HEALTHY ARCHITECTURE FOR CHILDREN

A research plan on how to design elementary schools for the healthy development of children

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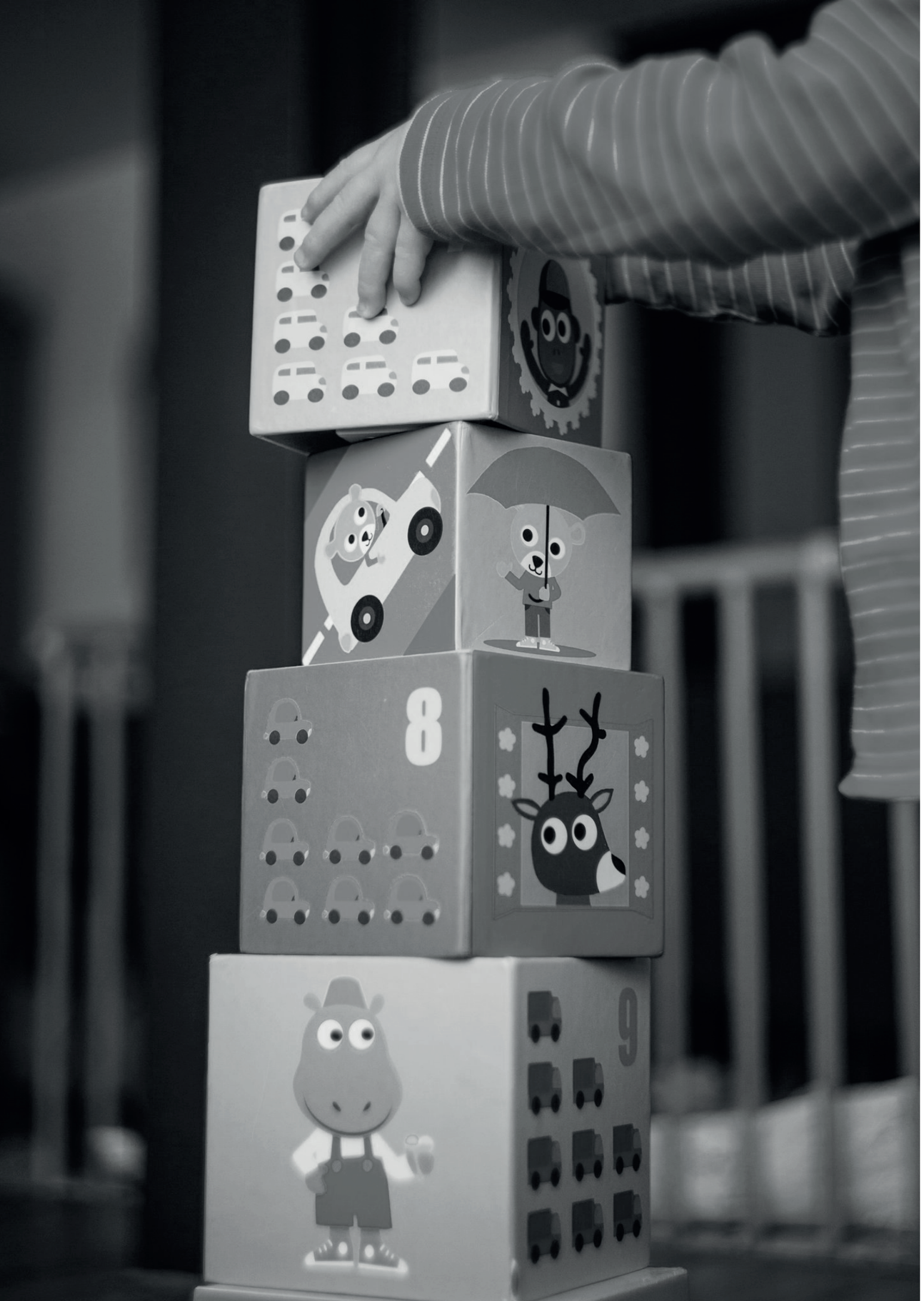
Introduction



PERSONAL FASCINATION

Psychology and the functioning and reasoning of the human brain has always been fascinating to me. The brain is the centre of the body's nervous system and the source of cognition. It is responsible for everything we do, feel, and perceive. It receives information from sensory inputs and converts this information to make sense of the world, by comparing and integrating it with past experiences. The brain has the ability to create, store and retrieve memories, while also controlling movements to enable actions and communication. Although the human brain is such a powerful tool, it can also fail us.

I have had to deal with a depression and a burn-out a few years ago while doing my bachelors. During therapy sessions I was told my burn-out was due to the pressure I was putting on myself to achieve the highest outcomes possible. This perfectionism was a result from an adverse childhood experience I had at primary school, bullying. Through therapy, I worked on understanding how and why my brain reacted to certain situations due to my trauma, and ultimately learned to alter certain onnections and control reactions. It is amazing to acknowledge how malleable the brain can be and to which extent it can be influenced by certain situations.

Over a century ago, the subject of child psychology has been introduced. Children perceive the world in a magical, imaginary way which is different from adults' perception of space and events. Researchers acknowledged the stakes of understanding the influences of the physical and social environment for the children's future development. The purpose of this carefully shaped environment is the promotion of the child's physical, psychological, and social development, as well as functioning as an educational space for the evolution of pedagogical processes. I started to wonder how some aspects of life would have been different if I hadn't had an adverse childhood experience, and whether it could have been prevented. Child psychology and architecture should have a stronger connection to be able to regulate the physical and social interactions in children's lives.

“Children are like tiny flowers; they are varied and need care, but each is beautiful alone and glorious when seen in the community of peers.”
(Froebel, n.d)

BACKGROUND

Friedrich Froebel, one of the most influential educational reformers of the 19th century, compared children to flowers. With his analogy he described children as unique and fragile as flowers. As flowers are genetically pre-determined, but can be influenced through external factors, such as wind, soil or amount of sun in such way that no flower is identical to another flower, so is a child's development. Every child is different and although we can be guided by general patterns of development from pre-birth to early childhood, development is unbalanced and unravels different for each individual child.

A person's identity is correlated to their experience of a place, especially during childhood; the formative years when personality is being shaped. The accumulation of experiences and knowledge that has been formed during childhood results in who we become as individual adults (Dudek, 2005). A person's development is a continuous process influenced by many factors. Development refers to the process in which the body, brain, abilities and behaviour of the infant, child or adult become more complex and continues to mature throughout life. It involves cognition, memory, attention, language, and communication, as well as feelings, relationships, and sensory-motor skills. A child's brain is not a rigid structure which is solely genetically pre-determined. It allows external stimulations from experiences to form and change neurological connections. Children are actively stretching their own capacities as they observe and interact with people, objects, spaces, and situations in their surroundings. Development is a complex and intertwined process as one domain always influences other domains (Early Education, n.d.).

Children are born with a natural sense of exploration and eagerness to explore their physical world. Psychologist Jean Piaget, known for his theory of cognitive development and epistemological view, argues children begin developing their sense of place during early childhood. A sense of place evolves from experiences in the world and the meaning discovered within those experiences. The definition of the words place and space differ. While space is attributed to a physical location, place is used to describe our attachment to certain locations. Both spaces and places are fundamental considerations in the study of the development of human behaviour and experience. Acquiring this sense of place allows children to acknowledge their importance in the physical world around them, as well as the social and cultural hub they share with others. Children need to develop a sense of place to understand their status in the world and to form a sense of self-identity (Mankiw, 2015).

Amidst all realms of childhood, a child's home is the most important place. However, school and outdoor play areas become more important in the socialisation process of a child's development. Among those domains, school is the sole place where social, cultural, and physical factors interlace. Along with this, a child spends most of it's day in an elementary school setting, including after school hours. Thus, the school becomes a child's second home where a sense of place becomes important. The educational environment is an essential aspect to a child's development (Rieh, 2020). Developing this sense of place is connected to a sense of belonging. This sense of belonging contributes to children's overall social and emotional development and is thus an essential aspect of school design (Mankiw, 2015). Children are born with a natural sense of exploration and that they interpret the realities of the world through their senses of touch, sight, smell and hearing (Piaget). Unstimulating environments tend to dull or deafen the child's perfections. School must be capable of supporting and stimulating sensory perceptions in order to develop and refine them. The arrangement of a classroom space unconsciously communicates expectations for behaviour, which is an essential aspect of education, part of the hidden curriculum (Dudek, 2005).

Influences on child development

02

Project Approach

PROBLEM FIELD

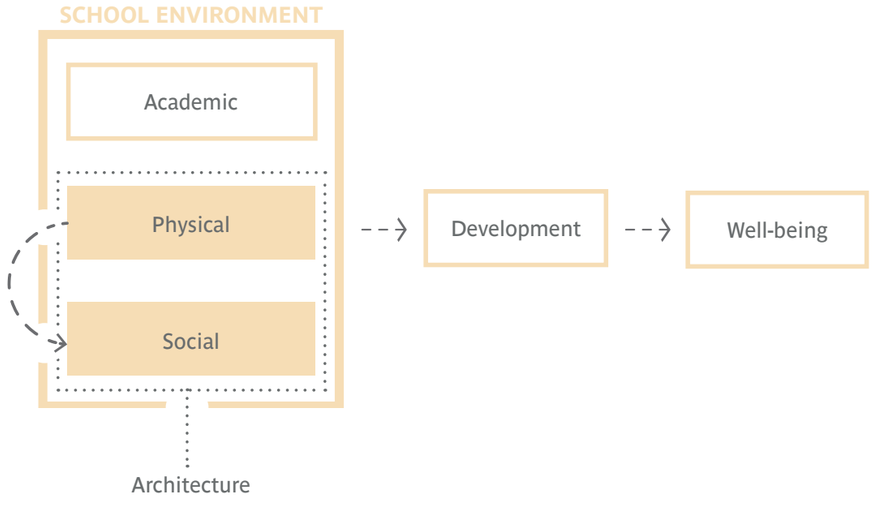
Over the last centuries, the gradual switch from mass education to individual education has taken place. The concept of mass education emerged at the beginning of the nineteenth century. At that time, the Industrial Revolution had created a demand for citizens that would fit into this new industrialised world. Education became a factory where children were taught basic skills and knowledge that would enable them to participate in the economy and society. School was a place to control and discipline children in large groups, with an emphasis on rote learning. The teacher was considered the sole authority figure and the classroom was arranged to reinforce this. Desks faced the teacher at the front of the classroom implying its role and order was maintained through strict rules and punishment. Classrooms were austere spaces with little consideration to the needs of the individual child (Lange, 2018).

As the twentieth century progressed, the philosophy of 'Form Follows Function' also applied to educational buildings. The shape and form of the school's design was fit to its educationists' efficiency needs. School design was focused on functional efficiency where all spaces had a dedicated function with little scope for alternative uses. However, new pedagogical theories also emerged at the same time. Jean Piaget's theory of cognitive development implied children go through distinct stages of development growing up. According to him, education is to facilitate this development instead of exclusively imparting knowledge. He emphasised the importance of active learning where children are encouraged to explore and discover new concepts on their own. Aside from active learning, Piaget also pressed the importance of individualised education where pace and style of learning was adapted to needs of an individual child (Dudek, 2005).

▲ School architecture extremities

Educators began to recognise the uniqueness of all children, regarding learning style, pace, and preferences. The traditional one-size-fits-all method of education was no longer suitable. With a new wave of theories emerging, it became apparent buildings needed to allow activities that did not fit in the primarily function. Attempts at maximising flexibility in education facilities often resulted in children losing their sense of place. Innovating approaches are required to support the expanding possibilities of learning of the twenty first century. A concept of contingency emerged, situating itself between the too strict and too flexible designs. Flexibility offers the opportunity for engaging users in taking creative action. Along with this concept, the Montessori method took its place in the world of educational system and building design. It implied the importance of allowing children to learn at their own pace and allowing them to explore and discover new concepts for themselves. The classroom layout was designed to promote independence and self-directive learning. The aim of the design was for children to understand the space with no teacher's help needed. The teacher became a facilitator rather than an authority figure (Dudek, 2005).

Educational architecture is in constant development aiming to design places where learning and development is the objective. Individualised education is crucial component of modern education systems and is likely to continue to evolve as new pedagogical theories and technologies emerge.



Influence school environment on children's well-being ▲

RELEVANCE

With this research, I am seeking to build a bridge between child psychology and architecture. A positive learning environment has a considerable impact on a child's mental and emotional well-being. Studies have shown that children who learn in an environment that is conducive to their learning, such as a well-lit and ventilated classroom with comfortable furniture, perform better academically than those who do not. Societally, the importance of improving elementary buildings cannot be overemphasized. The environment in which children learn has a direct impact on their cognitive development and future academic success. A well-designed learning environment, in which students feel comfortable, supported, and stimulated, helps to foster a love for learning and a positive attitude towards school. This, in turn, leads to increased academic achievement, reduced dropout rates, and a better chance for students to succeed in their future careers. By investing in the improvement of elementary buildings, we can ensure that our children are learning in safe and healthy environments that promote their overall development. By investing in our children's learning environments, we are investing in their future success and the future success of our society as a whole.

PROBLEM STATEMENT

The built environment has a significant influence on our health and well-being, and this is especially true for children's cognitive development. The architecture of schools and other learning environments can have a profound impact on how children learn, think, and develop academically, socially, and emotionally. However, despite the growing body of research on this topic, many schools and educational institutions continue to prioritize other factors, such as cost and convenience, over the potential benefits of high-quality architecture and design. The main problems facing this issue is the lack of understanding among architects, policymakers, and educators about the impact of architecture on children's cognitive development. There is a general perception that buildings are simply functional structures that need to be constructed as cheaply and efficiently as possible. This perspective often results in poorly designed buildings that do not consider the unique needs of children and their learning processes. It is important to comprehend how children perceive the world surrounding them in order to create a healthy environment for them to grow up in.

RESEARCH QUESTION

How do school environments influence the development of children between the ages of 4 to 8 years old?

SUB-QUESTIONS

What influences the development of children?

How do children look at space?

How do children use space?

What is the role of schools for children?

METHODS

CASE STUDIES

Children spend around fifty percent of their daytime a school; this childhood institutional environment has lots of influence on their development due to interactions with the surrounding on the social and physical ladder. In order to get an understanding on children's behaviour and learning environments, fieldwork will be done at primary schools. Since this methodology requires lots of time and attention, the case studies will favour qualitative research over quantitative research. Although on some aspects similar, only two of the various types of primary school educational systems in The Netherlands will be used as case studies. A regular primary school will be used as well as a Vrije School education system to get grip on this magical mind of children. Both schools will host around the same number of children but will have essential differences besides the educational system. The differences may lay in the location or advancement to high school level of education. Ideally, the regular school will be located in a less developed region in the Randstad, while the Vrije School will be in a normal neighbourhood Delft. As primary schools often host room for children between the ages of 4 to 12 years old, this age range will be divided into the age group 4-8 and 8-12. The main source of information will be in the age group 4-8 since they belong in the category of ages that has most influence on the development of children. The age group 8-12 could be analysed in future research.

The research will consist of 3 stages:
1. Literature Approach
2. Naturalistic Approach
3. Participatory Approach

At the end of the stages, the different approaches will be combined to determine how children use spaces, deciding on areas of continuity or areas of change, and what places do children see as important.

Stage one: Literature Approach (facts and figures)
Stage one will focus on facts and figures through literature. The architectural background will be approached, as well as the theory of psychology regarding a child's development. The relation between the social and physical environment and the influence of school design on the development of children will be reviewed.

Stage two: Naturalistic Approach (adult view)
The case study research will be divided into two approaches: passive and active. Stage two of the research will focus on the passive approach; I will seek to get an understanding of the world through the eyes of the child with my own viewpoint and observations. This will be done before prior to the active approach during site visit. By means of literature knowledge and background expertise, I will observe the relationship between children and their physical and social environment. Alongside my observation, conversations with parents and teachers could take place. This approach revolves around the exterior outlook, often an adult's, on children's day-to-day life.

Naturalistic observation focusses on the behaviour of participants in the environment where the phenomena occur. This enables me to see the children make choices and react to situations in their natural settings as opposed to structured interviews. The observations are made as unobtrusively as possible, by not interacting with the participants in any way.

Stage three: Participatory Approach (child view)
When doing research with children, traditional methods will not enable young children the possibility to express their 'voice'. Interviews may be too long and intense for children or they find it challenging to express themselves through verbal skills. I would like to find ways of harnessing young children's creativity and engagement with their world, while not over-simplifying approaches. Listening to children and retrieving information is a complex, multifaceted, and sometimes surprising process. Children should not be seen as incompetent and passive objects in research processes or society in general, but as social actors (Qvortrup et al, 1994). They have a unique body of knowledge about living in their environment in comparison to adults in that same setting. The viewpoint of children as competent users and explorers of their surroundings leads to a distinct research method developed by researchers Alison Clark and Pete Moss; the Mosaic Approach. It represents the bringing together of different pieces – or perspectives - to create an image of the children's world using their strengths, local knowledge, attention to detail and, visual and verbal communication skills. Central in this approach is the question "What does it mean to be in this space?". This multi-method allows children with different abilities and interests to take part in the individual and collective process. The participatory approach treats children as the experts of their own lives and enables the children to communicate their feelings and opinions in verbal and nonverbal ways through formal and informal interviews, as well as planned and unplanned interactions.

The central role of children in this research method contrasts the day-to-day position that they must endure where adults take the lead in education and creation of environments. Having children decide the direction of the research can cause the study to be led into unplanned areas. An open-minded and flexible mindset should be applied from the start to discover the unexpected mind of children.

Participatory tools allow children to set more questions, while also providing answers at the same time. These various tools are:
- Child conferencing
- Camera's
- Tours

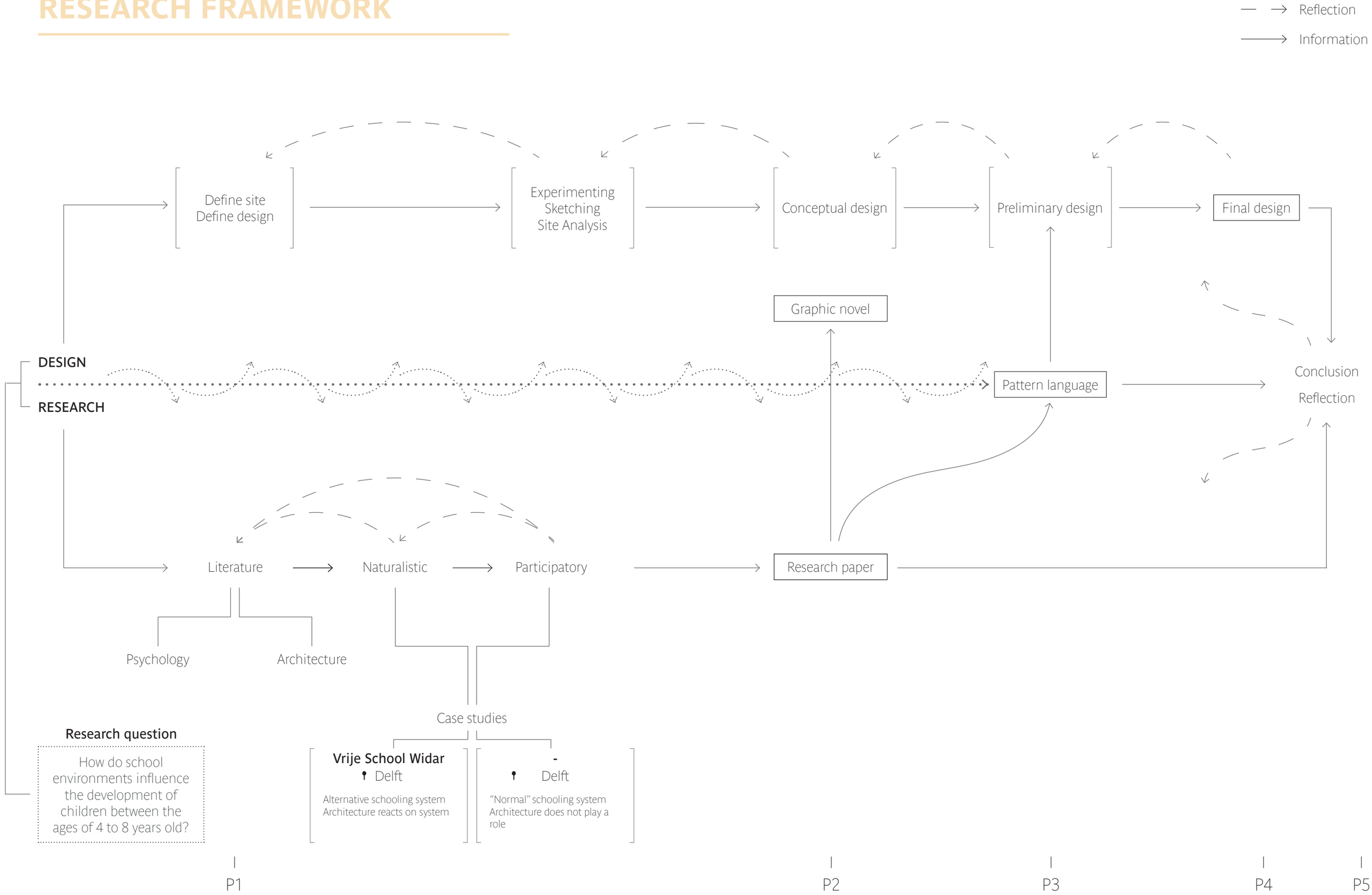
Child conferencing opens the possibility to have formal conversations with children about their educational institution, in which they are considered the expert of the situation. These one to one or group interviews are conducted in a short, structured manner. In advanced prepared questions guide the conversations but they are not leading. The dialogue will have open questions with a focus on important people, places, and activities they enjoy doing, or find hard. A formal conversation can turn into informal exchanges between peers or me, or be conducted on the move as children take me to places they are talking about.

Not all children are interested in talking in formal conversations. For them, other tools, such as the camera, would be more convenient. This participatory tool allows children to communicate in playful and informal ways. It displays the silent voice of the children behind the camera. They can explore their competency with a camera to represent objects, as well as the context of the object, the space itself. Asking them questions before hand such as "What do you think is important at school? ", "What is your favourite area?", "What spot do you not like?". Giving children single use camera's provides children freedom without giving them adult anxiety about expensive equipment. Additionally, they can express pride through photographs, which is not always the case with drawings and paintings (Clark, 2011).

The tools of conferencing and usage of cameras can be combined with the tool of onsite tours directed by the students. They lead the way and decide what route we are talking and what they want to share about the space. This allows me to also observe the routes children take to go from one space to another and hear the different items or areas that does or does not stand

Konntera, 2018

RESEARCH FRAMEWORK

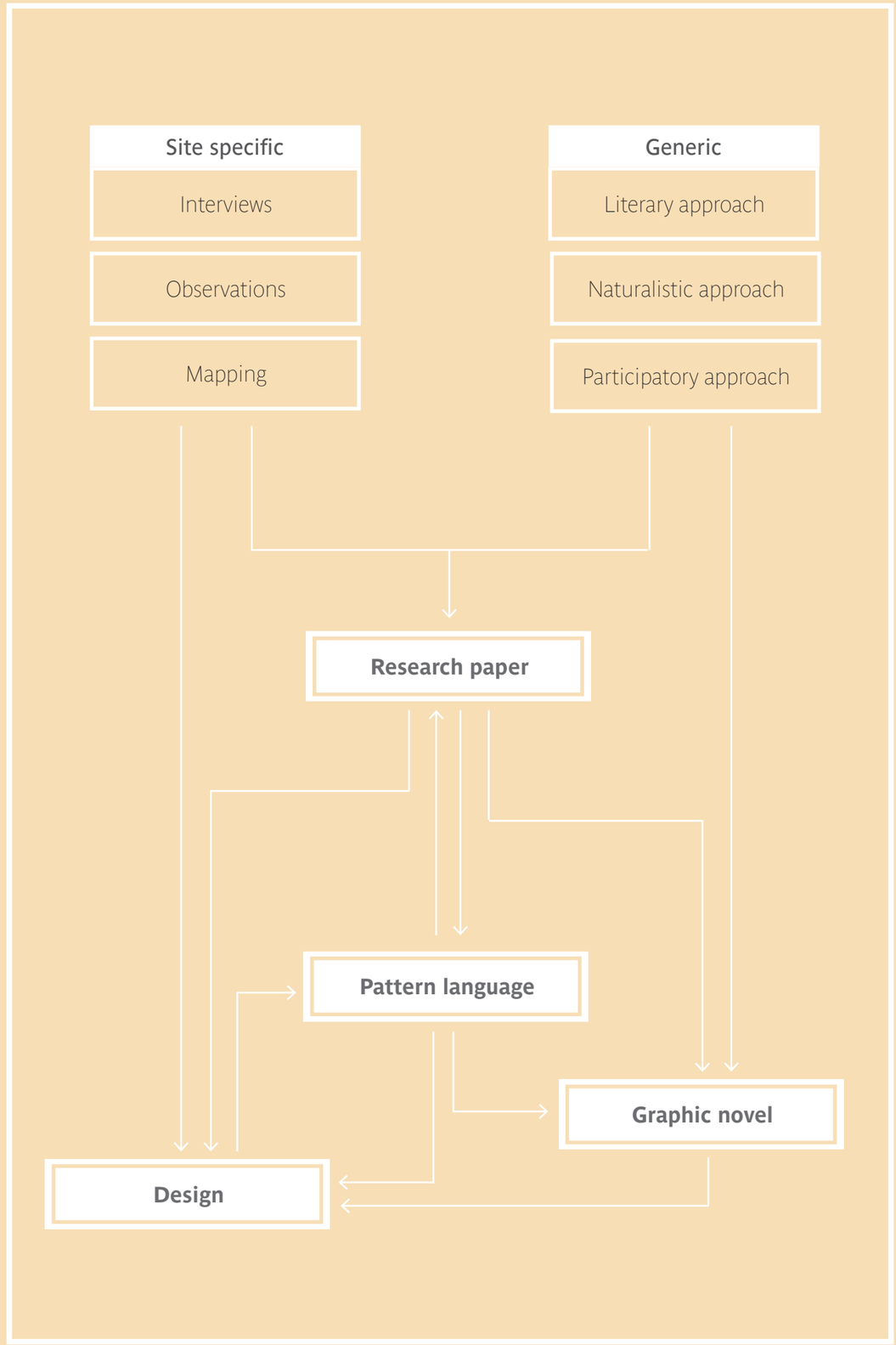


EXPECTED RESULTS

Research paper
The results of the literary, naturalistic, and participatory approaches will be combined into a research paper. The research paper will tackle research on child psychology and development, child environmental psychology, the role of the school for a child and in its community and site-specific analyses. As well as case study observations and participatory research results will be reviewed and discussed.

Pattern language
Aside from the research paper, the findings of the three different approaches will form a pattern language following Christopher Alexander's structure (1977). This library will serve as guidelines for the design of a school that strengthens the development and learning quality for children in educational environments. This pattern library will be expanded during the design period with patterns focused on climate control for example. Some patterns will be general for primary school design, while others will be site specific, specific for stress reduction, amplification of interaction, or the creation of strong learning environments for the age group of 4 to 8 years old. The pattern library will be 'completed' by the end of the research and design period, at P5.

Graphic novel
Aside from the pattern language, I would like to design a graphic novel that shows a child's daily life at primary school, displaying the natural interactions children form with their social and physical environment. A children's book that fosters a sense of place. This novel challenges me to put myself in a child's shoes as well as observing architecture through a child's eyes. Creating this book for children could in return teach by giving the novel as a participation gift to the schools approached as case studies.

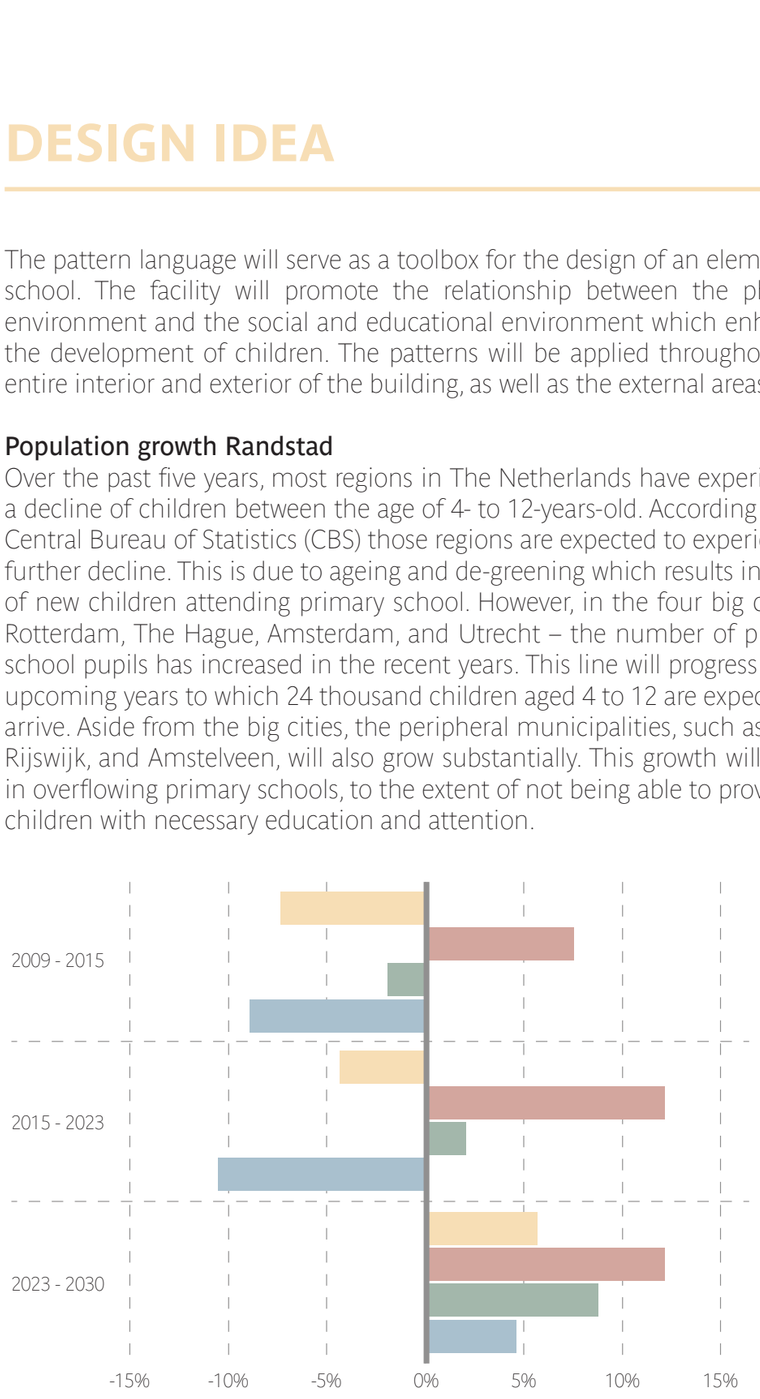


DESIGN IDEA

The pattern language will serve as a toolbox for the design of an elementary school. The facility will promote the relationship between the physical environment and the social and educational environment which enhances the development of children. The patterns will be applied throughout the entire interior and exterior of the building, as well as the external areas.

Population growth Randstad

Over the past five years, most regions in The Netherlands have experienced a decline of children between the age of 4- to 12-years-old. According to the Central Bureau of Statistics (CBS) those regions are expected to experience a further decline. This is due to ageing and de-greening which results in a lack of new children attending primary school. However, in the four big cities – Rotterdam, The Hague, Amsterdam, and Utrecht – the number of primary school pupils has increased in the recent years. This line will progress in the upcoming years to which 24 thousand children aged 4 to 12 are expected to arrive. Aside from the big cities, the peripheral municipalities, such as Delft, Rijswijk, and Amstelveen, will also grow substantially. This growth will result in overflowing primary schools, to the extent of not being able to provide all children with necessary education and attention.

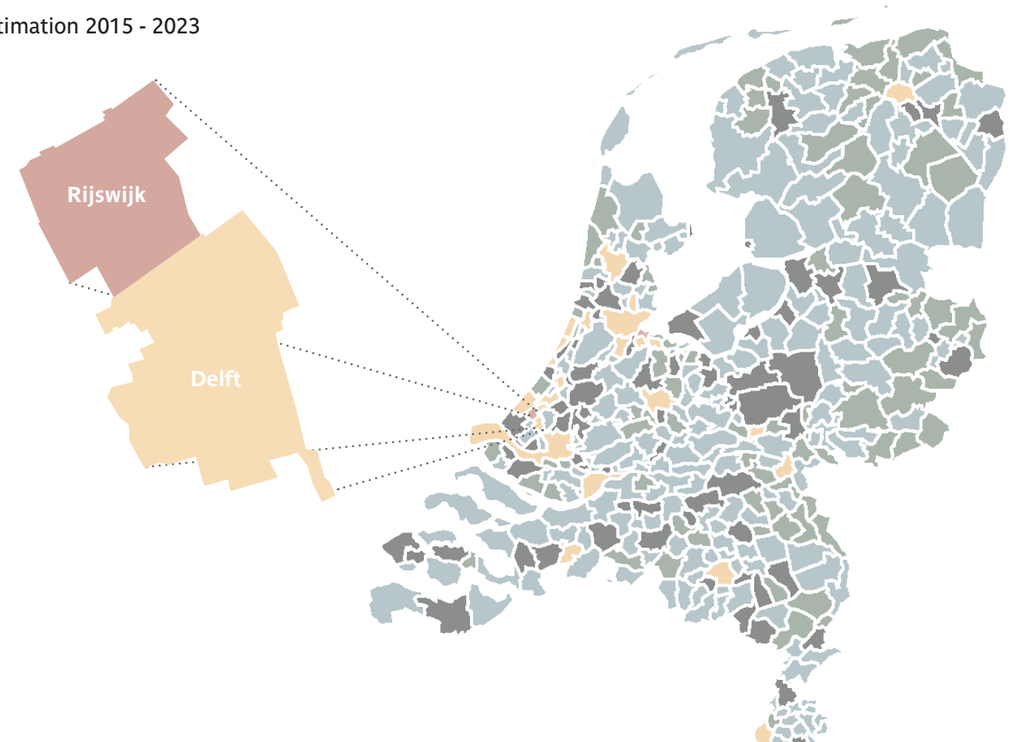


The Netherlands Four biggest cities Medium cities Other cities

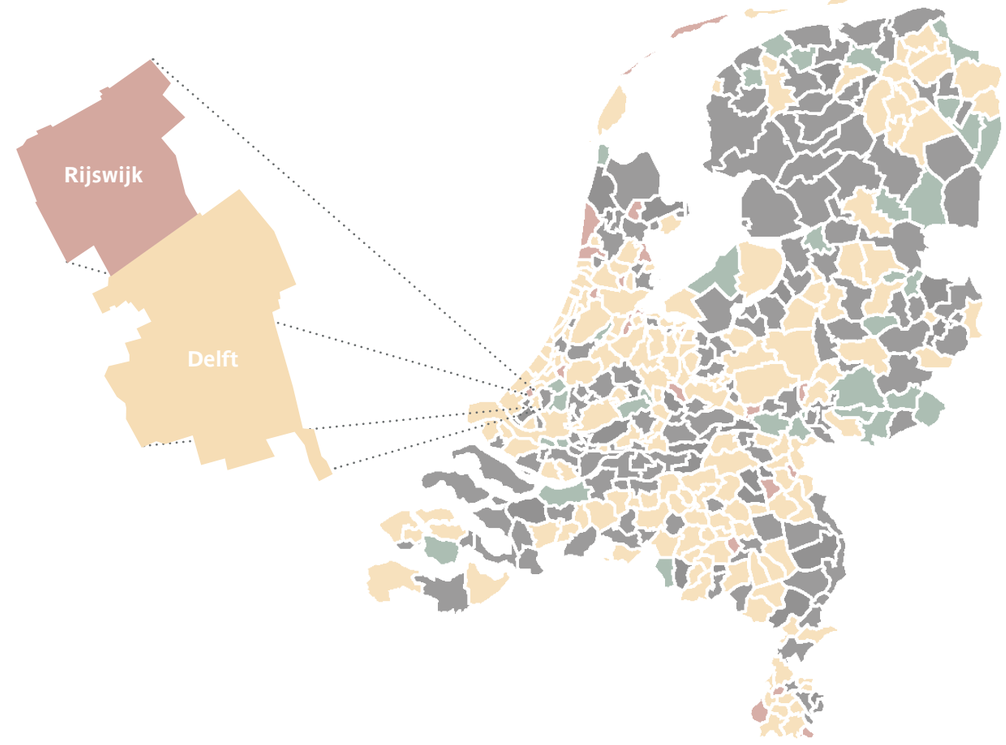
Development of 4- to 12- year-olds (CBS, 2016)

Increase or decrease of 4- to 12- year-olds per municipality (CBS, 2016)

Estimation 2015 - 2023



Estimation 2023 - 2030

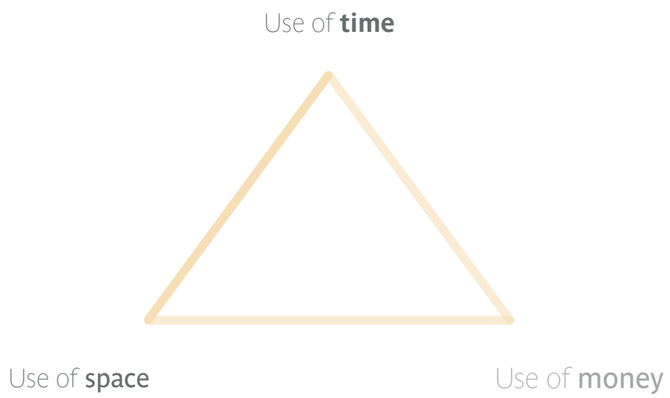


Psychological problems

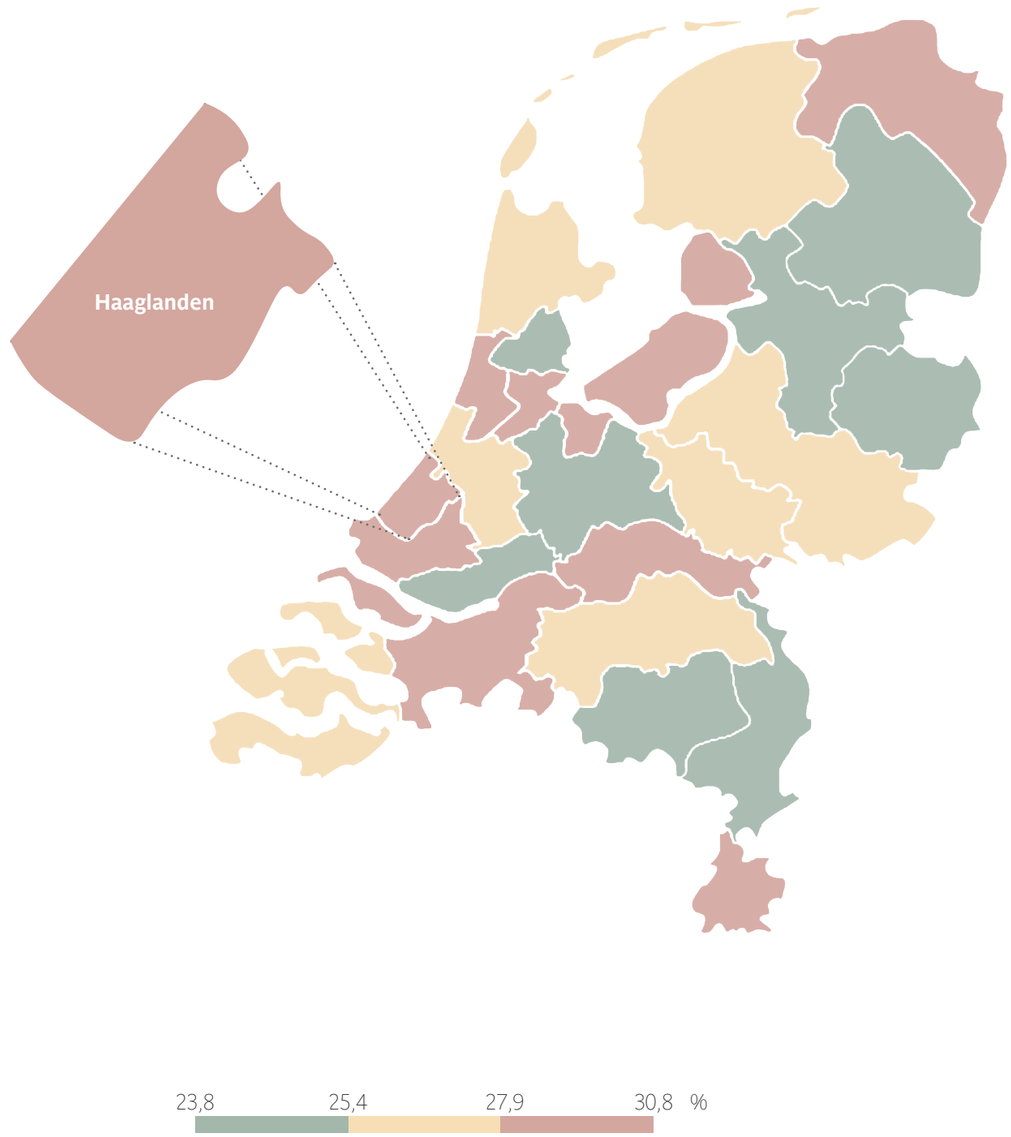
Besides the expected growth of children between the ages of 4- to 12-years-old, it is important to observe the psychological problems of inhabitants which could be a result of ACEs. Child increasing municipalities Delft and Rijswijk both categorise in a region with high number of people dealing with psychological problems. In those regions, there is a need for more primary schools as well as facilities supporting the positive development of children.

Time, space and money

Every aspect of school facilities is driven by someone's perception of what should and should not be provided for children. Most of those decisions are about three things: use of time, use of space and use of money. There is not unlimited time in a day or in a year; there is not an infinite number of squared meters and there is only a limited amount of money available. For every choice made during the development of a school, sacrifices must be made to meet the three requirements (Dudek, 2005). Especially money is a deciding aspect of school design. In order not to advocate financial decisions above the child's necessities, my design will not focus on the limited budget schools receive from boards.



Design of educational environments limitation trio



Inhabitants with psychological problems (CBS, 2021)

LIMITATIONS

Limitations can arise when conducting this research due to a lack of background in psychology and pedagogy. Without a deep understanding of psychological and pedagogical theories, struggles may occur when selecting valid data and accurately interpreting findings. I have a limited background in those fields by having taken several courses over the past few years:

- Architectural sociology course at Ecole Polytechnique de Lausanne
- Behavioural psychology course at Ecole Polytechnique de Lausanne
- Child development and psychology course at Universiteit van Leiden

Additionally, due to the finite amount of available time, this research will favour qualitative research over quantitative research. While qualitative research and observations can provide valuable insight into specific and individual's experiences and perspectives, it can also be subject to bias and quick generalisability.

A limitation occurring in the design of the elementary schools will occur as this research focusses on the influence of spaces on the development of children aged 4 to 8. The other children attending elementary school, aged 8 to 12, may have other aspects that influence their cognitive development as they categorise in the concrete operational stage instead of the preoperational stage. Their classrooms will be designed according to the guiding principles of design for 4- to 8-year-old children.

03

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