on caregivers.

3.4.4 'How do caregivers perceive ideas from children and act upon them in the residential *environment?'*

The way adults combine socio-ecological factors with a sense of place (Galway et al., 2019), is similar compared to how children perceive these factors (Blankman, 2022). Although children might have a different level of relating - they use a different scope.

This section uses a quantitative method. The null-hypothesis to investigate is *'in the population there is no difference between present and future perception of greenery'*. The use of a hypothesis brings a certain validation to the obtained qualitative data (Clifford et al., 2016). To find the active influence the results of the case study are combined with the outcome of questioning present as well as future perceptions by caregivers about greening their residential environment. The designs of children are used as leverage to influence caregivers, plus to establish a general feeling on greening one's residential environment. In a self-scaling exercise adults are asked before and after an intervention to grade their residential environment. To influence ideas about future greening, a mind map in an

interview setting is created. This to distract caregivers from their own environment by having them focus on the school's environment.

Study area

The case study is performed at an elementary school in Leeuwarden. The school thinks about greening their schoolyards yet waits for municipality policies to join in on. This research focuses on the schoolyard in general although the school has three schoolyards.

4.1 The school

The school has a population of approximately 270 students, with both Dutch and international backgrounds, in the age from 4 years (group 1) to 12 years (group 8). The school follows the International Primary School Curriculum (IPC, 2024) program. This program facilitates elementary schools with overarching programs to use in the traditional curriculum (e.g. reading, mathematics, history, geography). Despite the IPC program, the school is a '*stand-alone school*'. This '*single*' situation means, in the case of adapting to changes, extra challenges in the form of funding, gaining knowledge, plus, because of the international background of children and caregivers, different perspectives.

The school has a strong focus on social awareness by having programs against bullying and social exclusion starting from the age of 4 in group 1. Much attention is also given to '*real world issues*' which are incorporated in all different subjects via the IPC curriculum. The school joins in the '*Junior Energie Coach*', '*Junior LEGO© Masters*', multiple sports activities, and in environmental awareness programs as for example cleaning the direct surroundings of the school.

4.2 The schoolyards

To focus on active living the school has incorporated '*Schoolplein 14*' (Cruyff Foundation, 2024) elements for sports in its yards. The school has three separate schoolyards; 1. Main central square for children from groups 6 to 8, also serving as the waiting area for caregivers.; 2. A square for groups 3 to 5; 3. A play square for the groups 1 and 2. Apart from the main central square all other schoolyards are directly attached to the classrooms.

The design of yard 1 experiences excessive heat in the summer. Yard 1 and yard 2 experience problems with water during downpour during summer and winter. Yard 3, is experiencing the least heat and water problems yet could do with less pavement to create more suitable circumstances in both summer and winter. Yard 2 and 3 are bordered by a fence and water with a park on the opposite side.

4.3 Why this school?

This specific school is interesting for the case study since it has a traditional schoolyard, and is open for enhancing this yard with a more adaptive design. The school's awareness on *'real world issues'*, incorporated in their IPC program, makes the school very suitable for the research; they already work with exploratory education. The greening of its own surroundings falls within the scope of its own curriculum yet brings difficulties with for example finance. The multiple nationalities of the student population is a third reason why the school is applicable for this specific research. The inclusiveness of other cultures emphasises on the importance of respect to each other's norms and values. The views of different backgrounds might be present in the reactions of children and caregivers.

Being a caregiver to one of the students in the school is a very convenient extra aspect that provides '*shorter lines*'. The request for performing the case study was directed immediately to the school's principal. The staff found the research interesting and beneficial for the school.

Combining all these aspects makes this school interesting for the case study.

Methodology

This chapter describes the methods used for collecting primary data. This explorative research uses a quantitative, next to a mix of creative qualitative methods. Although research in creative methods can be biassed, well explained assignment instructions and semi-structured interview designs should prevent research bias, confirmation bias and actor-observer bias (Von Benson et al., 2021). By using a quantitative method next to the creative approach, the risk of bias is further reduced (Clifford et al., 2016).

This research is not looking for socially acceptable answers or one specific outcome. The focus is on the own thoughts of an individual child or caregiver. Therefore any outcome is valuable. Both children as well as caregivers are informed at the start of the research on how more green is thought to reduce heat stress in an urban environment.

5.1 Participants and procedure

Finding participants is done with the help of the school. During the research period the teacher's opinions on whether a child could miss 20 to 25 minutes of a class were leading. The school provided a classroom to perform the case study.

Starting the research a few caregivers had given consent for participation. As the three-week duration of the research proceeded, more and more children were given consent resulting also in a higher number of adult participants. The non-grading, non-teaching aspects of the researcher's role (Moore, 1986) had a positive impact on this snowball effect. In the case-study, 28 children, and 18 caregivers participated. In some families up to 3 children participated. Family compositions of participating

children resulted in a lower number of adult participants. One caregiver is excluded because of the relation with the researcher, the child is included in the LSP. One caregiver did not respond to the invitation to participate, the LSP of the child is included.

The LSP schoolyards are created by children between 4 to 12 years, from different classes with an almost even distribution of girls and boys. The children have different cultural backgrounds - most of them European. Each child participated as an individual. None of the children saw what the others had built. The main task of the researcher was to listen, observe and take notes on what the children told. An interview design (see appendix 4) was made to guide the question for the children.

Representations, such as those crafted using LEGO®, demand meticulous description, reflection, and adaptation to effectively extract meaningful insights (McCusker, 2014; Ghaziani, 2021; Von Benzon et al, 2021). The results of the LSP exercise were photographed (see appendix 5) plus counted (see Table 2). Notes are translated to English and AI-coded in ATLAS.ti.

All adult participants are invited as individuals to prevent confirmation bias. The mind maps are photographed, interviews (see appendix 7) are translated, and transcribed. The interview design, plus setting are described in appendix 6.

5.2 Case Study

The case study uses three different methods, 1. LEGO© Serious Play (LSP) for children, 2. A mind map exercise for caregivers, and 3. A self anchoring scale exercise. The latter will provide quantitative data to find a robust answer to the research question. All interactions and interventions are placed in an interview setting. The interviews are not audio recorded. Notes are taken to maintain absolute anonymity of the participants. All notes are translated to English (if needed) and AI-coded with checks on accuratesse.

5.2.1 LEGO© Serious Play

LEGO© Serious play (SLP) (Roos & Victor, 2018) is a method in which LEGO© bricks are used to visualise and achieve common goals, as well as to create new understanding (Brown & Collins, 2018). To investigate opinions on preferred (green) schoolyards, elementary school children were asked to build their preferred schoolyard incorporating as much green as they wanted. The process of LSP as described by Tewdwr-Jones & Wilson (2022) was used following steps 3, 5 and 6 (see Figure 3).

Figure 3: Example of sequential stages of the LEGO mash-up process (Source: Twedwr-Jones & Wilson, 2022)

The use of LSP as a research method is justified by the nature of LEGO©. The material invites children to express themselves (LEGO© corporate site, 2024), creating an inclusive manner of research. Most children have experience in playing with LEGO©. Another choice for LSP instead of drawing is the tendency of children, especially in younger age groups, to write their name on assignments. This would have breached the anonymity of the participant.

In LSP it is important the research exercise is explained in such a way that confirmation bias is prevented (Tewdwr-Jones & Wilson, 2022). The LSP began with an introduction of the assessment, starting with an explanation how a green schoolyard can prevent warming conditions. The children were asked to build their preferred schoolyard including more green. The inclusion of green was explicitly asked by the researcher. The time to build was 20 minutes, kept by a kitchen timer. The children were leading in the design. The researcher only asked questions on what they built. Only remarks on the design and building process were noted. The child was allowed to finish one aspect when time was done.

5.2.2 Mind mapping

The use of participatory mapping is a useful social research method that can be applied in a range of community contexts (Fenton et al., 2003; Coakes & Sadler, 2011; Coakes & Anagnostaras, 2024). In this research mindmapping is used to investigate the thoughts on a green schoolyard by adult caregivers. Next to distract caregivers from the greening of the residential environment in general, the mindmapping was also used to find influence of co-creation in LSP. Narrative mapping, like having participants create mind maps, visualises relationships between the experiences of individuals and their socio-spatial environments (Turner, 2021). The self-influence of actively thinking about greening is of major importance during this exercise.

Caregivers were introduced to the subject by an explanation on how greenery can reduce heat stress in general and specific in the schoolyard. First the adults were asked to answer question 1 of the self-anchoring scale (see section 5.2.4). Next ideas on how a green schoolyard should look according to caregivers were investigated. After this, all LSP results were shown. During this viewing and describing what the children had built, caregivers were invited to start creating a mind map. After the viewing, caregivers were given an additional 15 minutes to elaborate on the mind map. Time was kept

using a kitchen timer. The mind map was discussed on positive and negative aspects with regards to the LSP designs. The final question referred back to the self-anchoring scale.

5.2.3 Self-Anchoring Scaling

To find if there is a tendency towards a greener residential environment a self-anchoring scaling exercise (Gallup, 2024) is used. Caregivers were asked to scale their residential environment on a ladder from 1 to 10. The top end (10) represents the best possible green environment, the bottom end (1) represents the worst possible. Two scaling questions asked at caregivers were; 1. "On *which step of the ladder would you say you personally feel you stand at this moment?" (ladder-present)*, and; 2. "*On which step do you think you will stand five to ten years from now?" (ladder-future).*

The interview started with question 1, the present perception. After showing the results of the LSP exercise and the creation of the mind map (passive and active influencing), question 2 was asked, the future perception.

The self anchoring scale results are used to find significance in the null-hypothesis *'in the population there is no difference between present and future perception of greenery'*. The number of cases is 18. This is a very low number of cases therefore next to a paired sample T-test a Wilcoxon signed rank test is performed. The level of uncertainty is 5% meaning, within 0 to 5% the test is significant enough to reject the null hypothesis (Burt et al., 2009).

5.2 Coding and use of AI

This research uses AI-generated coding to prevent researcher-bias. With a small sample it might be possible the researcher remembers certain interviews much better compared to others. AI-coding of LSP interviews, as well as the mind map exercise is performed in ATLAS.ti, version 24.1.0.30612. Used prompts: a: find similarities and differences, and b: what general topics are mentioned. All AI-generated codes are manually reviewed.

Ethics

This research follows the guidelines of the Ethics Committee of the Campus Fryslan.

In this research children's ideas are leading in the research. Children have very creative views to deal with environmental or spatial issues (Kahn, 1999 in Burke, 2001). The general thought in this research is that the researcher can learn a lot from childrens' approach towards '*large world problems*'.

6.1 Consent

All participants are asked informed consent. Caregivers gave consent for their own plus their childrens' participation, Children were asked oral consent before and again after the intervention. Consent was given with regards to the participation, the use of photographs on LSP and mindmap,

results, plus the interview transcriptions. To keep all participants anonymous there are no audio-recordings. For information sheet plus consent form (in Dutch) see appendix 1 and 2.

6.2 Use of AI

For correct spelling, Chat GPT, version 3.5. is used, using the prompt: ‘check spelling’.

Results

This chapter shows the results the case study performed with children and their caregivers.

7.1 Case study results

This section shows the results of the case study as performed at the elementary school

7.1.1 LEGO© Serious Play - Childrens designs

The results of the LSP show a diverse preference on how elementary school children see their desired schoolyard. All child participants are consistent in what they want in their schoolyard - having a strong focus on play, socialising and preventing harm for others.

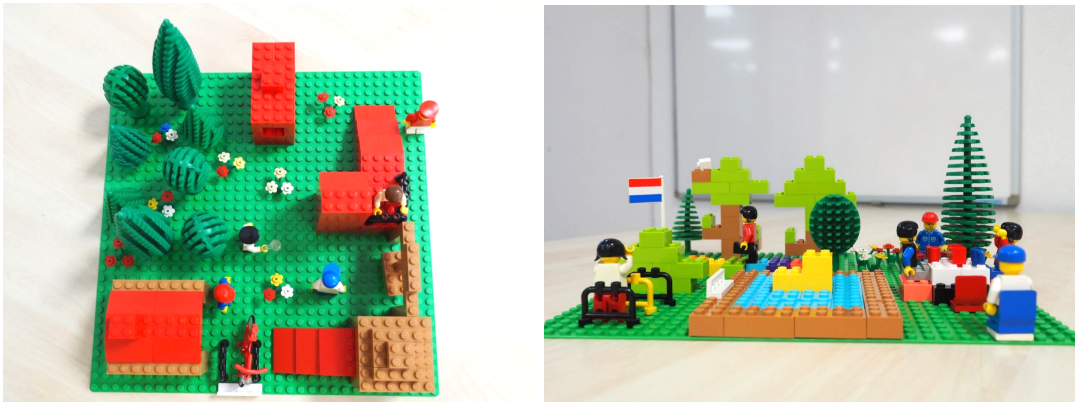


Figure 4, Photographed results of LSP design created by children

Looking at the counted results in Table 2, a strong focus on biotic elements such as trees and flowers on a natural (green) underground is found. Places to sit or relax, fences, tiny buildings, and water features also score high. Playing equipment is focussed on climbing obstacles, slides, and outdoor toys. Although there was an almost equal number of girls and boys participating in the LSP exercise, a football facility scores high. Children also thought about safety by adding fences around obstacles to prevent falling, fences around the schoolyard and around water.

ELEMENTS			TIMES	%
FLOOR		*Green floor*	25	89,3
		White floor	3	10,7
		Total	**28**	**100%**
BIOTIC ELEMENTS	**PLANTS**	*Trees*	248	43,1
		Flowers	320	55,7
		Shrubs	7	1,2
		Total	**575**	**100 %**
	ANIMALS	*Birds / ducks*	4	2,5
		Dogs / cats	1	0,6
	FIGURES	*Figures*	158	96,9
		Total	**163**	**100 %**
INFRASTRUCTURE	**NATURAL**	*Water (pond / pool)*	9	11,6
		Mountains	4	5,1
	BUILD	*Building*	14	18,1
		Benches / seats	33	42
		Fence	14	18,1
	ROADS	*Roads / paths*	4	5,1
		Total	**77**	**100 %**
PLAYING EQUIPMENT		*Climbing obstacles*	21	30
		Horizontal bars	8	11,4
		Sandbox	4	5,7
		Seesaw	6	8,6
		Slide	13	18,6
		Swing	4	5,7
		Toys	12	17,1
		Trampoline	2	2,9
		Total	**70**	**100 %**
SPORTS FACILITIES		*General sports*	3	25
		Basketball	2	16,7
		Football	5	41,7
		Other sports	2	16,7
		Total	**12**	**100 %**

Table 2: Elements children include in their schoolyard

7.1.2 Mind map exercise by caregivers

Mind mapping is used to find the active influence (Knafo & Galanski, 2008). Adults have specific ideas on what a green schoolyard looks like. Multiple caregivers talked about their ideas and their wishes. Some caregivers used the mind map to design their own favourite green schoolyard.

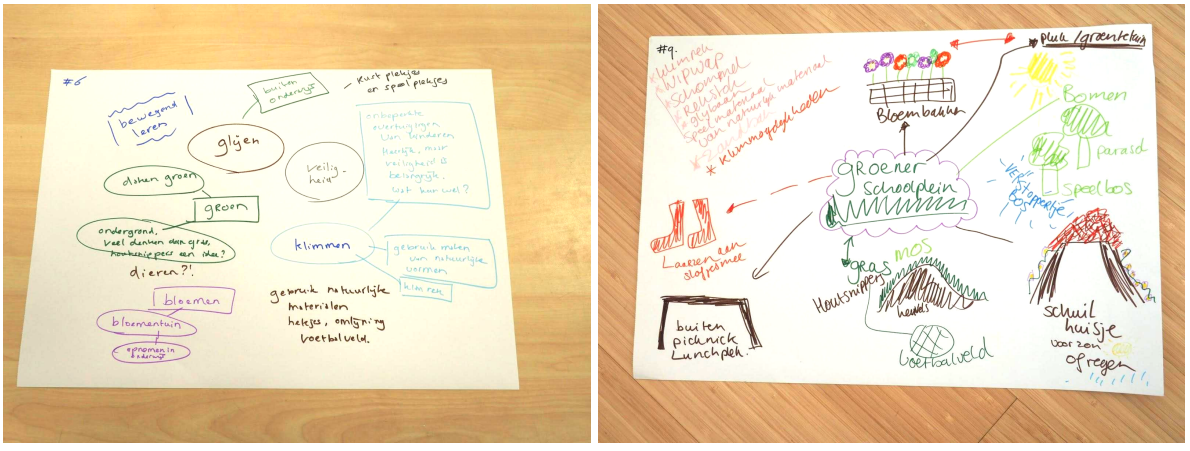


Figure 5: Examples of mind map created by adult participants

Table 3. shows the most frequent AI-generated code words. Coding looked for remarks on the design and the similarities between the mind maps created by caregivers.

Top applied codes		Amount
Design	Children's development	12
	Retreat place	12
	Playing equipment	12
	Outdoor play	11
	Schoolyard design	11
	Landscaping	11
	Happiness	9
	Creativity	9
	Recreational features	9
Similarities	Playing equipment	12
	Creating structures	12
	Risks	10
	Happiness	7
	Using natural building materials	7
	Trust in children	7

Table 3: Intentional AI Coding: top applied codes of interviews with caregivers during mind map exercise. (Source: ATLAS.ti, version: 24.1.0.30612)

In the mind maps the development of the child together with playing equipment are placed central. The wish for the use of natural materials for playing structures or creating structures is expressed by caregivers. Most caregivers emphasise on outdoor play, happiness, and creativity, often combined with a remark on risks or safety. See appendix 7 for interview transcriptions.

Figure 8 shows the amount of attention is given by children and caregivers using the highest scoring AI-generated codes. As Figure 8 shows, the views of children resonate with those of caregivers although adults focus on other aspects. Children have a strong vision on what their preferred green schoolyard should look like, caretakers show more affection towards an actual design, and safety. Children seem to have a larger vision on nature, caregivers on environmental enhancement. Key design elements are only connected to the LSP outcomes.

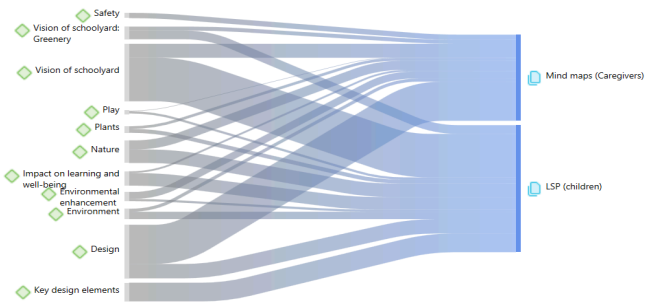


Figure 6: Sankey of co-occurrence within LSP and mind maps. (Source: ATLAS.ti, version 24.1.0.30612)

Differences and similarities in the design are discussed in the discussion section focussing on design in general, safety-, environmental-, and social aspects, plus the impact on learning and wellbeing.

7.2. Self-Anchoring Scaling

The goal of the mind map exercise was to influence caregivers in greening the residential surroundings using LSP examples. The outcomes (see appendix 8) are used to test the assumption that children influence their caregivers in greening their residential environment. The null hypothesis for testing is; *'in the population there is no difference between the present and the future perspective on greenery in the* residential *environment'*.

7.2.1 Frequency and descriptives

The analysis revealed that the mean score for current perceptions of greenery (M = 5.67, SD = 1.78) was significantly lower than the mean score for future perceptions of greenery (M = 7.78, SD = 1.31).

7.2.2 Tests

To find a robust result on the null hypothesis a paired sample t-test is performed.

$$t(17) = -5.63,\ p < .001$$

This result indicates a statistically significant increase in the perception of greenery from the present to the future. Given the p-value of less than .001, we reject the null hypothesis. Although the result shows significance, next to an uneven distribution of question 1, current perceptions of greenery (see appendix 9), the number of cases (N=18) is very small.

Therefore, a Wilcoxon Signed Rank test is performed. Analysis reveals that the median score for current perceptions of greenery is 6 (IQR = 4-7), while the median score for future perceptions of greenery is 8 (IQR = 7-9). The test indicates one negative rank, 15 positive ranks, and 2 ties. The sum of ranks is 120.00, yielding a z-value of -3.27, which is significant at p = 0.001. Given the p-value of 0.001, we reject the null hypothesis that '*in the population there is no difference between the present and the future perspective on greenery in the* residential *environment'*.

Both tests suggest a statistically significant increase in the perception of future greenery, which supports researchers' suspicion.

Discussion

The aim in this research is to find the influence of children on their caregivers in greening the residential environment using a co-creation approach with the schoolyard as inspiration. The designs by the children, and their sense of place (Galway et al., 2019) plus how these influence caregivers is discussed in this chapter. The combined views of children, the reactions by their caregivers on different aspects of the design are followed by how the designs influence caregivers' ideas for the residential environment.

8.1 Co-creation and the green schoolyard

Aerial pictures of schoolyards in Leeuwarden, show that the design of the case study schoolyard is comparable to other elementary schools. Most schoolyards have a paved surface surrounded with green elements. The major exception is the Montessory school. Montessori schools have a different curriculum compared to '*normal*' elementary schools emphasising stronger on experiencing natural surroundings (Loev, 2006). This could be the reason why this school has a very green schoolyard compared to all other elementary schools.

8.1.1 Design

Elements of the existing schoolyard are replicated in the LSP showing the influence of current surroundings on children (Günidi, 2012; Chawla, 2001 in Ghazani, 2021; Blankman, 2022). One of the caregivers noticed;

"Very inspiring although I did not see anything really new.
Most of the build items do already exist in one form or the other."

This is parallel to the views that children perceive their current surroundings as a benchmark (Blankman, 2022). When asked to build a green schoolyard, almost all children start with a green floor. Children see plenty of positive aspects of incorporating greenery in their play (Loev, 2006 in Wilson, 2007). Playing hide and seek is mentioned multiple times, also trees for climbing, or to add swings on. Designated areas for certain play are much incorporated in the designs. This made a caregiver make the remark:

"I see (negatively) gender stereotyping. Games for boys and games for girls.
I also miss a more cross age/gender design"

This sterio-typing might be caused by examples children see in their direct surroundings (Kahn, 1999 in Burke, 2001; Blankman, 2022).

Children did design complete new schoolyards when the adding of greenery is concerned. This corresponds with the idea that children have a large understanding, not only of their desired living surroundings, but also in how to alter these (Kahn, 1999; Ghaziani, 2021). The adding of green can also be explained by the understanding of, and experiencing by children towards problems (Lawson et al. 2018) such as heat stress.

How children understand to alter their surroundings (Kahn, 1999) as well as adjust space is shown in the consideration for multiple usage areas. The whole of the school's parameters are taken into the design. Example: having an accessible roof. Some children see a whole new playing area. Caregivers with a non-European background react to the usage of the roof as smart use of space. Energy collection is mentioned as is vegetable gardening. Having an accessible roof is seen as a safety hazard by most European adults.

8.1.2 Safety in design

Looking at the ideas on safety from the children's perspective shows a good understanding of 'problems' (Lawson et al. 2018) plus how to overcome them. As one caregiver puts it:

"I find it interesting that the children focus on safety for themselves and others.
I thought only adults would think of that"

Safety in design is unevenly named in the results. Children quite automatically construct safety measurements. In the case of designs with water, all children thought about safety measurements.

"There has to be a fence around it so the little ones won't fall in"

Caregivers appreciate a safe use of water bodies yet are unsure if pools, and ponds should be situated in a schoolyard considering the Dutch climate.

With regards to climbing equipment all children created safety measurements in the form of fences. Striking to see is how most designs have a fence surrounding the schoolyard. This again might resonate with the influence of existing surroundings (Günidi, 2012; Chawla, 2001 in Ghazani, 2021; Blankman, 2022). The case-study school has a fence around its perimeters.

Adults think about adventurous playing areas, however, they immediately incorporate diverse rules and safety measurements. In this case it is the adult setting the '*rules*' on safety, denying children to set their own agenda (Wilson, 2007). Children name safety foremost in a social context.

Children talk about grass and moss as being soft although sometimes a bit of '*messy mud*'. Caregivers prefere woodbark surfaces instead of grass. Children prefer grass or moss because it is softer when they fall. Children focussed on muddy conditions causing safety issues or becoming very dirty.

"If you have grass and it rains it becomes a mess. Plus when you fall you get wet.
I do not want the (other) children to be wet."

Unpaved surfaces are named by caregivers with regards to the school's interior hygiene.

"The children might get very dirty which will spread to the classes and the rest of the school"

Multiple solutions towards this problem are expressed by caregivers e.g. outdoor playing overalls or boots for outside, slippers for inside. This can be seen as setting rules and conditions for children to follow (Wilson, 2007) not acknowledging children's perspectives on hygiene. Only caregivers thought about ‘unhygienic’ conditions. Children did not consider this aspect other than taking off their shoes when entering the school. A very practical solution, yet not common in Dutch schools. Becoming dirty is no concern for children. Caregivers think differently. However some caregivers do not mind an extra bit of washing.

The children's remarks resonate with the idea that children construct adequate ways to act and understand their world (Kahn, 1999 in Burke, 2001). The perception of children that there can be a hazard, shows a certain preparedness for problems. Not only do the children see a dangerous situation, they can recall a situation that has not happened yet with acting on such a situation (Giezen & Pellerey, 2021). Caregivers are more focussed on avoiding hazardous conditions in general.

“Since I am a parent I think about the safety (and the maintenance)”

8.1.3 Social aspects in design

Almost all children focussed on incorporating every child in the play leaving no-one out or alone. Most designing started with building something for others.

“I think a slide is fun for the little children.
And a house you can sit in, for chilling, for the older children”

The diversity of designed playing equipment gives room for all children to interact. Much named are seating areas and little houses as places to enjoy outside lunches together or to ‘*chill*’ with peers. Some children designed a designated place for the teacher or the concierge. This might have to do with teacher–child interaction (Cosco et al., 2010), this subject is not deeply investigated. One child incorporated a small shop on the schoolyard for children who forgot their fruit or lunch.

Caregivers name tiny buildings as part of playing areas. The incorporation of the houses as playing equipment resonates with ideas that make-believe play harnesses children for future situations or to learn social standards (Loev, 2006; Wilson, 2007). One caregiver talked about the houses as place to find shelter from weather conditions for caregivers waiting for school to end. Only a few caregivers thought of the little houses as retreatment places from a busy schoolyard. In the latter, adults did think about supervision in these areas.

Caregivers stressed that unpaved surfaces create inaccessible areas for people with disabilities. Children did not think about these issues, resonating with not incorporating that they might not be familiar with (Blankman, 2022) or maybe children think more about helping each other to overcome accessibility issues.

8.1.4 Environment / Nature in design

Most designs are built on a green surface. Children understand the need for more greenery. Some name the nature services a green environment provides such as the creation of oxygen or shade, others talk about taking care of nature;

"People have to be careful with nature. For example plastics.
Plastic is a pretty cool material and very useful.
But you need to clean it in a neat way away so it does not pollute nature"

Children talked about warm summers and how to find shade. Grass or moss was discussed by the children as cooling. Adults thought of unpaved areas for reducing water problems during summer downpour plus trees to create shade. Caregivers referred to fountains or shallow water play gardens to limit the effects of warmth. This cooling effect is noticed both by children and adults although the actual playing with water is seen as cooling. A number of adults and children talked about warming conditions and finding shade or shelter in a greener area, corresponding with ideas that tree canopy cover combined with green pavements reduce the urban heat island effect (e.g. Wang et al, 2021).

Children name nature on the schoolyard, very diverse as in plants and trees, plus the presence of small animals like hedgehogs, frogs, ducks, different insects. Caregivers emphasised on trees and unpaved areas. When talking about animals, adults refer to domesticated animals such as rabbits or chickens for the children to learn how to live with animals. Children think of animals in general making no distinction, probably being more '*Nature Smart*' (Gardner, 2000) or having a different view on what nature is (Loev, 2006). Asked who had to take care of the animals during breaks and holidays, caregivers thought about leaving domesticated animals in school with a caretaker or the concierge. Children thought of taking turns in taking care of domesticated animals at home. Not-domesticated animals need no care-taking according to the children.

Apart from tangible nature, children thought about different seasons. For some children trees were off-limits for play in spring due to nesting birds. Feeders for animals or bee-hotels were not named by children or caregivers. Vegetable gardens are named by caregivers although growing vegetables can be seen as a domesticated use of nature (Clayton, 2007).

8.1.3 The impact on learning and wellbeing

A natural environment can be used as a classroom (Loev, 2006; Wilson, 2007), yet the current design of most schoolyards is not encouraging. When a schoolyard has little shade or shelter, being outside is not appealing (Loev, 2006; Albrecht, 2019).

Children and caregivers do not mention outdoor space to use for direct education in traditional subjects. Some children thought of tables to draw on when the weather was good. Caregivers did talk about nature education, plus that a green schoolyard can bring more respect to nature. The schoolyard is described by one of the children as:

“A place to learn how to play, you know playing with each other”

Caregivers did speak of a green schoolyard as the place where children can learn more about nature. This idea might be based on cultural or institutional barriers like trends in education, a marginalised direct experience in nature, together with the lack of green infrastructure in cities (Wilson, 2007) or in the residential surrounding. We could argue that school is not the first place children should learn about nature (Loev, 2006). However, that is not the subject of this thesis.

8.2 Influence of children on their caregivers

Taking a child-centred approach in co-creation, there is evidence that caregivers are influenced.

“The ideas of the children make me think“

A first unexpected influence of children towards their caregivers was on participating in the research. Starting with a small number of children, the amount of participants grew during the research. Children were permitted to leave the class for half an hour to participate. This sparked enthusiasm yet needed parental consent. The enthusiasm might have to do with the fact that children thought that building with LEGO© was much nicer compared to regular classes. Due to the enthusiasm of the children, more caregivers had to participate. The co-creation aspect of the research was emphasised on by the children. They seemed to enjoy creating a design their parents were to see afterwards.The enthusiasm of children is corresponding with earlier research (Pawlowski et al., 2017) where children are more motivated in showing their thoughts and ideas compared to elderly adult participants.

8.2.1 Co-designing the schoolyard

Taking co-design in consideration, caregivers respond positively towards the designs of the children. All of them are impressed by the designs, feeling their own designs resemble those of the children which can be seen as the influence caregivers have in the norms and values during the upbringing of their children (Thomas et al., 2018; Shrum et al., 2022).

“I think my ideas resonate with those of the children”

Although most caregivers claim their ideas resonate with the ideas of the children, the childrens’ designs are not taken over in full. Instead only certain aspects of the children's designs are added to the views of caregivers. Caregivers responded when asked why in manners like;

“I think I am a bit more realistic compared to the children”

“I like all the ideas. Not all of them are realistic but in general all are positive”

Others respond that their thoughts on a green schoolyard go much further compared to the children's ideas.

“I would even go further by creating hills and tunnels to roll off or to climb through.
And building materials to create their own fantasy buildings in the yard.”

Some caregivers are very open about their position;

“I’m way too old to think like the children do.
I think in restrictions like safety hazards, children think in possibilities.
Although I do think all the green resonates with my own thoughts”

Multiple caregivers respond towards the designs in what they feel is missing.

“I think about vegetables or herb gardens, the children did not.
They did think about a lot of flowers though.”

Although caregivers think about the designs of the children as being very interesting, they do not pass the consulting stage (Hart, 1997) towards a complete child-driven and child-initiated design. Childrens ideas are used to further create the vision of caregivers on what a green schoolyard should look like, not as in co-creation, rather more as in consulting (Arnstein, 1969; Hart, 21997). Caregivers are setting rules plus conditions in the design not acknowledging children's perspectives (Wilson, 2007) or following their plans or ideas (Hart, 1997).

8.2.2 Greening of the residential environment

The results of the self-anchoring scale show a positive reaction towards greening the residential environment. The influence of the children's designs might be responsible however the intervention itself also tried to spark a more green consciousness. During the intervention multiple caregivers talked about the aesthetics of playing forests, playing with pumps in creeks, or natural materials for play. Is the residential environment looking like these desired playgrounds? The results of the self-anchoring scale question 1 show different. However, the results of question 2 show a positive difference towards more greenery in the residential environment.

Adults understand the effects of green in their direct surroundings. The cooling effect of greenery plus the contribution of more green to urban biodiversity is talked about. Health impacts are named yet not fully contemplated regarding the residential environment. Heatstress in the residential home is not discussed. Caregivers refer to the questioning intervention about the green schoolyard as inspirational.

“This talk about a green surrounding sparks my mind on how to green my own garden”

The maintenance of a more green surroundings is something some caregivers talked about.

“I do wonder if all that grass does not need loads of maintenance”

A dislike towards gardening is sometimes expressed yet not by all caregivers. There is a distinctive difference between gardening in general and growing vegetables in the residential garden.

“I hate gardening although I work on a vegetable garden (at home)”

In the residential situation, garden maintenance is one of the reasons caregivers have paved gardens.

“We are going to remove the grass in our garden. It is not growing.
Instead we are going to add tiles and planters.
The garden will be less muddy so the children can play outside.”

Caregivers talk about adding more planters or plants in borders in their garden to create a greener space. Other adults unwild natural surroundings to ‘*develop*’ their residential environment by placing a pool. Multiple caregivers talked about their residential environment as a ‘*work in progress*’.

“Our garden is a work in progress.
We’ve just moved there and much of the garden still needs to start growing, so to say”

Conclusion

The awareness of children of their environment (Upitis, 2007; Ataol et al., 2020) and the influence of this environment on design ideas (Blankman, 2022) is found in the case study results. Using the case study, results show that all participating children have well developed thoughts or ideas. Comparing this with the idea of how children create their environment (Wilson, 2007), the thought patterns of children are influenced by their play in their current environment (Blankman, 2022). So do their caregivers. Domesticated nature (Clayton, 2007) in the form of planters or vegetable patches are discussed by caregivers. Nature such as forests or the frayed edges of the city (Wilson, 2023) are seen as either recreational or places still under development.

9.1 Co-creation and influence

In designing their surroundings, children and adults have a lot in common. The social aspect of co-creation (Pawlowski et al., 2017) is visible in the acceptance of the thoughts of children by their caregivers. The benchmark on schoolyards shows that both childrens‘ designs and caregivers' visions are influenced by existing schoolyard designs. Children incorporated ideas known in their existing world (Blankman, 2022), so did adults.

The case-study showed that children and their caregivers have similar ideas on design; more green, other usage of the schoolyard, different forms of floor coverage. A firm understanding of the surroundings was demonstrated by the children in this research. Caregivers resonate with the designs of the children however they prioritise practical and safety concerns. Like the children, caregivers have a strong opinion on how a green schoolyard should look. With regards to the residential garden or balcony, most caregivers see the need for greenery, yet greenery is not their top-priority.

The main research question *‘what is the impact of co-creation of a green schoolyard with regards to climate adaptive behaviour - can co-creation influence caregivers to green their* residential *environment?’* is partially answered. The results of the study suggest influence by children over their caregivers yet how straight forward this influence is, is not directly clear. Not one adult did replace their own ideas in full for those of the children. Caregivers merely incorporated the ideas of children in

their own plans. In a way this can be seen as a form of co-creation yet the influence of children is set on '*consulting*' instead of on '*shared decisions*' (Hart, 1997). A reason for this '*cherry-picking*' might have to do with the fact that caregivers did not know which of the schoolyard designs was made by their own child. There was no direct influence (Knafo & Galansky, 2008). The focus of caregivers for the needs of their own child is missing. Therefore we can assume children as a collective have lesser influence on caregivers in tackling the issues regarding heat in the schoolyard or the residential surroundings.

9.2 Recommendations

Although this research firstly focussed on the influence children have on their caregivers with regards to adapting to a warming urban environment, the designs give a representative overview on the wishes of the children attending the case-study school. Ideas obtained in this research could be used for future greening of the schools' schoolyard.

It can be argued the initiative for this research is still adult driven. However, true child-initiated combined with shared decision-making between children and adults can benefit the design of the urban spatial environment. Children express excellent knowledge (Blankman, 2022) and a creative approach towards altering their surroundings (Upitis, 2007; Ataol et al., 2020). In designing the urban environment, children can be seen as leading experts. This needs adults to take the child's ideas central as well as to stop '*cherry-picking*' ideas suiting within adult driven schemes. In future policy-making with regards to schoolyards and other areas children spend their time, true co-creation can be beneficial towards an increased stewardship of the living surroundings both by children and their caregivers.

Caregivers participating in the research were thinking they were the ones designing a green schoolyard. This adult thought pattern was planned to influence thinking about greenery in the residential environment. Although influence is expressed in the results, there still remains a gap in knowledge on how much the designs of the children affected their caregivers. Intentions to green the residential surroundings are expressed. Yet we have to bear in mind that no research can actually make people green their residential homes. To maintain the idea of greening the residential environment, education on the effects of a greener surrounding is crucial. Adults are leading in decision making. They are the ones setting examples as well as delivering most of the norms and values during the first years of childhood. Taking a child-centred approach this means starting with educating caregivers on the effects of greenery in combination with e.g. urban heat stress.

Finally, although the outcomes of the research show certain influence, more research on the amount of influence children have over their caregivers in climate adaptive behaviour plus the effect of this influence is desirable.

Bibliography

Albrecht, G.A. (2019) Earth emotions: new words for a new world. *Ithaca: Cornell University Press*. ISBN: 978-1-5017-1522-8.

Antoniadis, D., Katsoulas, N., & Papanastasiou, D. K. (2020). Thermal environment of urban schoolyards: Current and future design with respect to children's thermal comfort. *Atmosphere*, 11(11), 1144. DOI: 10.3390/atmos11111144.

Arnstein, S.R. (1969). A Ladder Of Citizen Participation, *Journal of the American Institute of Planners*, 35:4, 216-224, DOI: 10.1080/01944366908977225.

Atoal, O., Krishnamutry, S. & van Wesemael, B. (2020) Children's Participation in Urban Planning and Design: A Systematic Review. *Children, Youth and Environments*, 29(2), DOI: 10.7721/chilyoutenvi.29.2.0027.

von Benzon, N., Holton, M., Wilkinson, C., Wilkinson, S. (2021) Creative Methods for Human Geographers, *Sage Publications*, London, ISBN: 978-1-5264-9698-0.

van den Berg, A. E., Maas, J., Verheij, R. A., & Groenewegen, P. P. (2010). Green space as a buffer between stressful life events and health. *Social Science & Medicine*, 70(8), p. 1203-1210. https://doi.org/10.1016/j.socscimed.2010.01.002.

Bouman, T., & Steg, L. (2022). A spiral of (in) action: Empowering people to translate their values in climate action. *One Earth*, *5*(9), p. 975-978.

Brown, N., Collins, J. (2018), Using LEGO® To Understand Emotion Work in Doctoral Education, *International Journal of Management and Applied Research*, 2018, vol. 5, No. 4. DOI: 10.18646/2056.54. p. 18-014.

Burke, M. B. (2001) Book review: The Human Relationship with Nature. *Development and Culture, Population and Environment*, Vol. 22, No. 5 (May, 2001), p. 523-529.

Burt, J.E., Barber, G. & Rigby, D.L. (2009), Elementary statistics for Geographers, 3rd edition, *The Guilford Press*, New York, ISBN: 978-1-57230-484-0.

Blankman, M. (2022). The Everyday Environment: A Place to Feel Connected to, a Place that has Meaning. *Zeitschrift für Geographiedidaktik Journal of Geography Education,* Vol. 49(4), p. 183–196 ISSN 2698-6752 DOI: 10.18452/25365.

BNNVARA, Groep 8 aan de Macht, *ZAPP, NPO 3,* youth television broadcast, 17-3-2024, 18:30h.

Chawla, L. (Ed.). (2001). Growing Up in an Urbanizing World (1st ed.). *Routledge*. https://doi.org/10.4324/9781315541365.

Chawla, L. (2007). “Childhood Experiences Associated with Care for the Natural World: A Theoretical Framework for Empirical Results.” *Children, Youth and Environments* 17(4): p. 144-170. Retrieved 18-3-2024 from http://www.colorado.edu/journals/cye.

Clayton, S. (2007). Domesticated nature: Motivations for gardening and perceptions of environmental impact. *Journal of environmental psychology*, *27*(3), p. 215-224.

Clifford, N., Cope, M., Gillespie, T., & French, S. (Eds.). (2016). *Key methods in geography*. Sage. ISBN: 978-1-4462-9858-9.

Coakes, S., & Sadler, A. (2011). Utilizing a sustainable livelihoods approach to inform social impact assessment practice. In F. Vanclay & A.M. Esteves (eds), *New Directions in Social Impact Assessment.* Cheltenham, UK and Northampton, MA, USA: *Edward Elgar Publishing*, p. 323–340.

Coakes, S. & Anagnostaras, J. (2024) Social research methods for project social impact assessment, 460-474, In Vanclay, F. & Seteves, A.M. (eds), (2024) *Handbook of Social Impact Assessments and Management. Cheltenham: Edward Elger*. DOI: 10.4337/9781802208870, p. 460-474.

Cosco, N. G., Moore, R. C., & Islam, M. Z. (2010). Behavior mapping: A method for linking preschool physical activity and outdoor design. *Medicine & Science in Sports & Exercise*, *42*(3), p. 513-519.

Cruyff Foundation. (2024) Information retrieved 19-3-2024 from *website*. https://www.cruyff-foundation.org/wat-we-doen/inrichting-sportieve-buitenruimte/schoolplein-14/

Ekholm, S., & Olofsson, A. (2017). Parenthood and worrying about climate change: the limitations of previous approaches. *Risk Analysis*, *37*(2), 305-314. DOI: 10.1111/risa.12626.

Fenton, M., Coakes, S., & Marshall, N. (2003). Vulnerability and capacity measurement. In H. Becker & F. Vanclay, F. (eds), *International Handbook of Social Impact Assessment*. Cheltenham, UK and Northampton, MA, USA: Edward Elgar Publishing, p. 211–230.

Flax, L., Altes, R. K., Kupers, R., & Mons, B. (2020). Greening schoolyards—An urban resilience perspective. *Cities*, *106*(January), 102890.

Gallop (2024). Understanding How Gallup Uses the Cantril Scale. *Website* visited: 20-2-2024.

Galway, L. P., Beery, T., Jones-Casey, K., & Tasala, K. (2019). Mapping the solastalgia literature: A scoping review study. *International journal of environmental research and public health*, *16*(15), 2662.

Gardner, H. E. (2000). Intelligence reframed: Multiple intelligences for the 21st century. *Hachette Uk.*

Ghaziani, R. (2021). Primary school design: co-creation with children. *Archnet-IJAR: International Journal of Architectural Research*, *15*(2), p. 285-299.

Giezen, M., & Pellerey, V. (2021). Renaturing the city: Factors contributing to upscaling green schoolyards in Amsterdam and The Hague. *Urban Forestry & Urban Greening*, *63*, 127190.

Gill, S., Handley, J.F., Ennos, R. & Pauleit, S. (2007). Adapting Cities for Climate Change: The Role of the Green Infrastructure. *Built Environment.* 33. p. 115-133. DOI: 10.2148/benv.33.1.115.

Gillerot, L., Landuyt, D., Oh, R., Chow, W.t.l., Haluza, D., Ponette, Q., Jactel, H., Bruelheide, H., Jaroszewicz, B., Scherer-Lorenzen, M., De Frenne, P., Bart Muys, B. & Verheyen, K. (2022). Forest structure and composition alleviate human thermal stress. *Global Change Biology*. 28, (24), p. 7340-7352. DOI: 10.1111/gcb.16419.

Günindi, Y. (2012). Environment in my point of view: Analysis of the perceptions of environments of the children attending kindergarten through the pictures they draw. *Procedia-Social and Behavioural Sciences*, 55, p. 594-603. DOI: 10.1016/j.sbspro.2019.09.541.

Han, H., & Ahn, S. W. (2020). Youth mobilization to stop global climate change: Narratives and impact. *Sustainability*, *12*(10), 4127.

Hart, R., (1997). Children's Participation: The Theory and Practice of Involving Young Citizens in Community Development and Environmental Care. *London: UNICEF/Earthscan*.

Harpham, T. (2002). Measuring the social capital of children. Young Lives, An international Study of Childhood Poverty. *Working paper 4.*

Hintz, M. J., Luederitz, C., Lang, D. J., & von Wehrden, H. (2018). Facing the heat: A systematic literature review exploring the transferability of solutions to cope with urban heat waves. *Urban Climate,* 24, p. 714-727.

Inspectie van het Onderwijs (2024). Retrieved 19-2-2024 from https://www.onderwijsinspectie.nl/onderwerpen/onderwijstijd/onderwijstijd-in-het-basisonderwijs

Ind, N., & Coates, N. (2013). The meanings of co-creation. *European Business Review*, 25(1), p. 86–95.

IPC Nederland (2024). Retrieved 7-3-2024 from https://ipc-nederland.nl/het-ipc-curriculum/

IPCC (2023). Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. *IPCC, Geneva, Switzerland*, p. 1-34, doi: 10.59327/IPCC/AR6-9789291691647.001.

Kahn, P.H. (1999). The Human Relationship with Nature: Development and Culture. Cambridge, MA. The MIT Press in Burke, M. B. (2001) Book review: The Human Relationship with Nature: *Development and Culture, Population and Environment*, Vol. 22, No. 5 (May, 2001), p. 523-529.

Kellert, S. R., & Wilson, E. O. (1993). The biophilia hypothesis. *Washington DC: Island Press*. ISBN: 9781559631471.

Kincheloe, J.L., E. McKinley, M. Lim, and A.C. Barton. (2006). Forum: A conversation on 'sense of place' in science learning. *Cultural Studies of Science Education 1*, no. 1: p. 143–60.

Knafo, A., & Galansky, N. (2008). The influence of children on their parents' values. *Social and personality psychology compass*, *2*(3), p. 1143-1161. DOI: 10.1111/j.1751-9004.2008.00097.x.

Kudryavtsev, A., Stedman, R. C., & Krasny, M. E. (2012). Sense of place in environmental education. *Environmental education research*, *18*(2), p. 229-250.

LEGO corporate website. (2024). Obtained 14-3-2024 from https://www.lego.com/en-us/aboutus/lego-group/the-lego-brand.

Lamont, M., Pendergrass, S., & Pachucki, M. (2015). Symbolic boundaries. *International encyclopedia of social and behavioral sciences*, *2*, p. 850-855.

Lawson, D. F., Stevenson, K. T., Peterson, M. N., Carrier, S. J., Strnad, R., & Seekamp, E. (2018). Intergenerational learning: Are children key in spurring climate action?. *Global Environmental Change*, *53*, p. 204-208.

Louv, R. (2006). Last child in the woods: Saving our children from nature-deficit disorder. *Algonquin books.* ISBN-13: 978-1-56512-605-3.

Maas, J., van den Bogerd, N., van Dam, S., Bouman, M. & van der Veen, V. (2021). ‘De waarde van een natuurrijke, gezonde buitenruimte rond scholen’. Whitepaper over de positieve impact van groene schoolpleinen op de ontwikkeling van kinderen, de kwaliteit van het onderwijs, de klimaatbestendigheid van de omgeving en biodiversiteit. *IVN Natuureducatie en Jantje Beton*, augustus 2021.

Margetts, E. A., & Kashima, Y. (2017). Spillover between pro-environmental behaviours: The role of resources and perceived similarity. *Journal of Environmental Psychology*, *49*, p. 30-42.

McCusker, S. (2014) Lego®, Serious Play TM: Thinking About Teaching and Learning. *International Journal of Knowledge, Innovation and Entrepreneurship*, 2 (1). p. 27-37. ISSN 2054-3662.

Ministerie van Volkshuisvesting. (2024), Obtained 11-3-2024 from https://www.volkshuisvestingnederland.nl/documenten/praktijkverhalen/2023/03/21/met-junior-energiecoach-leren-kinderen-hoe-ze-energie-kunnen-besparen-in-huis.

Moore, R.C. (1986). Childhood's Domain: Play and Place in Child Development (1st ed.). *Routledge*. DOI: 10.4324/9781315121895.

Pagano, M. E., Hirsch, B. J., Deutsch, N. L., & McAdams, D. P. (2002). The Transmission of Values to School-Age and Young Adult Offspring: Race and Gender Differences in Parenting. *Journal of Feminist Family Therapy: An International Forum, 14*(3-4), p. 13–26. DOI: 10.1300/J086v14n03_02.

Pawlowski, C. S., Winge, L., Carroll, S., Schmidt, T., Wagner, A. M., Nørtoft, K. P. J., ... & Troelsen, J. (2017). Move the Neighbourhood: Study design of a community-based participatory public open space intervention in a Danish deprived neighbourhood to promote active living. *BMC Public Health*, *17*, p. 1-10.

Roos, J. & Victor, B. (2018), "How It All Began: The Origins Of LEGO ® Serious Play ®", *International Journal of Management and Applied Research*, Vol. 5, No. 4, p. 326-343. DOI: 10.18646/2056.54.18-025.

Sanders, E. B. N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *Co-design*, *4*(1), p. 5-18.

Sandholz, S., Sett, D., Greco, A., Bannewitz, M. & Garschagen, M. (2021). Rethinking urban heat stress: Assessing risk and adaptation options across socioeconomic groups in Bonn, Germany, *Urban Climate*, Volume 37, 100857, DOI: 10.1016/j.uclim.2021.100857.

Scholen op de kaart, (2024). Basisscholen in Leeuwarden, Obtained 7-3-2024 from https://scholenopdekaart.nl/zoeken/basisscholen?zoektermen=Leeuwarden Weergave=Kaart.

Shrum, T. R., Platt, N. S., Markowitz, E., & Syropoulos, S. (2023). A scoping review of the green parenthood effect on environmental and climate engagement. *Wiley Interdisciplinary Reviews: Climate Change*, *14*(2), e818.

Spiteri, J. (2020). Too Young to Know? A Multiple Case Study of Child-to-Parent Intergenerational Learning in Relation to Environmental Sustainability. *Journal of Education for Sustainable Development*, *14*(1), p. 61-77. DOI:10.1177/0973408220934649.

Tewdwr-Jones, M., & Wilson, A. (2022). Co-Designing Urban Planning Engagement and Innovation: Using LEGO to Facilitate Collaboration, Participation and Ideas. *Urban Planning*, 7(2), p. 229-238. DOI: 10.17645/up.v7i2.4960.

Thomas, G.O., Fisher, R., Whitmarsh, L., Milfont, T.L. & Poortinga W. (2018). The impact of parenthood on environmental attitudes and behaviour: a longitudinal investigation of the legacy hypothesis. *Popul. Environ.* 2018;39(3): p. 261-276. DOI: 10.1007/s11111-017-0291-1.

Thompson, S., Michaelson, J., Abdallah, S., Johnson, V., Morris, D., Riley, K. & Simms, A. (2011). Moments of change' as opportunities for influencing behaviour: A report to the Department for Environment, Food and Rural Affairs. NEF (the new economics foundation). *Derfa, London*.

Turner, S. (2021). '"Where I went today..."' Solicited Journals and Narrative Mapping. In: I. Hay and M. Cope, eds., Qualitative Research Methods in Human Geography. Oxford: *Oxford University Press*, p. 271–291.

UNCRC. (1989). United Nations Conference on the Rights of the Child (UNCRC).

Upitis, R. (2007). Four Strong Schools: Developing a Sense of Place through School Architecture. *International Journal of Education & the Arts*, *8*, p. 1-16. Retrieved 17-3-2024 from http://ijea.asu.edu/v8il/.

Urban Dictionary, 2024, Obtained 16-4-2024: https://www.urbandictionary.com/define.php?term=Curling%20Child

Vanclay, F. & Esteves, A.M. (2024), New Directions in Social Impact Assessment. Cheltenham, UK and Northampton, MA, USA: *Edward Elgar Publishing*.

van Valkengoed, A. M., & Steg, L. (2019) 'Meta-analyses of factors motivating climate change adaptation behaviour,' *Nature climate change*, 9(2), p. 158-163.

Vaughan, C., Gack, J., Solorazano, H., & Ray, R., (2003). The effect of environmental education on schoolchildren, their parents, and community members: A study of intergenerational and intercommunity learning. *Journal of Environmental Education*, 34, p. 12–21.

Wang, C., Wang, Z., Kaloush, K. E. & Shacat, J. (2021) Cool pavements for urban heat island mitigation: A synthetic review, *Renewable and Sustainable Energy Reviews*, Volume 146, 111171, ISSN 1364-0321, DOI: 10.1016/j.rser.2021.111171.

Wilson, B. (2023). Urban Jungle: The History and Future of Nature in the City. *Doubleday*. Dutch translation: Paul Janse, Stads Jungle, De natuur en de stad van het stenen tijdperk tot de klimaatcrisis. *Uitgeverij Unieboek, Het Spectrum bv, Amsterdam*. ISBN: 978 90 00 37890 6.

Wilson, R. A. (1996). Environmental education programs for preschool children. *Journal of Environmental Education*, 27(4), p. 28-33.

Wilson, R. (2007). Nature and young children: Encouraging creative play and learning in natural environments. *Routledge*. ISBN: 9780415428729.

Wolf, K.L., Lam, S.T., McKeen, J.K., Richardson, G.R., Van den Bosch, M. & Bardekjian, A.C. (2020). Urban Trees and Human Health: A Scoping Review. *International journal of environmental research and public health,* 17 (12): 4371. DOI: 10.3390/ijerph17124371.

List of figures and tables

Figures

Tables

Appendix

Appendix 1 Information sheet (in Dutch)

INFORMATIEBLAD over deelname aan een onderzoek met het onderwerp: Het schoolplein als een Groene Oase om stedelijke hittestress tegen te gaan - Casestudie basisschoolplein in Leeuwarden.

Geachte ouder en/of verzorger,

Bedankt voor uw interesse in deelname aan mijn onderzoek. In deze brief wordt uitgelegd waar het onderzoek over gaat en hoe het onderzoek zal worden uitgevoerd. Neem de tijd om de volgende informatie zorgvuldig door te lezen. Als er iets niet duidelijk is, kunt u mijn contactgegevens aan het einde van deze brief gebruiken om eventuele vragen te stellen.

WAT DIT ONDERZOEK INHOUDT?

Dit onderzoek maakt deel uit van mijn eindthesis zodat ik mijn masterstudie Climate Adaptation Governance aan de Universiteit van Groningen, Campus Fryslân, kan afronden.

- Mijn onderzoek zoekt een antwoord op de vraag of het gezamenlijk denken over een groen blauw schoolplein door kinderen en hun ouders of verzorgers ook een groenere thuissituatie kan veroorzaken en dan vooral met betrekking tot meer groen in de tuin of op het balkon.
- Het onderzoek richt zich op basisschoolkinderen en hun ouders. De keuze voor deze school is vooral praktisch, mijn dochter gaat hier ook naar school en de school heeft plannen om het plein te gaan vergroenen in de toekomst vanuit gemeentelijk beleid.
- Uw mening en die van uw kind(eren) zijn belangrijk, omdat mijn onderzoek zich richt op een meer kindgerichte benadering bij het maken van beleid met betrekking tot de directe leefomgeving van kinderen.

WAT HOUDT DEELNAME IN?

Deelnemen aan dit onderzoek betekent voor u en uw kind(eren):

- Toestemming geven voor de deelname van uw kind(eren) aan een LEGO Serious Play-oefening over hoe zij hun ideale schoolplein zien als het zou worden herontworpen tot een groen blauwe speel- en leeromgeving.
  Het eindresultaat van deze LEGO oefening zal worden gefotografeerd met een korte geluidsopname van wat er precies is gebouwd. Dit korte praatje wordt uitgeschreven zonder vermelding van naam, geslacht of andere herkenbare informatie met betrekking tot de identiteit van uw kind.

- Uw eigen deelname aan het onderzoek door het maken van een mindmap aan de hand van foto's van ideale schoolpleinen gemaakt door de kinderen. Uw visie op de voor- en nadelen van een groen blauw schoolplein wordt hierin gevraagd. De uitkomsten zullen worden gefotografeerd. U krijgt een aantal voorbeelden gemaakt door kinderen te zien die als inspiratie kunnen dienen. Dit zijn niet noodzakelijkerwijs voorbeelden gemaakt door uw eigen kind(eren).

- Naast het maken van een mindmap wordt u gevraagd uw leefomgeving op een schaal van 0 tot 10 te plaatsen met betrekking tot de huidige situatie van uw thuissituatie met betrekking tot groene en blauwe infrastructuur (bomen, gras, planten, bloemen en de nabijheid van water).

- Het laatste deel van de studie zal plaatsvinden wanneer de gebouwde ideeën van kinderen en de mindmaps van ouders of verzorgers worden gecombineerd, gepresenteerd en besproken. U als ouder of verzorger wordt gevraagd of, vanwege de plannen en de verschillende mindmaps, u denkt dat u uw leefomgeving in de toekomst groener kan maken (mits mogelijk). Deze bijeenkomst kan geheel informeel zijn.

Uw tijdsinvestering zal ongeveer anderhalf uur zijn. 30 minuten voor het maken van de mindmap en 5 tot 6 minuten voor het korte interview over hoe u uw groene thuis omgeving ervaart. Stap 4 zal ongeveer 45 minuten duren. De tijdsinvestering van uw kind(eren) zal niet langer zijn dan 15 tot 20 minuten voor de volledige LEGO Serious Play-oefening tijdens de normale schooltijd (in overleg met de docent) en de tijd gelijk met u in de laatste stap.

MOET U DEELNEMEN?

Natuurlijk niet.

- U hoeft niet deel te nemen aan dit onderzoek. U en uw kind(eren) zijn vrij om deel te nemen aan het onderzoek. Er is geen enkele verplichting om deel te nemen.
- Gedurende het onderzoek kunt u altijd besluiten om het onderzoek te verlaten. Uw resultaten, of de resultaten van uw kind(eren), worden dan uitgesloten (voor zover mogelijk) van het onderzoek.

- U kunt er altijd voor kiezen om vragen niet te beantwoorden. Redenen voor het niet beantwoorden hoeven nooit verstrekt te worden.

ZIJN ER ENIGE RISICO'S BIJ DE DEELNAME?

Tijdens dit onderzoek zijn er geen goede of slechte resultaten. Uw mening als ouder of verzorger en de ideeën van uw kind(eren) zijn voor mij belangrijk. Mijn mening of visie, die van de school of docenten, staat ondergeschikt aan die van u en uw kind(eren).

- Dit onderzoek is vrij van risico's, hoewel het mogelijk gesprekken met uw kind(eren) over het onderwerp kan uitlokken.
- Als onderzoeker zie ik geen schade of risico's voor kinderen die deelnemen. De methode om LEGO te gebruiken om de mening van kinderen te vragen, is eerder gebruikt in andere onderzoeken en door andere onderzoekers. In het verleden zijn geen negatieve effecten ervaren of gemeld.

ZIJN ER ENIGE VOORDELEN BIJ DE DEELNAME?

Deelname aan het onderzoek is gratis en vrijwillig, daarnaast kan uw bijdrage meehelpen aan:

- Een algemeen breder begrip over dit onderwerp.
- Uw deelname kan eventueel inzichten geven aan beleidsmakers dat een kind-oudergerichte benadering gunstig kan zijn voor de inrichting van de openbare ruimte.

U wordt niet betaald of gecompenseerd voor uw deelname, hoewel er uiteraard een blijk van waardering (lees: chocolade) zal zijn voor uw geïnvesteerde tijd.

De deelname of niet-deelname van uw kind(eren) zal niet worden beoordeeld of op enigerlei wijze van invloed zijn op schoolresultaten.

HOE WORDEN DE VERSTREKTE GEGEVENS OPGESLAGEN, BEWAARD EN BESCHERMD?

- De foto's van de LEGO- en mindmap-oefening worden volgens de regels van de Universiteit Groningen maximaal 5 jaar bewaard.
- Alle gegevens worden geanonimiseerd opgeslagen zonder enige verwijzing naar een specifieke persoon.
- De verkregen gegevens kunnen in toekomstig onderzoek worden gebruikt, maar zullen nooit kunnen worden teruggekoppeld aan één specifiek persoon of personen.
- Na 5 jaar worden alle gegevens van dit onderzoek verwijderd en gewist.

WAT GEBEURT ER MET DE RESULTATEN VAN DE STUDIE?

- De resultaten van de studie worden gebruikt in mijn eindthesis. Deze wordt gedeeld met mijn begeleider en andere faculteitsleden voor feedback en beoordeling.
- De studie wordt gepresenteerd op de Campus Fryslân Conference. Wees vooral welkom op 26 juni 2024 op de Campus Fryslân aan de Wirdumerdijk in Leeuwarden (oude bibliotheekgebouw)

- De uiteindelijke scriptie kan, indien goed beoordeeld, gedeeld worden met beleidsmakers van de gemeente Leeuwarden met betrekking tot het project van vergroening van schoolpleinen.
- In overleg met de school zouden de foto's van de LEGO werkstukken kunnen worden gepresenteerd in een kleine expositie maar het is niet aan mij maar aan de school omdat te besluiten en/of te organiseren.

ETHISCHE GOEDKEURING

- Dit onderzoek en de studie hebben de goedkeuring van de ethische commissie van de Universiteit van Groningen, Campus Fryslân.
- De onderzoeker zal zich houden aan de ethische normen zoals vastgesteld door de Universiteit van Groningen, Campus Fryslân, en zal de anonimiteit van alle deelnemers ten allen tijde waarborgen.

TOESTEMMINGSFORMULIER MET INFORMATIE

Wanneer u denkt 'dat is leuk om aan mee te doen', en u zich comfortabel voelt met uw en/of de deelname van uw kind(eren) aan mijn onderzoek, vul dan het bijgevoegde toestemmingsformulier in. Door het toestemmingsformulier in te vullen, nemen u en uw kind(eren) deel aan het onderzoek, u (of uw kind(eren)) kan op elk moment besluiten om de deelname te beëindigen.

MET WIE KUNT U CONTACT OPNEMEN VOOR VERDERE INFORMATIE?

Voor verdere vragen over het onderzoek kunt u contact opnemen met Susan Janssen Jouwsma via +31 6 810 44 577 (bellen of whatsapp) of via s.j.p.w.janssen@student.rug.nl.

Appendix 2 Consent form (in Dutch)

TOESTEMMINGSVERKLARING deelname aan het afstudeeronderzoek van Susan Janssen Jouwsma met als onderwerp: *'Het schoolplein als Groen/Blauw Stedelijke Oase om stedelijke hittestress tegen te gaan - Casestudie over een basisschoolplein in Leeuwarden'*.

Datum: April, 2024.

Naam ouder of verzorger en kind(eren):

……

Groep: ……

- Ik heb de informatiebrochure gelezen en heb de onderzoeker eventuele aanvullende vragen kunnen stellen.

- Ik begrijp dat ik of mijn kind(eren) op elk moment vragen kan stellen over de studie.
- Ik begrijp dat ik of mijn kind(eren) op elk moment het recht heb om me terug te trekken uit de studie zonder opgave van reden.
- Ik begrijp dat ik of mijn kind(eren) op elk moment kan weigeren om een vraag te beantwoorden zonder enige gevolgen.
- Ik begrijp dat ik of mijn kind(eren) niet direct zal profiteren van deelname aan dit onderzoek.

Vertrouwelijkheid en Gegevensgebruik

- Ik begrijp dat mijn individuele informatie of die van mijn kind(eren) aan niemand buiten het onderzoeksteam zal worden bekendgemaakt en dat mijn naam of die van mijn kind(eren) niet zal worden gepubliceerd.
- Ik begrijp dat de verstrekte informatie alleen zal worden gebruikt voor dit onderzoek en publicaties die rechtstreeks verband houden met dit onderzoeksproject.
- Ik begrijp dat gegevens (toestemmingsformulieren, opnames, interview transcripten) gedurende 5 jaar op de Y-drive van de server van de Universiteit van Groningen zullen worden bewaard, in overeenstemming met de GDPR-wetgeving van de universiteit.

Toekomstige betrokkenheid

- Ik wil een kopie ontvangen van de wetenschappelijke output van het project: ja/nee*.
- Ik stem ermee in opnieuw te worden benaderd voor deelname aan toekomstige studies: ja/nee*.

Na alles hierboven te hebben gelezen en begrepen, stem ik ermee in deel te nemen / toestemming te geven aan mijn kind(eren) aan het onderzoek: ja/nee*

Datum: Handtekening:

In te vullen door de onderzoeker:

- Ik verklaar dat ik de onderzoeksdeelnemer grondig heb geïnformeerd over het onderzoek en eventuele resterende vragen naar beste weten heb beantwoord.
- Ik ga akkoord met de deelname van deze persoon aan het onderzoek.

Datum: Handtekening:

**doorhalen wat niet van toepassing is*

Appendix 3 Interview design LSP

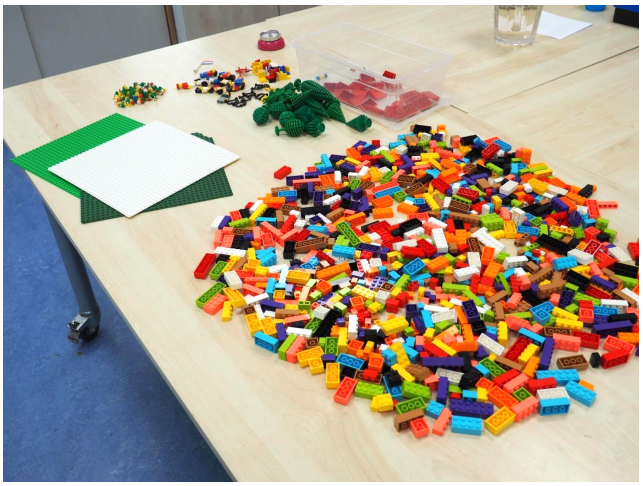


Figure 7: Picture: LEGO© for the LSP research

Time for the assignment: 20 minutes plus 5 minutes explanation. Time kept by a kitchen timer.

LSP Assignment: Build a schoolyard the way you think a schoolyard should look like. The only requirement is adding trees or other greenery. For the rest you can build whatever you want within 20 minutes. You build and describe what you build and I write down what you say and describe what you build. Afterwards I'll make a few pictures and the schoolyard will be broken down again so other children can build one also. without yours as an example of course.

Processing data: Pictures of LSP assignment. One from above and one from the side the child was looking at the LEGO© while building. Pictures are combined with descriptions of the schoolyard as explained by the children while building. The elements that children include in LSP building activities are counted and placed in a table.

Interview design / Questions asked while building:

1. What are you building?
2. Other questions on how and why the participants build a certain thing or place something.
3. Is this your preferred schoolyard?

Transcription abbreviations:

- P = Participant
- R = Researcher

Appendix 4 Transcription and pictures of LSP exercise (N=28)

Schoolyard 1:

Hesitates a bit before starting to build. Chooses the green floor plate.
P: So I can build what I want?
R: Yes, How you think the schoolyard should look like. The only thing it has to have is green like trees, shrubs and or grass.
P: OK! Here the football cage, so the boys have something to do.
Football cage is made by blocking an area with white bricks, a wall with an opening. The ball is made of two little bricks in the colours black and white.
P: And a bench for the teacher to sit and drink tea.
Builds a bench. Places a figure with a cup on a build bench. Adds a roof over it.
P: Lots of trees because of a lot of nature.
A bunch of trees are placed in a corner. Flowers are placed.
P: We have to keep the basketball area.
Baskets are made by towering bricks and placing a LEGO chair on top as being the basket. The ball is made of two little bricks in the colours black and orange.
R: Do you think there is enough room to play within the trees?
P: Good question! (no actions to reduce the amount of trees)
Flowers are added and the flag. Figures are placed to show playing children.
P: The rest is all grass to play on. This is how my favourite schoolyard should look like. With lots of places to play and sport.

Figure 8: Photograph LEGO© schoolyard created by child, above and side view, 10-4-2024

Schoolyard 2:

Starts building on the green floor plate immediately after the explanation
P: I make a tree with branches so birds can make a nest with eggs in it. See this white brick is the egg.
The main trees are self made instead of using the prefab trees.
P: Here we have a large field with flowers. And I'll build a sort of climbing obstacle thing here, or no, let's not do that. Let's build shrubs. And a little pond here with a duck. There has to be a fence around it so the little ones won't fall in. I think I'm going to build a 'hinkelbaan' here. Some more trees and a picnic table. White because that feels more cool. O and of course the flag at the end of the 'hinkelbaan' so you know where the end is. That's it. I'm ready.
R: Are you sure? Don't you want to add figures in it?
P: O, wait. A few fences here to jump over. And some extra fence here so you won't accidentally jump into the pond. And another chair at the picnic table. And a moving chair to be an attraction. And another tree.
Adds another tree
R: Not anymore?
P: No, otherwise there is too little room to play. This is a nice play yard. You can jump and play and sit to talk with the others. And you can hide between the flowers. I didn't build the football pitch and the bike shed. They will probably stay as they are anyway. O and I think the school needs a green roof. But most important is having fun in the yard. How many minutes do I have left?
R: Just a few.
P: One more high tree next to the table for shade.
Adds a tree and places some bricks on the table.
P: Some fruit that has to be placed here. So this is a fun schoolyard.

Figure 9: Photograph LEGO© schoolyard created by child, above and side view, 10-4-2024

Schoolyard 3:

Starts building after the explanation of the assignment. Chooses the green floor plate.
P: First I build plant boxes that are made of wood.
Builds with brown bricks a box.
P: In this one I can place a tree. And I'll add some flowers.
Uses a tree and some flowers.
P: Now we need a climbing area. I love to climb.
R: In trees or on a climbing rack?
P: Both. See the white bricks are the ropes. This is the climbing rack on the sports yard. I like to build what is already existing but without looking at it.
Builds a climbing obstacle with brown, green and white bricks.
P: Funny, I use green bricks for moss. That's soft. I like moss. Look, this is the climbing rack. Now we need some trees and sticks and moss behind them.
Places trees at one side with brown bricks as twigs and green bricks as moss.
P: I need more trees, a really large one. I'll build that myself. This is the most important function of the yard, climbing
R: And the rest of the space, is it paved?
P: No, it is grass with a lot of flowers.
Adds more flowers to the green patch.

Figure 10: Photograph LEGO© schoolyard created by child, above and side view, 10-4-2024

Schoolyard 4:

Takes the green floor plate.
P: Who am I building this play yard for?
R: For yourself
P: OK, but I'll add some for the other children as well.
Starts building
P: First we need a fence so the children can't run away. Here is the gate and a lot of trees. Nice and green. And a flag, maybe more from sponsors.
R: Has a schoolyard sponsors?
P: Of course!
P: When I 'm building for a primary school I think a slide is fun for the little children. And a house you can sit in, for chilling, for the older children.
P: I'll make the slide here, with a ladder otherwise you can't climb on it. And i'll place trees over here on the side
R: This starts to look like a forest
P: O, I need another entrance for the school building. I'll make that here.
Removes some trees and builds an entrance for the building.
P: I use a lot of colour, that is more fun and I'll use flowers on the entrance.
R: Are you building a green roof also?
P: O wait, that's a good idea. It will make the flowers look better.
Changes red bricks for green ones.
P: The rest is all grass, but that will be a muddy mess when it rains. What if I build some sort of a path. This looks weird but the path is not elevated. Here is the run track. And here a path is needed.
Places some bricks at the entrance.
P: And behind the house loads of flowers.
P: Where are these trees from? I have different trees in my LEGO© sets.
R: They are old ones I used to play with.
P: I like playing with this old skool LEGO©.

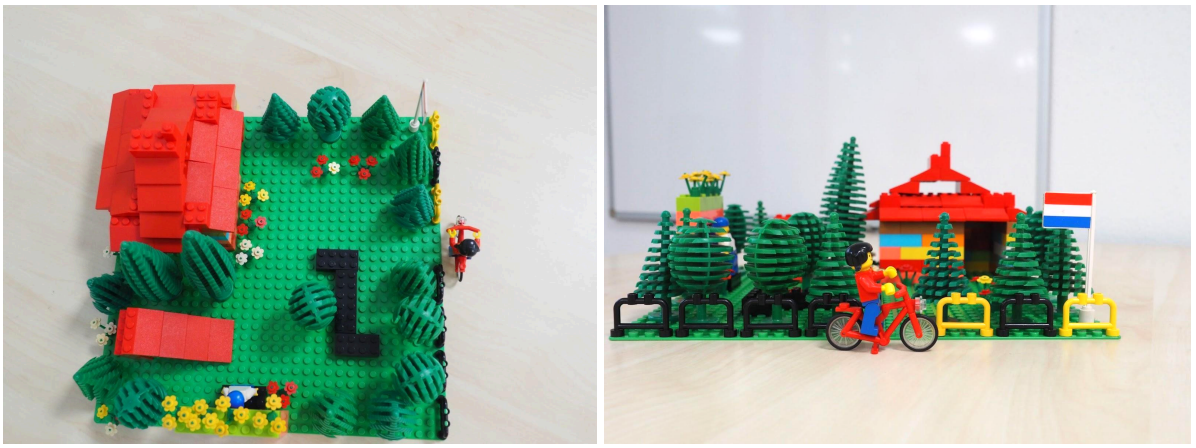


Figure 11: Photograph LEGO© schoolyard created by child, above and side view, 10-4-2024

Schoolyard 5:

P: I want loads of grass and beautiful flowers to place on the green floor plate.
R: Go ahead, you can build what you want.
P: I want trees because I love nature
Places on each corner a tree plus some flowers
R: Do you also want to play on your schoolyard?
P: Of course! That is what I am going to build now. I'm using a lot of colours because I like that.
Starts building with different small bricks
R: What are you making?
P: A multi-colored climbing fence. Look at the beautiful colours. O, and a flag of course. We have that also here at the schoolyard.
Places flag on a green brick.
P: I 'm also gonna place a lot of flowers around the climbing fence.
R: What about the ground under the climbing fence?
P: If I have time it will be purple. Those are tiles. I choose a green surface so I do not have to make so much grass. I have time to build other things I like. See, each brick is a different climbing step. I think this is nice. See I make a pattern with all the colours. O and these chairs are also part of the climbing thing.
P: Now I build horizontal bars. That seems difficult but I think I will manage. See they are all different in height. Just as we have in our schoolyard. So add some more flowers and of course the playing figures. One here on the chair, one on the horizontal bars and another one on the chairs. Some more flowers and o, a fence.
R: Why a fence?
P: Because we have a fence here at school also.
R: Is all grass?
P: No but I'm running out of time. Here close to the trees should be some tiles. This is nice, this is how I would like it.

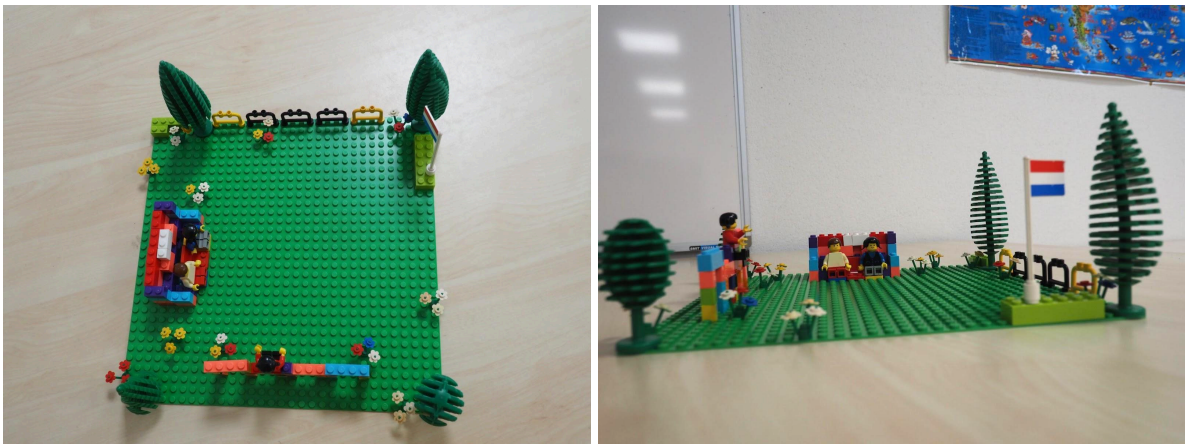


Figure 12: Photograph LEGO© schoolyard created by child, above and side view, 11-4-2024

Schoolyard 6:

Starts building. Chooses the green floor plate.
R: What are you building?
P: A house!
R: Do you want a house on your schoolyard?
P: Mmm mmmm, yes. A house made of trees and leaves. I can live in the house.
Builds a house with green bricks, places a tree on top.
R: What else do you want on your schoolyard?
P: A pond with piranha's. If you fall in they will bite your bottocks.
R: Good reason not to fall in. Would you like a real pond in your schoolyard?
P: Yes, but we already have a ditch with water and plants at the back of our yard.
Builds a pond with sides.
P: So this is one round of bricks and now another one. So the piranha's can not bite.
P: Can I use everything?
R: Anything on this table which is LEGO©.
P: OK, I'll start with the flag and some flowers around the swimming pool.
R: I thought it was a piranha pond
P: No, that was a joke. It is a swimming pool. Now I add flowers and fences. So, a swimming pool you can't fall out. This is the most safe swimming pool.
R: In or out?
P: Out, you can not fall out of the swimming pool.
Builds further and places flowers and some trees
R: Is all of the surface grass?
P: No, there are things to climb on. And there is a dog house. So we can have a small dog in the schoolyard.

Figure 13: Photograph LEGO© schoolyard created by child, above and side view, 11-4-2024

Schoolyard 7:

Hesitates a bit to start. Picks the green floor plate.
R: Where do you want to start?
P: With the school building
R: Do you want to build the school building? You can also only build the schoolyard.
Removes red bricks and restarts the building
P: Here is a bench, and some trees and flowers. I'm going to build a green football pitch.
R: With grass?
P: Yes
Builds two green goals and places figures in the space between. Builds a football out of black and white bricks.
P: Now I'm going to build a green super long bench, with seats so the audience can sit and watch.
Builds bench
P: And now water so the ducks can swim. Can you make me a duck? And a smaller bench here.
R: Don't you want more trees?
P: I'm going to place them now. O and a backrail so you won't fall of the benches. And I'm making a large table.
R: Where is the table for?
P: To put the cups of the audience on.
R; Is it also a place for teaching this table?
P: I do not know, it is for the cups of the audience. I'm also building a seesaw, and some shrubs here and of course flowers. I'll place some flowers on top of the goal.
R: So it rains flowers when you score?
P: That would be great. You can also use these big trees behind the goal to score. O and we need something white also. Maybe another seesaw, now it is a double one. If you have a row with someone you can always move over to the other seesaw.
R: Are there many fights?
P: No but just in case everyone wants to use the seesaw. It is better to have two.

Figure 14: Photograph LEGO© schoolyard created by child, above and side view, 11-4-2024

Schoolyard 8:

Starts building at a fast pace using the green floorplate. Tells he has the same colours at home, a few green ones and a few white ones.
P: I already practised at home. I build a lot with LEGO but today I'm going to make something different.
R: What are you building first?
P: A slide, a large slide.
Places bricks in a stairs form and uses roof tiles to show the slide part. Starts building in another corner.
R: And this is?
P: A toilet. I guess I am the only one thinking about a toilet in the schoolyard. But I always think of everything
R: Ok, so a large slide, a toilet, and now you are building what?
P: A bouncing castle. With a soft fence so you will not fly off when bouncing.
Moves to the last unbuilt corner of the ground plate.
R: And this is?
P: A climbing rack. Like I said, I think about everything we need. See here now I build an entrance with roof tiles. That makes it easier to cycle inside. Now some trees and a flag.
Places trees and a flag
R: Is all the unused ground grass?
P: Yes. So I'm finished. What do you think? Pretty ok schoolyard right!.

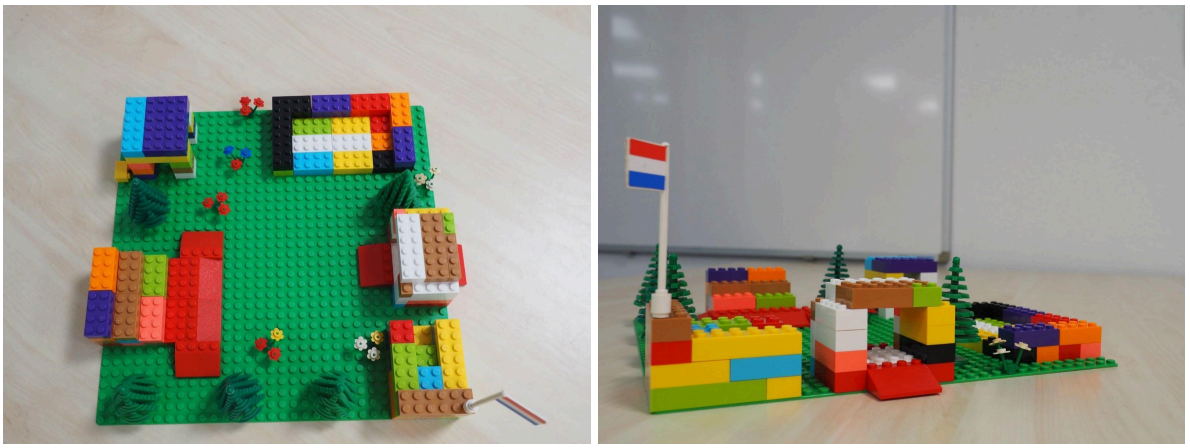


Figure 15: Photograph LEGO© schoolyard created by child, above and side view, 11-4-2024

Schoolyard 9:

Picks the green floor plate and watches first at all the bricks before starting to build.
R: What are you building?
P: A tiny house. I like those small funny houses to play in. We used to have one with a door. That was fun.
R: Why do you build in brown?
P: It makes me think about wood.
Builds a house with brown bricks and red roof tiles and a chimney. Starts adding roof tiles together.
R: What is this?
P: It is a slide Not a normal one. I built a whole climbing obstacle course behind it.
Builds tower behind the slide and adds fences on the top of the slide
P: For safety. Now, here I am going to build a climbing tool that you can hang on. Monkey bars. I'll add a figure so it is more clear. And now I make a sort of a forest with trees. A bit like a playing forest.
Adds trees and flowers in an empty patch.
P: O wait, this reminds me of something completely different, wait…
Builds with brown, a sort of tree with a house on it.
R: Is that a treehouse?
P: Yes, but I have not enough brown bricks. I'll change it to another climbing obstacle with another slide.
Makes two poles and attaches them with an arch together. Also adds a shorter pole in the middle of the arch with a small brick at the end.
P: See this is a swing.
R: And all the green?
P: That's grass.
R: So this is the schoolyard you would like?
P: Yes, especially the climbing fences and monkey bars.

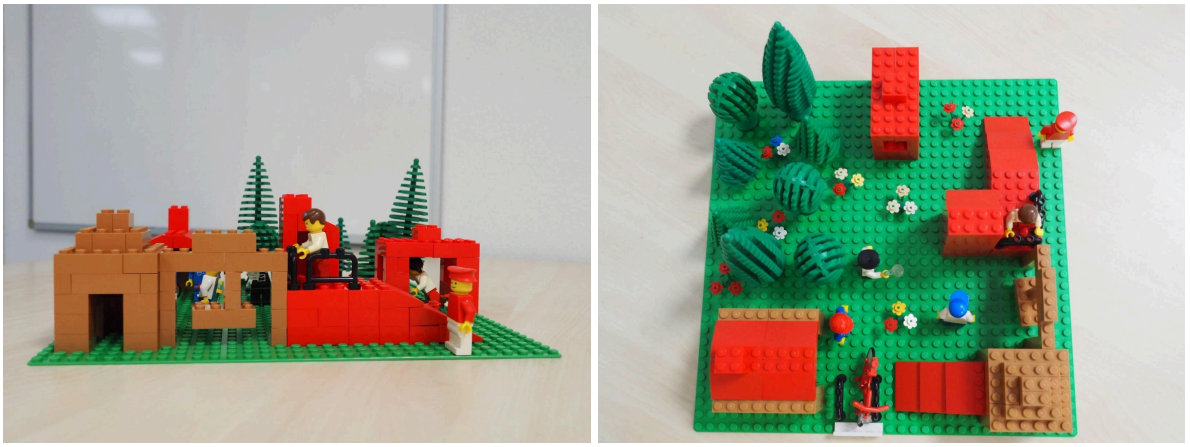


Figure 16: Photograph LEGO© schoolyard created by child, above and side view, 11-4-2024

Schoolyard 10:

Starts by taking a lot of trees and flowers. Places them on the green floorplate.
P: I'm going to put fences here. I like that. They can also be used as horizontal bars. Next I 'm going to build a table.
R: What is the table for?
P: To play games on. And it is part of the parcour. You have to crawl under the table. And you have to climb over this log her
Places a long brick close to the table
P: I make the finish with this flag but first you have to balance over this log here.
Places flag and long brick on the path of the parcours.
P: O yes, hmm, nee.
R: What do you want to build?
P; I want to make a swing but I do not know how to make the chair fit
R: I just learned that from another participant. Do you want me to tell you how they did it?
P: Yes. Then I'll start with the poles. Can you help me to attach the chair?
R: Yes, just tell me what I have to do.
Tells what R has to hold in order to fix the swing set.
P: Now I make a slide. You see, it looks like a play yard. Why did you ask to create a green schoolyard by the way?
R: In summer when it is warm the schoolyard gets too warm. That is not comfortable. Trees and other green create shade and cool the yard
P: Ah, ok. So a nature and playing yard would be the best. O look I build a stairs here otherwise you can not enter the slide. All it needs now is a flowerfield. And one more thing.
R: What are you going to build more?
P: Just wait and see. Do you see it already? A climbing wall like at the building of the climbing hall.
R: Wow, that is great.
P: All we need now is a bench for people to rest. Well I think this is it. This is what I like and it is pretty.

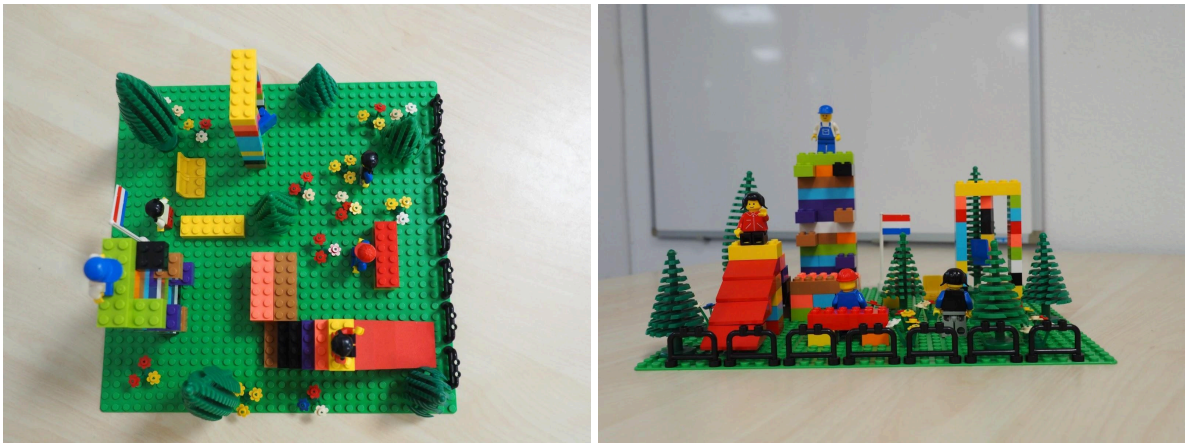


Figure 17: Photograph LEGO© schoolyard created by child, above and side view, 11-4-2024

Schoolyard 11:

Picks a green floor plate and starts to build by placing trees. Next adds chairs to the floor plate
P: This is going to be sort of a sitting area.
Creates seats, adds a tree and places a figure sitting on the chair. Starts building a box.
R: What is this?
P: This is a sandbox.
Adds yellow bricks on the floor of the box. Takes roof tiles and places them together
R: May I guess?
P: Yes of course,
R: It is a slide.
P: Very correct. The school has a slide on the yard for the children in kindergarten. Our yards do not have slides.
R: Why do you build these fences?
P: To make sure the children won't fall off while climbing on the slide. Now I'm going to make a forest.
R: Why do you build a forest?
P: So more bees will find a place to live.
R: Only bees?
P: No, also birds.
Places more trees and flowers in a corner. Ads figures too. Starts building the school entrance.
R: Is this another slide?
P: No this is the stair to the roof of the school. This is convenient for picking up balls from the roof. The roof is part of the schoolyard.
Places a fence and figures. Also places figures on top of the highest trees.
P: They climbed the tree.
R: With a bike?
P: Yes. So now I am finished.

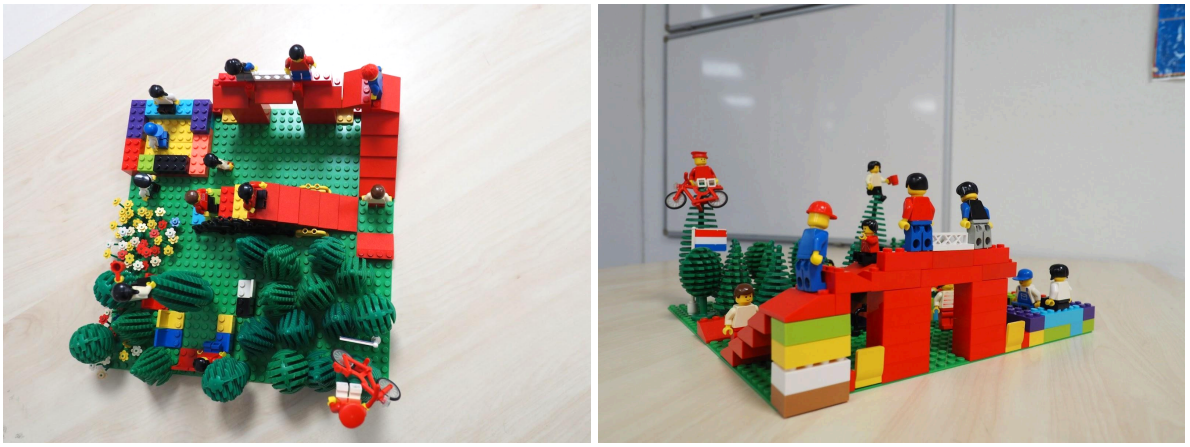


Figure 18: Photograph LEGO© schoolyard created by child, above and side view, 12-4-2024

Schoolyard 12:

Starts with a green floor plate and places trees on them.. Searches through the bricks.
P: No dark blue, that is a bit of a shame, but it doesn't really matter. I can use light blue also. I am going to build my favourite thing, a trampoline. And nature. That is something I find important.
Starts building
P: What do you write on your device?
R: What do you tell me about your building. I do not want to forget what you build. For example, what are you building now?
P: A climbing rack with monkey bars but I do not know if I'll manage.
R: It looks pretty cool how you build this. I think you will manage.
Builds a yellow climbing rack with monkey bars.
R: You said nature is important.
P: Yes, people have to be careful with nature. For example plastics. Plastic is a pretty cool material and very useful. But you need to clean it in a neat way away so it does not pollute nature.
R: A right. Smart of you to think about that.
Builds further on the climbing rack and places flowers.
R: What about the green in the middle?
P: I like that it is an open space with grass. Yes, this is what I like to have on a schoolyard. Climbing and jumping.
R: Thank you for sharing.
P: Any time it was fun to build LEGO with you.

Figure 19: Photograph LEGO© schoolyard created by child, above and side view, 12-4-2024

Schoolyard 13:

Chooses the green floorplate. First places trees, moves some and removes others.
P: Is it ok to build a house?
R: Do you want a house on your schoolyard?
P: Laughs, NO!
Builds a large box.
P: A large sandbox. The inside I will make with brown bricks
Builds a second layer of bricks on the box.
P: See now the sand stays in here.
Builds a little staircase.
P: A tiny staircase for the little ones so they can climb in the sand box.
Starts building something else.
R: What is it you're building now?
P: A slide. And a bench here so they can sit. And this is a seesaw. What else should I build?
R: Whatever you want
Places flowers and a bike. builds a table
R: What is the table for?
P: To put things on. When you are in a hurry you can place your things here first.
R: Could you als have class or lessons in your schoolyard?
P: I think that is possible
Places figures. Each figure comes with a story.
P: This figure picks flowers and brings them to this other figure. And this one is playing in the sandbox with a cup. Those two are throwing sand at each other.
Places fences around the floor plate.
P: These are for the young children so they can not run away. I do not know what else to build
R: If you want you can build more but you can also stop building
P: I'll make a turning chair and place it here. And this is the chair for the king. I'll put that in the sandbox. Now I am finished.

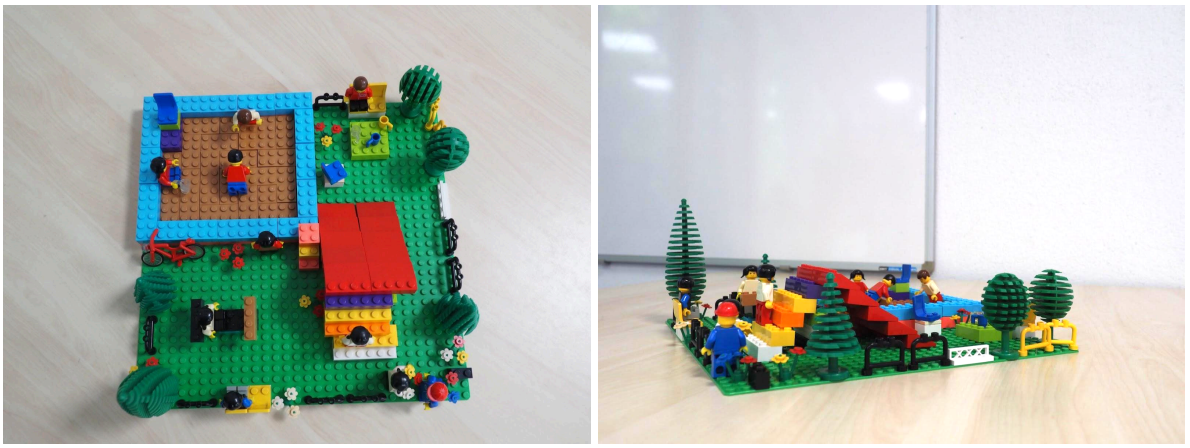


Figure 20: Photograph LEGO© schoolyard created by child, above and side view, 12-4-2024

Schoolyard 14:

P: I am going to build something that I think will never be on a schoolyard.
R: And that is?
P: A swimming pool
Chooses the green floor plate and starts building a white box with blue bricks in it.
R: How come you think a swimming pool should not be on a schoolyard?
P: A swimming pool on a schoolyard is a bit strange I think. O I need a lot of blue bricks. And I make an entrance here. I think I'll use a roof tile for that.
Starts building something else.
R: What is this going to be?
P: A mountain to climb on. O I forget something.
R: What are you forgetting?
P: What I also like, a swing.
Starts building a swing.
R: Is this a schoolyard to play on or to learn on.
P: A place to learn how to play, you know playing with each other. O look at this branch of this tree I'm building. I'll put the swing on it.
Looks at the bricks
P: Mmmm what else should I build. I know something. I build a big apple
Starts building an apple.
R: An apple to eat or as a piece of art to look at or maybe play on?
P: As art to look at
Building breaks.
P: This is not working. Maybe if I'll make it smaller. You know what, I'll make it smaller and place it here.
R: Do you want any figures in your schoolyard?
P: Only two. For the rest I'm going to place flowers everywhere.

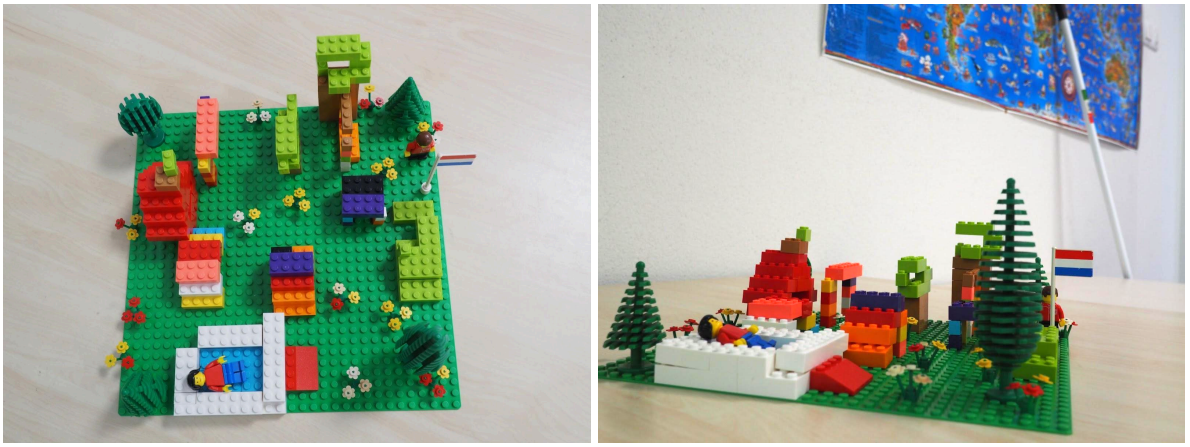


Figure 21: Photograph LEGO© schoolyard created by child, above and side view, 12-4-2024

Schoolyard 15:

Participant chooses the green floorplate. Starts by placing fences.
P: This is for climbing
Places a few trees and starts to build.
R: What are you building?
P: This is a playhouse with a tree in it.
R: Is the playhouse only for playing or also for learning?
P: I do not know yet.
Builds further
P: This is a mini window you see.
Adds more trees
R: Do you add trees because of the assignment or for other reasons?
P: Trees are important
R: Why?
P: So we can breathe well.
R: What else are you going to build?
P: I do not know. I think we need more flowers
Places flowers and some chairs.
P: This is a bench, and we need more flowers.
R: Are those fences climbing frames or horizontal bars
P: These are horizontal bars, now I build a climbing frame. O and I remove the tree from the house so more figures can sit in it.
R: Are you fine with the result?
P: Yes. See this is my favourite playing yard, just to play in ofcourse.

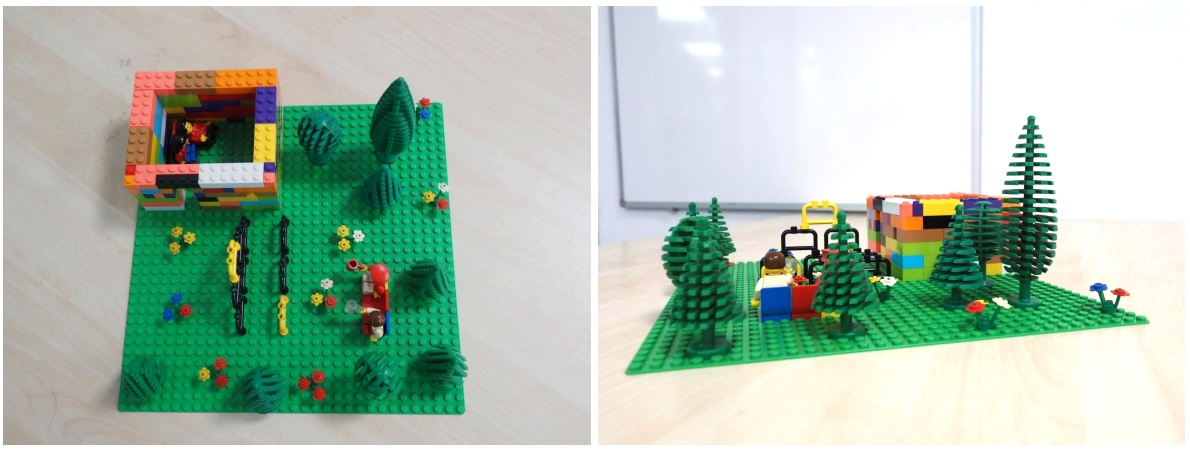


Figure 22: Photograph LEGO© schoolyard created by child, above and side view, 17-4-2024

Schoolyard 16:

Starts with placing trees on a green ground plate.
R: What are you building?
P: Here I make a bench so you have a nice spot to sit on. With a little path so you can reach the bench. See I build it in brown because the bench is made of wood. I am only building the schoolyard. I love playing hide and seek. I'm going to build a lot of hiding places.
Places more trees.
P: I think I will use most of the trees, if not all.
R: Are there only trees in your favourite schoolyard?
P: Not only but in the trees you can also climb. Here I place some fences because outside the schoolyard is a lot of water
R: Why a fence?
P: Otherwise you might fall in.
Places flowers on the fence.
R: Do the flowers have special meaning?
P: No, just for fun and because they are beautiful. See this yard is an island surrounded by water.
Builds a higher fence with a roof tile on top.
P: See, this is the entrance to the school yard. I am also going to build a table tennis table. And here I'm going to build a climbing fence or climbing obstacle. See here is the flag, because this girl is having her birthday. The concierge plays ping pong with her. This is the ball. So I think I'm ready.
R: Are you sure, you have plenty of time left
P: O then I build something else. A stairs you can place and remove. That is convenient for the concierge. And a bridge. You see, this is a survival bridge to the other islands. And also a way to sneak off to your home during the breaks. O, I think there will be a fence for it to prevent that during the breaks. I'm finished. This is how I like a schoolyard.

Figure 23: Photograph LEGO© schoolyard created by child, above and side view, 17-4-2024

Schoolyard 17:

Chooses the green floorplate and places trees on all four corners. Starts building with the bricks
R: What are you building?
P: A climbing fence. I like to climb.
Builds tree walls and places fences around them
P: Now I am building something else. A sort of swimming pool.
R: Wow, is that a diving board there at the edge of the climbing obstacle
P: (beams) Yes!
Starts placing more bricks on the floorplate.
P: And this is a parkour with balancing beams. You see, you can move all different directions on the beams. This is parkour for jumping. And here is a thing so you can climb easily to the top of the trees. O and the pool needs an edge otherwise the water runs out. And I'll add water here. You see, this is the paddling pool for the little ones.
R: It looks like you want a waterpark instead of a schoolyard.
P: Yes, that would be great.
R: Is this a place for learning to swim or to play?
P: Only for playing. Look, it is spring.
Places flowers and more trees.
P: I think my favourite schoolyard is ready.

Figure 24: Photograph LEGO© schoolyard created by child, above and side view, 17-4-2024

Schoolyard 18:

Chooses the green ground plate.
R: Why did you choose this one?
P: On the white one trees can not grow. This green one is fresh, the other one is a bit broken.
Starts building.
R: Is this a swimming pool?
P: No it is a pond.
R: What is this fence for?
P: To prevent anyone from falling into the water.
Builds a stair with bricks and places two bricks steeply against them.
P: See this is a slide. Let's see how to keep these two in place so it is safe.
Builds a casket holding the two bricks in place. Creates two seats on both sides of the slide.
P: These are for sitting on. O wait, I have a better idea.
Removes the stairs and build a rack.
P: This is a climbing rack to enter the slide.
Places figures in a line behind the climbing rack and slide.
P: Here I place a lost cup. This is a yard to play on. Nowwe need more flowers.
R: Why all the flowers?
P: They look cosy.
Adds a figure near the fence
P: See this one is jumping over the fence.
R: Why do you build so many fences around the slide?
P: To prevent children from falling off. I make a longer line here so everyone can play on the slides.
This is my ideal schoolyard, because of all the flowers.

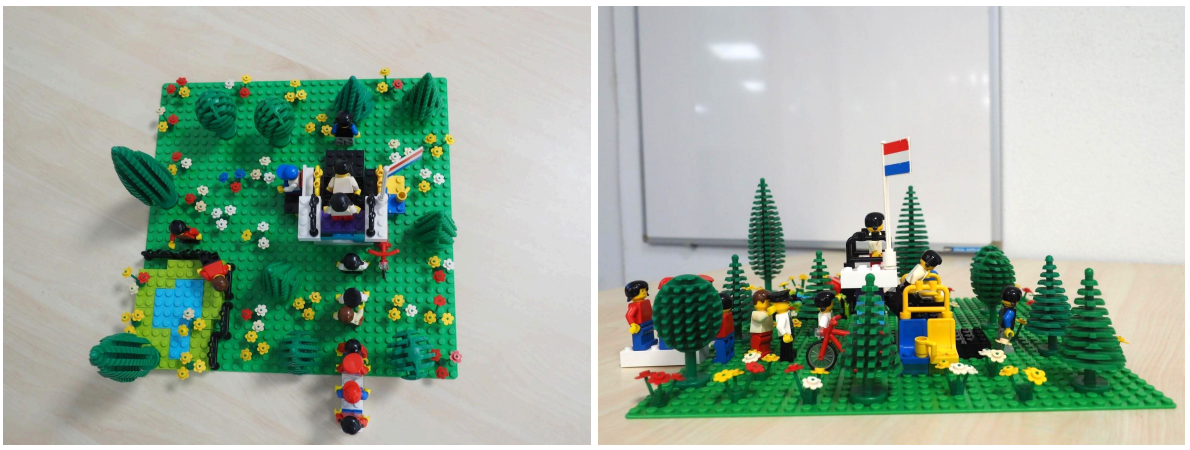


Figure 25: Photograph LEGO© schoolyard created by child, above and side view, 18-4-2024

Schoolyard 19:

Chooses the green floorplate. Starts placing flowers and starts building with the bricks.
R: I think I know what this will be, a slide?
P: Yes, we do not have one. At the small childers yard you have a slide. Our yard does not have a slide anymore. It would be great if we had one again.
R: And this is?
P: A seesaw, and a wobbling instrument.
R: And this is a sandbox?
P: With a sandcastle. And this is a large slide for the older children. And this is the football pitch, and a high place to oversee the schoolyard. With fences so no one can fall off.
R: Is this what you build a picnic table?
P: Yes, for the girls. And for others to place their bread on during the break.
P: Now I build a basket, my best friend loves to play basketball.
R: What do you like the most?
P: Being inside I love to play with LEGO but outside I love slides and playing basketball.
Places trees on the schoolyard
R: That is funny. You put the trees in now instead of the beginning.
P: Yes, we need them for the shade on warm days. You can sit in the shade instead of having to move inside. O and this is the cycling path. To ensure that the football players are not disturbed.
R: Does the yard need figures?
P: O yes, and you know what else… a tiny restaurant. For all the children who do not have brought food or drinks. They can get it here, for free. That is important.
R: This is your ideal schoolyard?
P: O yes. It suits me and everyone else.

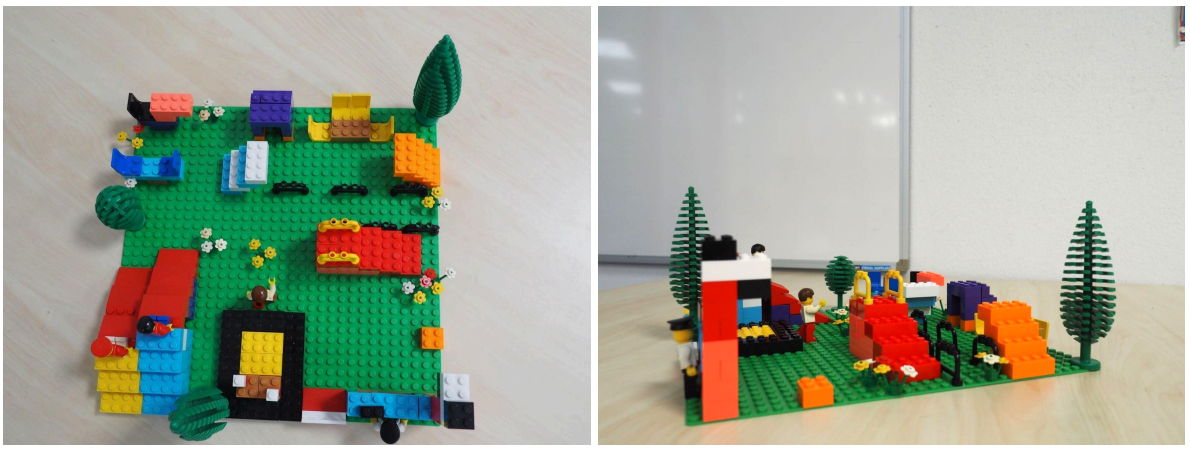


Figure 26: Photograph LEGO© schoolyard created by child, above and side view, 18-4-2024

Schoolyard 20:

Starts by using the green floor plate. Places flowers on it and starts building
R: What are you building?
P: A climbing fence.
Places a line of flowers and some fences.
P: See, here at the fences is the school.
Builds a line of bricks before the flowers.
P: This is for the followers, a bit like a flower garden or border. And this is the football pitch, with a wall around it. See, black and green. The green is to show we care about green. And here I build a wall so the children will not leave the yard.
R: Why do you place roof tiles on the wall?
P: To find shelter when it rains.
R: Do you ever need shelter from the sun?
P: No not really. See I build a wall with roof tiles on top of it here. Also for shelter when it rains.
R: Is all the green grass?
P: Yes, all is grass. I also heard you can have flowers and grass growing on roofs. Now I place some trees and create a seating area under the trees. Also to find shelter against the rain and the wind. So this is what my schoolyard looks like. I am very satisfied with it.

Figure 27: Photograph LEGO© schoolyard created by child, above and side view, 18-4-2024

Schoolyard 21:

Chooses the white floor plate and starts building
R: What are you building?
P: A climbing fence. You see I use black and purple.
R: Why did you choose the white floorplate?
P: Those are tiles. Because if you have grass and it rains it becomes a mess. Plus when you fall you get wet. I do not want the children to be wet. What do you write?
R: What you explain so I do not forget. What are you building now?
P: The entree of the school. See the cars here. Now I'm going to make the football pitch.
Looks for purple and red bricks.
P: See I use all the same colours. This is a race track. This is it. I'm finished.
R: Don't you want to add some flowers or trees?
P: O, right, yes.
Places trees and some flowers
P: Now I'm really finished. I am happy with a schoolyard like this.

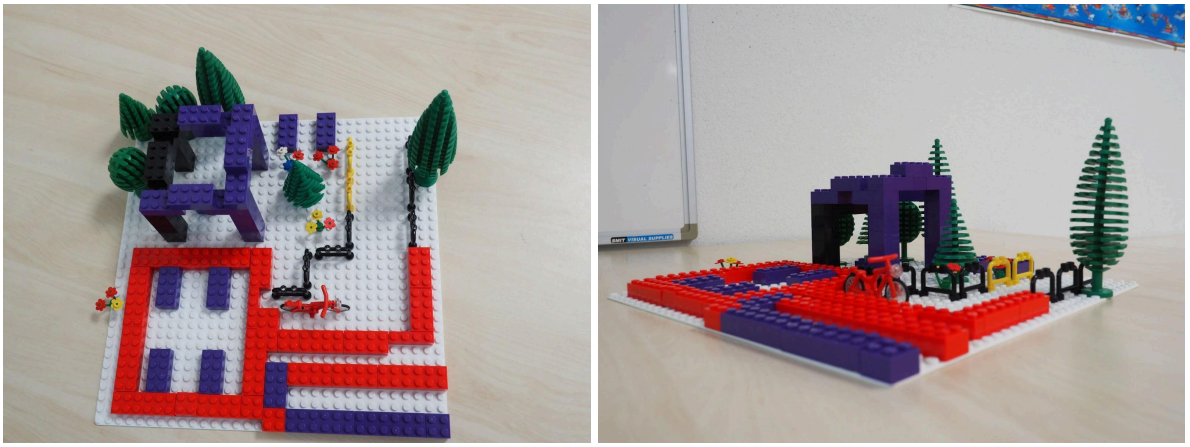


Figure 28: Photograph LEGO© schoolyard created by child, above and side view, 18-4-2024

Schoolyard 22:

Starts with a green floor plate
P: I'm going to use all the fences.
R: What for?
P: A school has fences. And now I'm going to build the school.
R: You can also leave the school and stick to the schoolyard.
P: But I want to build a school building. A schoolyard has to have a school building
Builds a school with a roof on it. Explains where the classrooms are situated.
P: Now I place the students in them of course. And I'll make chairs for the yard watch. You see. Everyone can sit on them.
Places flowers
R: Don't you want any play gear on the schoolyard?
P: Yes, that's what I'm going to make now. A slide, a climbing fence or, no. Not a climbing fence. I place the flag here on top of the building.
R: Can you enter the school roof like on a roof terrace or so?
P: No, you can not enter the schoolroof. Plus a school does not have a roof terrace. And I need a sandbox and another tree. O and some rocks in the sandbox.
R: Is all that is left of the surface grass? There are no little roads or paths?
P: No because there are no cars and so on the yard no roads are needed. The little paths I'm not going to build. O, I'm going to place this bike here. In the kindergarten we had small bikes and so to play with. Now I'll add all the other figures.
R: This is your preferred and green schoolyard? Did you add enough flowers and trees?
P: I'll add some more flowers but I think this is ok. I like this schoolyard.

Figure 29: Photograph LEGO© schoolyard created by child, above and side view, 19-4-2024

Schoolyard 23:

P: I choose white as the floor.
R: Why?
P: I can add loads of colours on it.
Places trees and flowers at the corners.
P: This is the entrance of the yard. I do not know yet what I'm going to make. I'll just do something.
R: Is this the entrance of the schoolyard?
P: Yes, you see. This figure just walks off the yard. Now I'm going to build a slide.
Builds a slide and removes it again.
P: I do not like it. I'll build something else. See this is the concierge doing his tasks.
Places a figure close to a tree.
R: What do you like in a schoolyard?
P: O climbing fences and you know what. I'll build that game with the yellow figure that eats the little balls.
R: You mean a real life pacman?
P: Yes. See this is the yellow figure and now we need a few kids. Or let's add all the children.
Places figures
P: I'm ready!
R: Are you sure?
P: No wait, I'll add more flowers.
R: These walls for the game, can you also sit on them?
P: Sure, see, she is already catched by the yellow figure. She sits here.
R: The floor is white, what is it made of?
P: It is snow, flowers and snow. Great fantasy world. O and this is the school's flag. And here is a bike. O wait. The yellow figure has just caught a child. See it is here in its beak. And I put some more trees and flowers here.
R: So this is your ideal schoolyard?
P: Yes, with my own fantasy in it.

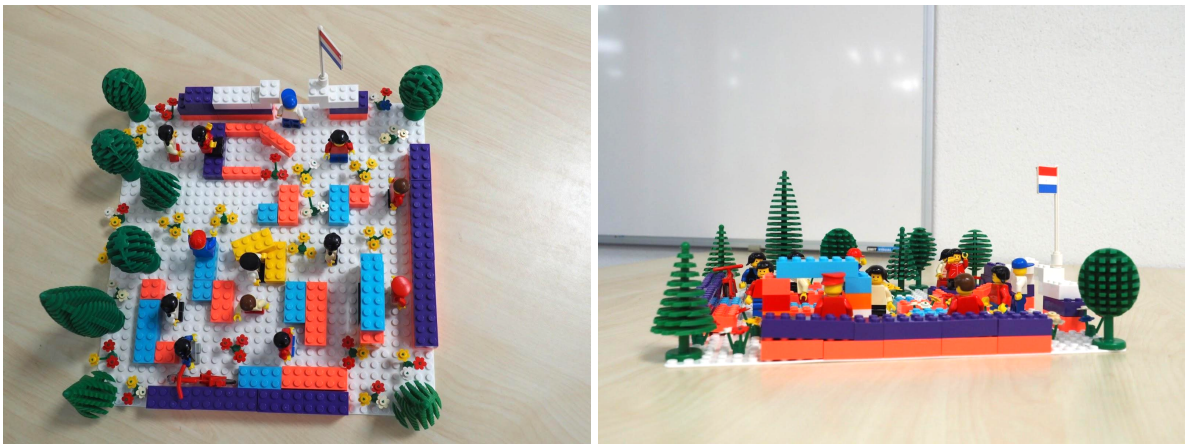


Figure 30: Photograph LEGO© schoolyard created by child, above and side view, 19-4-2024

Schoolyard 24:

Choses the green floor plate and starts building two poles.
R: What are you building?
P: A swing
R: Would you like to have a swing on your schoolyard?
P: Yes. Now I'm building a slide. These are the stairs. I would not know how to build stairs in another way.
R: And what else do you want on your schoolyard?
P: I'm going to build horizontal bars.
R: Is this all you want on your schoolyard or is it also for other children?
P: Also for the other children. You know at school we always play football, what if I build a hockey field. This flag can be a hockey stick, and this tiny brick the ball. And now I'm going to build a seating area. So you can rest if you're a bit tired. And you can also draw here when the weather is nice.
R: Is this also a place for learning?
P: See I build a tiny pencil case here on the table. O, and I'm going to build a basket. We have one on our schoolyard. You throw the ball in and you do not know out of which hole it appears again.
Builds a basket with different holes.
R: Does your yard also have any trees or flowers?
P: O right, I was almost forgetting them. And I know what I want to build: a tiny river.
R: Is the water for playing?
P: No, our schoolyard has a tiny river also. See I build a duck to sit in the river. Now I'm adding some chairs here and a few more flowers and now I'm finished. This is the schoolyard I want to have, only a bit more space, otherwise it is way too full with things.

Figure 31: Photograph LEGO© schoolyard created by child, above and side view, 24-4-2024

Schoolyard 25:

Chooses a green floorplate. Places green bricks in a corner.
P: See these are shrubs, and this is a tree. Are you sure I do not have to tell you everything I do?
R: Yes
Starts building with black bricks.
R: What is it you are building now?
P: (smiles) I'm not telling……. It is a school.
R: You can also build only the schoolyard.
P: O wait, right of course.
Removes all the bricks and starts all over.
P: What about a rollercoaster, or wait I know what I'm going to build. A large tree to climb in. And a treehouse. A really large tree. A rollercoaster might be a bit too much work.
Starts building
P: Can you help me? If you find all the brown and green bricks for me I can build faster and it might be finished within the time limit.
R starts looking for all the green and brown bricks. P keeps on building.
P: I think it becomes a mountain. I do not think I'll be finished in time.
R: I think you will have enough time.
P: I also have to build a path around the tree with stairs and so on. See these black bricks here make the path around the tree trunk.
R: Is this a tree or a mountain?
P: A tree. Up here should be a tree house. But I'm running out of time.
R: How many floors does this treehouse have?
P: It is not the treehouse from the books (smiles). See, I'll add some more shrubs and a few trees. See this would be cool to have on the schoolyard. If I had more time I could have finished it further.
R: I wonder if I have enough bricks than
P: (smiles) I don't think you would have enough.

Figure 32: Photograph LEGO© schoolyard created by child, above and side view, 24-4-2024

Schoolyard 26:

Chooses the green floor plate. Places fences and uses roof tiles to build.
P: I am trying to build a skatepark.
R: Nice! Now I understand the fences. Are they also for sliding with your board or skates on them?
P: No, this is the line in which the skatepark is situated.
Builds further with bricks
R: And this is?
P: Some sort of stairs to climb on or off.
Places some trees.
P: I have a cool idea with the figures. They can play in the skatepark.
Places a figure on a bike on the roof tiles.
P: Now I make a few chairs so you can sit and look at the skateboarding.
R: This is still all on the schoolyard?
P: Yes, you can also enter the schoolyard when there is no school. See these black bricks? This is a road. And this is a tube to slide on with your skateboard. And now I make a figure on a skateboard. See that goes here.
Places figure on one of the roof tiles pretending to be sliding down.
P: Now I want some more chairs and one other thing.
R: What is that?
P: It is a seesaw. I try to show how it moves. And these things here are for holding when playing on the seesaw. I think I am ready. This is a schoolyard I would love to play on.

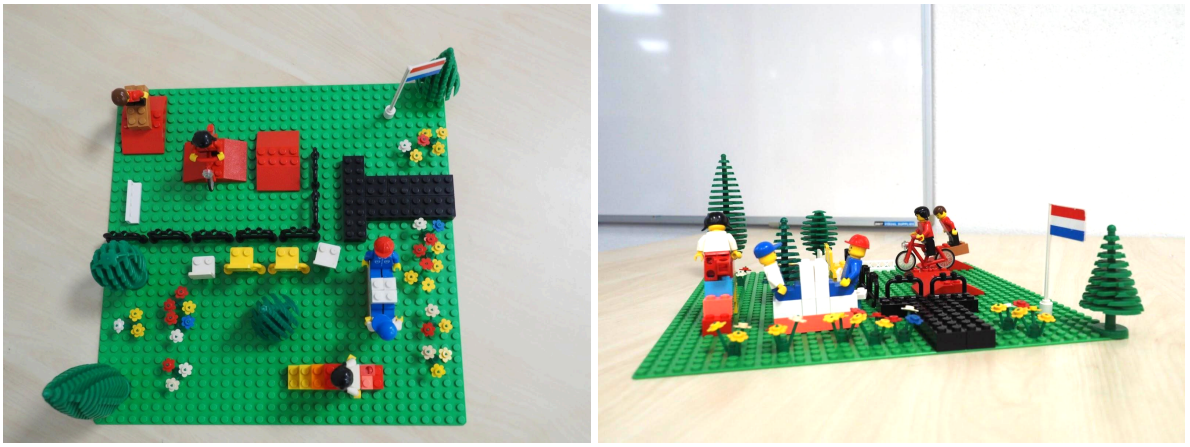


Figure 33: Photograph LEGO© schoolyard created by child, above and side view, 24-4-2024

Schoolyard 27:

Chooses a white floor plate.
P: See this looks like our current schoolyard. The white are the tiles. I'm going to build our school.
Starts building the outline of the school
R: Is there enough space to design a schoolyard you like?
P: O yes, I did this before. I am a very good LEGO builder. See here I place blue bricks for the windows and these chairs are showing the classes. All it needs now is a roof.
Builds a roof.
P: Now I'm going to build the schoolyard.
R: How are you going to design the schoolyard? What will be on it?
P: All that is now.
R: It seems you are building the schoolyard as it is, do you like this yard?
P: Yes. I like the trees around it. See now I make the bridge. O that needs to be smaller.
R: What do you like about this schoolyard?
P: I like also that is it big
R: What do you do in the yard during the breaks?
P: I like to climb trees and run around. I practise survival skills
R: Didn't you want to have a cool survival track on the schoolyard?
P: No, a survival track with all the ropes and nets is not a schoolyard. This is a schoolyard. See exactly as it is in real life. This is how I like the schoolyard.

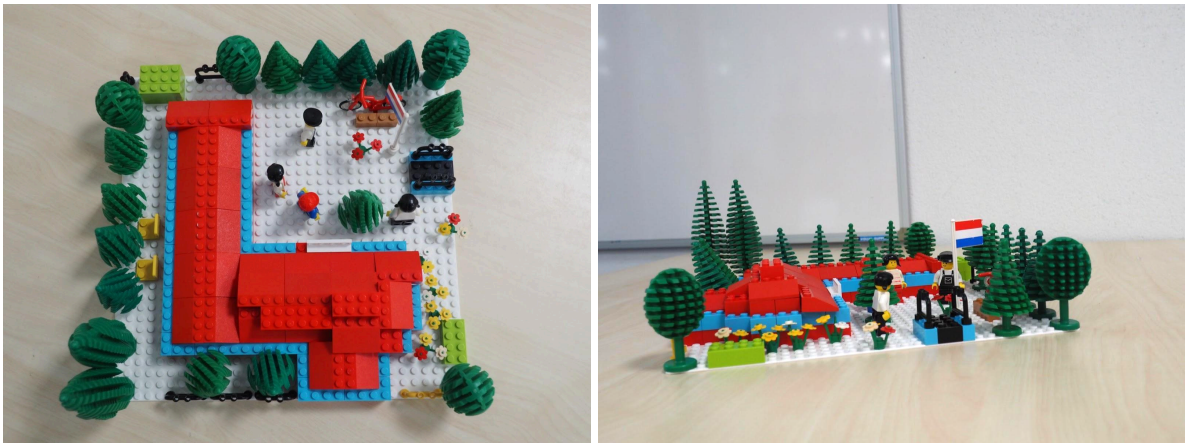


Figure 34: Photograph LEGO© schoolyard created by child, above and side view, 24-4-2024

Schoolyard 28:

Chooses the green floor plate.
P: See, over here I'm going to create a sort of forest with playing equipment and this part here will become a football pitch. I like to play football but I do want a pitch of grass instead of tiles. That is a lot nicer to play on.
R: And how about those playing instruments and equipment?
P: I'm going to build them later on. I'm thinking about something to climb on and maybe a slide. But first I have to finish the football pitch. See I'll add the figures here. 5 against 5, that's how we play it.
Starts building something else between the trees.
R: Is that a climbing obstacle?
P: Yes, see the trees are part of the climbing instrument. More like a treetop parkour. I think I'm ready.
R: Are you sure, you want nothing more on your schoolyard?
P: Wait, these chairs. I'll add them so there is some place to rest and to suit for a while.
Adds more trees.
P; Look, this is a better place for hide and seek now. On our schoolyard that is not that possible. There aren't enough places to hide.
R: Maybe you need to play hide and seek the other way around.
P: You know how to play that. That is cool, one hides and the rest starts looking. That is the best way of playing hide and seek. I'll add some more trees and now I'm really finished.

Figure 35: Photograph LEGO© schoolyard created by child, above and side view, 24-4-2024

Appendix 5 Interview design mind map

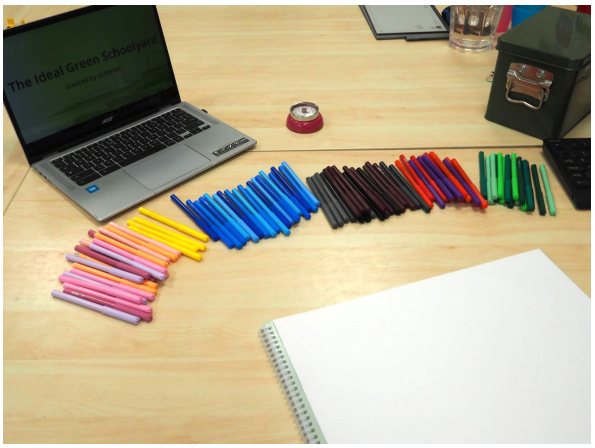


Figure 36: setting for mind map research

Time for mindmapping: 15 minutes plus 5 minutes explanation. Time kept by a kitchen timer.

Mind map assignment: Your child(ren) built schoolyards with LEGO the way they think a schoolyard should look like. The only requirement was they had to add some green; trees or other greenery. What I like you to do is look at the schoolyards and to write down your own thoughts on a green schoolyard using the examples made by the children as inspiration. I also would like to ask you to note whether your thought is positive or negative or neutral. During the mapping I ask questions on what you write and make notes on them. Your answers help me to process the data.

Processing data: Pictures of mind map assignment. Pictures are combined with transcriptions of the interview during the creation of the mind map. The elements that are included in the mind map activities are counted and placed in a table. Short interviews are noted and transcribed. There is no audio recording of the interviews.

Interview design / Questions asked while building:

1. What do you think about a green schoolyard?
2. Can you see some of the examples really happening in this school's schoolyard?
3. Can you create a mind map inspired by the pictures of the LEGO building you have seen?
4. What is positive in your mind map?
5. What is negative in your mind map?

Transcription abbreviations:

- P = Participant
- R = Researcher

Appendix 6 Transcription and pictures of mind map exercise (N=18)

Mindmap 1

R: What do you think about a green schoolyard?

P: A lot of green and trees. Also mud and water pools. It is really healthy for children to get dirty during play. Although I think the teachers would be less happy with a messy classroom filled with dirt.I see at my own children, as soon as they are playing outside they become more happy and more creative.

R: Can you see some of the examples really happening in this school's schoolyard?

P: Yes. And I think some of these ideas are good for children's development. For example this little house here for the older children to have a place to retreat in with peers or alone. It fills a need in my opinion plus it also shows teachers and others trust the children to not act in inappropriate ways.

What I find cute is this little slide. The retreat place for the older children and also thinking about the smaller children and building a slide.

R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

Figure 37: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?

P: O yes, I would even go further by creating hills and tunnels to roll off or to climb through. And building materials to create their own fantasy buildings in the yard.

R: What is positive in your mind map?

P: All the playing materials I find positive. Als the place for retreat, a bit of a zen and mindful place. The sandboxes I find positive because they stimulate creativity. The trees giving shelter and the colourful flowers might help to reduce stress of being in school and having to perform. Animals in the schoolyard are also positive. Those can be used for nature education.

R: What is negative in your mind map?

P: Climbing obstacles brings risks. As have trampolines. On the other hand, children need to learn how to fall. All the water ideas I find less safe. And for nature education, that might bring extra burden to the teachers.

Change in the future residential environment: More structure like in the children's schoolyards

Mindmap 2

R: What do you think about a green schoolyard?
P: I think mostly about more trees, grass and wood chips instead of tiles. Wood chips especially around climbing obstacles. That is softer when someone falls. And they prevent muddy conditions. I do like borders with more flowers and plants and the panna cage could do with grass instead of a paved surface. More like a real football pitch. O and loads of daffodils. Those flowers create a positive vibe according to me. My dream schoolyard would have fountains on the floor. Those are great during summer to cool and for playing. I once saw a schoolyard which had those really big air cushions for jumping. That would also be great, with wood chips around them for safety.
R: Can you see some of the examples really happening in this school's schoolyard?
P: I can see more trees being planted and also a more exciting yard to play and discover in.
A sandbox would be nice for all the children I think. And some of the examples with the benches and the flowers I think can be realised. It gives a cosy atmosphere.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

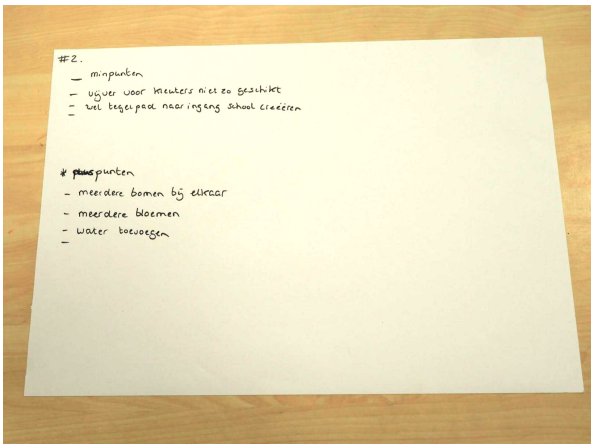


Figure 38: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?
P: I think my ideas resonate with those of the children. The tiny forests, I would combine that with climbing obstacles. Water as in a swimming pool or ponds I would not do.
R: What is positive in your mind map?
P: My positive aspects are more trees and also in groups, more flowers and adding of water in the form of fountains.
R: What is negative in your mind map?
P: I think a pond would not be safe for the smaller groups. I would like to have a paved path towards the entrance of the school. People less able need to have easy access also.

Change in the future residential environment: : A tree and maybe more wood chips instead of tiles

Mindmap 3

R: What do you think about a green schoolyard?
P: I think about trees, shrubs and grass. Maybe a vegetable garden.
R: Can you see some of the examples really happening in this school's schoolyard?
P: I think a lot of what the children build can be realised. I do wonder if all that grass does not need loads of maintenance. You could opt for artificial grass, although that might not be very natural. I like the remark about moss. That sounds interesting. Those swimming pools, I wonder if it is not too cold here. The idea is great yet not that practical. All the flowers and trees, I think that is a great idea and do-able. Slides and climbing obstacles, yes. They are needed on the schoolyard. I would not use trees for climbing. The places for chilling are also a good idea, especially for the older kids. The football pitches I wonder about, the school already has on, although without the stands for the public though.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

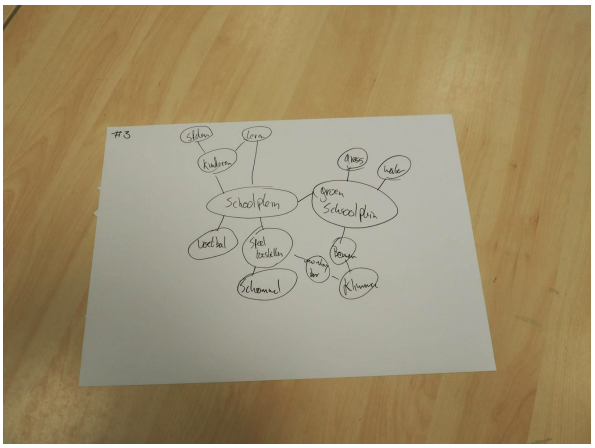


Figure 39: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?
I think it does on certain examples and less on others. I miss the vegetable gardens. I wonder why.
R: What is positive in your mind map?
P: I like the greenness. More green means less paved and more ways for CO2 capture and it reduces heat. I think the last is especially healthier for the child. Also more green creates more oxygen. I see it in my own child. When it plays outside in a natural environment it seems a lot happier.
R: What is negative in your mind map?
P: I think water to play in is a bad idea. It is way too cold here and children could fall in. I think it is not that safe. And I wonder if climbing into trees is smart. You have to think about the safety of the child. There are special trees needed for climbing. And a lot of maintenance. Those trees are maintained by professionals. I think the school does not have that knowledge. I do think more monkey bars would be a better idea. They are less dangerous due to mal-maintenance.

Change in the future residential environment: It will never become a 10, I hate gardening although I work on a vegetable garden.

Mindmap 4

R: What do you think about a green schoolyard?
P: Grass, trees, and a vegetable garden. Also a place where kids can play in a more natural environment. I like those hills with all the tunnel tubes to crawl through. And playing equipment made of natural materials. Not all that ‘plastic fantastic’.
R: Can you see some of the examples really happening in this school's schoolyard?
P: The slide and the sandbox are great. I always wondered why they are on the kindergarten yard and not on the other yards. I like the amount of trees for more shade, the flower fields and the places just to relax are also great. I think those swimming pools are not such a good idea. And the grass is great. Those paved areas are too hot. I am willing to pay a higher membership fee if the school had a green schoolyard. To ensure there is enough green and for well maintenance. Those ponds are also nice, but I think they are not safe for the little children.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

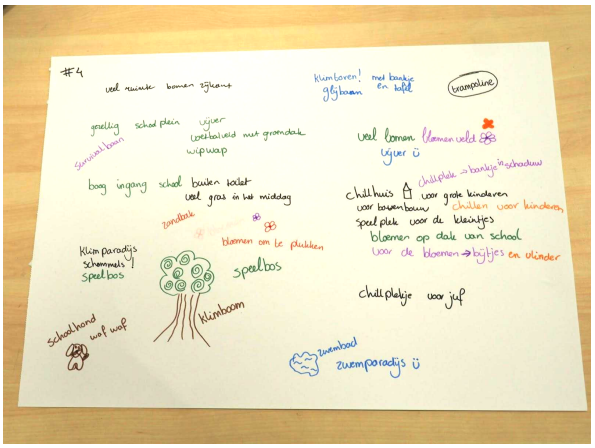


Figure 40: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?
P: I think my ideas are quite comparable to the yards I have seen. I would also add a vegetable garden.
R: What is positive in your mind map?
P: I loved the flowers and the playing forests the kids created. I think that is very positive. And a climbing tower with a slide to decent is nice, although the safety has to be looked at. I love the panna cage with the sedum goals, but why not a whole sedum roof over it. That would create more shade. I also like the places to relax and chill for I think the older children. I really like the entrances the kids created. I can see that with a flowering plant. That would look great!
R: What is negative in your mind map?

P: I think the pool is negative. The survival track is fun yet also not convenient to enter the schoolyard. I also think only grass is not something I would suggest. I would like something else instead of paved surface or grass.

Change in the future residential environment: We are going to move to a new house with an enormous garden with trees and a lot of grass. We are going to make a vegetable garden there yet there is more than enough space left for green.

Mindmap 5

R: What do you think about a green schoolyard?
P: I think about grass, flowerbulbs, and a cheerful view because of a lot of plans. Trees, I think it will be quite green when these elements would be added to this schools schoolyard
R: Can you see some of the examples really happening in this school's schoolyard?
P: I think those football fields might be do-able. The seating areas and a green roof might also be easily incorporated in the schoolyard and on the school building. The ideas of ponds and pools seem quite unrealistic to me. Some trees yes, yet not overcrowding the whole schoolyard. You need to have an overview. In the kindergarten yard they have a sandbox. I wonder if the older children really need one. The small houses I like. They are also great for shelter when it rains
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

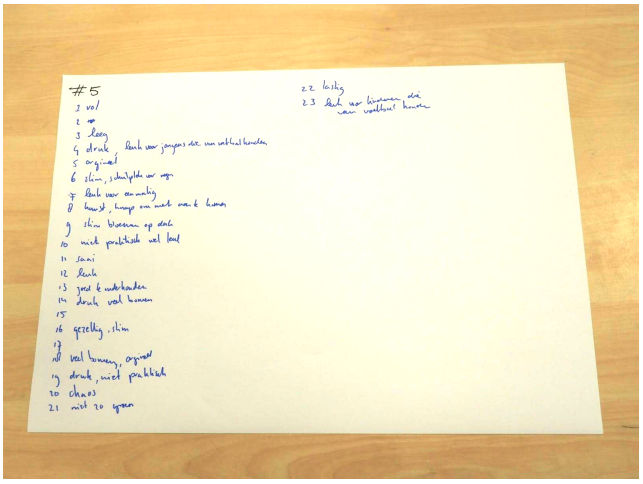


Figure 41: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?
P: I think it is partially comparable. Although I think too many trees in the yard will cause less overview.
R: What is positive in your mind map?
P: I wrote down what I saw in the examples. I like all the climbing obstacles. I would either place grass or wood bark or any other natural material underneath them though. Tiles are too hard. I also like the idea of small houses. Some place for shelter for the children.

R: What is negative in your mind map?
P: I do not think all the water ideas are safe for all the children. And I noticed most yards are very crowded with things. I would probably go for a less crowded view.

Change in the future residential environment: I know I have to green my home environment more. It is more healthy. This is not something this research brought me although it might have some influence.

Mindmap 6

R: What do you think about a green schoolyard?
P: When I think about a green schoolyard I think about no paved surfaces. A child friendly schoolyard. I would probably use wood chips on the floor, no coloured playing material, more natural materials and natural colours, like they have in the Jenaplan education form or in playing forests. Much more holistic with nature. And I would also not over do the greening. You have to be practical, there are many possibilities to green a schoolyard, yet you also have to keep the children and the classes a bit clean. I can imagine the teachers would not be happy with 25 children covered in mud and dirt.
R: Can you see some of the examples really happening in this school's schoolyard?
P: I love that the children use all possible forms of space usage including the roof. Children think without the limits grown-ups have. I like all the playing in the trees and also the climbing obstacles and slides. You could incorporate these two elements with natural materials.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

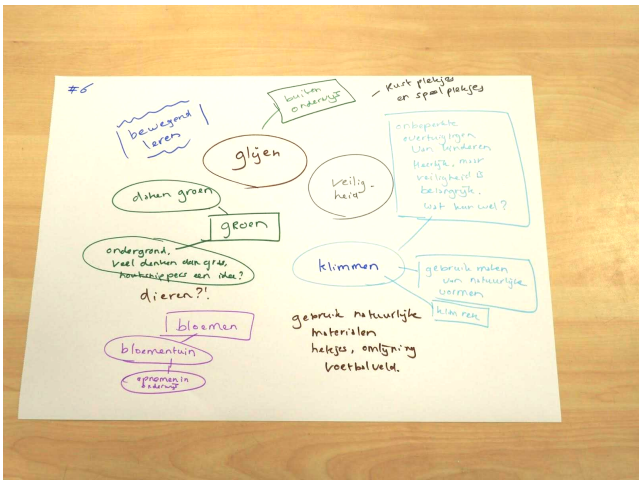


Figure 42: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?
No, I'm way too old to think like the children do. I think in restrictions like safety hazards, children think in possibilities. Although I do think all the green resonates with my own thoughts.
R: What is positive in your mind map?
P: I like the idea of animals in the schoolyard. A dog might not be so useful, chickens for example would be nice. Probably in cooperation with an animal petting zoo or something like that. This could

also bring the idea of outdoor education, environmental education, and more movement while learning traditional subjects. Almost all the playing and climbing and sliding is great. I also really like the combination of playing areas and relaxing zones.
R: What is negative in your mind map?
P: Since I am a parent I think about the safety and the maintenance. The more the practical sides so to say.

Change in the future residential environment: I just had the garden done by a garden architect. It is very green. If I had to do it over I would choose more natural shapes for playing instead of our current design.

Mindmap 7

R: What do you think about a green schoolyard?
P: I think more trees and shrubs to play in and around. Tiny paths with wood bark on the floor and those wooden stem things to climb on or walk on and jump off. And a pond or a stream with a bridge to walk and wonder about although there are some safety issues coming with that. And a picking garden for flowers and fruits or vegetables.
R: Can you see some of the examples really happening in this school's schoolyard?
P: I like the designs by the children. I see a lot of items returning. For example the tiny houses to chill in. Looking at this yard here there are no such places at all. And the many trees. We have trees around the yard yet not on the yard. I know planting trees will not immediately create shadow but I also think about shelter during the other seasons. I can see the hide-and-seek possibilities in some of the designs. And I really think the flowers can be incorporated.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

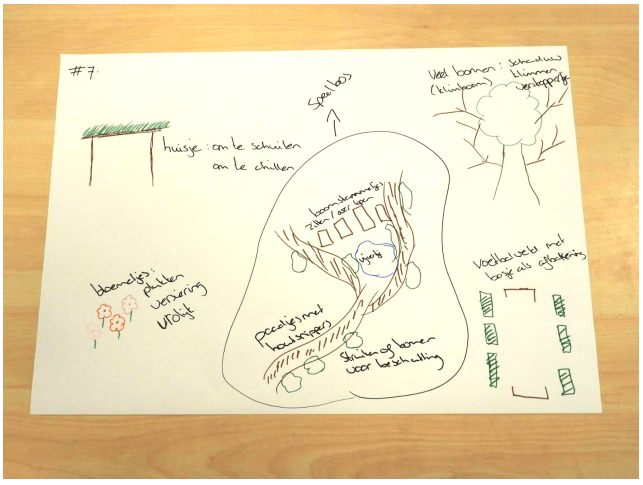


Figure 43: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?

I think it does although now you have me thinking, I think I go much further. I think more about an urban playing forest instead of a traditional schoolyard surrounding the school.
R: What is positive in your mind map?
P: The many trees, the tiny houses, the flowers. The school could easily do something with these ideas. And I like the use of natural materials to play on and with.
R: What is negative in your mind map?
P: I have two things. I miss the use of natural materials and football. I really hate football. I know a lot of children play football in school and in the schoolyards during the break. I would like to have a more natural pitch. If they have to play the game, it might as well be on real grass.

Change in the future residential environment: We have a paved backyard because we thought that would be convenient. Now I already wanted to change to a more green one. We are just not that far yet.

Mindmap 8

R: What do you think about a green schoolyard?
P: I think about all but this schoolyard. I would say a green schoolyard has sand and mud, and many trees. I do not think about grass but I do think about less paved areas. Meer fruit trees, planters with green plants and flowers, and water. Instead of planters with plants you could make small ponds with water plants in them. Also great for the insects.
R: Can you see some of the examples really happening in this school's schoolyard?
P: Yes, I can see the ponds and climbing trees happening. And swings in the climbing trees. I also think next to the football pitch seats and tables would be a great idea. And many more trees. That is definitely possible.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

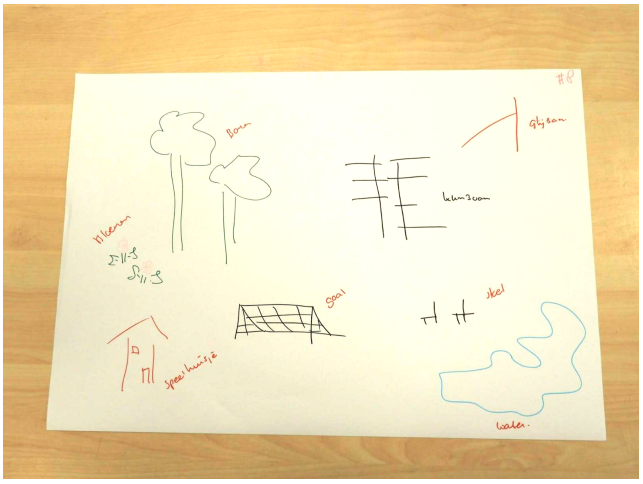


Figure 44: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?

P: Yes, I definitely think so.
R: What is positive in your mind map?
P: The trees, the flowers, and the tiny houses. The variation of all the things the children have thought about. It is amazing to see.
R: What is negative in your mind map?
P: Well I think about that one design with all the tiles and paved surfaces so the children would not get dirty. That is not a schoolyard in my opinion.

Change in the future residential environment: Our garden is a work in progress. We've just moved there and much of the garden still needs to start growing, so to say.

Mindmap 9

R: What do you think about a green schoolyard?
P: I think about a sort of forest, trees, a natural ground surface, playing equipment made of wood and everyone wearing rubber boots outside and slippers inside.
R: Can you see some of the examples really happening in this school's schoolyard?
P: Sure, I can see the hills and picking gardens happening. Also the lunch and picnic places, the tiny houses for shelter and relaxation, the playing forests. I think most of what the children build can be made possible. Apart from the water. I think pools are not realistic and unsafe. Little streams I think should be possible. As long as they are very shallow.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

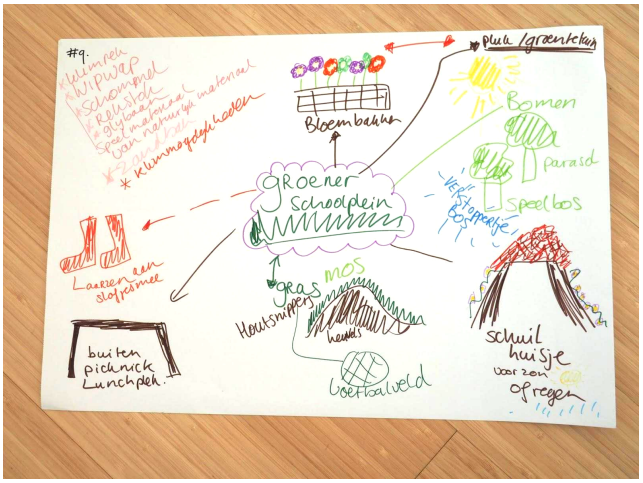


Figure 45: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?
P: Yes
R: What is positive in your mind map?

P: The outside areas for lunch, the flowers, I see them as picking gardens for vegetables, the natural materials some of the children talk about. The trees and flowers are positive. I like the tiny houses for shelter and I would add planters.
R: What is negative in your mind map?
P: I did not add any negatives. I like all the ideas. Not all of them are realistic but in general all are positive.

Change in the future residential environment: We did have plans, thinking about greening in combination with children's ideas of schoolyard greening sparks thinking about removing more paved areas.

Mindmap 10

R: What do you think about a green schoolyard?
P: Lots of green like more trees, grass, a vegetable or herb garden. Maybe a small creek, some place to build huts and maybe some animals like rabbits or chickens
R: Can you see some of the examples really happening in this school's schoolyard?
P: I can see all the climbing obstacles happening. Also the different areas for sports and relaxation. The sports and play equipment I can see those being realised. I hope they did think about natural materials to create the equipment.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

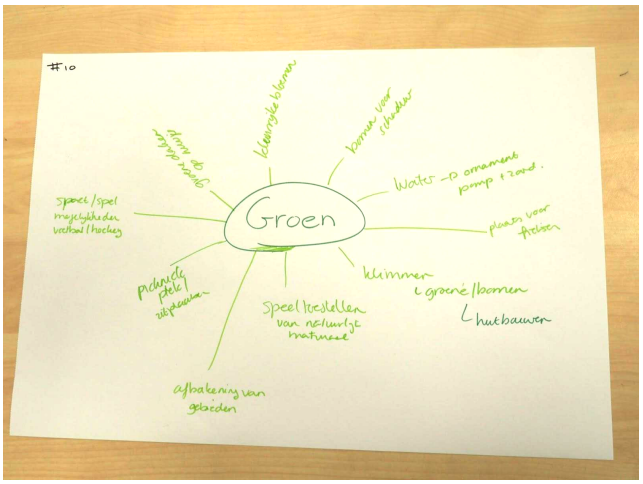


Figure 46: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?
P: Yes, there were only a few children that added animals. I thought there would be more. And I think about vegetables or herbs gardens, the children did not. They did think about a lot of flowers though.
R: What is positive in your mind map?
P: I think water is a great idea, yet not as a pool or a pond. I think more in the idea of a water ornament, like you have on those nature playgrounds in forests. With a hand pump you know.

R: What is negative in your mind map?
P: I did not really think about the negative aspects when creating the mind map. Thinking about it, some had really large football pitches. And I do not think all those tiny houses are something I would add to the schoolyard.

Change in the future residential environment: We've planted a lot of plants in our garden. It is a small one yet the planted plants need time to grow. I think it will be much greener in the future.

Mindmap 11

R: What do you think about a green schoolyard?
P: Lots of plants and green energy solutions. A place where the children can experience a green surrounding, to play in and with and to learn from. I also think about vegetable gardens and maybe ponds for fish. In my home country we have such items in the schoolyard. Also to incorporate in school lunches maybe.
R: Can you see some of the examples really happening in this school's schoolyard?
P: O Yes, I can see most of the climbing obstacles happening. I love the treehouse, yet one will not be enough. It is important to think about safety.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

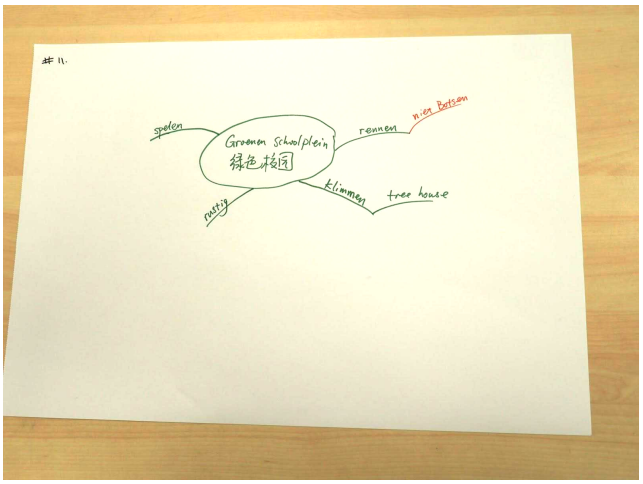


Figure 47: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?
P: Yes
R: What is positive in your mind map?
P: I like how they think about the different places for the different age groups. A place for chilling for the older children and for the younger children more places to run and play.
R: What is negative in your mind map?
P: I think large areas for running and climbing might also cause more accidents. I also think the school and the schoolyard have more functions than only playing and learning. It could be more incorporated.

Change in the future residential environment: I hope at least it can become a 10. My mother in law lives with us, she is a good gardener. I am not that good.

Mindmap 12

R: What do you think about a green schoolyard?
P: No paved surfaces. I think about a lot of plants, borders, grass, flowers. No plastic climbing gear, I think about natural materials where the children can play on and with. A yard where they can develop themselves
R: Can you see some of the examples really happening in this school's schoolyard?
P: I can see the slides and obstacle runs being realised. Also the play houses and maybe a swing. I see the children build climbing obstacles, slides, tower houses etc. I think if you place them all together on a hilly surface which is soft to fall on it would be a great adding to our current schoolyard.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

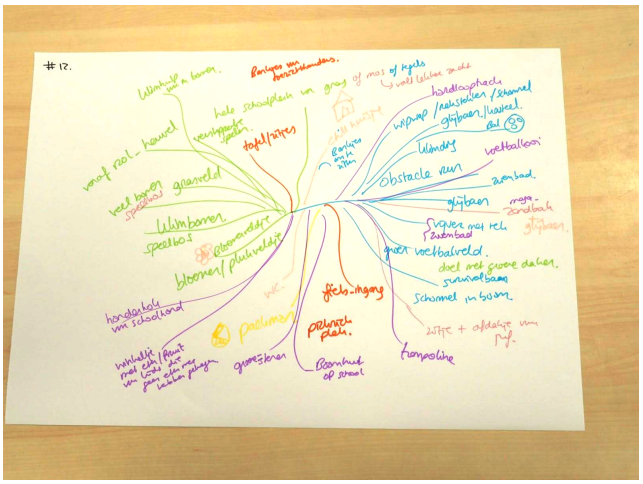


Figure 48: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?
P: Yes, although I think more in a centred form. Not all the different areas. I think having a more centred idea can create more feelings of interconnectedness.
R: What is positive in your mind map?
P: I like how they created things especially for the concierge or the teacher. The buildings make me happy. I like the dog house in one of the buildings, I would rather go for rabbits though.
R: What is negative in your mind map?
P: The grass looks green but I think it would not be a good surface to play on the whole year around. Also the swimming pools are not realistic. As the pacman game, really creative yet not easy to execute I think. The one I didn't like were the ones where the whole yard was still paved. In this case all stays the same. I think that is not green enough.

Change in the future residential environment: We have a very green garden. Only at the back of our farmhouse we have a piece of land that still needs development. We are thinking about a small house with a swimming pool. To create a more livable area with green plants and stinzen flowers of course.

Mindmap 13

R: What do you think about a green schoolyard?
P: I think literally about more greenery, trees, shrubs, grass, flowers. Removing pavement. Natural materials for playing equipment and leaving natural materials like tree trunks or small stems and branches to play and build with. More incorporation of play and learning. More game play. A tree trunk can be a place to sit on, also to play balancing games on or play in general. I like games in and with nature, using natural materials.
R: Can you see some of the examples really happening in this school's schoolyard?
P: Quite a lot. The ideas of the children make me think. The current situation of the schoolyard and the school is a bit colourless. More green and maybe more colour on the outside of the school building could work. More moss and more grass. I also see the interactivity in the play on the schoolyard. The climbing and scrambling equipment could be easily placed.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

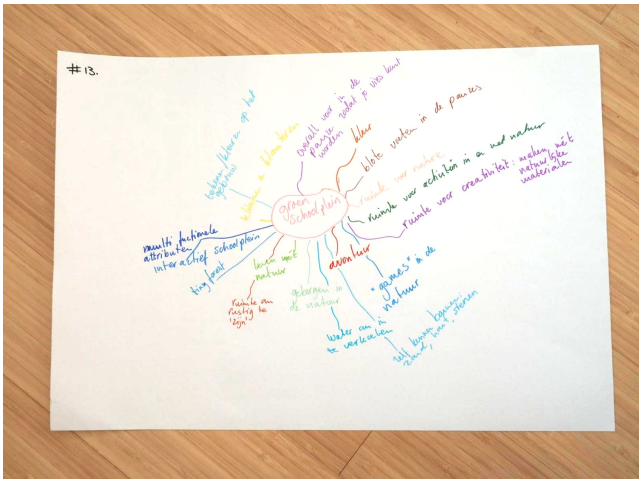


Figure 49: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?
P: Yes I think so. I learn how to play because of my child.
R: What is positive in your mind map?
P: I think a school overall to play outside would be a great idea. This keeps the classrooms and the clothes less dirty. What I feel in the examples is a need for adventure by the children.
R: What is negative in your mind map?
P: I did not write down any negative ideas. Only what I find striking in the designs. Thinking about a negative aspect would be becoming dirty. Both the school and the children. In some designs there were a lot of paved areas. I think a green schoolyard should not have too many stone paved areas.

Change in the future residential environment: Our garden is a work in progress. I want it greener yet it takes time. In small steps we will get a green garden and roof.

Mindmap 14

R: What do you think about a green schoolyard?
P: Loads of climbing obstacles made of natural materials. And other items that spark creativity. Trees, yet maintenance friendly. Tree shrubs on the floor als pavement, also partial tiles, some of rubber or another soft falling material. And planters with flowers etc, that will brighten up the yard.
R: Can you see some of the examples really happening in this school's schoolyard?
P: Yes, I see the swings and climbing obstacles happening. Also a grass football pitch. Also the different parcours, that could also create more options for playing hide and seek. And I like the water play items, not in the form of pools and ponds, more3 as in a water pump and a small creek.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

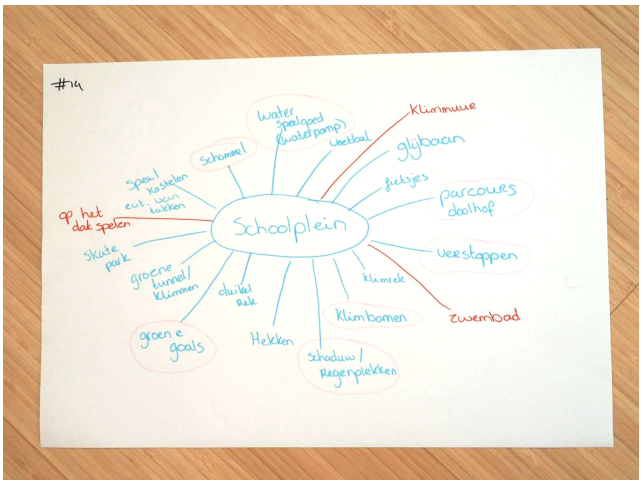


Figure 50: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?
P: Yes, I like the parcours and maybe a maze
R: What is positive in your mind map?
P: I only wrote down the positive items that sparked my mind. I find it interesting that the children focus on safety for themselves and others. I thought only adults would think of that.
R: What is negative in your mind map?
P: I find the ideas of a swimming pool, the climbing wall or playing on the roof dangerous. For the rest I did not see anything dangerous in the LEGO building.

Change in the future residential environment: We are going to remove the grass in our garden. It is not growing. Instead we are going to add tiles and planters. The garden will be less muddy so the children can play outside.

Mindmap 15

R: What do you think about a green schoolyard?
P: I think a green schoolyard lets children think what to do with the schoolyard. I think about planters with fruits, a tree house for climbing. You see, when children think they can't do anything they will not do that thing. O and I think about playing equipment made of natural materials. A football pitch, and maybe a water path with a pump. That is fun during the summer. And room for animals like hedgehogs or so.
R: Can you see some of the examples really happening in this school's schoolyard?
P: I think the football pitch with a larger frame around it. And also the trampolines although they should be embedded on the ground level. I also see more trees and flowers. Maybe a patch of asphalt for skating or scooter driving.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

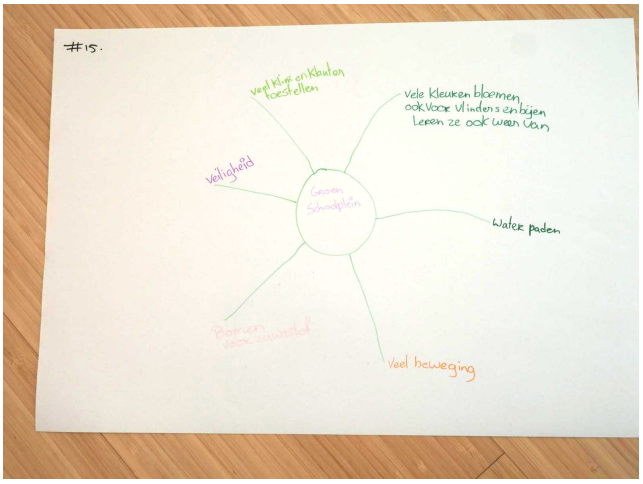


Figure 51: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?
P: I think we have certain matches
R: What is positive in your mind map?
P: Lots of climbing and crawling. I think when children move a lot in play it is much more healthy. Being active is important.
R: What is negative in your mind map?
P: I think the pools are negative. Not all children have diploma's for swimming so there is a safety hazard. For the rest I see only positive ideas by the children.

Change in the future residential environment: Although I am going to replace the grass for tiles I think my garden will be greener in the end. I want to place planters with vegetables and more green plants covering the walls. I just hate grass maintenance.

Mindmap 16

R: What do you think about a green schoolyard?
P: I think about natural shade spots, like trees and leaves. No tiles of course. More nature, birds. Wild or planted nature.
R: Can you see some of the examples really happening in this school's schoolyard?
P: I think the grass is a good idea. The flowers also
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

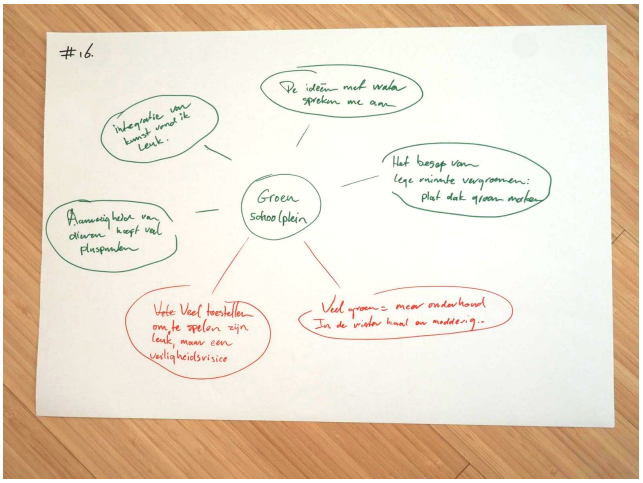


Figure 52: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?
P: I think I am a bit more realistic compared to the children.
R: What is positive in your mind map?
P: I like the flowers. I also like the idea of art. Water is also positive in the form of a pond or stream. Water works cooling.
R: What is negative in your mind map?
P: With the survival tracks and the swimming pools I think about maintenance and injuries, safety in general. Also swings and seesaws on a busy schoolyard are unsafe. Also a green schoolyard needs more maintenance and becomes muddy when there is a lot of rain and in winter.

Change in the future residential environment: We have to remove a lot of tiles and I am going to create a vegetable garden.

Mindmap 17

R: What do you think about a green schoolyard?
P: I think grass, hedges, trees although more on the side and one or two in the centre of the yard. You still need room to play. I think about climbing obstacles, or climbing trees. Water is important. Maybe a shallow pond with fish. A pond does cool an area.

R: Can you see some of the examples really happening in this school's schoolyard?
P: If you combine all designs a lot is possible. I like the idea of picnic tables. Lots of flowers and the trees. On a personal level I would like a playing forest or a treehouse built with natural materials.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

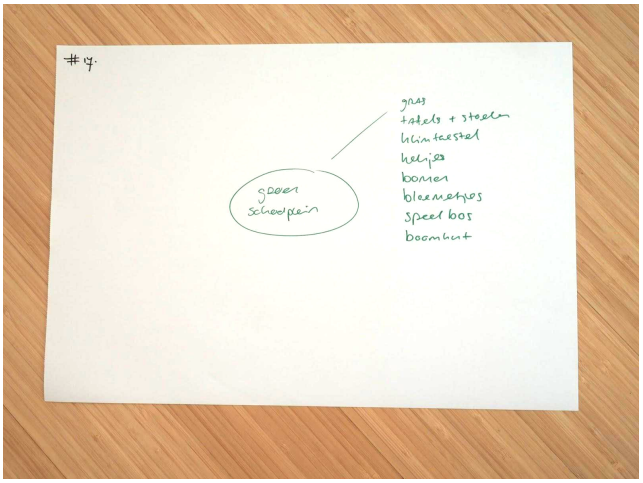


Figure 53: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?
P: Yes, I think the same themes are returning in my vision compared to those of the children
R: What is positive in your mind map?
P: I like the outdoor tables and chairs. That will increase the social activity of the children.
R: What is negative in your mind map?
P: I did not see direct negative items. Although the swimming pools and ponds are nice, there are small children. They should be safe.

Change in the future residential environment: we all like more green so this thinking about greening is sparking ideas.

Mindmap 18

R: What do you think about a green schoolyard?
P: Plants, trees, bushes, greenery in general. Wild, I mean not to be over-organised. Fun and playful, also messy and organic. Use the roof for food and place edible plants and herbs.
R: Can you see some of the examples really happening in this school's schoolyard?
P: Yes, very inspiring although I did not see anything really new. Most of the build items do already exist in one form or the other. I think the playground should also be part of the classroom.
R: Can you create a mind map inspired by the pictures of the LEGO building you have seen?

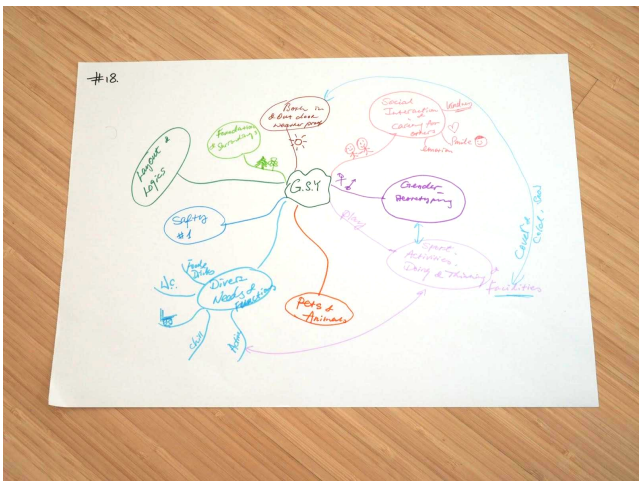


Figure 54: Mind map created by adult participant

R: Is your vision of a green schoolyard comparable to those of the children?

P: To some extent. The green is important. The children's yards are messy yet that is logical. It is their space of play, where they express their emotions, where they feel safe

R: What is positive in your mind map?

P: Pets and animals. Those are not common on schoolyards yet educational. Experience with living with animals, we are all part of the ecosystem. I also like the social interaction, the caring for others the children express. The kindness and emotion in for example connecting falling with being hurt. But also psychological safety. They did talk about that.

R: What is negative in your mind map?

P: What I see negatively is gender stereotyping. Games for boys and games for girls. I also miss a more cross age/gender design.

Change in the future residential environment: We have plans for our garden. Although there is a desire, the practical focus is not on more green.

Appendix 7 Self anchoring scale results (N=18)

	How do you perceive the current greenery in your home environment on a scale of 1 to 10?	How do you perceive the future greenery in your home environment on a scale of 1 to 10 having seen all the examples?
1	**7**	**8**
2	**6**	**8**
3	**4**	**6**
4	**7**	**10**
5	**4**	**7**
6	**8**	**8**
7	**1**	**8**
8	**5**	**7**
9	**6**	**8**
10	**7**	**8**
11	**5**	**10**
12	**8**	**9**
13	**4**	**8**
14	**7**	**5**
15	**4**	**7**
16	**6**	**8**
17	**7**	**9**
18	**6**	**6**

Table 4: Self anchoring scale results

Appendix 8 SPSS Output Self-Anchoring Scaling

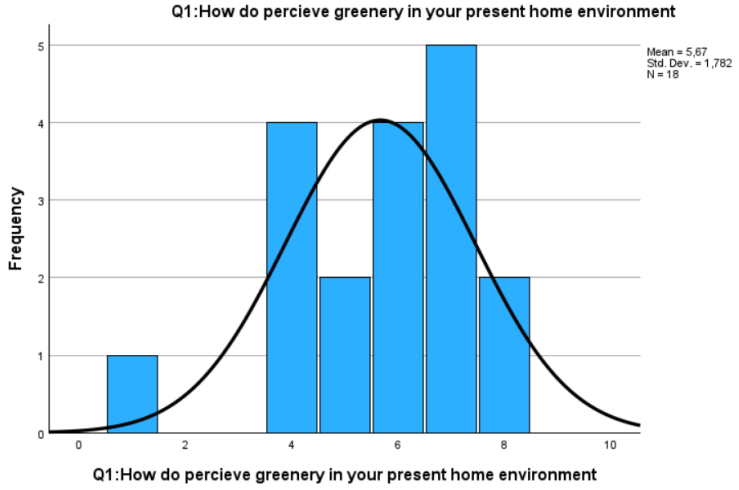


Figure 55: Distribution question 1

(source: SPSS)

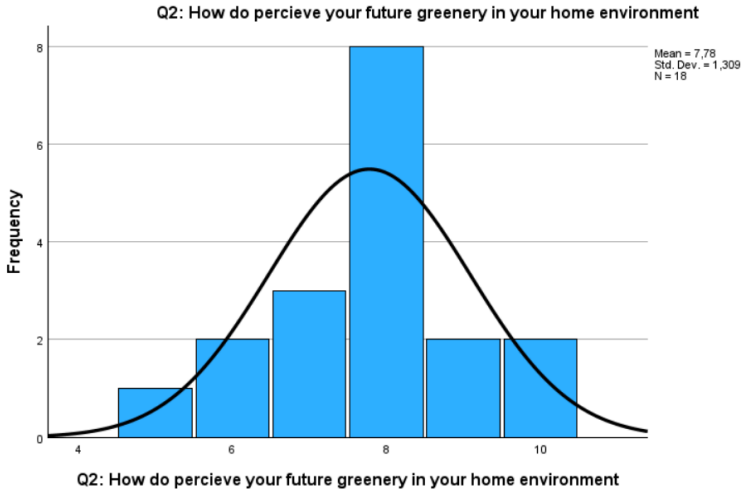


Figure 56: Distribution question 2

(Source: SPSS)