Masteroppgave

NTNU
Norges teknisk-naturvitenskapelige universitet
Fakultet for arkitektur og design
Institutt for design

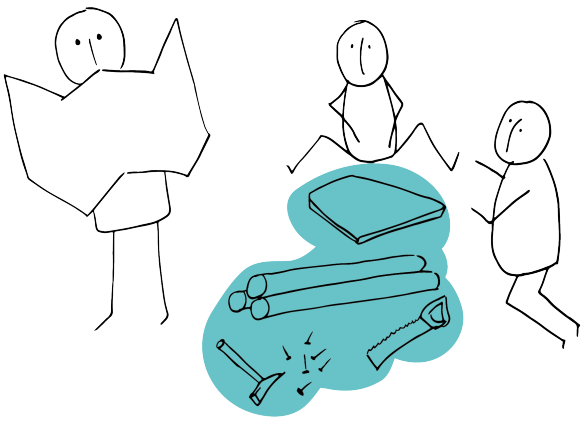
Wanda Filarowski

Guidelines for making learning spaces

Children inclusion in space design to create learning spaces for the future

Masteroppgave i Industriell Design
Veileder: Martina Keitsch & Marikken Høiseth

Januar 2021



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Kunnskap for en bedre verden

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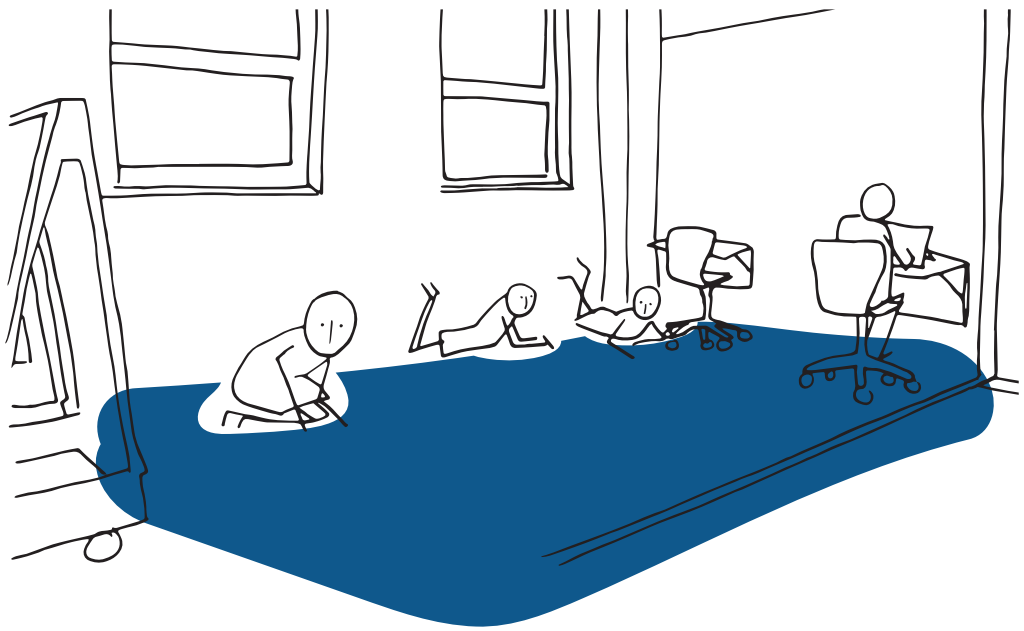

Foreword

Quality in education is a broad and important topic.Throughout the last five months, I have experienced a roller coaster ride with ups and downs, with frustrating days, with happy days. Writing a Master thesis with restrictions and other obstacles was a big challenge. In these challenging times, I have had many people supporting me and standing by my side for whom I am very grateful.

Thank you Martina and Marikken for your guidance, your encouraging ideas, and wonderful discussions.

I would also like to thank all my colleagues at workingwell for their support and for the opportunity to study while working. To write this thesis would not have been possible without your encouragement, your trust, and your approach to personal development.

A big thank you to my family and friends who have been there for me. Thank you for your feedback and support in the last months and years. This could not have been done without you.

Sammendrag

Flere og flere mennesker verden rundt har idag tilgang til utdanning, men lav utdanningskvalitet er fortsatt et stort problem. Derfor har FN inkludert God Utdanning som et av deres bærekraftsmål. God utdanning er en menneskerettighet. God utdanning dekker tilgang til utdannelse, inkludering, trygghet, alders-tilrettelagt utvikling for barn, tilstrekkelig med læringsmateriell og mangfold.

Mange organisasjoner har som mål å gi god utdannelse til barn. Denne masteroppgaven utforsker hva god utdannelse betyr og hvordan plasser for læring burde utformes. Hvilke funksjoner trenger plasser for læring å ha for å takle fremtidens utfordringer? En hovedtilnærming i oppgaven har vært å undersøke ulike perspektiver som påvirker utdannelse av barn. Disse perspektivene skaper et bilde på hvordan kvalitet til utdanning påvirker barns fremgang og deres evne til å lære og vokse. Oppgaven avslører også andre viktige aspekter ved utdanning.

I denne oppgaven ble det utviklet en prosess som bruker metoder og verktøy for å inkludere barn og interessenter til å lage nye plasser for læring. Formatet på denne prosessen er presentert som en prosjektplan. Å inkludere lokalsamfunnet og barnas ønsker og behov sikrer eierskap og ansvar overfor nye plasser for læring. I tillegg til en prosjektplan er det utviklet seks veiledende prinsipper for utforming av plasser for læring. De veiledende prinsippene er et nyttig verktøy for å sikre god utdannelse ved å skape bedre plasser for læring.

Abstract

More and more people across the world have access to education but low quality of education continues to be a major concern. Therefore, the United Nations included Quality Education as one of their Sustainable Development Goals. Quality education is a human right. Quality education covers access to education as well as, inclusiveness, safety, age appropriate development of children, sufficient learning materials, and diversity.

Many organisations have the goal to provide quality education to children. This thesis investigates what quality education means and how learning spaces should to be designed. Which features do learning spaces need to meet future challenges? Researching different perspectives that influence education and children has been a main approach to the topic. These perspectives create a picture of how the quality of education influences childrens´ progress and their ability to learn and grow. In addition, the findings of the research reveal the important aspects of education.

In this thesis, a process was developed that uses methods and tools to include children and stakeholders into the making of new learning spaces. The format of this process is presented as a project plan. Including the wants and needs of the children and local community secures ownership and responsibility towards new learning spaces. In addition to a project plan, six guiding principles for learning space design have been developed. The guiding principles are a helpful tool to ensure higher quality education through creating better learning spaces.

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Introduction

"Countries with greater gender equality and fewer gender differences in the primary and secondary schools are more likely to have higher economic growth. An educated female population increases a country's productivity and contributes to economic growth" (Norad 3, 2017)

Background

Education is a human right. Education is essential in order to fulfil other human rights such as the right to life and liberty, freedom from slavery and torture, freedom of opinion and expression (Norad 1, n.d.; UN 1, n.d.). However, 61 million children do not have access to basic education (Norad 1, n.d.). 250 million children worldwide cannot write or read (Norad 2, 2017). This covers a third of all children in the world. Of those 250 million children, only 130 million attended school for at least four years (Norad 2, 2017). Not only is access to education a problem, also the quality of education influences the development of children and young adults. Article 26 of the Universal Declaration of Human Right says that "… Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms. It shall promote understanding, tolerance, and friendship among … racial or religious groups…" (Norad 1, n.d.). The stability of a country, the gross domestic product and the local political situation play a large role in the reasons for the lack of education (Nir, Kafle 2011). Nevertheless, education is a good tool to increase a country's stability (Norad 3, 2017). With good education children and young adults receive important developmental skills, such as economical and social skills, to lift themselves out of poverty. This gives people more freedom, as well as empowerment (Norad 1, n.d.).

Many researchers mention a global learning crisis since quality in education does not have equally high priority worldwide (Norad 2, 2017). Sustainable Development Goals have been set by the United Nations. The goals are an "urgent call for action by all countries – developed and developing" (UN 2, n.d.). The Goal number 4 is "Quality Education" (UN 2, n.d.). The goal´s statement is to "ensure inclusive and equitable quality education and promote lifelong learning opportunities" (UN 2, n.d.). These goals and statements are guidelines and a part of the mission for many companies and organisations. By acting according to these statements, everyone can become a part of reaching the UN goals and change the future of our planet for the better.

Language has a large influence on education since the chosen language for instruction is important for better learning (Norad 2, 2017). Instructions in a native language is important for minority groups and the basis for other languages (Norad 2, 2017). This is especially important to ensure education for girls (Norad 2, 2017). Education can be a game changer in gender stereotypes and attitudes and in promoting gender equality (Norad 3, 2017). Equal educational opportunities are a fundamental human right and the basis of equal opportunities later in life (Norad 3, 2017).

Motivation

The creation of new spaces is an important part in my professional life. Working for several years as a workplace consultant creating workspaces and improving the process of work-life, I gained experience and knowledge from many different fields. Experiences with strategy and process development, working with different cultures and opinions, and especially working together with many different people to create new spaces. This work experience motivated me to use my knowledge to create learning spaces, and to include children in the design process. Children are the main users and have other needs than adults. To create spaces that fulfil the needs of the user is one of my biggest motivation as a designer. The thesis is partly written in collaboration with the PATRIZIA Children Foundation (PCF) with the goal to support them in creating better learning spaces for children all over the world.

The PATRIZIA Children Foundation is a non-governmental organisation with headquarters in Augsburg, Germany. Since 1999, the foundation, which is a part of the PATRIZIA AG, has been helping projects all over the world by raising money to build schools and homes for children and young adults. Over the last 21 years they have built 17 institutions in 11 countries and have therefore helped 220.000 children (PCF, 2020). PCF´s vision aligns with the Sustainable Development Goals as their mission is to ensure access and quality in education. To continue their mission for the next 20 years, the foundation and their project partners want to define their picture of future schools that are resistant against environmental disasters, pandemics, and other non-controllable occurrences. PCF suggested working with three existing schools in Rwanda, Cameroon and Nepal. These countries serve as research objects and informers to create better learning spaces.

Aim and Objectives

The initial aim of this Master thesis was to create a strategy for the PATRIZIA Children Foundation to build children centred future learning spaces in developing countries. Throughout the work on this thesis the focus and development gradually changed towards creating a process to ensure quality education through learning space design. This work can be adapted and adopted by PCF and may contribute to shape their strategy.

The updated objectives are

- To understand education in developing countries
- To understand the link of pedagogy and space and technology
- To analyse learning space design and principles of comfort and education
- To create a process to include children when developing new projects
- To create design guidelines for flexible and adaptable use in each new project

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Master thesis for Wanda Filarowski

Adaptable spaces in education - Tilpasningsdyktige områder i utdanningen

Education and learning possibilities are valuable and important topics for people. The main reason the NGO, Patrizia Children Foundation (PCF) was created was to give children worldwide the chance for a better future. PCF has developed 17 schools and children homes over the last 20 years. This thesis will focus on the schools. To develop and improve the educational systems in the coming 20 years PCF are going to change their strategy. In the past PCF has only given financial support. In the future they are going to support with expertise and guidance and money.

My master thesis will develop a new strategy for PCF, with specific focus on the design of learning environments. The main delivery is to develop guiding principles for flexible and adaptable spaces of future PCF projects in combination with general principles of comfort and education. I will investigate the topic using the approach of transition design. To develop the concept, I will include methods from participatory design, children inclusion, space planning and business development.

- Research behaviour, needs, etc. of children to figure out what good educational spaces are.
- Research principles of comfort and education to understand current theories of education.
- Analysis of PCF projects and other schools to understand best practices in education.
- Analysis of PCF projects from a financial perspective for feasible and realistic strategy.
- Develop guiding principles so that PCF builds a stronger identity connected to their work.
- Develop ways for PCF to include children when planning new projects. This is to make sure that the school is well used by the community, and that children adapt to the new school.

Oppgaven utføres etter "Retningslinjer for masteroppgaver i Industriell design".

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Eventuelt biveileder:	Marikken Høiseth
Bedriftskontakt:	Angelika Jacobi, Patrizia Children Foundation
	Minka Frackenpohl, workingwell GmbH

Utleveringsdato:	26.08.2020
Innleveringsfrist:	19.01.2021

Trondheim, NTNU, 19.08.2020

Martina Keitsch
Ansvarlig faglærer

Ole Andreas Alsos
Instituttleder

Schedule of the Thesis

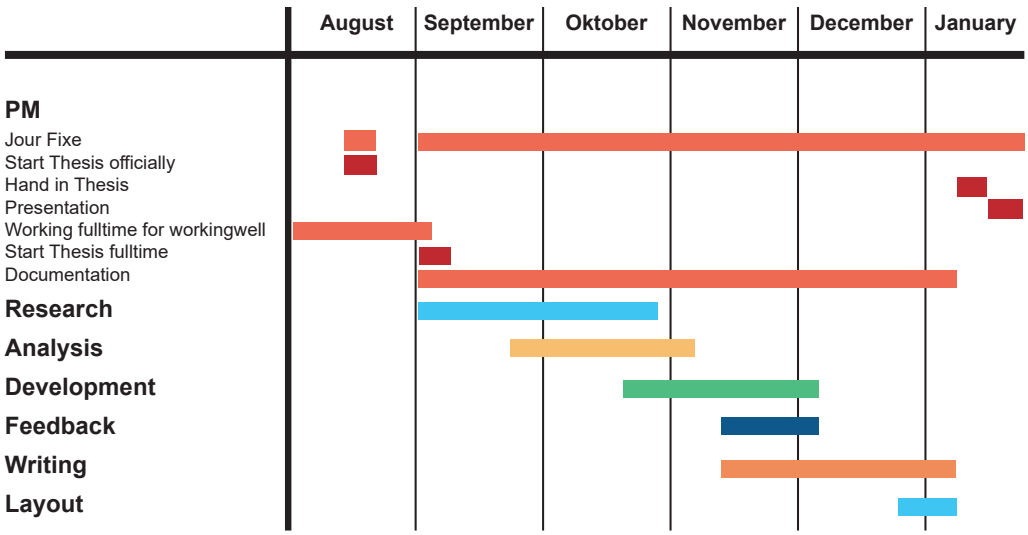


Fig. 1: Thesis schedule

Methodology and Process

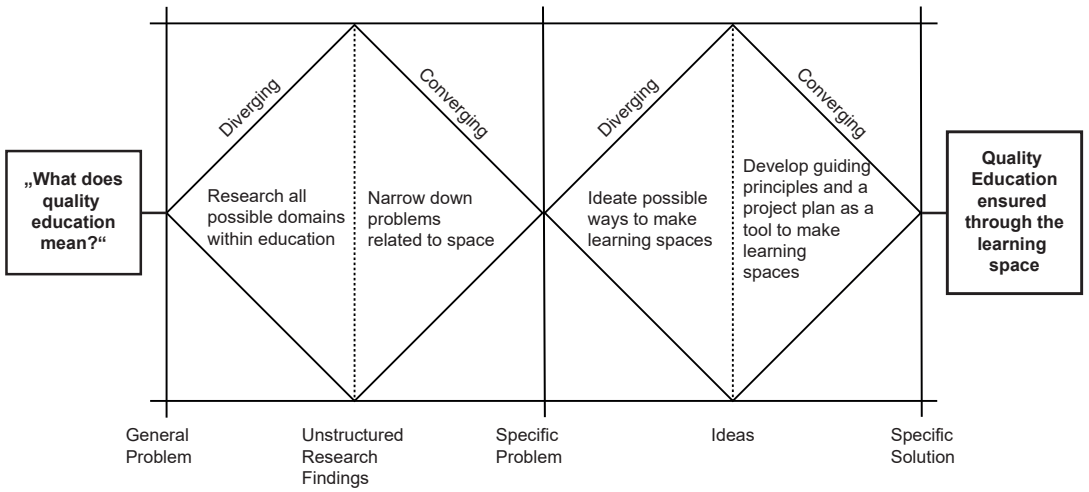


Fig. 2: Adapted Double Diamond Process

My design process was inspired by the double diamond process which I adapted towards my needs and the possibilites I had to approach the thesis outcome. My process starts with the general question „What does quality education mean?“ and diverges into possible domains and research topics within education. My goal was to cover many different perspectives to create a full picture of education and its current quality. I structured my findings and converged on space related problems that I can solve with my thesis approach. After the first diamond, I concluded that my contribution to tackling the problem of quality education would be by creating better learning spaces.

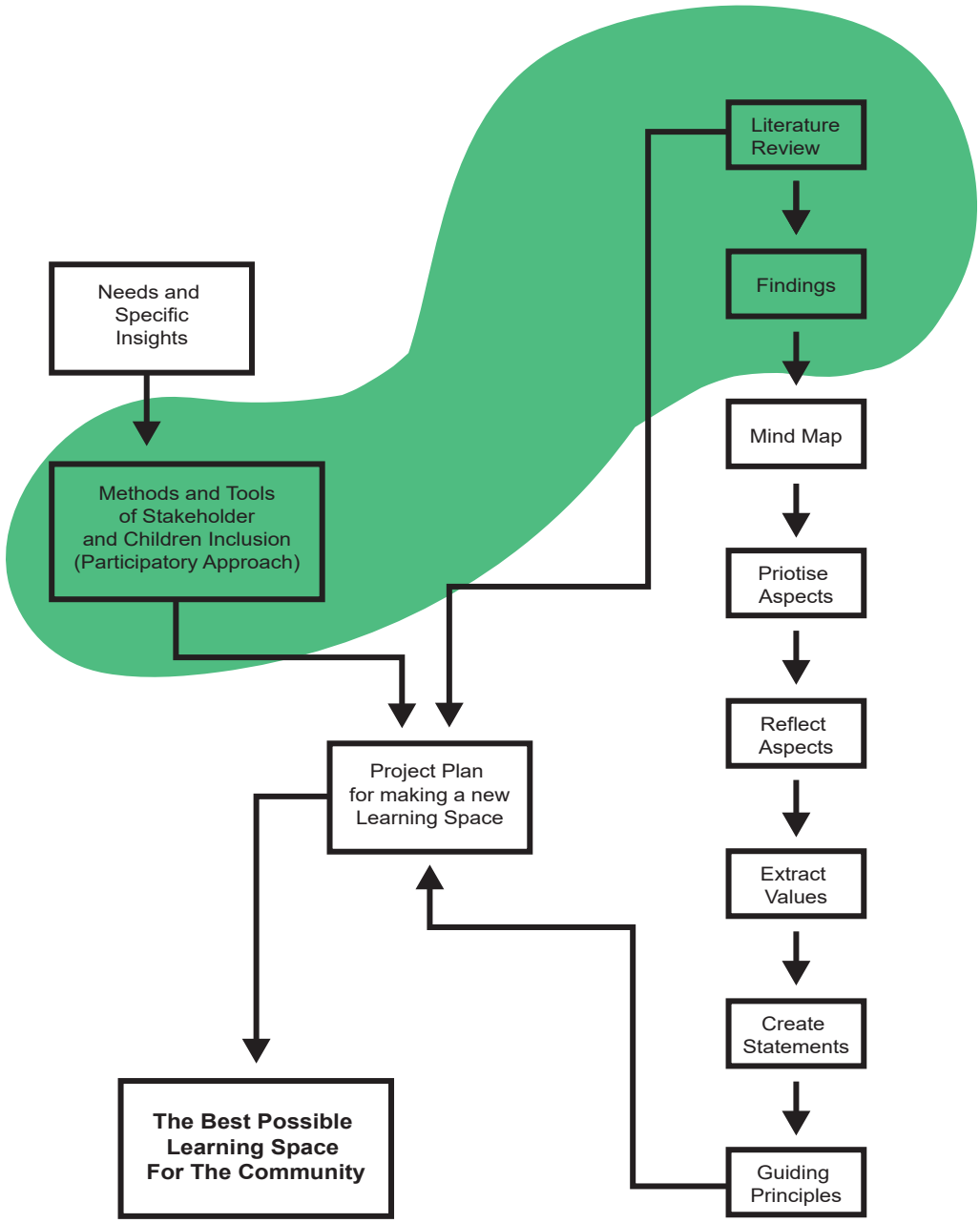
I ideated possible ways to develop a new learning space in my second diverging process. I decided to develop guiding principles and a project plan as the best and most appropriate tool to make learning spaces. My double diamond process ended with a specific solution for ensuring quality education through learning space.

The methodology of the design process is influenced by the participatory design approach (p. 92 ff) and inspired by service design thinking (p.136 ff) and scenario-based design (p. 157 ff).

”

Exploration

„Exploration“, as the first part of the thesis, explores the different topics that influence the thesis outcome. The graph on the next page shows an overview of my work that I created after conducting the thesis. It is the pathway I took to create the best learning space possible for the community.


Literature Review
Findings
Mind Map
Priotise Aspects
Reflect Aspects
Extract Values
Create Statements
Guiding Principles
Needs and Specific Insights
Methods and Tools of Stakeholder and Children Inclusion (Participatory Approach)
Project Plan for making a new Learning Space
The Best Possible Learning Space For The Community

Investigated research topics which influence the concept of a new learning space

The following mind map was created to structure research topics and related themes to figure out what influences the learning space. The map is divided specifically by the topics pedagogy, educational technology and learning space design. The other influencing factors of developing a new learning space are children and stakeholders because they have specific needs and challenges.

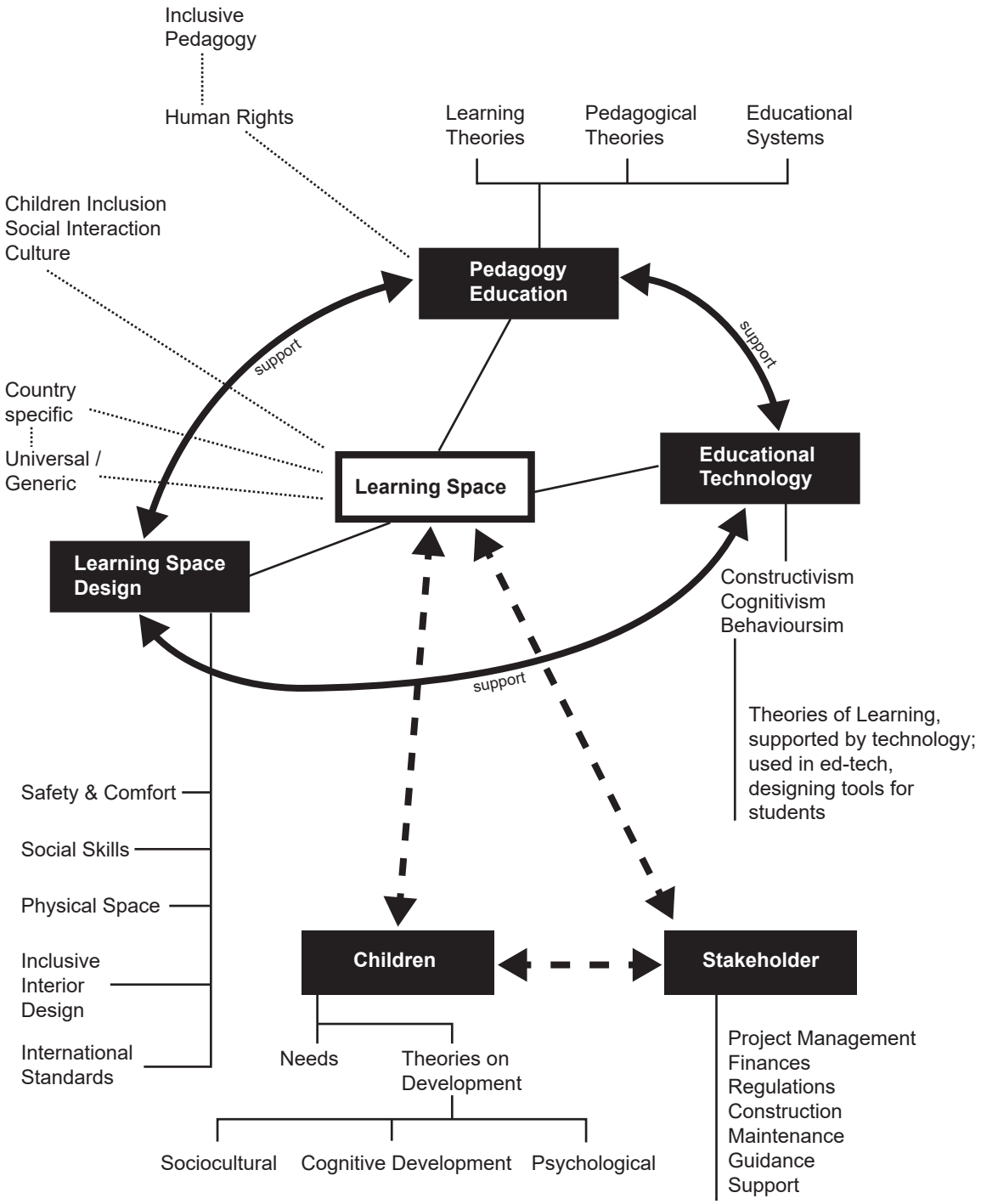


Fig. 3: Influencing research topics

Childhood Studies

Psychological and sociological approaches to children and childhood

Investigating the field of children studies is necessary for this thesis to understand the circumstances around children. It is a part of a puzzle in understanding how children develop and learn, and what children need in a learning space to support their development and learning. This research part does not show in detail theories and thoughts around children but extracts valuable insights regarding learning habits which can be supported by the learning space. The results of the research which are important for creating the best possible learning space can be found in the main findings at the end of this chapter.

History of Childhood Studies

In the 19th and early 20th century, the developmental psychologists were only investigating child psychology and not including the social structures around the child (EEB, 2017). In the 1950´s a change of focus happened, and psychologists became interested “in the relationships between personality variables and child rearing” (EEB, 2017). In addition, behavioural theories, cognitive theories, and developmental theories were created and added to children studies (EEB, 2017).

Throughout history, adults were always seen as the experts on childhood (Leonard, 2015). Leonard also mentions that “childhood development is a body of knowledge constructed by adults for other adults to use in order to make sense of, regulate and promote children‘s lives and learning” (Leonard, 2015). In this time of research, age was used as an indicator of universal traits (Leonard, 2015). Every action, every thought of children was interpreted against “models of psychological processes, stages of relative competence and/or deviations from normality” (Leonard, 2015). To educate children was an approach to measure, assess, praise individual children against a produced universal child, or problematise if they deviated from what was considered normal (Leonard, 2015). Children are seen as objects of research and research is done to children rather than with children (Leonard, 2015).

Child Psychology

According to Cherry and Janssen, child psychology has three major contexts – cultural context, social context, and socioeconomic context (Cherry, Janssen, 2020).

Cultural Context
The culture a child lives in contributes a set of values, shared assumptions, and ways of living that influence development throughout the lifespan (Cherry, Janssen, 2020). Culture also plays a role in how children relate to their parents, the type of education they receive and the type of childcare that is provided (Cherry, Janssen, 2020). Children whose cultural context is taught through the family and secondary systems like the school, grow up with certain rules and expectations. They have set boundaries which are still flexible in a certain way. Growing up with basic rules are important for people to understand the social environment and expectations.

Social Context
Relationships with peers and adults influence how children think, learn, and develop (Cherry, Janssen, 2020). Families, schools, and peer groups all make up an important part of the social context (Cherry, Janssen, 2020). Children who grow up with a stable social environment feel safer and are more cared for. Therefore, children can develop and grow freely and live with the feeling of security in their lives.

Socioeconomic context
Social class plays a major role in child development (Cherry, Janssen, 2020). The status of a person is in some cultures based on a number of different factors including how much education people have, how much money they earn, the job they hold and where they live (Cherry, Janssen, 2020). Children who are raised in households with a high socioeconomic status tend to have greater access to opportunities, while those from households with lower socioeconomic status may have less access to such things as health care, quality nutrition, and education (Cherry, Janssen, 2020).

These contexts are constantly interacting. A child can have fewer opportunities due to a low socioeconomic status but have enriching social relationships and strong cultural ties that help correct this imbalance (Cherry, Janssen, 2020). There are several topics influencing child psychology. The major subjects which are essential for child psychology are cognitive development, environmental influences, gender roles, genetics, language, personality development, prenatal development, social growth, and sexual development (Cherry, Janssen, 2020).

Developmental Needs of Children

Like adults, children have specific needs which need to be fulfilled to live a good life. To be able to develop, specific needs have to be tackled (Annie, 2020). These developmental needs are:

- Health: good food and water, clean place to live, and good medical care when they are sick.
- Education: instruction from more skilled people on how to do many of the tasks they will need to do in their lives
- Emotional Development: good role models and examples of how to build positive emotions, and to deal successfully with negative feelings
- Identity: confidence, achieving goals, and self-esteem
- Family & Relationships: love and affection from relatives and friends
- Social Presentation: respect for and of others, and being included in groups
- Self-care skills: ability to take care of one‘s self, including hygiene, and managing time and activities

“Adults have little awareness of their security needs except in times of emergency or periods of disorganization in the social structure (such as widespread rioting). Children often display the signs of insecurity and the need to be safe.” (Annie, 2020)

Piaget vs. Vygotsky vs. Erikson

The following three theories discuss insights and approaches of how children develop and learn. These theories influence education and teaching approaches as well as being important for the field of child psychology.

Cognitive Development according to Piaget

Jean Piaget was a swiss biologist who is also the founder of genetic epistemology. Genetic epistemology is part of the philosophy of cognitive science. Under `genetic´ is to be understood the sense of `concerning the genesis´, which means history and development (Hecker, n.d.). From the 1920s on, Piaget developed the theory of cognitive development by studying his children growing up (Hecker, n.d.). Piaget‘s theory dominated developmental psychology from the early 1960s to the early 1980s (Cherry, Swaim, 2020). The theory assumes that human knowledge is the result of active action and interaction with the environment as well as the outcome of a long development process (Hecker, n.d.). Piaget´s hypothesis is that children‘s minds were not merely smaller versions of adult minds (Cherry, Gans, 2, 2020). Up until the beginning of the 20th century, children were largely treated as smaller versions of adults (Cherry, Gans, 2, 2020). Piaget identified that the way children think is different from the way adults think (Cherry, Gans, 2, 2020). He also concluded that intelligence is something that grows and develops through a series of stages – sensorimotor stage, preoperational stage, concrete operational stage, formal operational stage (Cherry, Gans, 2, 2020). There are qualitative and quantitative differences between thinking of young children versus older children, which also includes that older children think more quickly than younger children (Cherry, Gans, 2, 2020; Sample, 2005).

Sociocultural Theory according to Vygotsky

Lev Vygotsky was a Russian psychologist and founder of a theory of cognitive development in children known as the Sociocultural Theory of Cognitive Development which was developed in the early 20th century (The Psychology Note Headquarter, 2020; Envision Your Evolution, 2019). Vygotsky developed the theory until his death in 1934 but it was not recognised by the field of psychology until the 1960s (Taylor, 2018, Lourenco, 2012). Vygotsky‘s theory accentuates the fundamental role of social interaction in the development of cognition (Envision Your Evolution, 2019). He believed that community plays a central role in the process of `making meaning´ (Envision Your Evolution, 2019). The sociocultural theory says that “the knowledge and skills of the child are forming and developing due to [a] cooperation process, which implies a novice and an expert” (Envision Your Evolution, 2019). The social environment gives the child guidance, forms an assistive or collaborative relationship between the child and the social environment, for example an adult or another, mostly older, child (Envision Your Evolution, 2019). After this, the triggering and individual control of activities happen (Envision Your Evolution, 2019). One of Vygotsky‘s ideas that was included in the Sociocultural Theory is the Zone of Proximal Development (The Psychology Note Headquarter, 2020; Envision Your Evolution, 2019; Lindsay, 2018). This is to say the range of things that a child is learning to accomplish.

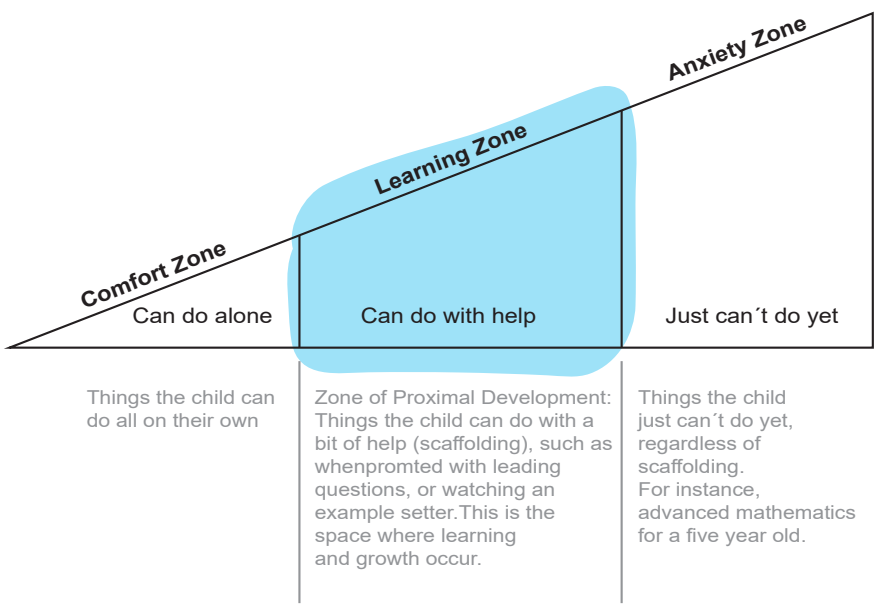


Fig. 4: Zone of Proximal Development

A study explained that “human development results from a dynamic interaction between individuals and society. Through this interaction, children learn gradually and continuously from parents and teachers‘‘ which describes the concept of Vygotsky‘s theory (Envision Your Evolution, 2019). Vygotsky‘s theory interprets that learning can vary between different cultures (Envision Your Evolution, 2019). People socially interact and communicate with others to learn the cultural values of their society (Sample, n.d.). Samples states that “human activities take place in cultural settings and cannot be understood apart from these settings‘‘ (Sample, n.d.). Therefore, culture is a tool to shape cognition (Sample, n.d.).

Piaget and Vygotsky had different, even contradictory opinions on how children develop. Piaget´s viewpoint is that children‘s cognitive development is impacted by their own ability to acquire knowledge without a big influence of their social environment whereas Vygotsky says that children‘s cognitive development is mainly influenced by their social environment. Vygotsky states that cognitive development varies across cultures whereas Piaget points out that cognitive development is mostly universal across cultures. But both agree that a change agent is involved in the cognitive development of children (Adams, 2016).

The idea of the Zone of Proximal Development and the Sociocultural Theory was and is still useful to develop educational approaches as it explains how teachers can interact with children and support them to acquire knowledge. Both theories support the teacher-student interaction and the ability to learn and develop. In Piaget‘s idea the role of a student is that a student “actively manipulates objects / ideas, continually invents / reinvents knowledge through interaction with the world” (N.a., 2014). The role of the teacher and the classroom is to “provide [an] environment that encourages students to interact and ask probing questions‘‘ (N.a., 2014). In comparison when the theory of Vygotsky is the source for a pedagogical approach, the role of a student becomes more interactive as peers, and the socio-cultural environment supports the problem solving (N.a., 2014). Also, the role of the teacher and the classroom changes as both engage learners in socially organised activities (N.a., 2014). Both approaches can be used for developing a new learning space. Each of the theories work in their own way and show that children can learn in different ways which the learning space should support.

Psychosocial Development according to Erikson

Another approach to cognitive development is the theory of psychosocial development by Erik Erikson which investigates development throughout the entire lifespan of a person. Erik Erikson was a German American developmental psychologist and psychoanalyst throughout the 20th century (McLeod, 2018; Cherry, Susman, 2020).

Erikson‘s theory was impacted by the psychosexual development which was central to Sigmund Freud´s work (McLeod, 2018; Cherry, Susman, 2020). He believed that personality developed in a series of stages which are impacted by social experience (McLeod, 2018; Cherry, Susman, 2020). These stages are Trust vs. Mistrust, Autonomy vs. Shame & Doubt, Initiative vs. Guilt, Industry vs. Inferiority, Identity vs. Role Confusion, Intimacy vs. Isolation, Generativity vs. Stagnation, and Integrity vs. Despair (McLeod, 2018; Cherry, Susman, 2020). Erikson’s interest lies in how social interaction and relationships play a role in the development and growth of human beings (McLeod, 2018; Cherry, Susman, 2020).

His theory is a mix of stages and experiences which paves the way for his development stages (McLeod, 2018; Cherry, Susman, 2020). Each experience includes a conflict which is seen as a turning point in development. The conflicts are of a psychosocial nature because they involve psychological needs which clash with the needs of society (McLeod, 2018). This can also result in an identity crisis (Lindsay, 2018). This means that “conflicts are centred either on developing a psychological quality or failing to develop that quality” (Cherry, Susman, 2020). So, in each stage there is potential for personal growth but also the potential for failure. The theory says that if people successfully deal with the conflict, they emerge from the stage with psychosocial strength that will serve them well for the rest of their lives (McLeod, 2018; Cherry, Susman, 2020). If they fail to deal effectively with these conflicts, they may not develop the essential skills needed for a strong self. These psychosocial strength characteristics, also referred to as basic virtues, can be used to resolve following conflicts (McLeod, 2018).

Erikson‘s theory is a broad framework. It emphasizes the social nature of human beings and shows the important influence that social relationships have on development. Erikson‘s theory cannot be compared with the theories of Piaget and Vygotsky as Erikson‘s theory tries to explain personality development which does not merely interfere with the learning and the cognitive development. While Piaget and Vygotsky investigated in children‘s cognitive development which includes girls and boys, critics say that Erikson’s theory and the experience people have in each stage “may only apply to males” (Adams, 2016). Educators and the learning space need to understand and support the

stages of psychosocial development in a way that children can overcome their conflicts and master the development stage. This means for example, that in the stage of Initiative vs. Guilt it is important to give children the opportunity to interact with other children through playing and initiating activities which helps children to explore interpersonal skills (McLeod, 2018). In this stage children´s knowledge grows as they are eager to ask questions (McLeod, 2018).

Socialisation

The first human group a child belongs to is the family (Leonard, 2015). From the family the child gets to know distinctive patterns of behaviour of adults (Leonard, 2015). Later in school, children learn to accept the authority of adults and get to know the system of reward and status in society (Leonard, 2015). Education is part of the process of preparing children for their adult roles, and for their lives as future workers, which puts children into a passive character (Leonard, 2015). There can be a possible tension between the rights of parents and the rights of children regarding education (Quennerstedt, Quennerstedt, 2013). This means that sometimes traditions and cultures in education intervene with children´s rights thinking. The traditional educational system gives adults control over time, space, bodies, and activities. Consequently, children are passive recipients of adult knowledge and views of their education are downgraded or ignored (Quennerstedt, Quennerstedt, 2013). Leonard points out that “through sites of secondary socialisation such as school, children develop a sense of wider social structures and their place within them” (Leonard, 2015). However, socialisation can be seen as going `wrong´ if children resist or challenge the norms and values (Leonard, 2015). This means that children who do not behave as `normal´ children were perceived as bad children or children without proper parenting (Leonard, 2015).

The concept of socialisation dominated theories and research about children and their childhoods throughout the 20th century which also highlights the power of adults to define children (Leonard, 2015). As a reflection of this adult ideological viewpoint, children were regarded as dependents in a range of adult structures, rather than children being considered as individuals in their own right (Leonard, 2015). This ideological view of socialisation can also be seen in the acknowledgment of rights, which has been associated with competence and a rational mind (Quennerstedt, Quennerstedt, 2013). It was defined as `normal´ to deny rights of large groups of adults, like women, coloured adults, and disabled adults because men thought those people did not possess the competence and rationality that is necessary to have and exercise rights (Quennerstedt, Quennerstedt, 2013). In the same way, children were perceived as incompetent and irrational which defended treating them differently than adults (Quennerstedt, Quennerstedt, 2013).

By the end of the 20th century, the universal psychological principles that shaped children‘s development towards adulthood were being increasingly questioned (Leonard, 2015). In a way, adults began to realise that children and childhood might have social and cultural significance and are likely to differ across time and space (Leonard, 2015; Quennerstedt, Quennerstedt, 2013). This also developed a renewed concern about how children may experience their childhood and how their experiences might impact childhood and adulthood (Leonard, 2015; Kehily, n.d.). The child settles in an increasingly complex and changing world which involves a range of multi-personal and interpersonal relationships (Leonard, 2015). The ongoing societal changes make it difficult for the universal psychological theories to apply (Leonard, 2015). Another change is that families are less likely to act as children‘s primary socialisation in the early years (Leonard, 2015). Modern children interact with a wide range of adults, with each of them contributing to the socialisation context in which the child is located (Leonard, 2015). Reasons for a higher number of early interactions with more adults are the third-party care possibilities and the need to use them because of full time work of both parents. The definition of socialisation changed to being “the result of reciprocal interactions, occurring between various people and the child” (Leonard, 2015). Childhood leads to adulthood and the environment of a child and its experience can influence adult life (Kehily, n.d.). Therefore, “children have only one chance of a childhood. They deserve to be protected from harm, to enjoy good emotional, mental and physical health, and to feel that they belong in their home, at school, and in their local community” (Kehily, n.d.).

The “new” meaning of childhood

The shift in viewpoints and mindsets from the child as a passive, to an active contributor to its own education is a condition for the `new´ sociology of childhood. Leonard emphasizes that it is the “conceptual autonomy to children to see them in their own right without the reference to adulthood” (Leonard, 2015). The key features of this new approach of childhood studies are (Quennerstedt, Quennerstedt, 2013; Leonard, 2015; Kehily, n.d.):

- Childhood is understood as a social construction
- Childhood is a variable of social analysis
- Children‘s relationships and cultures are worthy of study in their own right
- Children should be seen as active social agents
- Ethnography is a useful method for the study of childhood
- Studying childhood involves an engagement with the process of reconstructing childhood in society

Learning styles

As people have different needs, characters, and personalities, they also have different ways of how they want to learn or how they learn best. There are many theories about different learning styles. Some get criticised for being implemented at too young an age (Chapman, 2017). Working with young people requires that teachers should use systems and methods with care and caution (Chapman, 2017).

Learning through Multiple Intelligences

Fleming and Mills describe in their study from 1992 four different modalities of student learning (KU, 2020). The acronym “VARK” stands for visual, auditory, reading/writing and kinesthetics which were identified by observing classrooms and children‘s behaviour for many hours (KU, 2020). Another resource identified three other learning styles in addition to the VARK-concept (Time4Learning, n.d.). Children can also be logical (mathematical) learners, social (interpersonal) learners, or solitary (intrapersonal) learners (Time4Learning, n.d.). Howard Gardner developed in 1983 his Theory of Multiple Intelligences in which he explains how multiple intelligences form our learning style, personality and behaviour (Chapman, 2014). Individuals can have many different intelligences but the “most prevalent intelligence can form the basis of our existence” (Chapman, 2017).

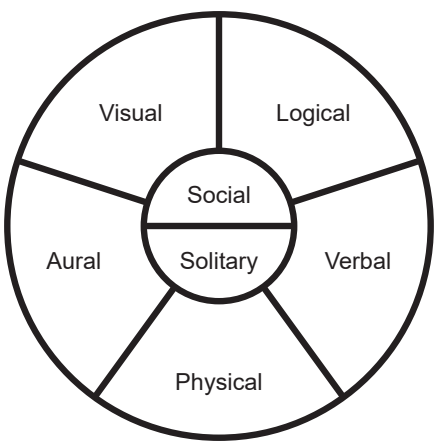


Fig. 5: Multiple Intelligences

Kolb‘s Learning Cylce

Both Gardner‘s Multiple Intelligence Theory and the VARK learning styles model are helpful in understanding the following learning theory investigated and developed by David Kolb in 1984 (McPheat, n.d.; McLeod, 2010; Chapman, 2017). In Kolb´s publication, he analysed the Experiential Learning Model which involves a four-stage cycle: Concrete Experience, Reflective Observation, Abstract Conceptualisation, Active Experimentation [see Fig. 6] (McPheat, n.d.; McLeod, 2010; Chapman, 2017).

Kolb‘s model of learning style works in two dimensions. Next to the first dimension, the Experiential Learning Model, the second dimension is a definition of learning styles divided into four types (McPheat, n.d.; McLeod, 2010; Chapman, 2017):

1. Diverging (CE/RO)
2. Assimilating (AC/RO)
3. Converging (AC/AE)
4. Accommodating (CE/AE)

Kolb says that the learning style preference is the product of two pairs of variables, or two separate `choices´ (McPheat, n.d.; McLeod, 2010; Chapman, 2017). These choices are presented as axes with conflicting modes on each end. We cannot undertake both choices at the same time.

Concrete Experience (CE) = feeling vs.
Abstract Conceptualisation (AC) = thinking
Active Experimentation (AE) = doing vs.
Reflective Observation (RO) = watching

Kolb mostly presents this in a two-axis continuum called Processing Continuum and Perception Continuum (McPheat, n.d.; McLeod, 2010; Chapman, 2017). Kolb expresses with this model that people need to “decide” which learning style they prefer in a specific situation (McPheat, n.d.; McLeod, 2010; Chapman, 2017). People firstly choose a way of `grasping experience´, which defines the approach, thereafter, choose a way to `transform the experience´ into something meaningful and usable, which defines the emotional response to the experience (McPheat, n.d.; McLeod, 2010; Chapman, 2017).

An example might make Kolb´s thought process easier to understand (McPheat, n.d.; McLeod, 2010; Chapman, 2017).
Our learning style is a product of two choice decisions:
1. How to approach a task (grasping experience):
   Do I want to watch, or do I want to do?
2. Our emotional response to the experience (transforming experience):
   Do I want to think, or do I want to feel?

We choose our approach towards the task or experience (grasping experience) by opting for (a or b):

a) Watching others involved in the experience and reflecting on what happens (reflective observation – watching)
b) `Jumping straight in´ and just doing it (active experimentation – doing)

And at the same time, we choose how to emotionally transform the experience into something meaningful and useful by opting for (a or b):

a) Gaining new information by thinking, analysing, or planning (abstract conceptualisation – thinking)
b) Experiencing the `concrete, tangible, felt qualities of the world´ (concrete experience – feeling)

The following diagram attempts to visualise the principle for a better understanding of how Kolb defined his learning styles.

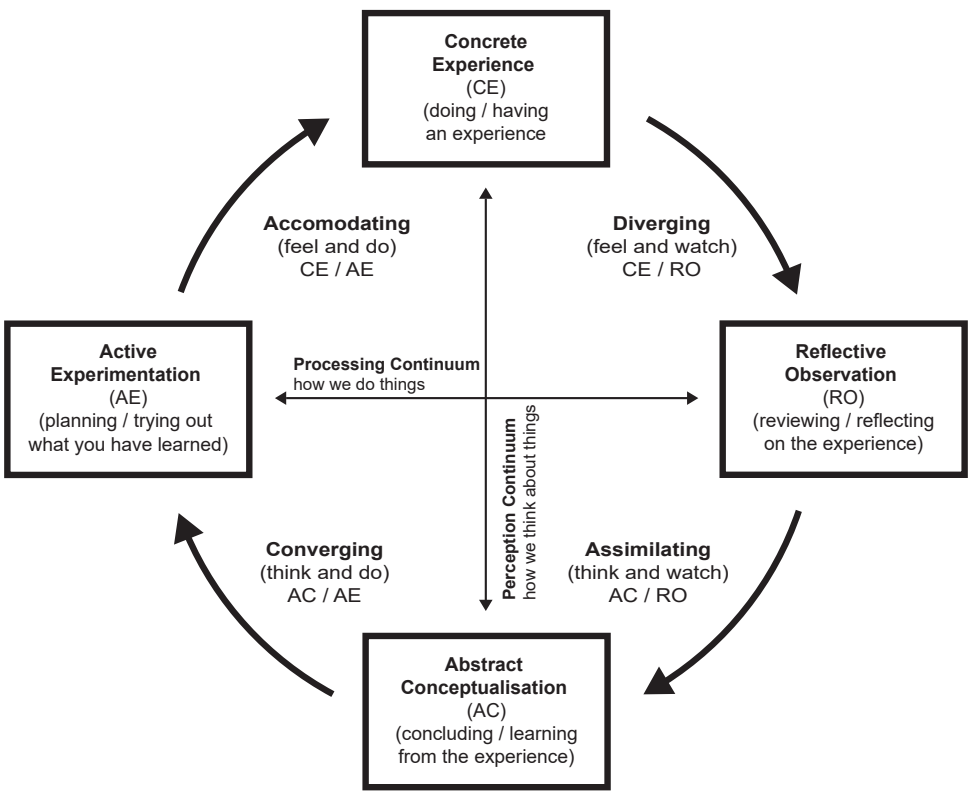


Fig. 6: Kolb´s Learning Cycle

Kolb explains that this “process represents a learning cycle […] where the learner `touches all the bases´, i.e., a cycle of experiencing, reflecting, thinking, and acting” (Chapman, 2017). He also says that immediate or concrete experiences lead to observations and reflections (Chapman, 2017). When these reflections are assimilated (absorbed and translated) into abstract concepts with implications for action, the person can actively test and experiment with the results which enable new experiences (Chapman, 2017).

Since learners continuously “decide” how they want to approach a certain topic and adjust their approach to the desired learning outcome, the pedagogical approach and the learning space need to be flexible and adjustable.

How children understand spaces

„The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill”
– James J. Gibson, Theory of Affordances (Sanyal, 2016)

Gibson describes his theory of affordances as an “ecological alternative to cognitive approaches to learning and behaviour” (Gibson, 1977; Greeno, 1994). Gibson developed his theory of affordances to study the direct perception versus the inferential or indirect perception (Gibson, 1977; Greeno, 1994). Inferential perception means that “meaning arises inside an individual through interactions with the physical and social environment” (Gibson, 1977; Greeno, 1994). The aspect of direct perception says that “the environment inherently holds the meaning separate from the individual, and the individual gathers meaning from this meaning-laden environment through the actions it affords” (Gibson, 1977; Greeno, 1994). Gibson´s viewpoint perception enables action (Gibson, 1977; Greeno, 1994). An affordance therefore is a resource that the environment offers if the individual has the capabilities to perceive and use it (Gibson, 1977; Greeno, 1994).

Each aspect of the environment, like surfaces, objects, other people, animals have affordances (Sanyal, 2016). Affordances are properties perceived by an individual which can also be altered by each individual (Sanyal, 2016). They are context- and situation-specific (Gibson, 1977; Greeno, 1994). The human being is therefore a creature of his or her environment (Sanyal, 2016). Affordances are the relations between the abilities of individuals and features in the environment (Atmodiwirjo, 2014). In other words, affordances are the characteristics of an object or space that encourage a particular behaviour, or the opportunity for action (Haworth, n.d.). This also means that if the learning space is well-designed it participates in performing the task, enabling optimal human performance – cognitively, emotionally, and physically (Haworth, n.d.). Designing spaces needs to be based on the understanding of the multiplicity and relational character of affordances and their role in supporting the process of adaptive response (Atmodiwirjo, 2014). Thus, designing by understanding many different affordances and their characteristics would lead to learning space design that not only provides possibilities for actions, but also enhances meaningful purposes of the space for the body (Atmodiwirjo, n.d.). Placemaking is a way to include affordances into learning space design. Placemaking is “a collectively planned design process of nurturing and cultivating a space´s optimum affordances” (Sanyal, 2016). The process is built up by stakeholders coming together and discussing their needs and expectations for a particular place (Sanyal, 2016). This reduces the chances that the space has negative affordances. Placemaking is a continuous process (Sanyal, 2016). When people and places change, the affordances of a place must evolve too (Sanyal, 2016). To have a successful placemaking, active and equal citizen participation is required (Sanyal, 2016). A learning space can also be a public space. Those spaces serve many different types of people with different needs. Therefore, learning spaces need to be inclusive, vibrant, and inviting because they need to offer multiple affordances, which encourage people from multiple backgrounds to express themselves (Sanyal, 2016).

There are three distinct but interrelated categories of affordances – cognitive affordances, emotional affordances, and physical affordances (Haworth, n.d.). Cognitive affordances support intellectual activities such as thinking, reasoning or remembering (Haworth, n.d.). Emotional affordances nurture a person‘s psychological state (Haworth, n.d.) and physical affordances support the body‘s needs (Haworth, n.d.).

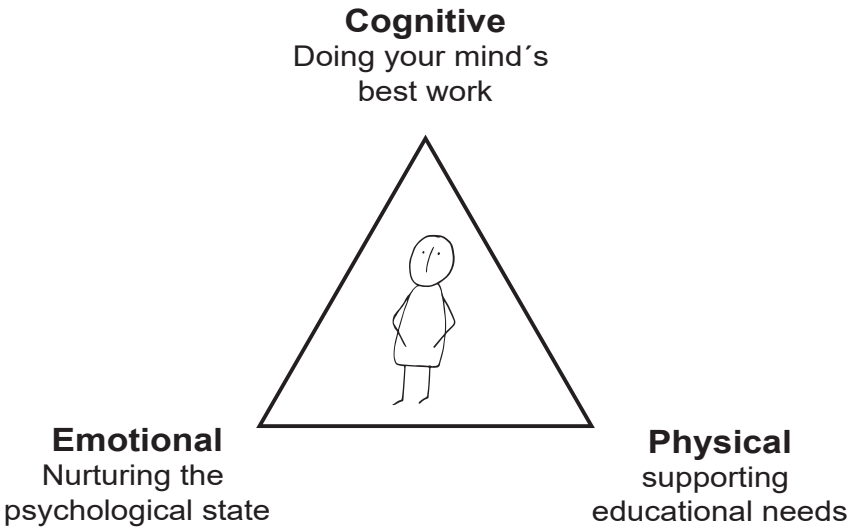


Fig. 7: Affordances in a learning space

Affordances of spaces and objects in education offer possibilities for various actions and activities but can also trigger and invite certain actions (Atmodiwirjo, 2014). Affordance in educational context is “the relationship between the properties of the interventions and characteristics of the learners that enables learning to occur” (Gibson, 1977; Greeno, 1994). In the educational context affordances are divided into social, educational and technological affordances (Gibson, 1977; Greeno, 1994). These affordances demonstrate how elements of the environment support the emergence of social interaction thereby assisting reaching the targeted competencies (Gibson, 1977; Greeno, 1994). This means that affordances are utilized as a conceptual framework to illustrate teachers´ and students´ perceived and actual use of these spaces to foster social interaction (Gibson, 1977; Greeno, 1994). Affordances in education are perceived in relation to the planned educational purpose and the social activity of teaching (Frelin, Grannäs, 2020).

“An affordance is the design aspect of an object which suggests how the object should be used” (Norman, 1988)

Because of all these theories, research subjects, and findings in child psychology, the traditional educational system is not a good fit to support children in their developing process. A change in the educational system needs to happen to support children‘s ability to grow and develop in their best way. These new approaches pave the way to a better future.

Findings of Childhood Studies

- Slow change in mindset within childhood studies – The child is sometimes still seen as a blank page where adults can project their beliefs, behaviours, on to. Tere is a picture of a `universal, normal´ child and every child should behave like that picture

- Children‘s development and their psychological mindset are influenced by cultural factors, social factors and socioeconomic factors as well as meeting the basic needs and emotional needs

- Children take an active role in the learning process as they interact with the world and build knowledge

- Children think differently from adults and should be treated differently as well as being included in processes and decision-making

- A child‘s skills and knowledge are influenced by a cooperation process with the community, the social environment around the child. If a child gets guidance from the social environment it gains control over activities

- Learning can vary between different cultures

- A person‘s personality develops throughout the lifespan in different stages which are impacted by social experience and conflicts a person has to master in order to grow

- Children participation is a children‘s civil right to freedom of speech and information

- Childhood is a social construction and children are active social agents

- Learning styles, personality, and behaviour of children are influenced by multiple intelligences which are the preferable way to understand, process, and learn new things

- A learning style preference is built up by two choices - do I want to watch, or do I want to do? and do I want to think, or do I want to feel?

- Children and children‘s rights have been in the spotlight of social sciences since the 1990s

Education Studies

The following chapter gives an overview of what education and pedagogy is. It supports the understanding of how teachers and students interact while "working" together. Therefore, knowing what kind of educational approach and pedagogical theories can be used to accumulate knowledge is important for creating the best possible learning space. It helps to understand how the space needs to be structured to have specific effects on learning and how space supports the education of children.

Definition of Pedagogy and Education

Pedagogy is concerned with the education of people, focusing on the changeable (Plaßmann, Schmitt, 2007). It is no intervention in innate reaction tendencies (Plaßmann, Schmitt, 2007). Pedagogy is the theory of education and educational action (Plaßmann, Schmitt, 2007). It combines historical foundations, values, goals, techniques with the institutional-organisational framework and the acting persons (Plaßmann, Schmitt, 2007). In "About pedagogy" from 1803, Emanuel Kant talks about the necessity of education: "A human being is the only creature that must be educated. By education we understand maintenance (food, entertainment), discipline (chastisement) and instruction … Accordingly, the human being is an infant, a pupil, and an apprentice" (Plaßmann, Schmitt, 2007).

Education is the process of facilitating learning. It is the act of "acquiring general knowledge, developing the powers of reasoning and judgement, and generally of preparing oneself or others intellectually for mature life" (Merriam-Webster, n.d.). Education is important for each individual but also for society because it transports knowledge through all ages and shares the standard of conduct (Mondal, n.d.). Through education each person will learn how to socialise, understand their own culture and their rules and expectations about future behaviour (Mondal, n.d.). Depending on the interpretation of a person education has different meanings (Mondal, n.d.). Education means for a student, gain of knowledge and receiving a degree (Mondal, n.d.). For a statesperson education is a method to train individuals as ideal citizens (Mondal, n.d.). And the meaning of education for teachers is to create a new person and a new society (Mondal, n.d.). The meaning of education changes also from place and time. It passes through many ages and stages of evolution.

Approaches of Pedagogy and Education

Education should be systematically planned and consciously implemented (Plaßmann, Schmitt, 2007). Educational styles play an important role in planning. They define the target state of the personality, in which individuals should find themselves (Plaßmann, Schmitt, 2007). Every education is a transgression of a given situation with a “teleological dimension” (Greek telos = goal) and follows certain goals (Plaßmann, Schmitt, 2007). These goals can be given by the state, society, church, traditional culture, or they can be articulated in the educational process in dialogue or communication between the educational partners, like educators and pupils, or they can be designed by the educator (Plaßmann, Schmitt, 2007).

Education is a planned activity that attempts to influence the personality development of other people through social actions, communication, and to improve, maintain or eliminate their individual psychological tendencies (Plaßmann, Schmitt, 2007). Education means responsible and value-oriented influencing of individuals, which is carried out by opening, initiating, or controlling and strengthening or correcting development and / or learning processes (Plaßmann, Schmitt, 2007). Education implies making a responsible and full member of a society, which includes maturity, and emancipation (Plaßmann, Schmitt, 2007). The aim of education is to impart skills, abilities and attitudes to the up-and-coming generation which are considered important for its existence and further development in an existing society (Plaßmann, Schmitt, 2007). In Article 29 of the Convention of the Rights of a Child from 1989, the aims of education for each child are described very clearly (UN, 2001).

“1. States Parties agree that the Education of the child shall be directed to:
a) The development of the child‘s personality, talents and physical abilities to their fullest potential;
b) The development of respect for human rights and fundamental freedom, and for the principles enshrined in the Charter of the United Nations;
c) The development of respect for the child‘s parents, his or her own cultural identity, language and values, for the national values of the country in which the child is living, the country from which he or she may originate, and for civilisations different from his or her own;
d) The preparation of the child for a responsible life in a free society, in the spirit of understanding, peace, tolerance, equality of sexes, and friendship among all people, ethnic, national and religious groups and persons of indigenous origin;
e) The development of respect for the natural environment.”

There are many different pedagogical theories about how education can be undertaken which have been developed in the last centuries. Which one will be used to educate students depends on the educator (Persaud, 2019). The most important and common pedagogical theories are Behaviourism, Liberationism, Constructivism, Social Constructivism, and Connectivism.

In the last decades, the educational approach shifted in many countries. In the 1900´s teaching was about imparting just the basic literacy skills like reading, writing, and calculation (Brown, n.d.). Knowing was referred to as the "ability to remember and repeat" (Brown, n.d.). Memorization was an important skill set in the industrial age thus practices changed slowly, and people mainly did one task as their daily work (Brown, n.d.). Education was based on a "one size fits all" model and did not have any modifications towards the students´ needs (Brown, n.d.). This is a very traditional teaching style which is included in the ideas of the behaviourist pedagogy. This pedagogical theory is defined by the teacher as the sole authority figure, who leads the lesson and provides lecture-based learning (Tes Editorial, 2018). It says that knowledge should be transferred through a fixed curriculum where each subject is taught discretely (Tes Editorial, 2018). For example, in a lesson the behaviourist pedagogy can be seen as a mix of lecturing, modelling and demonstration, rote learning, and choral repetition (Tes Editorial, 2018).

The constructivism theory says that people learn through experiences and reflections which therefore put the child at the centre of learning (Tes Editorial, 2018). It is sometimes referred to as the `invisible pedagogy´ and incorporates project work and inquiry-based learning (Tes Editorial, 2018). Some schools with a constructivist pedagogy approach might adopt a Montessori or Steiner method, which leans on the findings of Piaget‘s Theory of Cognitive Development, but introduces also Vygotsky´s insights on social development (Tes Editorial, 2018). In a lesson, children are ready and eager to learn and the teacher builds activities to facilitate their learning (Tes Editorial, 2018). A lesson may show individualisation, a slower pace, hidden outcomes, the mantle of the expert, and less teacher talk (Tes Editorial, 2018).

The social constructivism approach is teacher guided and student centred and is considered as a mix of behaviourism and constructivism (Tes Editorial, 2018). The cognitive psychologist Lev Vygotsky developed social constructivism because he believed that learning was a collaborative process between student and teacher (Tes Editorial, 2018). In a lesson for example, the teacher would use group work elements with smaller group sizes and would limit the topics the students can choose from (Tes Editorial, 2018). As a teaching approach the teacher could use modelling, questioning, and a mixture of individual, pair, and whole class instruction (Tes Editorial, 2018).

Liberationism is also referred to as critical pedagogy developed by Paulo Freire, a Brazilian educator, between the 1950s and 1980s (Tes Editorial, 2018). He says that a liberationist approach is “one where the student voice is placed at the centre, and a democracy is put into the classroom” (Tes Editorial, 2018). He puts the teacher into the position as a learner and the class together discovers subjects (Tes Editorial, 2018).

Connectivism is handled as the pedagogy of the future (Greenwood, 2020). Connectivism is about students learning best if they are taught to navigate and create social networks through technology and to use these networks to learn (Greenwood, 2020). George Siemens who embossed this theory, says that connectivism is “a pedagogy that truly aligns with the technology available to us as educators” (Greenwood, 2020). He also implies that traditional pedagogies are components within connectivism, but it is the only theory that has distinctive differences to other theories (Greenwood, 2020). Connectivism relies on technology and needs tools like online courses, webinars, and dedicated forums to work (Greenwood, 2020). The classroom will use technology that complements and strengthens learning (Greenwood, 2020). Next to technology use, freedom is very important for connectivism (Greenwood, 2020). Freedom results in autonomy which creates a sense of ownership. Further on, this encourages collaboration and better teamwork within the class (Greenwood, 2020).

Besides a large collection of pedagogical approaches, there are many learning strategies which can be used in numerous ways and are helpful in structuring teaching and make it possible for students to learn differently. These strategies can be used in a flexible way especially if the learning space is made for such flexible school days where children and teachers can together choose the best way to accumulate knowledge. Some of these learning strategies are innovative and include crossover learning, context-based learning, computational thinking, analytics of emotions, or stealth assessment (Teach Thought Staff, 2018).

To be sustainable for the future, learning should be understood as the understanding and discovery of knowledge (Brown, n.a; Mondal, n.d.). Learning is a creative experience (Mondal, n.d.). Learning should be tailored towards the students and has many options for students to master the tools of learning (Brown, n.d.; Mondal, n.d.). It should transfer and construct knowledge and cultivate talents in a formal and informal way (Brown, n.a; Mondal, n.d.). The teacher can be the expert and mentor for the children. Education is the living of life and the preparation of life (Mondal, n.d.). The teacher as an expert in life, educates students to earn a livelihood, transfers knowledge of the cultural heritage, and tries to support students to function efficiently and constructively as a member of the society (Mondal, n.d.). All roles are flexible and can be adapted (Brown, n.a). Classrooms are flexible and adaptable and offer many different types of spaces (Brown, n.a).

Trends in Education

Trends are helpful for the development of strategies for a good learning space since they are indicators of what happens on the market and what people need for good or a better education and schooling. Trends are important to see the way in which education is developing and what possibilities there are. These trends can be either good or bad for students and education. Trends tend to be in the direction of technology, pedagogical approaches, interior, and school design, but also in the future of work and society. There are many sources that talk about the future and trends in education. Different trend researchers observed behaviour, triggers of different influencing factors and the environment that are in any way influencing schooling systems and education in general. Some of these researchers are big tech companies like Google, or smaller organisations which observe the market and the events of the time. The complete analysis of the trend research can be found in the appendix (p. 179ff.)

Key drivers for the trends in education are globalisation and economic growth, global population growth, the future of work and skills, and advancements in technology. There are different trends and ideas for the education system in the future. One main trend researchers observed are changes in educational aims and objectives (Bhojane, 2019; Rogers, 2019; Edsys, 2017; Burbules, 2020). Other trends are changes in educational ecologies, changes in learning and teaching processes and changes in educational governance and policy (Bhojane, 2019; Rogers, 2019; Edsys, 2017; Burbules, 2020). All the changes are caused by a changing world towards which many systems have to adapt to sustain the future. Also, how schools are distributed all over the world is a trend which shows itself as a trend for micro-schools and pods (Ranieri, 2020). Trends that are influenced by recent developments in technology are artificial intelligence learning, augmented reality training, internet of things, digital responsibility, computational thinking, and emerging technologies, assistive technology, voice platforms, virtual learning, emerging technologies tablets in classrooms (Bhojane, 2019; Rogers, 2019; Burbules, 2020; Maryville University, n.d.; Loren, 2019; Ranieri, 2020). Technology supports the concept of learning and teaching in a way to make learning and gaining knowledge more personalized and more flexible.

"Education is evolving at a faster pace than any other period in recent history. Because of this, it's more important than ever to understand how and where it's changing so that educators and schools can properly support students."
(Rogers, 2019)

All these trends and changes in the educational system, be they in a more general way or in technology, require a new picture of how the building of a school, the learning space in general needs to look to be able to support students´ needs and be a good platform for the execution of an adapted education system for a better sustainable future.

Girls and Education

There are several reasons and challenges why girls do not start, attend, or finish school. A big challenge is poverty. Many poor families often rank other expenses higher than sending their daughter to school (Norad 3, 2017). Another challenge is child marriage with an estimation of 15 million girls under the age of 18 marrying every year (Norad 3, 2017; Girls not Brides, n.d.). Also, early pregnancies influence girls‘ education since they often do not return to school after having children (Norad 3, 2017). Yet another challenge is gender-based violence. Girls are exposed to sexual harassment and violence on their way to or at school (Norad 3, 2017). It is suspected that teachers and other school staff are often involved in that type of violence (Norad 3, 2017). The lack of female teachers is one more challenge. Some parents do not want to send their daughters to school, or remove them from school when they reach puberty, unless the school has female teachers. Another reason why girls leave school when they reach puberty is the lack of sanitary facilities that fulfill girls needs of safety, support, and retreat (Norad 3, 2017). Gender stereotypes still play a role and are a big challenge. Traditional families with traditional perceptions of gender roles often believe that educating girls is not equally relevant and valuable as educating boys (Norad 3, 2017). This again results in high numbers of child marriages and early pregnancies.

“Girls are still in the minority in schools in low-income countries”
(Norad 3, 2017)

Investing in a girl´s education and in education in general is one of the best investments for a country (Norad 3, 2017). This results in many positive effects (Norad 3, 2017). Investing in girls‘ education promotes health and welfare for the next generation, it helps reduce poverty and slows down population growth (Norad 3, 2017). Access to education and the chance to gain knowledge leads to greater potential of employment and income earning as adults (Norad 3, 2017). If girls go to school, they can increase their future income in a low-

income country by 10 to 20% with each additional year of school (Norad 3, 2017). That means also that girls can have a more active role in the political and social debate and in the development of their own society (Norad 3, 2017). This results in mothers, who attend school, make sure that their own children go to school. Thus, girls‘ education can be an upward spiral and lead women and their families out of poverty (Norad 3, 2017).

Education in Developing Countries

Educational approaches can vary from country to country. To figure out the best way to improve the three case schools in Rwanda, Cameroon, and Nepal, it is necessary to understand how the educational system works in each country. As concluded in earlier chapters, culture and the social environment are important influencing factors on education. Therefore, the next chapter will take a brief look at what the cultural settings are and what education looks like in these countries. The section also describes problems and challenges in each country.

Nepal

Fig. 8: Map of Nepal

The Himalayan Mountains and Mount Everest are one aspect to experience in Nepal, but there are many more which will be explored in the following. Nepal has a rich and unique culture, a multi-dimensional heritage that shows diversities of Nepal´s ethnic, tribal, and social groups (Mofa, n.d.). Nepal expresses its culture through music and dance, art and craft, folklore and folktales, languages and literature, philosophy and religion, festivals and celebration, foods and drinks (Mofa, n.d.). The Nepali culture is the result of a long history of migration, conquest, and trade and is mainly represented by Indo-Aryan and Tibeto-Mongolian influences (Everyculture 1, n.d.). Another reason for the rich culture is the diverse topography which divides the country into three horizontal zones: high mountains, the lush central hill, and the flat in the south (Everyculture 1, n.d.) which are responsible for different climate, vegetation, and resource regions (Supertecture, 2019). Those circumstances let the culture evolve and conclude with 125 ethnic groups and 123 spoken languages (Borenovic Dilas, et al., 2018; Everyculture 1, n.d.; Mofa, n.d.). 44.6% of the people speak Nepali, the official language, as their first language (Borenovic Dilas et al., 2018).

Hinduism is the main religion in Nepal and 80% of the population identifies as Hindu, compared to 11% of the population who practice Buddhism (Mofa, n.d.). Modern capitalism made changes in the political and economic system possible and gave people of historically disadvantaged castes better opportunities (Everyculture 1, n.d.). Today, symbols of ethnic identity and castes, like physical traits and styles of dress and ornamentation, are still important and are combined with distinctive forms of music, dance, and cuisine (Everyculture 1, n.d.). These celebrations of the ethnical diversity are being influenced by westernization (Everyculture 1, n.d.). This results in the ability to speak English as a mark of prestige and gives advantages in the job market (Everyculture 1, n.d.). Also, the modern status symbols have changed from owning land and livestock to owning motorcycles, cars, fashionable clothing, televisions, and computers which can be mainly recognised in the cities (Everyculture 1, n.d.). In 2015, Nepal was one of the least developed countries in Asia and ranked 144 out of 188 countries in the UN Human Development Index (Borenovic Dilas et al., 2018). Statistics from 2010/11 show that 25% of the population have approximately USD 1$ per day (Borenovic Dilas et al., 2018). Nepal is also very vulnerable to earthquakes which lead in 2015 to one of the strongest earthquakes in more than 80 years (Borenovic Dilas et al., 2018). Two consecutive earthquakes destroyed almost 500,000 houses, more than 9,300 schools and pushed 700,000 people into poverty (Borenovic Dilas et al., 2018). These earthquakes had a huge impact on the educational system and its slow recovery is mainly due to the high degree of political instability and fragmentation in Nepal (Borenovic Dilas et al., 2018). By January 2018, 88,112 private homes and 2,891 schools had been rebuilt. For several years children were taught in makeshift tents (Borenovic Dilas et al., 2018).

The Ministry of Education is in general responsible for primary, secondary, and higher education (Nuffic, 2015). On the other hand, the Council for Technical Education and Vocational Training (CTEVT) handles technical and senior secondary vocational education (Nuffic, 2015). The education system today is divided into preschool and kindergarten for children under 5 years (Nuffic, 2015); followed by 12 years of school education, primary and secondary, and for people of the age 18 and up, higher education (Nuffic, 2015). Nepalese is the spoken language in primary and secondary school, English is added in higher education (Nuffic, 2015). After the lower secondary examination, which means after 8 years of school, pupils can leave the school or start with the higher secondary education (Nuffic, 2015). In higher secondary, pupils take five subjects a year, whereby English and Nepalese are compulsory (Nuffic, 2015).

Dhoksan

Dhoksan is a rural settlement of the Kathmandu Valley and approximately 1.5 hours away from the capital city (Gyawali et al., 2016). Dhoksan connects Chisapani and Nagarkot, which are both bigger tourist attractions (Gyawali et al., 2016). This connection path is known as a trekking and biking corridor (Gyawali et al., 2016; Bibeksheel Nepali, 2015). The area is an elevated tar land with an altitude of 1810m and sloping terrain towards the Khodku and Godavary River (Gyawali et al., 2016; Bibeksheel Nepali, 2015). The closest market for buying food and other necessary products is in the neighbouring village of Jarsingpauwa (Gyawali et al., 2016). The monthly income is for 77% of the families lower than the national per capita income which is caused by the inability of engaging in high income generating activities (Gyawali et al., 2016). The people in Dhoksan rely on agriculture and animal husbandry, and most women produce wine to generate additional income (Gyawali et al., 2016). Agriculture depends on rainwater which is seasonal in Nepal (Gyawali et al., 2016). Therefore, corn is the main crop as it requires less flooding (Gyawali et al., 2016).

The majority of people in Dhoksan belong to the Tamang ethnic group which has their own culture, language, and architecture (Gyawali et al., 2016; Emergency Architects, 2016). The Tamang believe in Buddhism. Socio-cultural activities are very important for the community of Dhoksan and the Nhangkhor institution plays an active role (Gyawali et al., 2016).

Cameroon

Fig. 9: Map of Cameroon

Cameroon, also called “Africa in miniature” is a state between West and Central Africa and known for its geological and cultural diversity (Studycountry, n.d.). The country has many natural features such as beaches, deserts, mountains, rainforest, and savannas (Studycountry, n.d.). Cameroon has also distinct regional cultural, religious, and political traditions as well as ethnic varieties (Everyculture 2, n.d.). Sharing cooked food is one of the major ways to improve social relationships and express the high value placed on human company because it demonstrates hospitality and trust (Everyculture 2, n.d.). Social support networks between people from the country and from the cities are held together symbolically with gifts of cooked and uncooked food (Everyculture 2, n.d.).

There were and still are different systems in Cameroon of how to rate people, which results in a high degree of social inequality (Everyculture 2, n.d.). Some ethnic groups still practice the traditional social organisation which includes hierarchical relations between members of groups with different status, like royalty, nobility, commoners, and slaves (Everyculture 2, n.d.). Other ethnic groups have a more egalitarian social organisation in which age and gender are the major factors of social stratification (Everyculture 2, n.d.). New forms of social inequality are evolving which are based on access to political power and level of formal education which coexists with indigenous forms of stratification (Everyculture 2, n.d.).

Colonized by Portugal and later Germany, Cameroon got divided into British- and French-ruled League of Nations after World War I, which created Anglophone and Francophone regions (Everyculture 2, n.d.). The English-speaking region consists of the Southwest and Northwest provinces, where Pidgin English is the lingua franca and English is taught in school (Everyculture 2, n.d.). Also, the educational system and legal practices are similar to the British ones (Everyculture 2, n.d.). The majority of the country is French (Everyculture 2, n.d.). In eight provinces, French is the main language, and the French school system is being used here (Everyculture 2, n.d.). The legal system is based on the statutory law of continental Europe (Everyculture 2, n.d.). The tension in Cameroon because of two different systems, languages, and ideals is ever growing, became even bigger as the government introduced in the 1990s a multiparty political system and reached another peak in 2019 with mass demonstrations, riots, war-like situations (Displore, 2018; Nickerson, Hanson, 2014; Everyculture 2, n.d.).

There are approximately 250 local languages in Cameroon which makes it difficult to communicate throughout the country because most people speak one local language and sometimes one official language (Everyculture 2, n.d.). Both English and French are taught in school, but different regions have different preferences (Everyculture 2, n.d.). Only people with a secondary education are actually fluent in speaking at least one official language (Everyculture 2, n.d.). But choosing a random language from those 250 languages to be taught in the whole country would produce political feelings of superiority that might endanger national harmony (Studycountry, n.d.). Some schools try to implement programmes that teach local languages, but there are concerns regarding social stigmas attached to those who just speak their native language (Studycountry, n.d.).

Education in Cameroon is supposed to be free (Displore, 2018). To get into a secondary school is difficult without some pocket money which can be called bribes (Displore, 2018). The schools are expensive even though they are advertised as free schools (Displore, 2018; Studycountry, n.d.). Primary schools have been free of charge since 2000 but parents have to pay for uniforms, books, fees and sometimes even anti-malaria prophylaxis (Studycountry, n.d.). Even though the school enrolment at primary level is at 93.5%, the school attendance is not that high (Studycountry, n.d.). This is mainly affected by child labour (Studycountry, n.d.). 56% of the children between the ages 5 and 14 are working and 53% mix work and school (Studycountry, n.d.). More boys than girls attend school which is caused by early marriage, pregnancies, domestic chores, and traditional biases against girls and women (Studycountry, n.d.). There are also regional differences in attending school. Almost all children of primary school age in the southern areas go to school (Studycountry, n.d.). But the north experiences a low registration. The north is an isolated part of Cameroon, with bad infrastructure and most students do not go beyond

primary school, which is compulsory until the age of 12 (Studycountry, n.d.; Displore, 2018). The education system and the quality of education is not in a good condition to let people develop to their fullest (Studycountry, n.d.; Displore, 2018). Classrooms are overcrowded (Displore, 2018), absenteeism of teachers is normal (Studycountry, n.d.), school buildings in rural parts are in horrible shape (Displore, 2018), educational materials are insufficient (Displore, 2018), and there is a school curriculum that does not work (Displore, 2018). Because of two different school systems, the French and the English systems, teachers cannot establish a general academic approach and repertoire around professional matters and cannot engage in productive debates to improve the quality of education (Studycountry, n.d.).

Rwanda

Fig. 10: Map of Rwanda

Rwanda is the land of 1000 hills (About Rwanda, n.d.), with rainforest and savannah, with golden monkey tracking, gorilla sights, and different tourist attractions around Kigali, a metropole, and the capital city of Rwanda (Bestdestination, 2013). Rwanda has a varied culture (About Rwanda, n.d.). Carving, sculpture, and weaving are the main crafts people learn from childhood (Bestdestination, 2013). One of the best-known art methods in Rwanda is cow-dung painting, which was mainly used as artful plastering on the inside of houses (Bestdestination, 2013). Rwanda is populated by

the Banyarwanda people who share a single language and cultural heritage (About Rwanda, n.d.). Music and dance are essential parts of Rwandan ceremonies, celebrations, social gatherings, and storytelling (About Rwanda, n.d.). The culture also includes the population from neighbouring states like Congo and Uganda who all speak the Kinyarwanda language (Everyculture 3, n.d.). Kinayrwanda is the common and universal language, less than 10% speak French and just a small portion knows English (Everyculture 3, n.d.). Rwanda is the cleanest country in Africa (African Insider, 2020) which makes the country an even more attractive tourist attraction. The government has developed modern roads throughout the country, which created a skating culture, and slums have been transformed into good and affordable housing for the people (African Insider, 2020). “Umuganga” is the key to those developments (African Insider, 2020). It is a practice that takes root from the Rwandan culture of self-help and cooperation (African Insider, 2020). In the traditional Rwandan culture, members of the community would call upon their family, friends and neighbours to help them complete a difficult task (African Insider, 2020). Today, the government is using this cultural aspect to create a national cleaning day each month, where all people in the country help to clean up (African Insider, 2020). It is a mandatory community clean up, and not a voluntary project, which means that no shops are open, so people have time to contribute (African Insider, 2020). Rwanda has three ethnic divisions – Hutu, Tutsi and Twa (Everyculture 3, n.d.). These divisions are based on perceptions of historical group origins rather than on cultural differences (Everyculture 3, n.d.). All these groups speak the same language, practice the same religion and live in the same territory, they share a common culture but are deeply politically divided (Everyculture 3, n.d.). The political differences reached their peak in 1994 with 100 days of genocide (Everyculture 3, n.d.; Trines, 2019). In this war Rwandan armed forces, extremist militias and radicalized civilians from the ethnic Hutu majority massacred 800,000 ethnic Tutsis and political opponents (Trines, 2019). It resulted in the decreasing of the population by 1/3, two million Hutu fleeing the country and traumas in all the people experiencing that time (Trines, 2019).

Ntarama is a small town in a very rural location and further away from larger roads (Hohenhaus, n.d.). It was hit by the genocide in 1994 much harder than in other regions because Tutsis here formed a much greater proportion of the population (Hohenhaus, n.d.). The church in Ntarama was a place of refuge but became a place of massacre. The church is now one of the memorial sites from the genocide (Hohenhaus, n.d.). In towns like Ntarama, Hutus and Tutsis, victims and perpetrators are living beside each other mostly unreconciled (DW, 2014). However, reconciliation is very important for the people to experience closure with the past and continue with life (DW, 2014). Before the war, Rwanda was among the most rural countries in the world, but the war accelerated rapid urbanisation (Everyculture 3, n.d.). This is caused by refugees not returning to their rural homes preferring to settle in the cities (Everyculture 3, n.d.).

Although the government developed the country, the level of industrialisation is low (Everyculture 3, n.d.). The economy is mostly agrarian, with subsistence farming and coffee-growing on the side to supplement income (Everyculture 3, n.d.). The main food and cultivation strategy are dry beans, sorghum, bananas, corn, potatoes, sweet potatoes, and cassava (manioc) (Lemarchand, n.d.). The average economic growth rate has been around 8% for the past 15 years (2004 to 2019) (Trines, 2019). At the beginning of the century about 90% lived from farming (Trines, 2019). Rwanda is called the “Singapore of Africa” and is becoming a technology hub (Trines, 2019).

The mother has the primary responsibility for child rearing and education. Before 1900 education was informal and family members were educators (Visit Rwanda, 2018). Especially the oldest brother of the mother, the maternal uncle, still plays an important role in educating the children by overseeing the moral development and socialisation of the children, and ensuring that they learn social traditions (Everyculture 3, n.d.). There were also specific training schools with courses like military and war skills, foundry and iron smith, basket making and poetry (Visit Rwanda, 2018). Between 1900 and 1960 the formal education of children became popular (Visit Rwanda, 2018). In 1933, the Belgian census led to measurement as well as classification of the population along ethnic and racial lines (Visit Rwanda, 2018). This resulted in the Tutsis being entitled to go to school, and they acquired the best education at the expense of the Hutus. This ethnic tension continued for many decades until 1994.

The Rwandan education system is built up by a 6-3-3-4 school system. This means 6 years of primary school, 3 years of junior secondary school (ordinary level), 3 years of senior secondary school (advanced level) and 4 years for a bachelor‘s degree (Visit Rwanda, n.d.). Although Rwanda´s universal language is Kinyarwanda there are three official languages which are used at school. Kinyarwanda is the main language at primary school in grades 1 to 3, from the 4th grade to university, English is the spoken language (Visit Rwanda, n.d.). French is a supplement subject in public primary and secondary schools (Visit Rwanda, n.d.). Each year there are 44,000 students enrolled in higher education for undergraduate, graduate, certificate and diploma programmes (Visit Rwanda, n.d.).

Improvements and implementations by the government in 2003 resulted in free elementary education, while since 2007 there has been free education up to 9th grade (Trines, 2019). By 2017 all primary and secondary schools had toilets, 60% had tap water (Trines, 2019). Hydroelectric supply is available in more than 55% of the primary schools and in 70% of the secondary schools (Trines, 2019). 70% of the primary schools and 85% of the secondary schools have computers but only 25% of the primary schools and 40% of the secondary schools have access to the internet (Trines, 2019).

Challenges and problems in the three case countries

Most of the challenges and problems of the three case countries regarding education which might be valied for many countries, lie in the quality of education.

- Insufficient budget and curriculums, badly educated teachers, old school materials, overcrowded classrooms, limited early childhood education

    - In **Cameroon**, for example, the curriculums do not work because students are taught irrelevant things, which do not bring value to their lives and the future (Displore, 2018; Zmarly, 2019). Students get to learn a broad field of subjects, but they do not get support from the system to use their knowledge in the future (Displore, 2018). This leads to confusion of misorientation which increases dropout levels, and unemployment rates (Displore, 2018, Zmarly, 2019).

    - Teaching is seen as a bad job which results in fewer good teachers. These teachers get insufficient teacher education as well as no proper curriculum that can be taught (Zmarzly, 2019). This is supported by not having proper textbooks and in general under-resourced schools (Zmarzly, 2019). Understaffed, bad schools are causing high dropout rates especially at high school and secondary education level as, for example, in **Nepal**.

- Lack of accessibility, lack of appropriate classroom materials in combination with no understanding of learning needs and differentiating learning plans

    - The United Nations stated in 2010 that one of their biggest concerns is that girls, indigenous children, children with disabilities, refugee children, children from poor rural areas and children in street situations suffer certain disadvantages regarding education and access to health and social services (Studycountry, n.d.).

    - In **Rwanda,** 98% of children are enrolled in primary school but only 71% will complete it (Unicef, n.d.). 70% of the children with disabilities are enrolled in primary school but schools struggle to give children access, and appropriate teaching (Unicef, n.d.). Only 18% of the children under 5 are enrolled in pre-primary education which is caused by not enough facilities, insufficient budgets, and no trained teachers (Unicef, n.d.).

Findings of Education Studies

- Different people have different preferences of how to learn best
- Learning should be tailored towards the student and has many options for students
- Learning should transfer and construct knowledge and cultivate talents
- Teachers can be the expert and mentor for children
- All roles are flexible and can be adapted
- Connectivism could be the main pedagogic approach
- Education should be updated to life needs and country circumstances (Educating valuable things for life and that community and that time)
- Teachers do not need to only use one educational approach but can vary in their settings depending on the learning approach, project, students, etc. and other circumstances
- Challenges in education are similar in each investigated part of the world
- Lack of quality in teaching and lack of teachers are one of the bigger challenges in the case countries
- Traditional teacher-led education

- No support and access for children with special needs
- Investing in girl´s education is crucial for the development of a country
- High drop-out rates after basic education
- Urban-rural divides
- Difficulties in understanding each other due to different languages, cultures, mindsets, values, status, ...
- The profession of teacher is not respected in many countries
- Many forms of education and little willingness to experiment
- Students often cannot express what they want to learn and have too little freedom in a thoroughly structured day
- Some countries have a good progress in their educational system, but political stability is fragile
- Some problems can be solved by the approach of the thesis but most of the problems are too big to be solved by one thesis

Technology for Education

"Information and communication technology (ICT) in education is the mode of education that uses information and communications technology to support, enhance, and optimise the delivery of information" (LinwaysTeam, 2017).

ICT enabled Dducation

Learning and teaching that is supported by suitable technology improves the students´ ability to learn and to gain knowledge from different fields and perspectives (LinwaysTeam, 2017). Many research projects investigated how technology is improving student‘s skills (LinwaysTeam, 2017; Explainer, n.d.; WBG, n.d.). A study from Japan proved "that an increase in the use of ICT in education with integrating technology to the curriculum has a significant and positive impact on students´ achievements‘‘ (LinwaysTeam, 2017). Students who work with technology every day, have better knowledge, presentation skills, innovative capabilities and put more effort into learning (LinwaysTeam, 2017).

ICT provides access to information through telecommunication, and includes the internet, wireless networks, cell phones, and other communication mediums which means people have more opportunities to use ICT in their everyday life (Ratheeswari, 2018). ICT plays a role in workplaces, business, education and entertainment (Ratheeswari, 2018). ICT is a catalyst for change in every sector (Ratheeswari, 2018). It can influence and trigger change in working conditions, handling and exchanging of information, teaching methods, learning approaches and scientific research (Ratheeswari, 2018). In education, the use of ICT opens up for more opportunities in teacher training programmes, and can improve the quality of teaching (Ratheeswari, 2018). The combined use of ICT in improving teachers' skills and students‘ skills are a key feature for the future (LearningPortal, 2019). It is therefore important that teachers are digitally literate and understand how to integrate ICT into the curriculum as it impacts students‘ learning (LearningPortal, 2019). Ratheeswari points out that "ICT is a scientific, technological and engineering discipline and management technique used in handling information, its application and association with social, economic and cultural matters" (Ratheeswari, 2018).

Many new approaches in ICT have been developed in the last years and even more trends are imminent in the field of education in the following months and years (Ratheeswari, 2018; LinwaysTeam, 2017; LearningPortal, 2019). One of these trends is Mobile Learning (m-learning) (LinwaysTeam, 2017). M-learning is a form of e-learning that is used to reach more students because the classroom is too small or more mobility is required from the students (LinwaysTeam, 2017). This means that students can access information whenever and wherever they want (LinwaysTeam, 2017). Especially during times where children cannot go to school, having ICT tools and using ICT tools is necessary and important for learning and teaching, and for educating children in general. ICT tools can be used to communicate, create, disseminate, store and manage information (LearningPortal, 2019). The technological devices of ICT can give access to course material when students are remote (LinwaysTeam, 2017). They can provide online digital storage for lectures, course material and a digital library (LinwaysTeam, 2017). They can include cloud based academic management systems, and of course hardware with a combination of different teacher-student settings (LinwaysTeam, 2017).

Common educational applications of ICT are for example tablets, interactive white boards or smart boards, and e-readers. Initiatives like “one laptop per child” or the model of the flipped classroom bring other approaches of ICT to the school and the students. In the “one laptop per child” initiative, less expensive laptops have been designed for school use on a 1:1 basis with features like lower power consumption, a low-cost operating system, and special re-programming and mesh network functions (LearningPortal, 2019). The flipped classroom is a teaching and learning model that involves lectures and practice at home via computer-guided instructions and interactive learning activities in class (LearningPortal, 2019). They are also a good possibility to expand the curriculum through their flexibility and adaptability towards needs in knowledge gaining (LearningPortal, 2019).

ICT is a good tool for inclusion. Technology can give children with learning disabilities new opportunities to learn and be with other children of the same age (Explainer, n.d.). ICT brings equity into the classroom as teachers can adapt their lectures and present information that is accessible for every child‘s learning abilities (Explainer, n.d.). For example, students with speech, languages and communication impairments can have access to a text that is supported by symbols or using picture-based systems or text/picture-to-voice applications (Explainer, n.d.). But those applications require specific technological skills and bring some challenges (Explainer, n.d.). To apply those skills while using the technology, resources and commitment are needed (Explainer, n.d.). One of the main challenges is the patchy internet access worldwide (Explainer, n.d.). In the poorest countries only 10% of the people are online (Explainer, n.d.). Less than 10% of the schools in developing countries

have internet access (Explainer, n.d.). Another challenge that comes with the lack of internet access is the knowledge of how to use technology (Explainer, n.d.). The study explains that "… most new technologies are made for those who already have some access, rather than being designed and deployed in a manner that proactively prioritises the most marginalised" (Explainer, n.d.). But the trend shows that a more reflective use of technology for education is emerging, with "increasing focus on rigour, learning, and contributing to the evidence base for the sector" (Explainer, n.d.).

Educational Technology to enhance Pedagogy

Educational technology (ED Tech) is a term for a wide range of different aspects but mainly refers to the "study and ethical practice of facilitating learning and improving performance by creating and managing appropriate technological processes and resources" (Lee, 2019). ED tech deals holistically with the topic education and experiences through learning management systems, digital tools and media, information and communication technology, and school infrastructure, like wifi, devices for students and teachers, data privacy and security (Lee, 2019). The main aspect of educational technology and how the expressions stand out from ICT is the focus on learning experiences and learning theories. ED tech is the use of technology and tech processes to facilitate learning and improve performance (Lee, 2019). With education supported by technology, learning can be self-paced, asynchronous learning, or instructor-led, synchronous learning (Braincert, 2015). Educational technology also enables students to learn in a classroom with the same quality as somewhere else (Braincert, 2015). Researchers refer to that type of learning as `blended learning´ (Braincert, 2015).

Synchronous learning occurs in real-time with many other participants, like the whole class, and refers to the exchange of ideas and information with fellow students during the same period (Braincert, 2015). Some examples of synchronised tools are face-to-face discussions, online real-time live teacher instruction and feedback, via Skype conversations, or chat rooms, or Virtual Classrooms where everyone is online and working collaboratively at the same time (Braincert, 2015). Collaborative work helps students to create an open mind and enables them to listen and learn from other students. It also fosters online awareness and improves writing skills (Braincert, 2015). Synchronous learning uses insights of Vygotsky's socio-cultural theory of cognitive development.

Asynchronous learning is self-paced and allows participants to engage in the exchange of ideas or information without the dependency of other participants´ involvement at the same time (Braincert, 2015). It can use tools like email, blogs, wikis, and discussion boards, as well as web-supported textbooks, hypertext documents, audio or video courses, and social networking using the

web (Braincert, 2015). Asynchronous learning is a good method for inclusive pedagogy (Braincert, 2015). With this type of learning, students can learn new things and use the time they need to do it. They can listen to a lecture a second or third time, or think about a question for a while longer, without fear of holding the class back or embarrassing themselves (Braincert, 2015). Asynchronous learning is inspired by Piaget‘s theory of cognitive development.

Other types of learning are linear learning and collaborative learning (Braincert, 2015). Linear learning is computer-based or web-based learning and refers to self-paced learning activities on a technological device (Braincert, 2015). Through methods like drag-and-drop, multiple choice, simulation, and interactive means, students can store and record their learnings with immediate end-user feedback completion status (Braincert, 2015). Collaborative learning on the other hand uses instructional methods to encourage students to work together on a task. By using social tools students and teachers can work together collaboratively, discuss ideas and promote information (Braincert, 2015). Collaborative learning also prepares students with important technological skills for the workforce (Braincert, 2015).

The ED Tech Learning Experience

The ED Tech learning experiences are categorised by identifying the learning theory behind the whole experience and how to use the knowledge of those learning theories to develop new applications for a better student learning experience (Lee, 2019). As discussed in the beginning of the thesis, there are different learning theories that are mainly influencing the future schooling approach – behaviourism, cognitivism and (social) constructivism. Those topics provide different perspectives of learning and teaching and are important for further ed tech developments (Lee, 2019). The following section is an introduction to how ed tech facilitates learning through the lenses of these learning experiences.

Behaviourism is the idea that all behaviours are acquired through conditioning (Lee, 2019). The psychologist and behaviourist B.F. Skinner translated operant conditioning into academic learning which is now called programmed instruction (Lee, 2019). Programmed instruction is a type of instruction that involves a teaching machine that provides stimuli and additionally reinforces them based on their responses (Lee, 2019). The learning content is split into smaller sections, each section requiring students to respond to stimuli (Lee, 2019). Students get immediate feedback to the response (Lee, 2019). Behaviourism-based technologies are digital, game-based learning tools that incorporate drill and practice to increase the student‘s knowledge in the required subject areas of a project (Lee, 2019). They are mostly computer assisted instruction websites that provide quizzes with immediate responses (Lee, 2019).

Cognitivism focuses on “how information is received, organised, stored and retrieved by the mind” (Lee, 2019). It focuses more on the mental processes. Therefore, it focuses in education on how information is presented (Lee, 2019). Information is mainly organised in sequences so that it is easier to understand and remember (Lee, 2019). It can catch attention and helps students to make sense of the information that was given, which leads to storing that information and building up mental maps (Lee, 2019). Cognitivism-based technologies can be presentation tools which provide visual learning – with visuals that follow perception principles to help students better focus on important information (Lee, 2019). They can also support auditory learning, or they are digital multimedia tools to communicate information via text, photo, videos and interactive whiteboards (Lee, 2019).

Another perspective of learning experiences is constructivism. There are many meanings of the term `constructivism´ so it is hard to define it, but all definitions have in common the belief that “knowledge is constructed by learners as they attempt to make sense of their experiences” (Lee, 2019) which is the key essence of the cognitive development theories of Piaget and Vygotsky. Mary Driscoll from the Florida State University College defined prescriptive principles in constructivism as followed (Lee, 2019):

- Embedded learning in complex, realistic, and relevant environments
- Provide for social negotiation as an integral part of learning
- Support multiple perspectives and the use of multiple modes of representation
- Encourage ownership in learning
- Nurture self-awareness of the knowledge construction process

Constructivism-based technologies are digital tools to support the learning experience of each student and are helpful in interpreting information. Those technologies can facilitate collaborative activities during the investigation process of a project, for example, by digital learning journals to document the learning as well as to reflect on the learning (Lee, 2019; Isik, 2018). Constructivism-based technologies enable, in addition, individual learning as well as lifelong learning (Isik, 2018). They provide flexibility to the curriculum and to the learning environment (Lee, 2019). These technologies cansupport activity-based learning (Lee, 2019). Technologies and different applications are good tools to support skills development and the attitude towards learning as the constructivist approach has a positive impact on students´ attitudes towards the classes (Isik, 2018).

A study concluded that the best use of educational technology is done by the teaching approach of project-based learning (Lee, 2019). During project-based learning the tech integration is most effective because students learn by actively engaging in real world and personally meaningful projects (Lee, 2019). The use of educational technology and ICT facilitates learning and is transforming the learning experience of each student. It is a helpful resource to empower connected learners in a connected world. Students who “use a variety of technologies within a learning process identify and solve problems by creating new, useful or imaginative solutions” (Lee, 2019). It gives students a new role with more responsibility and ownership which leads to better learning experiences and learning outcome.

Findings of Technology for Education

- Suitable technology improves student´s ability to learn and gain knowledge
- Integrating technology in the curriculum has a significant and positive impact on student´s achievements
- Many ways to integrate technology in daily school life but infrastructure is in many countries not good enough or non-existent
- Educational technology is flexible and can introduce different pedagogical approaches to the learning environment

Learning Space Design

Creating a new learning space that sustains in the future needs additional information regarding the status quo of school architecture, planning standards and regulations. Understanding the basic principles which are crucial for school architecture is important to figure out why schools in many countries lack in quality. This research part investigates what a learning space has to give children to be the best place for learning and developing. The research deals with the three case schools in Rwanda, Nepal, and Cameroon to understand the intentions. It also gives a brief look into school buildings and how the space is made to support children (or not).

The Learning Space in Cameroon, Rwanda, and Nepal

Three schools which were built with the help of the PATRIZIA Children Foundation are examples for how the learning space looks today in three different countries. These three schools are also used as a tool that supports the process of creating a new learning space. They serve as support and reference points for testing of the thesis outcomes. Contact was established with various people who either come from these countries, or work in the educational sector, or have already implemented several school architecture projects, or are students of architecture.

Secondary School Yaoundé, Cameroon

The secondary school in Yaoundé is situated next to a kindergarten, a primary school, and is in close proximity to a parish (PCF, 2020). Built in 2016, PCF invested 200.000 € of the total amount of construction cost of 350.000 € (PCF, 2020). 800 children have the possibility to communicate, collaborate, and learn in 21 classrooms (PCF, 2020). Unfortunately, there is no further information regarding the secondary school in Yaoundé.

Fig. 11: School in Cameroon, inside and outside

Vocational Training Centre + Boarding School, Ntarama, Rwanda

The “Nelson Mandela Education Center for apprentices“ is a training centre for adolescents between the ages of 15 and 20. The students can get apprenticeship as an electrician, a sewer, a mason, a hairdresser, and in metalworking and welding (PCF, 2020). The Patrizia Children Foundation supported the Vocational Training Centre by investing money that was used to build the two accommodation buildings for girls and boys (PCF, 2020). The school buildings include rooms for teachers, a kitchen, and a dining room, four workshop areas to teach and store machinery, as well as seven classrooms (PCF, 2020). The classrooms are split between four buildings. Approximately 200 students get further education and a possibility to improve their future (PCF, 2020).

Fig. 12: School in Rwanda, inside and outside

Shree Shila Devi School, Dhoksan, Nepal

The Shree Shila Devi School in Dhoksan is divided into two parts and in total six buildings. The first part, with two buildings, was built in 2012 and serves for grades 1 to 5. In 2018, four additional buildings were built as classrooms for grades 6 to 8 and a library. It is therefore a primary school as well as a middle school. With a total amount of 152 m², 120 students get access to education. The total sum of construction costs was 225.000 € invested in 2012 and 2018 (PCF, 2020).

After the earthquake in 2015, the NGO “supertecture“ was commissioned to expand the „Patrizia-Children-Foundation“ elementary school in Dhoksan. Supertecture´s concept was to build “classroom houses” which were designed in four different styles (supertecture, 2019). Each „classroom house“ was planned, prepared, and implemented by architecture students mainly from Germany (supertecture, 2019). The result was a brick house, a clay house, a natural stone house and a library house made of recycled windows and other materials (supertecture, 2019). Because Nepal in general is an earthquake region, schools need to be especially robust and withstand earthquakes without any damage. Supertecture used for examples clay reinforced with five different materials combined with narrow bands of prefabricated concrete elements which are connected to each other (supertecture, 2019).

Fig. 13: School in Nepal, outside and sketches

The buildings need to be safe in case of emergency for the children as well as a shelter for the community in general.

Developing a new school in Nepal

Building a school in Nepal includes specific preparation and requirements due to the country´s topography and its vulnerability to earthquakes. As in many other countries, schools in Nepal are built with certain standards which are mainly older and have been used for some decades. An interview was held with Dr. Sangeeta Singh from the Department of Architecture at the Tribhuvan University in Nepal to get more insights on how schools are developed in Nepal. Dr. Singh explained that many schools teach in a traditional way and they feel comfortable with their teaching approach and the resulting settings of their classrooms. The learning spaces in Nepal and especially in rural parts of the country do not include a lot of equipment. So far, they have what they need for their teaching. Teaching in rural schools is mainly done out of books, with a blackboard and some chalk. In urban areas the demand for more technology is increasing and the schools and their supporters are trying to better implement it in the classroom and teaching approach. Parties who build schools are either the public sector or the private sector which also includes NGOs. All three parties have different preferences about what is most important for a learning space. The government considers costs more and decides on a

specific procedure, as well as the consultancy and construction builders for developing the new school. This is also observed in other countries like Norway or Germany. The private sector prefers to use the existing space as efficiently as they can. The public sector puts more emphasis on sustainability than the private sector and tries to support local material suppliers and regional materials. Some schools began to introduce passive solar technology to their building sites. When NGOs are involved in the school building process, more innovation is happening. The school becomes perhaps more advanced and mostly there are more funds to play with. Since the Covid-19 pandemic, money and costs in general have become more important. To combat this better, Nepal and the changing demand in the educational sector is supported by donations from other countries. Planning and developing a school in Nepal is mainly done by architects and civil engineers. They are seen as experts in their field. Therefore, it is not a necessity to involve students and teachers in the planning process. Dr. Singh explained that this is the case in most processes including creating schools. Schools are built by standards and do not need insights from users and other stakeholders. She also said that the general attitude of the developers is that children are there to study and not to participate. Dr. Singh mentioned that the use of the participatory approach is established in Nepali architecture and design but mainly in the context of public spaces, parks, and outdoor facilities. Here designers and architects gain more insights and ideas which are important for the people using those specific spaces. Social and cultural traditions play an important role when it comes to community spaces. The same was observed regarding disaster management and reconstruction of communities. Here people are more involved in the rebuilding process. Schools are not built with a community especially when the demand for a school has higher priority than building an appropriate school with good qualities that fulfil the needs of the people using it.

Dr. Singh believes that the school in Dhoksan is a good example of how schools are built with regional materials in Nepal. The school shows the preferred way of building, processing and material use. It used local materials, and interesting ones too, like clay combined with straw, pine needles and cow dung and a bamboo, rice-straw roof (supertecture, 2019).

School Architecture

A good learning space is not only about how children interact with the environment but also about how the environment supports the child‘s wellbeing and health and so a child‘s ability to learn (Tucker, Izadpanahi, 2017). A child spends a lot of time in the classroom and school in general. Research shows that the environment in which children live and are can impact their intelligence (Tucker, Izadpanahi, 2017). It also says that a child‘s immediate built environment is a primary medium for learning in young children (Tucker, Izadpanahi, 2017). Children observe their surroundings, their environment, and the people they are with and identify behaviour and other aspects which are important to live and easy to use. The school environment is an important influencing factor in the child‘s development (Tucker, Izadpanahi, 2017) and buildings need to support the development of children in a positive way (Wolters Kluwer, n.d.).

The natural environment has a big effect on children learning (Tucker, Izadpanahi, 2017). Children‘s concentration levels can be improved by integrating natural environments with indoor and outdoor built environments, so having green schools can improve children‘s physical, mental, and social wellbeing (Tucker, Izadpanahi, 2017). Air quality, visual comfort, thermal comfort and acoustics are also big influencing factors which are under the umbrella of the natural environment (Tucker, Izadpanahi, 2017). The impact of those factors is highly influencing behaviour and attitudes, and a well-designed school can increase the engagement with learning activities (Tucker, Izadpanahi, 2017). Other impacts on the learning process are the relationship of the rooms and the interaction between inside and outside as well as the balance between personal space and community space, the arrangement of different learning landscapes, colour and quality of light (Wolters Kluwer, n.d.).

Designing good schools gives the opportunity to enhance educational outcomes by creating better learning environments (Tucker, Izadpanahi, 2017). The design of buildings can have a direct and long-term symbolic impact on children and can even impact children‘s behaviour outside the school (Tucker, Izadpanahi, 2017). Studies have discovered that environmental experiences in childhood can endure into adulthood (Tucker, Izadpanahi, 2017).

Old School Architecture

School building architecture reflects the respective educational, cultural, social, economic, and technical conditions of each country and era of time (Kettel, 2020). During Industrialisation, school buildings were structured towards discipline, standardisation, operationalisation, and principles of order (Kettel, 2020). They reflected the needs of the time and workforce.

Old school architecture has a hidden curriculum and shows the specific requirements for students (Brittin, et al., 2015). Front seats, answering questions correctly, and completely reproducing what has been handed down have been, and in some countries still are, the most important requirements (Brittin, et al., 2015). So far, the school architecture is a good tool for that type of curriculum and pedagogic approach. But those requirements are no longer important. Children in schools now are the employees of the future. Therefore, it is obvious that the curriculum, the requirements of students and what they learn should be useful for the future. So, to see what the new requirements for students are, one must research what the requirements for future employees are. In the working environment, it is not important that an employee can `sit still´ (Brittin, et al., 2015). Employees should be able to move around and be flexible (Brittin, et al., 2015). There is also no need for employees who can only `answer questions´ (Brittin, et al., 2015). There is a need for employees to ask questions independently, who raise awareness and who not only reproduce what has been handed down, but find new things themselves (Brittin, et al., 2015). Some new tasks for a school are supporting learning to solve problems, and to give children space and time for independent, active exploration, in order to experience the world and learn from it (Brittin, et al., 2015).

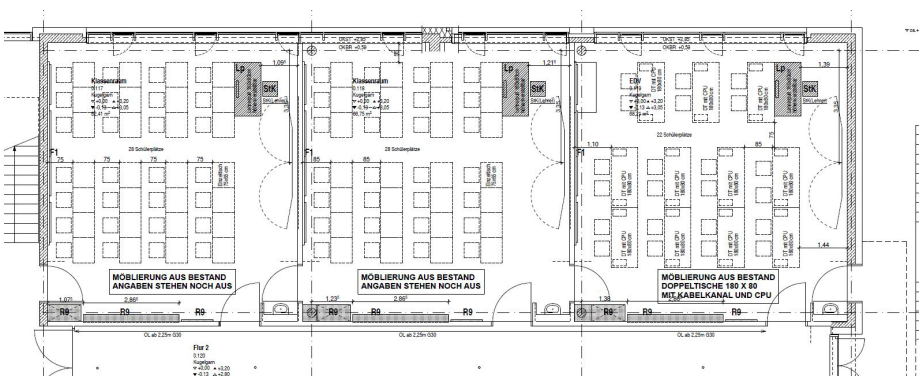


Fig. 14: Floorplan of a school from 2012 shows a traditional teaching approach

In a traditional classroom the curriculum emphasizes on basic skills (N.a., 2014). There is a highly valued fixed curriculum, and the learning materials are primarily textbooks and workbooks (N.a., 2014). The traditional classroom supports learning by repetition and is set up to give the teacher a directive authority role (N.a., 2014). The rows of tables for students let the student become a recipient of knowledge who is mainly working alone (N.a., 2014).

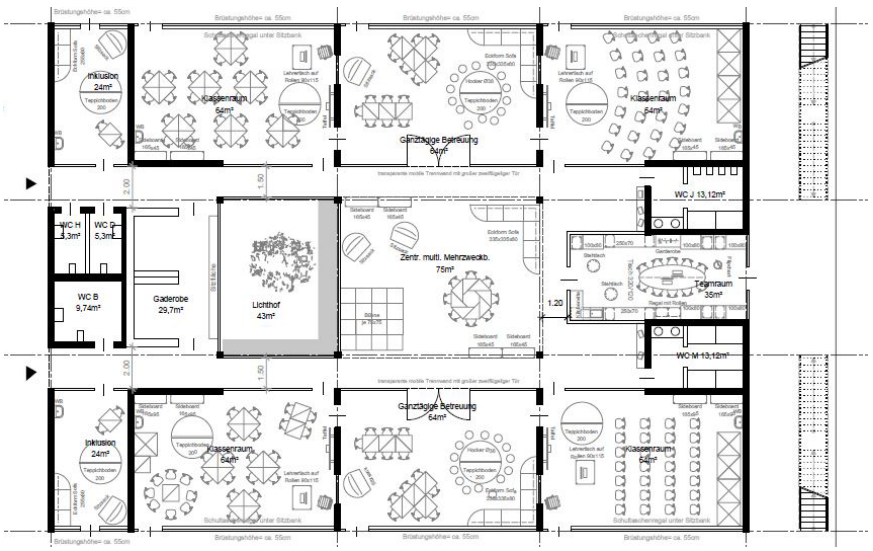


Fig. 15: Floorplan of a „learning house“ from 2016 with an advanced teaching approach

This floorplan can be seen as an example of a constructivist classroom. A constructivist classroom supports an interactive learning experience (N.a., 2014). Through the classroom set up, the teacher has the opportunity to have a better dialogue with students and students can work in groups (N.a., 2014). The teacher‘s role changed to an interactive role which roots in negotiation (N.a., 2014).

School architecture reflects the standards of working and living. Some of the schools with old school architecture guidelines are still in use as barracks or corridor schools (Kettel, 2020). The school construction guidelines in Germany which were established in the 1960s were not revised until 2012 (Kettel, 2020). This phenomenon is also noticed in other countries all over the world. Schools are not adapting towards future needs for a long time and discovered in the last years that changes need to be done.

To understand how the space can be to sustain for the future, it is helpful to explore the most common mistakes in general school architecture. These common mistakes are (Zickgraf, 2007):

- Buildings are too large which leads to anonymity. If buildings are too large students and staff will not recognise each other and that can lead to safety concerns

- Lack of protection against crime, accidents or violence due to lack of clarity for supervisory staff and unsafe paths, stairs or playground equipment

- If buildings are too small, they lack special rooms for leisure activities after school and enough space for students to learn and grow

- Too little connection between entrance and classrooms

- Noise if build with bad acoustic measures or next to busy places

- Waste of energy due to drafts and poor insulation of heating systems in older buildings which can cause health concerns for students and staff members

- Dark corridors and rooms that require constant artificial lighting

- Low ceiling heights because it oppresses the room

- Too small classrooms or too few learning materials for students

- Too few and poor common facilities for teachers and students (technical equipment, ergonomic furniture, noise)

- Too few and too small rooms for administration

- Insufficient noise insulation

- No facilities suitable for the disabled (lack of elevators, ramps, handrails, electric door openers, etc.)

- Poor facilities for maintenance which leads to an increase in vandalism

- Lack of cleanliness due to materials that are difficult to maintain and insufficient possibilities for waste collection

These common mistakes may be also found in the three case schools in Rwanda, Cameroon, and Nepal. Some observed mistakes that all three schools have are too few learning materials for students and too few common facilities for teachers and students. Another mistake concluded from photographs is that the facilities do not include all children very well. It must be said that a proper analysis of the schools could not be done due to the lack of information and photographs, as well as other insights from school members and the PATRIZIA Children Foundation.

In most of the developed countries there are special guidelines and standards on how to build a school and to ensure that the important influencing factors on how children learn are fulfilled. These guidelines and standards are not specific for each of these countries, but one can assume that they can be useful for building schools all over the world. These guidelines and standards are a good base for the design principles which this thesis would like to create.

Child-friendly schools

Children are the main user of a learning space, so it is obvious that a school should be planned with the children in focus. UNICEF, with support of Wright et al., created a guideline for developing child-friendly schools. UNICEF´s study researches many different factors that influence a child in general and shows a way to create a good school for children.

"Quality education is education that works for every child and enables all children to achieve their full potential!" (Wright, et al., 2009)

There are many factors that keep children out of school. These are mainly concerned in the areas of household poverty and the need to work, ethnicity or minority status, gender, remote rural location and early childhood illness caused by exposure to unsafe and unhealthy environmental conditions, like contaminated water or indoor air pollution (Wright, et al., 2009). Although children have a school close by and go to school, there are other factors which influence the attendance and the experience of going to school. Children‘s experience in school can be influenced by marginalization by teachers who either fail to engage students in the learning and teaching process, who do not speak the children‘s language, who do not believe that the students are

capable of learning, and by teachers who do not have the pedagogic skills to handle the diversity of children (Wright, et al., 2009; UNICEF, 2007). Also, a lack of support from parents can be a reason for children not attending school. Parents who did not attend school themselves cannot recognise the importance of good education and prefer to let their children work to earn more money for the family.

But not only teachers are a problem for the students' attendance at school, also the physical design and infrastructure can exclude children. This type of exclusion can happen through giving children with disabilities no access and a chance for participation (Wright, et al., 2009; UNICEF, 2007). A big impact on exclusion is the lack of separate toilet facilities (Wright, et al., 2009). Other factors that influence the school experience of children are the management of the school, the prevailing ambience of the school, and a school culture that "supports" bullying (Wright, et al., 2009). The word "support" is described as an underlying problem in the education system that certain populations are routinely demeaned or stigmatised by school practices (Wright, et al., 2009; UNICEF, 2007).

A child-friendly school is also a child-seeking school (Wright, et al., 2009; UNICEF, 2007). Those schools celebrate diversity and include all children in the education system by ensuring non-discrimination (Wright, et al., 2009; UNICEF, 2007). UNICEF created a list of innovations on how schools can become more inclusive for all children. The list includes local school mapping and community monitoring systems, satellite schools, community schools, mother tongue instructions in the early grades and multilingual and multicultural education, non-formal education programmes, special efforts to combat exclusion, safe spaces for education in emergency situations, promoting birth registrations and strengthening community-based early learning opportunities, as well as building partnerships through a mix of education and non-education partners (Wright, et al., 2009). Inclusiveness is an important factor in designing the best learning space for the future. The measures UNICEF listed above are good examples of tackling the problem. All these measures should be seen as possibilities and not mandatory measures. This also means that organisations can choose the most appropriate measures to solve the problem of a specific situation.

A good approach to finding the most appropriate measures is a democratic participation of the different stakeholders, including children. Architecture can be used as a tool in pedagogy (Tucker, Izadpanahi, 2017). People can learn from architecture and not just in it (Tucker, Izadpanahi, 2017). Zickgraf specifies that "people's participation in the planning and construction of their houses is a primeval human need and therefore leads, especially among young people, to a strong identification with the houses that have been built through participation" (Zickgraf, 2007). This refers also to a participatory process in

the planning and construction of schools and community buildings. To include users and stakeholders in the process of planning and creating the school building as well as in developing and negotiating the curriculum, will make it easier for children attending school. If parents and other stakeholders are involved in the process, they can express certain aspirations they have for their children (Wright, et al., 2009; UNICEF, 2007). Parents have to see the benefits of investing in education to let their children attend school. To use the inputs from stakeholders and professionals, like curriculum planners, subject specialists, school managers, and classroom teachers, they need to be a part of the co-creation process too (Wright, et al., 2009).

Including the children´s perspective is very important in creating child-friendly schools (Wright, et al., 2009; UNICEF, 2007). With the child-centredness aspect and child participation, the planning and decision-making process of a new learning space will be fully accepted as a space for educating children in a developmental and age-appropriate way. This will also include the needs and wishes of children.

"When school´s architecture is a reflection of the community, culture, natural environment and the family, schools are more than just shells or physical structures. When a school is envisioned and created with the child at its centre and supported by the family and the community, the physical structures become interactive places to learn and teach – places where teachers facilitate and manage the learning process and students learn and explore new possibilities that match their abilities and potential." (Wright, et al., 2009).

The following table shows UNICEF´s principles for child-centredness which can be included in the process of creating universal guiding principles and therefore the best learning space for children.

Principles of child-centredness	
Starting with the child	- Consider the child holistically and coherently, embracing the particular characteristics - Every child‘s developmental and learning needs should be considered throughout the life cycle, and every child‘s ability, health, and nutritional status, as well as any discriminatory pressure should be acknowledged
Healthy for children	- Environmental factors can undermine participation in education. - Providing safe water and appropriate sanitation facilities are basic first steps in the creation of a healthy, child-friendly learning environment
Safe for children	- Safe location for all children in the community - Environment needs to be designed to meet the basic human needs of children - Children‘s involvement in activities that make the school cleaner, prettier and more environmentally sustainable
Protective of children	- A child-friendly, protective environment is not only conducive to learning, but also to play and healthy interaction - Harassment and antisocial behaviour cannot be allowed - Child protection and safety at home has a direct impact on children‘s capacity to attend class and to learn - Children must feel safe as they travel from their homes to school - Establishing and enforcing codes of conduct that protect children from sexual harassment, abuse, violence, bullying, physical punishment, stigma and discrimination

Fig. 16: Principles of child-centredness

General Principles in Educational Architecture

"There is no blueprint for the design of child-friendly schools, but there are guidelines that illustrate how child-friendly principles help generate standards for high quality in a variety of circumstances" (Wright, et al., 2009)

There are many different influencing factors on a school's physical design. These include local environmental conditions, climatic conditions, building materials, level and availability of local human capacity, resources, and priorities (Wright, et al., 2009). The following topics and themes are a collection of different perspectives on planning standards in educational architecture. These standards are governmental standards from different countries and / or internationally accepted standards, like those from ISO. This compilation gives an overview of what is necessary and important but is not saying that these standards are mandatory for each school project in the world´s countries. Each country has its own guidelines which are adapted to a country's specific circumstances. When developing a new school in a new country, the country specific guidelines need to be included and compared with the necessary and important internationally accepted standards.

Technical norms

„A norm is a rule, standard, or pattern for action" (William, 2020). The following technical norms are a collection of ISO standards. ISO is the International Organisation for Standards which developed and agreed with experts in internationally accepted standards for various fields. These include for instance quality management standards, environmental management standards, health and safety standards, energy management standards, food safety standards, and IT security standards (ISO, n.d.). ISO explains that their "… standards are working in the background of our daily lives to make things easier, safer and better" standards (ISO, n.d.).

The technical norms which are relevant for developing and building schools are found in the ISO Standards catalogue under ICS 91 Construction Materials And Building Standards (ISO, n.d.). ICS 91 has several under-categories which explain the norms for several aspects of building such as general elements of buildings, structures of buildings, external structures, construction materials, protection of and in buildings, installation in buildings, lighting, interior finishes, building accessories (ISO, n.d.).

Human Comfort in the School Building

The physical space impacts human health and wellbeing (Barett, et al., 2015). The human comfort in buildings is partly regulated by international standards. Comfort can be influenced by personal factors such as age, gender, level of health, clothing worn, activities and level of intensity, access to food and drink, acclimatisation, and the psychological state (Designing Buildings, 2020). Health and wellbeing are a big part of feeling comfortable in a space. Health and wellbeing are defined by individuals having "… the psychological, social, and physical resources they need to meet a particular psychological, social and / or physical challenge" (Designing Buildings, 2020). Other aspects of the physical space that impact human health and wellbeing are thermal comfort, indoor air quality, visual comfort, acoustics, and ergonomics (Designing Buildings, 2020).

Thermal comfort

Thermal comfort according to BS EN ISO 7730 is the "… condition of mind which expresses satisfaction with the thermal environment", which means the feeling when someone is not feeling either too hot or too cold (Designing Buildings, 2020). Two parameters are decisive: 1) "the thermal comfort feeling due to the balance between accumulated and lost calories in the body; and 2) the control of the climatic conditions including sun position and radiation, temperature, humidity and winds" (MEST, n.d.). When people are dissatisfied with the thermal environment, the impact of discomfort influences the ability to function, the satisfaction in the school or at work, or the likelihood to remain as a customer in a shop (Designing Buildings, 2020). When developing school buildings, the climatic conditions of the area need to be considered when the construction is proposed. Therefore, additional data needs to be collected, such as: 1) "average monthly temperatures with minima and maxima; 2) local hygrometry; and 3) prevailing wind for each climatic season and frequency of strong winds and storms" (MEST, n.d.). The indoor air quality is an important factor in thermal comfort. Ventilation is necessary in buildings to remove `stale´ air and replace it with fresh air, and prevents overheating (Designing Buildings, 2020). Classrooms need good fresh-air circulation to avoid heat and excessive humidity (Wright, et al., 2009). School buildings should use building and furniture materials which are non-toxic to not pollute the air children are learning in.

Visual comfort

Visual comfort is defined by the provision of light, external views, and reduction of glare (Designing Buildings, 2020; ISO, n.d.). The need for standards and well-designed lighting is based on 1) "natural lighting resulting from direct sunlight or indirect light reflected from surfaces" (MEST, n.d.); 2) artificial light from electricity sources (MEST, n.d.); and 3) "brightness or intensity of light

whether from natural or artificial source or from an opaque surface or object" (MEST, n.d.). For adequate daylight, a minimum of 20% of the classroom floor area should be window area (Wright, et al., 2009; ISO, n.d.). Classrooms must be sufficiently shaded from direct sunlight, glare (direct light) and reflection (indirect light) (Wright, et al., 2009; ISO, n.d.). Good use of the changing daylight in primary schools stimulates creativity and playful learning (Lykke Jensen, et al., 2015; Kongebro, 2019). If light is evenly distributed and reaches far into the classroom, it provides ideal conditions for reading and studying which is important for all types of schools (Lykke Jensen, et al., 2015; Kongebro, 2019).

Acoustics

Excessive noise or disturbance may have a negative effect on health or the quality of life (Designing Buildings, 2020). Schools should not be located close to sources of excessive noise like traffic, railways, industries, informal sector activities (Wright, et al., 2009; ISO, n.d.). The exposure to excessive noise can contribute to cardiovascular disease, high blood pressure, headaches, hormonal changes, sleep disturbance, reduced physical and mental performance, and reduction of wellbeing (Souya, 2019). If the environment is acoustically comfortable, children can better focus and feel calmer too (Souya, 2019). Acoustical discomfort can interfere with the learning process and decrease attention levels and worsen student-teacher communication (Souya, 2019). This can result in mood swings, increased stress, tiredness in students, and decreased cognitive skills (Souya, 2019).

There are four different types of sounds in a school which can be improved with the right measures. These are outside noises from vehicles, from the yard, from the sports court; internal noises from teacher´s speech or parallel conversations; impact noise such as footsteps and jumps, or equipment noises from furniture, air conditioning system, fans or computers (Souya, 2019). The right measures are for example the use of porous materials to absorb more sound. This can be furniture, textiles, posters and pictures which do not reflect the sound back into the classroom.

Health provision

Water and hygiene

Sanitary spaces for different users with access to hot water, water use, reuse and collecting measures are the main areas of the hygienic environment (MEST, n.d.) and need to be included in the process of developing a new learning space. Giving girls and boys, teachers and other staff members separated facilities with access to soap and other cleaning agents to wash hands is necessary for feeling comfortable, safe, and protected (Wright, et al., 2009). Those facilities are also good to teach children what hygiene is and

how to be hygienic. Schools need to provide water and hot water (Wright, et al., 2009; ECDM, 2009).

Nutrition
A school building should also include space for a kitchen and school meal preparation (Wright, et al., 2009). A lack of nutrition has shown its negative effects on children‘s development and ability to learn and concentrate in school (Wright, et al., 2009). Each kitchen should be equipped with the necessary tools and furniture to store and prepare food and to ensure the quality of the food (Wright, et al., 2009).

First aid
Schools should have at a minimum a first-aid kit or a medicine cabinet for basic emergencies or accidents in areas which are frequently used like kitchens or common spaces (Wright, et al., 2009). If the school is in close proximity to a clinic, this would enable health personnel to visit the school from time to time and permits children to be taken to the clinic for the treatment of health problems (Wright, et al., 2009). Having a school and a clinic close by provides students with general health services but can also provide access for community patients (Wright, et al., 2009).

Safety and Protection

Next to being safe and protected while in privacy in sanitary spaces, the school itself should be a safe place for children, staff and the community. Therefore, a mix of privacy and transparency, a link between indoor and outdoor, should be the norm to ensure safety. The school building and the school grounds in general should be developed to protect against intrusion, theft, vandalism, and arson (Wright, et al., 2009; ECDM, 2009; MEST, n.d.). It should protect against accidents and fires by using good, inflammable materials, and providing fire fighting equipment, as well as escape possibilities (Wright, et al., 2009; ECDM, 2009; MEST, n.d.). Another big protection point is maintenance and measures against deterioration. The school should be a safe space while confronted with natural disasters (Wright, et al., 2009; ECDM, 2009; MEST, n.d.). Primary aspects for disaster resilience are for example earthquakes, storms and strong winds, floods, fire safety, lightning, landslides (Anwaar, et al., 2016). Climatic factors can have serious effects on the school building if not taken care of (MEST, n.d.). One possibility is to consider the climatic factors while developing the school building, especially on external features like insulation, waterproofing, roof water drainage, the position of windows and doors (MEST, n.d.). Biological agents, like termites, ants, or spiders, but also small animals like birds and rodents as well as fungi can destroy the school structure but can also be harmful for the health, safety and comfort of the users (MEST, n.d.).

Furniture, Equipment and Ergonomics

“School furniture and equipment must be adapted to the size of the students using them”, as well as appropriate for the user and use case (MEST, n.d.; Brittin, et al., 2015). Classrooms should include tables and chairs for students as well as for the teacher. Figure 17 shows standards in ergonomics and how high tables and seats should be regarding different age groups. Classrooms should provide tools to present and collect knowledge and have the possibilities to supplement the learning experience with technical devices (MEST, n.d.; Brittin, et al., 2015). Many countries and schools see the advantages in following the ergonomic standards and norms for furniture in schools (Singh, 2020). Dr. Singh explained in the previous mentioned interview that from experience, Nepal´s schools use standards which were implemented 30 years ago and support the traditional teaching approach (Singh, 2020).

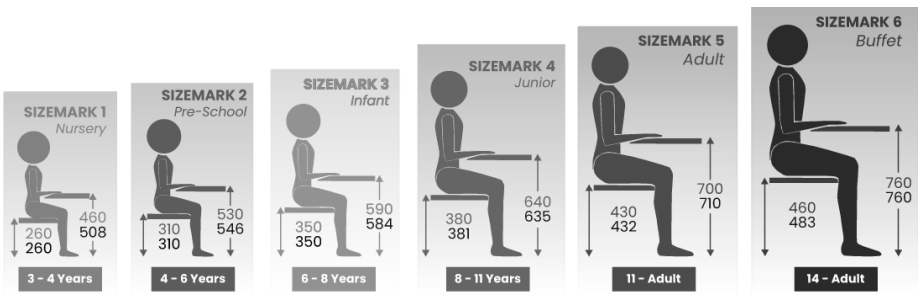


Fig. 17: Standards in ergonomics. Table and seating height regarding age group

Impact of Human Comfort in Learning Spaces

Many studies researched the impact of the factors for human comfort on human health and wellbeing and measured how these are affecting the learning conditions and learning results of students. The study conducted by Sigmund concludes that “well designed classrooms can boost learning progress in primary school pupils by up to 16% in a single year” (Sigmund, 2018).

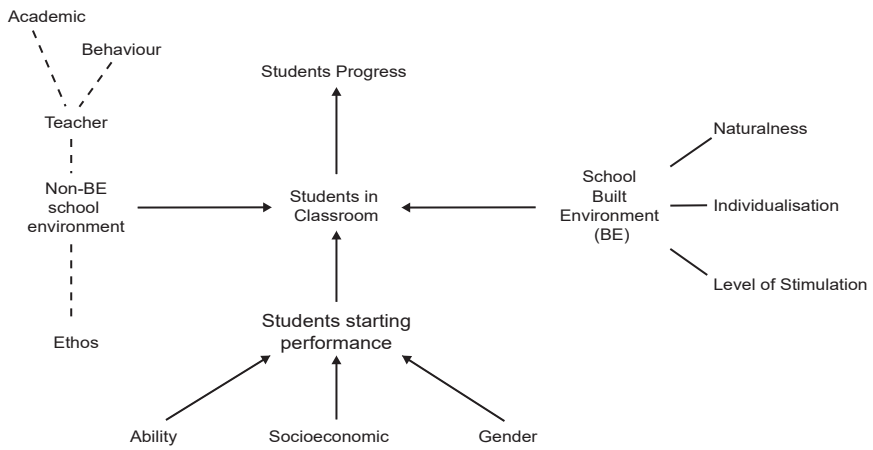


Fig. 18: Overview impact on students progress

One study concluded that 50% of the impact on the learning outcome comes from the aspect of comfort, or what they call “naturalness” (Tucker, Izadpanahi, 2017). The study defines “naturalness” and the influencing parameter as light, sound, temperature, air quality, and links to nature (Tucker, Izadpanahi, 2017). All in all, the study found that there are 7 parameters which explain 16% of the variation in pupils´ academic progress (Tucker, Izadpanahi, 2017). Next to light, temperature and air quality are ownership, flexibility, complexity and colour (Tucker, Izadpanahi, 2017). The impact on students learning progress is driven by a wide range of factors, none is dominant. These factors support the holistic experience of space (DETAIL, 2018; Barett, et al., 2015).

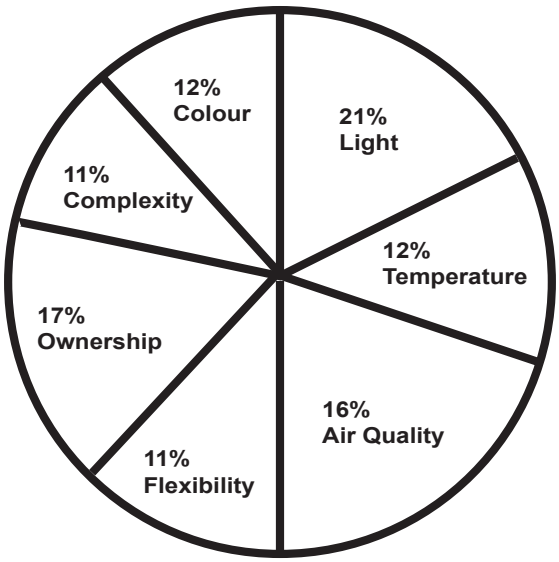


Fig. 19: Impact on students learning progress in reading, writing and mathematics

To feel comfortable in a space is important to be able to spend several hours in a classroom. Space can encourage students or disturb them (Tucker, Izadpanahi, 2017). The right amount of stimulation is key. Space can stimulate, as well as under- or overstimulate children through colours and complexity (Tucker, Izadpanahi, 2017). A focused attention is important for the learning experience (Tucker, Izadpanahi, 2017). This can be challenging for younger children because the visual features in the classroom may influence the still developing and fragile ability to actively maintain tasks and ignore distractions (Tucker, Izadpanahi, 2017). The degree of stimulation is part of the general planning process, but developers and planners should be aware that students still contribute to the classroom by using the classroom (Tucker, Izadpanahi, 2017). One study found that it is important for all students of different ages to be self-actualized, to develop, to individualize and personalize the classroom (Tucker, Izadpanahi, 2017). Individualisation also means how well the classroom meets the needs of a group of children (Tucker, Izadpanahi, 2017). This is influenced by the feeling of responsibility and flexibility, as well as by the students´ spatial connection with the rest of the school and other children (Tucker, Izadpanahi, 2017).

Stimulation through wall space

The effect of complexity is curvilinear which means high or low levels of complexity produce poorer learning conditions. An intermediate level of visual complexity is therefore optimal (Barrett, et al., 2015).

too little | about right | too much

Fig. 20: Levels of visual complexity of display

Stimulation through colour

Choosing a colour for a room is mainly a matter of preferences but colours can have a functional learning perspective (Barrett, et al., 2015). Studies found that young children like bright-ish colour more than darker or ligher colours (Barrett, et al., 2015). But knowledge about the functional apporoach of colours can be very useful because colours influence students progress. With colour in the classroom, students achieve an increased attention span and lower levels of eye fatigue (Barrett, et al., 2015). Different colours can influence the working performance, can cause certain behaviours, create negative or positive perceptions of the surroundings and tasks given (Barrett, et al., 2015). They also influence moods and emotions (Barrett, et al., 2015). Coloured environments have significant effects on student‘s learning activity and their wellbeing.

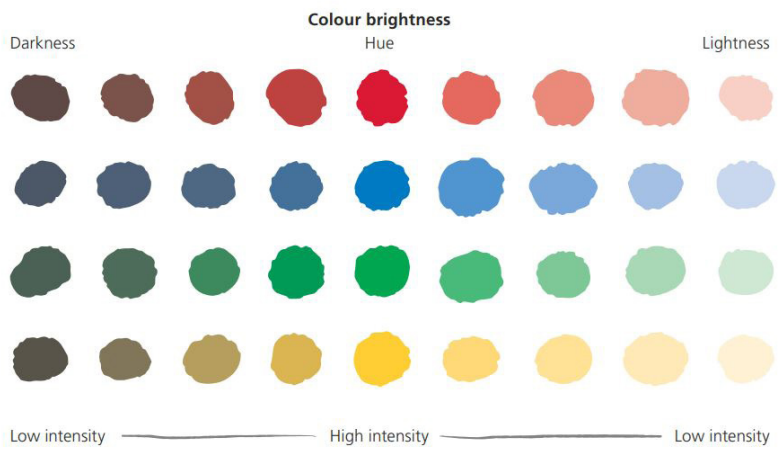


Fig. 21: Example of range of brightness in colour

Post Occupancy & Building Performance

Several studies used post occupational evaluation as a tool to measure the impacts of the building on students´ performance by also comparing data from the evaluation with students´ grades.

A post-occupancy evaluation is “the examination of the effectiveness for human users of occupied designed environments” with the “process of systematically evaluating the performance of buildings after they have been built and occupied for some time” and it is also “a process that involves a rigorous approach to the assessment of both the technological and anthropological elements of a building in use” (Cleveland, Fisher, 2013). A post-occupation evaluation is used to collect information to validate occupants´ needs, improve the fit between occupants and their buildings, optimize services to suit occupants, reduce waste of space and energy, reduce operational expenses, and improve competitive advantage in the marketplace (Cleveland, Fisher, 2013). Cleveland and Fisher describe in their research paper that “there are valuable lessons to be learned from occupants about space in use which can be used to improve existing spaces and inform the programming of future buildings … without a feedback loop, every building is, to some extent, a prototype – space and systems put together in new ways, with potentially unpredictable outcomes” (Cleveland, Fisher, 2013).

A more holistic approach to the post-occupancy evaluation is the building performance evaluation. It is a multidimensional process that has an emphasis on information gained through evaluation across a building‘s life cycle into the next building cycle (Cleveland, Fisher, 2013). The building performance evaluation is a good tool “to improve the quality of decisions made at every phase of the building life cycle, i.e., from strategic planning to programming, design and construction, all the way to facility management and adaptive reuse” (Cleveland, Fisher, 2013). This tool takes not only facilities into account but also organisational, political, economic and social factors (Cleveland, Fisher, 2013).

The following paragraph is an example for a building performance evaluation which can be implemented throughout the process of developing a new learning space (Cleveland, Fisher, 2013). It is divided into life-cycle stages with questions regarding the pedagogy, the space and the technology the school building has to offer. The building performance evaluation is mainly done with the principal, teachers and other staff members. An example for the life-cycle stage I: Conception and Design can be found in the appendix.

Life-cycle stage II: Implementation and Operation

- Overall

    - What does success look like?
    - Is the faculty considered to be a success?
    - What lessons were learned for the future?

- Pedagogy

    - What type(s) of learning and teaching take place? What is the evidence?

- Space

    - Which aspects of the space design and equipment worked and which did not? Why?
    - What were the unexpected (unintended) uses of the space and facilities that aided learning or facilitated teaching? Do these present ideas for future projects?
    - How was the effectiveness of the use of the space to aid learning and teaching measured?
    - Were there synergies between this and other spaces that enhanced learning?

- Technology

    - What technologies were most effective at enhancing learning and teaching? Why?
    - What were the unexpected (unintended) impacts (positive and negative) of the technology on learning and teaching?
    - How did technology enhance the continuum of learning and teaching across the campus and beyond?

The building performance evaluation tool is helpful as it evaluates physical features of the physical environment aligned between spaces, desired educational practices, activities and behaviours.

A building performance evaluation tool for the purpose of this thesis can be used through different methods. These possible methods can be in the form of a questionnaire to explore the facility performance profile. This questionnaire includes aspects like planning, finance, site, space, light, heat and air, sound, aesthetics, equipment and maintenance. Another method could be the site building rating scale which is a walk-through questionnaire. This questionnaire investigates physical features, outdoor areas, learning environments, social areas, media access, transition spaces and circulation routes, visual appearance, degree of safety and security, overall impression, and personal information. It is also possible to design an evaluation tool on the basis of a building performance evaluation to evaluate the space from a student‘s perspective. Therefore, questions need to be adapted and simplified.
Building performance evaluations are mainly executed before building a new school and involve the old school building to assess what went wrong and needs to be changed. But it is also possible to use the tool to evaluate the new school building after some time of use.

New Approaches all over the World

In the last years, many schools all over the world recognised the need for a different approach in designing the learning space to sustain future needs. The following paragraph summarises a benchmark comparison of different schools that all introduced a different pedagogic approach, more use of educational technology and adapted their learning space towards the new requirements.
The benchmark comparison studied different schools from different perspectives. The main aspects for the investigation were pedagogical approach, spatial approach, technological approach, user and stakeholder inclusion in planning process, education, daily life as well as highlighting special features.

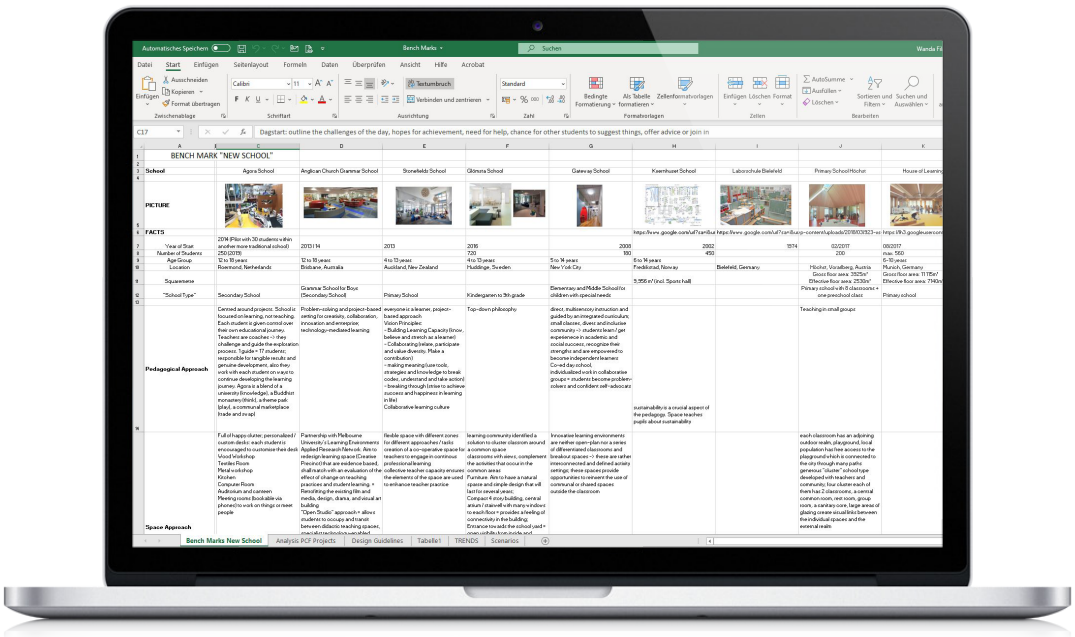


Fig. 22: Benchmark comparison in excel

The full outcome of the benchmark analysis can be found in the appendix.
All the different schools compared in the benchmark analysis, found their way for teaching and learning. Students gain knowledge and learn in the most different ways and learn for the future. All schools combined their ideas with new school design and use of space with supporting technology, software, and hardware. Every school designed the outdoor space in the same way as the indoor space to give every space a specific purpose and a well-designed outlook. Indoor and outdoor spaces are used for facilitating learning. All the schools had in common that they had to follow specific guidelines that they created to design their schools and maintain their daily life at school.

The Link Between Space, Pedagogy, and Technology

Many factors drive innovations and experimentation in learning space design. This includes changing social patterns, generational change, changing funding environment, new and emerging technology, and a shift to a more learner-centred pedagogy (Radcliff, n.d.).

"Creating learning environments that challenge students to become actively engaged, independent, lifelong learners inside and outside of formal learning should be the critical aim of change in teaching strategies" (Radcliff, n.d.)

Technology is a big part of people's daily life and a good method to acquire knowledge, present knowledge and to be in contact with other people and cultures. This is also the reason why learning space should be planned towards future changes and therefore include technology in an age-appropriate way. Byers and Lippman state that "flexible and technology-rich spaces are innovative learning environments which can shape behaviour to trigger student learning" (Byers, Lippman, 2018).

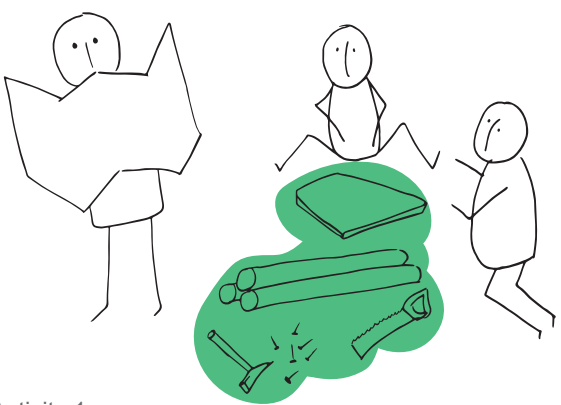


Fig. 23: Learning Activity 1
Collaborate - Fostering Networks

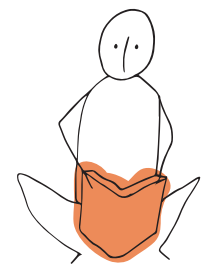


Fig. 24: Learning Activity 2
Reflect - Internalizing Knowledge

New requirements for schools are greatly influenced by flexibility and adaptability. Schools should allow different learning forms like learning alone, with a partner, in smaller groups, or in large groups like the whole class (Brittin, et al., 2015). Also, teachers should be enabled to use methodically varied changes between instruction and different forms of students´ own activity (Brittin, et al., 2015). The classroom should be an ergonomically adapted, healthy and learning-friendly environment that appeals to all senses (Brittin, et al., 2015).

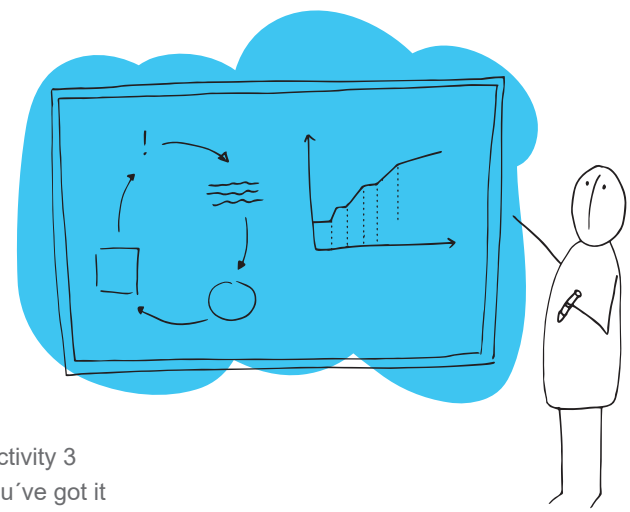


Fig. 25: Learning Activity 3
Master - proving you´ve got it

Fig. 26: Learning Activity 4
Acquire - Actively Seeking Knowledge

The design of a school does not only focus on the provision of a diversity of spaces allowing different forms of learning and subjects, but also on highly accessible communal spaces, internal and external, as a way to foster social interaction among users (Heitor, 2005). The social and intellectual development of children is supported by flexible spaces with different layouts (Heitor, 2005).

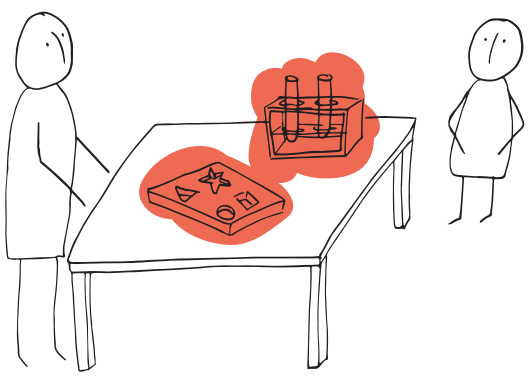


Fig. 27: Learning Activity 5
Experience - Testing Knowledge by Experimenting

The best learning space is a setting of a wide range of learning modalities to adapt the learning space towards the teaching goal and the best way to acquire knowledge. This results in students choosing how to learn and study.

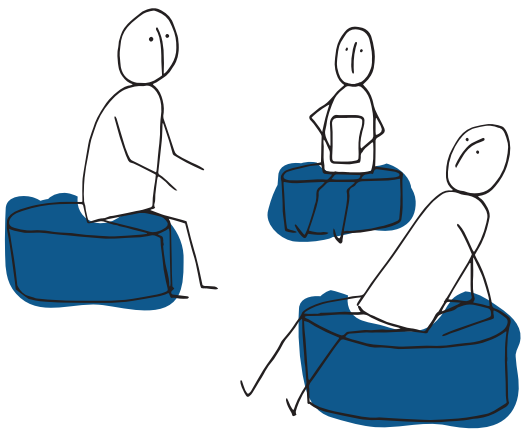


Fig. 28: Learning Activity 6
Convey - Sharing what you´re Learning

The school should also be an adequate workplace for teachers, giving teachers different possibilities to work and teamwork opportunities, which include common meeting and communication places for teacher-teacher meetings, student-teacher meetings, or student-student meetings (Brittin, et al., 2015). A major new requirement relevant for many countries and communities is the joint use of spatial resources of the school and community (Brittin, et al., 2015). To enable the community to use the school after school hours as a place for different activities is as important as using other facilities in the community to enable students to learn something useful and practical, and something about the community they live in.

Findings of Learning Space Design

- Architects build according to old standards
- Classrooms need to be flexible and adaptable
- Classrooms need to offer many different types of spaces
- Architecture can be used as a pedagogical tool
- Participation educates people as building can be a social process
- School buildings need to serve the community in case of emergency and need to withstand natural disasters as well as possible
- The environment children spend their time in impacts the intelligence of children
- Children learn from their environment
- Spaces need to be designed to provide actions and activities to which the body can adapt to (affordances of space)
- “Placemaking” can reduce negative affordances of a space but only with active and equal citizen participation
- The environment and school building influences a child‘s wellbeing and health, and impacts behaviour outside the school which can endure into adulthood
- Child-centeredness is important in education and learning space design
- Child-friendly schools are gaining more importance and a higher priority
- The child-centeredness aspect and child participation have a big impact on the planning and decision-making process and can result in a fully accepted learning space
- Physical human comfort in the school building greatly influences a child‘s performance in school

- The school needs to provide healthy and safe conditions

- The interplay of pedagogy and space is too little researched and too little applied in practice

- Most schools worldwide follow the traditional way and are satisfied with it.

- “Architects are seen as experts. They do not involve users in their developing process”

- School architecture cares a lot about the representative building, but too little about the interior.

- The private sector and the public sector do not cooperate, each has different priorities and sometimes different guidelines.

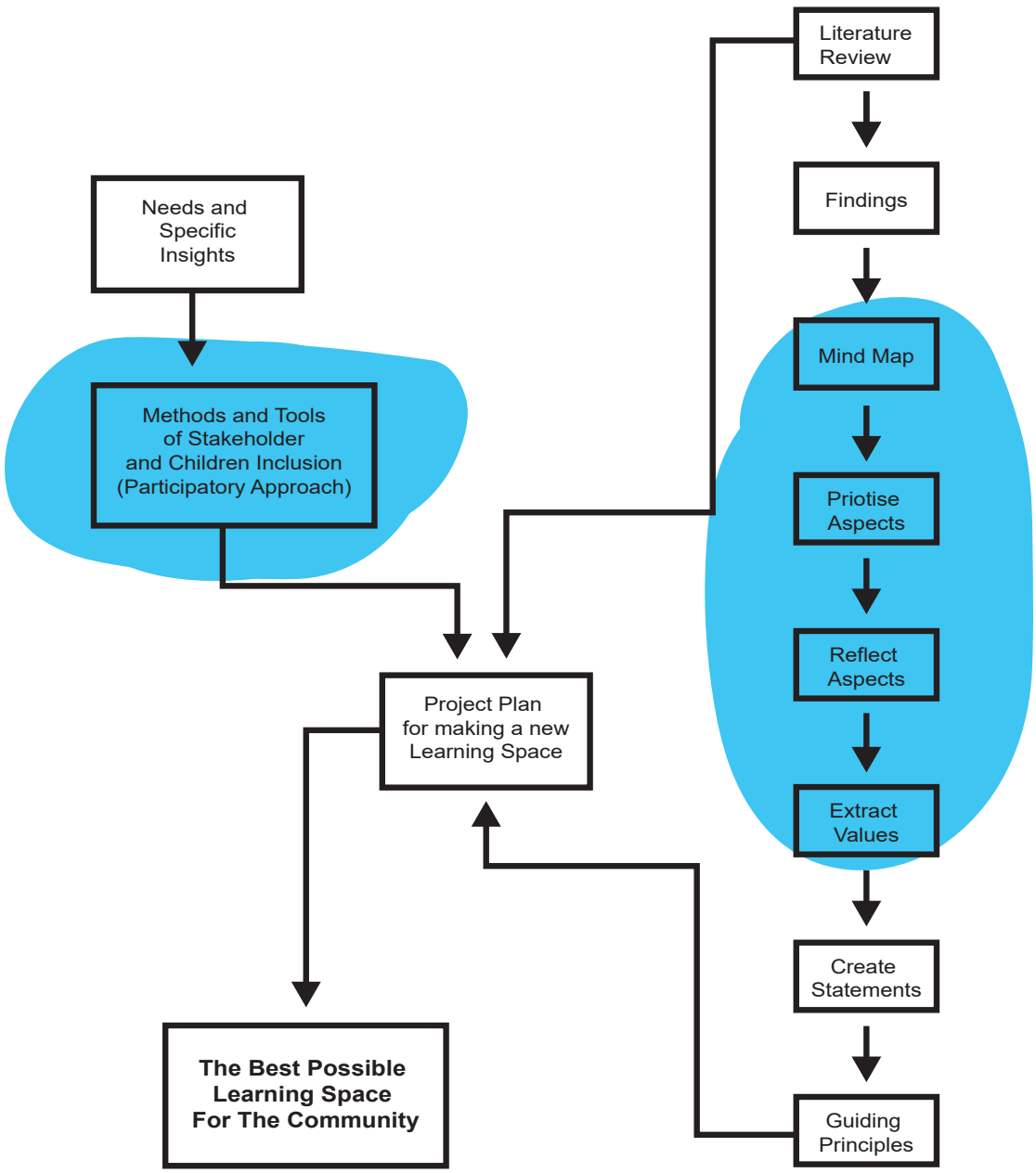
- Trends are visible, technologies are there, but too little time for implementation because teachers are busy, do not know the technologies themselves, and do not get support in terms of training

- In crisis situations, it is more important that there is a school than that it is planned and built with the community

- Schools and education are in a state of flux. Trends were evident even before the COVID-19 pandemic and are now becoming much more visible as needs have crystallised

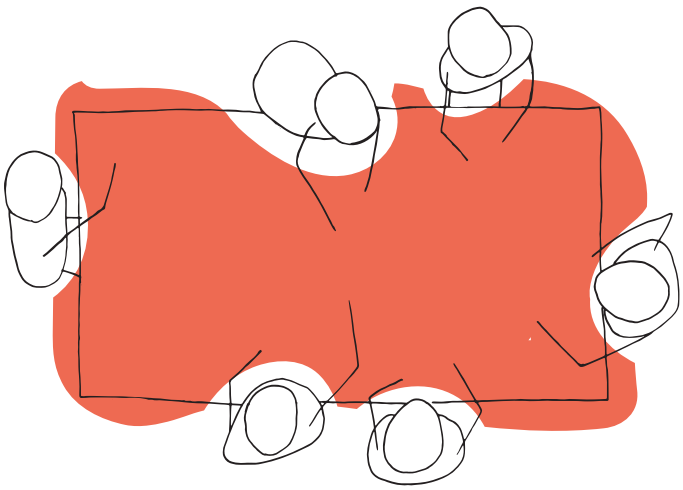
Structure

In addition to structuring findings, the „Sturcture“ part of the thesis also includes some „Exploration“. It was necessary to gain knowledge of how participation of users and stakeholders influences the process of developing new learning spaces. „Structure“ investigates in possible methods and tools for including childen and stakeholders. „Structure“ iterates on possible ways to use findings to create guiding principles.


Literature Review
Findings
Needs and Specific Insights
Mind Map
Methods and Tools of Stakeholder and Children Inclusion (Participatory Approach)
Priotise Aspects
Reflect Aspects
Project Plan for making a new Learning Space
Extract Values
Create Statements
The Best Possible Learning Space For The Community
Guiding Principles

Participation

Designing the best learning space possible does not work without the influence and opinion on needs and wishes of users and stakeholders. Having the insights from research is just one aspect of designing a learning space but those insights need to match with the specific needs of people using the space in order to have the best possible learning space for that community.



Participatory Design

Participatory design is a good approach to help involving people in the design process. Participatory design is a creative approach to actively involve all stakeholders in the design process in order to ensure that the results are usable and meet stakeholders needs (PiD, 2020). It is a democratic process for design research and development as well as an assessment of designs, like services, products, systems (Hartson, Pardha, 2019). Participation generally refers to the process of sharing decisions affecting one‘s life and the life of the community (Hart, 1992). This also means that stakeholders should be included in the design process more than once, to actively involve them into the process and to create a product, system, or service that gives people an improved situation. This involvement also creates a greater meaning of the end results to the stakeholder, and gives them a sense of ownership (Volini, et al., 2019). A session (in participatory design) with stakeholders is useful when the understanding of how people think about a given problem is needed, or when

there is a difference between observation results and interview statements, or when there is or could be a cultural or political disconnect between the user, stakeholder and the designer (Cipan, 2019). Participatory design is about design research with different research methods which are then interpreted by the participants and future users as well as by the design researcher (Spinuzzi, 2005).

Design researchers use knowledge and insights which may have larger causes influencing a specific problem and engage in a democratic dialogue with the participants over these larger causes (Spinuzzi, 2005; Cipan, 2019). The researcher becomes a participant in a democratic process. As a result of the process, the participants not only transform some conditions related to a practical problem in their lives, but they also educate themselves about their general situation (Spinuzzi, 2005, Cipan, 2019). Thereby they empower themselves for future action. A bigger problem of this research approach is getting participants to become interested in theoretical analyses which go far beyond their own analysis of practical problems. Another difficult factor is as a researcher and facilitator being too pedagogical and maternal / paternal, which results in losing sight of the participatory (democratic) nature of the exchange and the role of the outside researcher.

Levels of Participation

Not every user or stakeholder wants to participate in the design process at the same level. The methods and tools of developing a design can have different levels of participation. What kind of levels, what it means for the process and how to apply participation, will be discussed in the following section.

Ladder of Citizen Participation

vs.

Ladder of Young People´s Participation

The Ladder of Citizen Participation

The ladder of citizen participation is a guide to see who has power and who can make important decisions in the design process (Arnstein, 1969). The ladder of citizen participation was proposed by Sherry Arnstein in 1969 and describes "how empowered public institutions and officials deny power to citizens" (Arnstein, 1969) and it clarifies foundational theories of public engagement and participation. Arnstein´s model influenced later models like the Ladder of Empowerment by Elizabeth Rocha or Roger Hart's Ladder of Young People´s Participation. The ladder of children participation will also be discussed in this chapter.

This model of citizen participation is presented as a ladder with increasing levels of citizen power which are divided into eight "rungs" of participation. Those levels are described as "Non-Participation" (no power), degrees of tokenism (counterfeit power) and degrees of citizen power (actual power) (Arnstein, 1969; Gaber, 2019).

Rung 1 and 2 (manipulation and therapy) are non-participative with the aim to educate or "cure" the participants without getting anything from the participants. As the titles say it is a misleading concept to make the citizens believe they are given power in a process (Arnstein, 1969; Gaber, 2019). The therapy rung attempts to convince citizens that "they are the problem" although institutions and policies are creating problems for citizens (Arnstein, 1969; Gaber, 2019). Informing is the first step to participation which mostly refers to a one-way information flow without feedback. In citizen participation this information includes rights, responsibilities and options which can be intimidating for citizens due to legal jargon, and prestige of the officials (Arnstein, 1969; Gaber, 2019). The fourth rung "consultation" is based on informing the citizens but also invites citizens´ opinions through attitude surveys, neighbourhood meetings and public enquiries (Arnstein, 1969; Gaber, 2019). Placation is defined by "a limited degree of influence in a process" which means that "citizens are (…) involved only to demonstrate that they were involved" (Arnstein, 1969; Gaber, 2019). Partnership is the first step of actual participation. Partnership is the distribution of power through negotiation between citizens and power for better deals, veto decisions, and shared funding (Arnstein, 1969; Gaber, 2019). In general, planning and decision-making responsibilities are shared in, for example, joint committees. Delegated power means giving up some degree of control, management, and decision-making authority by the public institutions or administrators (Arnstein, 1969; Gaber, 2019). Citizen control is the highest level of participation and occurs when "participants (…) can govern a program or an institution, [and] be fully in charge of policy …" (Arnstein, 1969). Those participants have the control and make decisions in community relevant organisations without the interference of public institutions.

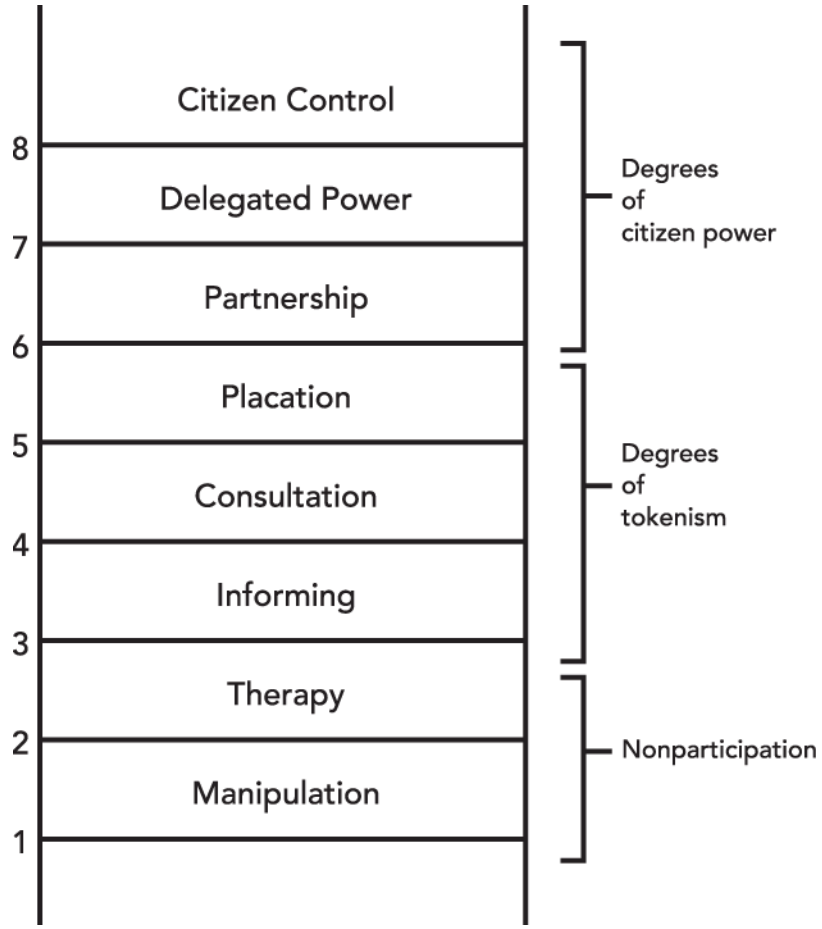


Fig. 29: Ladder of Citizen Participation

Critical points of this model are the two-dimensional viewpoint and the non-consideration of the complexity of power dynamics, as well as the negation of the lower rungs and the assumption that the upper rungs are always positive and good. For further use of this model of participation, it is important to mention that depending on the situations and circumstances, some levels are better suited than others. Therefore, in the further design process the different stakeholders and the possibilities of participation through different methods and tools are clustered by the ladder, for example, with the help of stakeholder mapping.

Ladder of young people‘s participation

Roger Hart created in the 1990´s for UNICEF the Ladder of Young People‘s Participation (Fletcher, n.d.; Hart, 1992) which adjusts Arnstein‘s Ladder of Participation and creates a new and better understanding of how children can be involved in community activities (Birmingham, 1996; Fletcher, n.d., Hart, 1992). Hart describes in his paper that “young people‘s community participation is a complex issue which varies not only with a child‘s developing motivations and capacities, but also according to the particular family and cultural context” (Hart, 1992). There are positive but also negative ways to use young people‘s participation in community activities. Children can be a starting point for change in communities where adults have little opportunities to influence in community decisions (Hart, 1992). However, improving the participation of children in community activities means improving the whole society (Hart, 1992). The degree of opportunities for children to collaborate in the everyday management of family, school, neighbourhood and community groups are a reflection on the participatory opportunities for adults in that culture (Hart, 1992). This is an indicator of a democratic society (Hart, 1992). The Convention on the Rights of the Child states that “parties shall assure to the child who is capable of forming his or her own views the right to express those views freely in all matters affecting the child, the view of the child being given due weight in accordance with the age and maturity of the child” [Article 12] (Hart, 1992). And article 13 says that “the child shall have the right to freedom of expression; this right shall include freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of the child‘s choice” (Hart, 1992). Therefore, it is a child‘s right to be included in planning and decision-making processes and to work together with adults to create for the need and use of communities.

Manipulation happens when children do not understand the issues and their role and adults therefore use young people to support causes and pretend that the causes are inspired by young people (Birmingham, 1996; Fletcher, n.d.; Hart, 1992). The second rung is Decoration. This occurs when adults use young people to help in a very indirect way without pretending that the cause is inspired by young people (Birmingham, 1996; Fletcher, n.d.; Hart, 1992). Tokenism is giving young people a voice without actually giving them a choice about what they do and how they participate (Birmingham, 1996; Fletcher, n.d.; Hart, 1992). These three rungs show non-participation. The next rungs will explain different degrees of participation. Assigned but informed involves a specific role and information to the young adults of how and why they are being involved (Birmingham, 1996; Fletcher, n.d.; Hart, 1992).

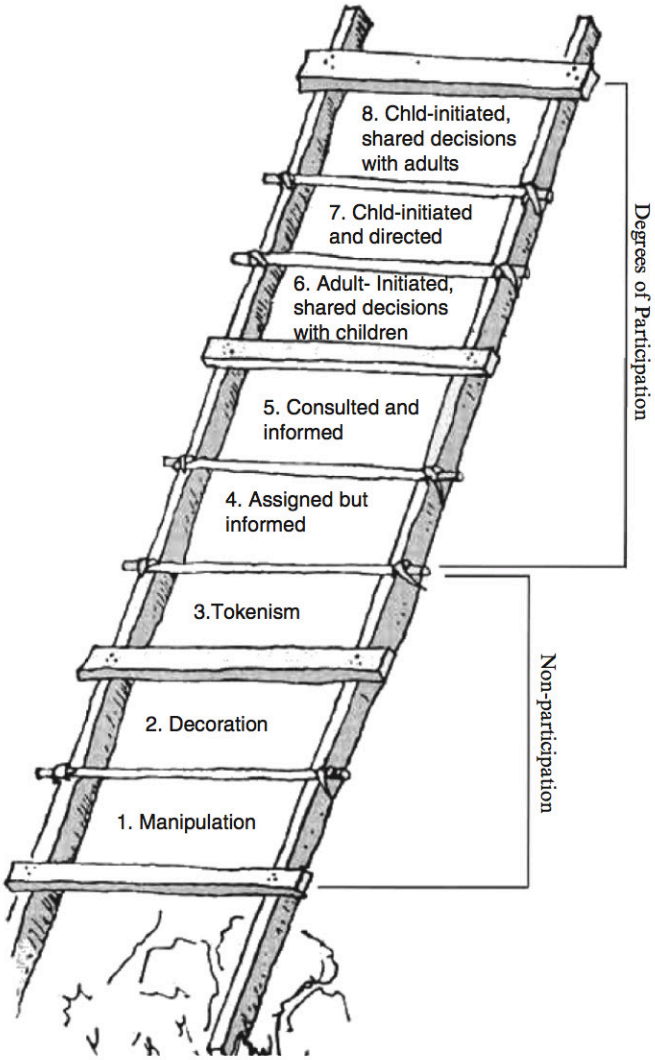


Fig. 30: The Ladder of Young People´s Participation

To assess whether a chosen project is participatory for children the following checklist can be helpful (Birmingham, 1996):

- Do children understand the intentions of the project?
- Do they know who made the decision about their involvement and why?
- Do they have a real rather than `decorative´ role?
- Was the project explained to them before they were invited to volunteer?

The rung consulted and informed gives young people the possibility to advise on projects or programs designed and run by adults. Information about the use of the children´s input and the outcomes of the decisions made by adults are transferred to the young people (Birmingham, 1996; Fletcher, n.d.; Hart, 1992). Rung 6 is the degree of participation where projects are initiated by adults but young people are involved in the decision-making process (Birmingham, 1996; Fletcher, n.d.; Hart, 1992). The step "young people-initiated and directed" is when young people oversee the project and the adults take a supportive role (Birmingham, 1996; Fletcher, n.d.; Hart, 1992). The highest degree of participation according to Hart is "young people-initiated, shared decisions with adults" (Birmingham, 1996; Fletcher, n.d.; Hart, 1992). This rung is about young people initiating projects and programs and deciding together with adults. This level of participation empowers young people and gives them the opportunity to have access and learn from adults and their life experience or expertise (Birmingham, 1996; Fletcher, n.d.; Hart, 1992).

A good addition to the Ladder of Participation is Harry Shier's Pathways to Participation from 2001. This model shows the stages of development that decision-making processes take when working with children and other citizens which are identified in five levels of participation (Shier, 2001):

1) Children are listened to
2) Children are supported in expressing their views
3) Children's views are taken into account
4) Children are involved in decision-making processes
5) Children share power and responsibility for decision making

The Pathway to Participation model is useful in assessing organisational readiness and commitment to youth participation beyond individual projects. Each level is then divided into three stages – opening, opportunities and obligations – asking a specific question that needs to be answered by individuals and the organisation to identify the current situation and the areas they need to improve to reach the next stage or level, and so be more effective in youth participation (Shier, 2001). It is also helpful for individuals who want to view their practice and for organisations to perceive their position. As soon as an answer is no, one knows the current position. The opening stage enables dialogue about potential opportunities and identifies a route to create possible obligations (Shier, 2001). This model can be a good tool for the first steps of developing an action plan to enhance children's participation (Shier, 2001).

Children participation has many benefits for a learning space and the community. It enables individuals to develop into more competent and confident members of society as well as improving the organisation and functioning of communities (Hart, 1992; Pfefferbaum, et al., 2018). Including children in public projects gets them off the streets, reduces delinquency, and vandalism (Hart, 1992). Hart also points out that the "involvement of young people in projects leads to a sense of responsibility for the maintenance and protection of those products which are created" (Hart, 1992). A big benefit of children participation is that it allows a child to have a voice (Hart, 1992; Pfefferbaum, et al., 2018). This enables children to discover the rights of others to have their own very different voices which results in children benefiting from developing the skills of social cooperation (Hart, 1992; Pfefferbaum, et al., 2018). To create a learning space together with other people who have different backgrounds is a useful tool for community building because it offers opportunities for a group to see the impact of its joint efforts in a direct and lasting way (Hart, 1992).

"Participation is an important antidote to traditional educational practice which runs the risk of leaving youth alienated and open to manipulation. Through genuine participation on projects, which involve solutions to real problems, young people develop the skills of critical reflection and comparison of perspectives which are essential to the self-determination of political beliefs. It benefits the self-realisation of the child and the democratisation of society."
- (Hart, 1992)

Inclusion of Children in making a new Learning Space

A child said in an interview that “computers for kids need to be fun like a friend but can make me smart for school. They should also be friendly like my cat. The real thing is that they shouldn‘t make me have to type since I don´t like that. I can talk much better!” (Druin, 2002). This child explained ideas, needs, and preferences about schooling aspects an adult would not otherwise know. Children have their own likes, dislikes, curiosities and needs (Druin, 2002). These preferences and needs are different from their parents’ and teachers’ (Druin, 2002). Young people are not `just short adults´ but an entirely different user population with their own culture, norms and complexities (Druin, 2002). Before the 19th century children were still seen as “mini-adults or blank canvases” (Pho Tan, 2017) who passively absorbed information and were moulded by adults (Pho Tan, 2019). Starting in the early 19th century and with an increasing change in mindset in the 20th century, children are seen as a distinct population and the interest in children‘s behaviour, emotional and cognitive stages increased. Through the UN Declaration of the Right of the Child, attitudes about children began to change and children are now even more in focus when designing products, services or systems for themselves (Pho Tan, 2019; Clark, Moss, 2005; Rouvali, Riga, 2018). Having children as research participants and including their opinions on important aspects of educational research, helps adults to understand “how children experience the educational setting and their sense of well-being in these environments” (Pho Tan, 2019; Clark, Moss, 2005; Rouvali, Riga, 2018).

“The evaluation of quality of early childhood education must include the voices of children“ (Pho Tan, 2019) but children have a more difficult time verbalising their thoughts, especially when it concerns abstract concepts and actions (Druin, 2002). But there are other ways to listen to children than listening to their speaking words (Pho Tan, 2019; Clark, Moss, 2005; Rouvali, Riga, 2018). Responses and voices reflect diverse forms of communicating, representing and interpreting children‘s thoughts and emotions (Pho Tan, 2019). Loris Malaguzzi wrote the poem „Hundred Languages of Children“ [p.186], in which he describes that a child is born with and speaks a hundred different languages but as it is growing up it loses 99 of them (Betrifft Kinder, 2013; Pho Tan, 2019; Dialog Reggio, n.d.).

Especially pre-verbal children have a hundred ways of communication (a hundred hands, a hundred thoughts, a hundred ways of thinking, of playing, of speaking) with adults (Pho Tan, 2019). Malaguzzi´s thoughts were the starting point of the Reggio Emilia pedagogic approach which at its core has “the idea of young children as component, and active individuals and tries to listen to all children‘s voices“ (Rouvali, Riga, 2018). Adults need to listen, allow and provide materials to the children to be able to speak to them beyond the use of language (Pho Tan, 2019). Adults need to find a way to overcome the

communication gap which is caused by limited oral communication skills and abilities (Rouvali, Riga, 2018). Adults also have to understand that everything has a meaning, “even the most absurd gestures and actions contain language: they have a meaning, occasionally forgotten, or unknown” (Rouvali, Riga, 2018). A child will eventually learn how to talk, read and write (Rouvali, Riga, 2018). Language is not a milestone that is achieved by a certain age or development stage (Rouvali, Riga, 2018).

Listening is a part of our society. Listening is “an emotion, a reciprocity, a meaning and a meaningful change” (Rouvali, Riga, 2018). It encompasses multiple senses, languages, symbols, and codes to express and communicate with the environment (Rouvali, Riga, 2018). Listening is an active process of receiving through hearing and observation, interpreting and communication (Rouvali, Riga, 2018). Therefore, it involves all senses and feelings, and cannot be limited to verbal communication (Rouvali, Riga, 2018). Rouvali and Riga describe listening as “… a pluralistic process that requires all our senses, as well as transparency and honesty of all those involved” (Rouvali, Riga, 2018). There is a need for pluralistic, manifold, and flexible approaches to enable more enhanced listening of young children‘s voices to promote the freedom of expression and participation (Rouvali, Riga, 2018). Since the beginning of the 1990s, the perception of children as participants changed (Pho Tan, 2019; Clark, Moss, 2005; Rouvali, Riga, 2018). The UN Declaration on Child‘s Rights was a big influencing factor on changing the perception and including children in design and decision-making processes (Pho Tan, 2019; Clark, Moss, 2005; Rouvali, Riga, 2018). When designing something for children, the research should be with children and based on respect and recognition of both sides´ capabilities and roles (Pho Tan, 2019; Clark, Moss, 2005; Rouvali, Riga, 2018). The most important aspect for research with children is to build an environment based on trust and care (Pho Tan, 2019; Clark, Moss, 2005; Rouvali, Riga, 2018). In the early 2000s the Mosaic Approach was developed to “include the `voice of the child´ in an evaluation of a multiagency network of services for children and families” (Rouvali, Riga, 2018). The Mosaic Approach is designed to catch all voices of children and listen to them better (Pho Tan, 2019; Clark, Moss, 2005; Rouvali, Riga, 2018). The Mosaic Approach is a “participatory learning in action way of listening which acknowledges children and adults as co-constructors of meaning” (Pho Tan, 2019). Children are experts of their lives and the approach recognises that, and enables children “to play an active role in their daily lives and decision-making processes through a shared construction of meanings with adults” (Rouvali, Riga, 2018).

The Mosaic Approach includes imaginative methodologies without the written word, which is an important aspect of researching young children (Pho Tan, 2019). The Mosaic Approach is divided into two stages (Pho Tan, 2019; Clark, Moss, 2005; Rouvali, Riga, 2018):

> **Stage 1:** Adults gathering documentation about the children through a collaborative process (Pho Tan, 2019; Clark, Moss, 2005; Rouvali, Riga, 2018).
>
> **Stage 2:** Piecing together information for dialogue, reflection, and interpretation (Pho Tan, 2019; Clark, Moss, 2005; Rouvali, Riga, 2018).

The integration of both stages in the end gives a complete pictured documentation of the child‘s response and representation of their voice (Pho Tan, 2019; Clark, Moss, 2005; Rouvali, Riga, 2018). Clark and Moss explain that “a mosaic is an image made up of many small pieces, which need to be brought together in order to make sense of the whole” (Clark, Moss, 2005). These small pieces of a mosaic can be in this approach non-verbal tools or verbal tools. The following list presents different tools of the Mosaic Approach which are seen as useful for the developing process of new learning spaces. The list explains tools for stage 1 and how those tools can be structured, and what kind of goal each tool wants to reach (Pho Tan, 20179; Clark, Moss, 2005; Rouvali, Riga, 2018).

Non-verbal tools in stage 1

Observation	Enables obtaining information about the characteristics of a group or individual (would be impossible to discover in any other way). Observations of the pre-verbal child requires the researcher to “listen” to the child‘s body language, movements, interactions with the activity, as well as with peers and adults (Pho Tan, 20179; Clark, Moss, 2005; Rouvali, Riga, 2018).
Drawings	Semiotic interpretation of the learning environment or activity represented through a child‘s drawing, often seen as swirls, scribbles and lines. This is an effective method to collect responses from children with speech as they can provide narration through the symbols, they have used (Pho Tan, 20179; Clark, Moss, 2005; Rouvali, Riga, 2018).

Photographs	Preschool children are provided with cameras to capture their favourite scenes and activities. This gives control to the child as a researcher and allows the researcher to view the world from the child‘s perspective. It is possible that “taking photographs may be one way of enabling children, who are preschoolers to tell adults more about the important things in their learning environment” (Clark, Moss, 2005). Cameras also offer opportunities for young children to participate and complete a project that they can take pride in. When children choose which photographs they want to present to the researcher, the documentation becomes more authentically child-originated (Pho Tan, 20179; Clark, Moss, 2005; Rouvali, Riga, 2018).
Maps	Visual way to illustrate a unique view of the school. Children are provided with a piece of cardboard, pens and a group of pictures with all the school sites, people and objects children chose to photograph. The researcher can discuss the map with the children to approach each child‘s interpretation of the setting (Pho Tan, 20179; Clark, Moss, 2005; Rouvali, Riga, 2018).

Verbal tools in stage 1

Guided Tour	A guided tour is an extension of young children´s work with cameras. The use of guided tours provides children with the opportunity to observe, ask, listen, discuss and learn to investigate their environment. Tours are led by children and include documentation through children‘s drawings, recording of their conversations and photographs. This is a child-led way of thinking, beyond the traditional interview room. This can be viewed as a way of moving towards a child agenda for change (Pho Tan, 20179; Clark, Moss, 2005; Rouvali, Riga, 2018).
Adult - led Interview	Interviews with closed or open-ended questions from adults to children. Adult-led discussions between small groups of children and the researcher (Pho Tan, 20179; Clark, Moss, 2005; Rouvali, Riga, 2018).

Child - led Interview	If children found the concept of interviewing interesting, children can be the interviewers of other children. A child can ask questions to the researcher and roleplay the interview so that the child ends up feeling more confident in taking the role as the interviewer. This empowers children´s voices to highlight their ability to be experts about their lives and minimise possible misinterpretation from the communication gap (Pho Tan, 20179; Clark, Moss, 2005; Rouvali, Riga, 2018).
Day in your Life	Combination of interview, questionnaire, and drawings. While describing a day in life, children are able to describe their school day including their favourite places in school and favourite activities.
Day in Life Parent - Version	Parents were asked the same questions as the children to compare the answers more easily and find possible contradictions. There might be a greater need for interpretation due to variation in participants‘ ages, cognitive development and understanding. Both children‘s and parents’ views are important elements of listening (Pho Tan, 20179; Clark, Moss, 2005; Rouvali, Riga, 2018).
Day in Life Teacher - Version	Open-ended questionnaires based on the children’s questions. Teachers´ everyday observations and exchanges with young children can potentially add greater depth to the life at school. But this tool should not overpower children‘s voices (Pho Tan, 20179; Clark, Moss, 2005; Rouvali, Riga, 2018).

In stage 2 different methods are used to interpret the outcome of stage 1. Possible methods in stage 2 are discussion and reflection on, for example, children‘s photographs, books and maps (Clark, Moss, 2005). To use the results of stage 1 helps to facilitate dialogue between young children and adults (Clark, Moss, 2005). Discussion can take place between practitioners and the researcher, between children and the researcher, between parents or parents and children together with the researcher, and/or between practitioner’s groups and the researcher (Clark, Moss, 2005).

To include a parent‘s perspective shows how the caregiver perceives a child‘s learning and their daily experiences (Pho Tan, 2019). Therefore, the voice of parents can be seen as another piece of the Mosaic Approach towards understanding children‘s lives (Pho Tan, 2019). Each tool gives a piece of the overall picture (Clark, Moss, 2005). One or two tools together can give insights on interest and priorities of the child (Clark, Moss, 2005). Combining many tools may give a more detailed impression of young children‘s perspectives (Clark, Moss, 2005).

The Mosaic Approach was initially developed to collect the voices of young children between the ages 3 and 4 (Clark, Moss, 2005). But the approach is not limited to young children. When adapting the tools to collect insights relating to older children, also their voices can show what their needs and wants are (Clark, Moss, 2005). For example, instead of taking pictures, children can make a video of their spaces (Clark, Moss, 2005). Older children can also describe in a more detailed way and understand more complex questions than younger children (Clark, Moss, 2005). Researchers need to be more specific when talking to young children and pay attention to how they phrase questions and interview them (Clark, Moss, 2005). Clark and Moss describe in their book “Spaces to Play”, a good example that shows how children can understand complex questions (Clark, Moss, 2005). A researcher asked the following question to a child: `What is missing outside at [your preschool]?´ The researcher got a more literal answer than expected. Clark and Moss concluded that “children who were answering the questions while sitting in the playhouse answered `the window´. The Perspex was missing because a vandal had broken the pane and it had to be removed” (Clark, Moss, 2005). The question seems to be simple, but it was in fact complicated. The aim of the question was to “… view … experience[s] of this and other play spaces [and] what resources or opportunities should be added to this preschool´s outdoor space” (Clark, Moss, 2005). Clark and Moss concluded in their study that “as researchers we need to consider more carefully what are our explicit and implicit purposes when asking each question, and what demands this makes on our interviewees” (Clark, Moss, 2005).

The Mosaic Approach is a good method that can affect learning space design. The approach can be applied with children of different age-groups. For this, tools have to be age appropriate and adapted towards the age-groups. When including older children, tools can be more advanced to support abstract thinking or the development of new interests and skills.

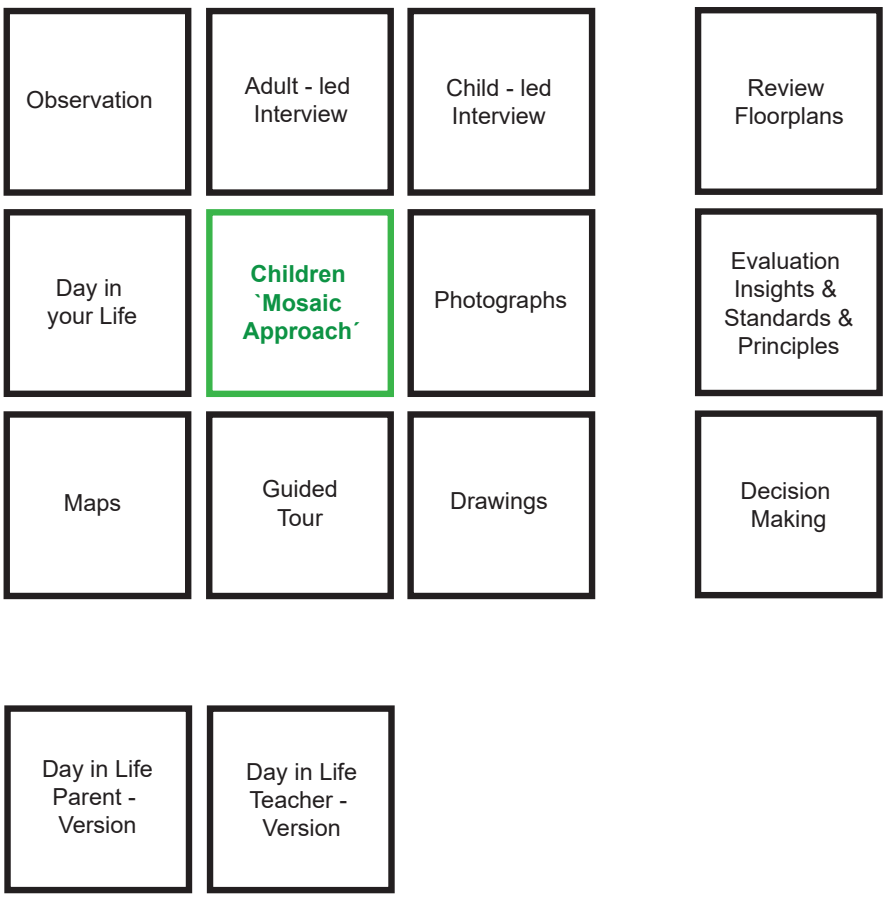


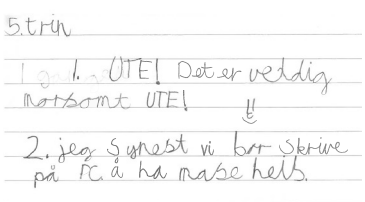
Fig. 31: Overview of possible data collections tools in the development process of a new learning space

Test of one tool to listen to the voice of children

Testing a method of the Mosaic Approach was a good possibility to understand the way children think and express themselves and to see what it actually means to ask children about their school. With the help of a teacher, the following two questions were presented to children in the 5th grade and 7th grade of a Trondheim-based school. It was important to involve the teacher closely and to explain the topic and goal of the thesis in a more detailed way. This was necessary as the teacher was also the facilitator and observer of the task. Due to the COVID-19 pandemic it was not possible to visit the school and interact with the children. The iteration process of the questions was a collaboration with the teacher to make the goals of the questions easier for the children to understand. In this process it became very clear that presenting a question to children needs carefulness in selecting the right words so as not to complicate the question. The following questions were the result of the iteration process:

“What is your favourite place at school?”
“How do you see the future of school and what would be your role?”

Both questions were presented to the 5th and 7th grade. The students were able to write some words and were able to support their thoughts with sketches. The following answers give a small insight into what children think about their future school and what their favourite spot in school is.



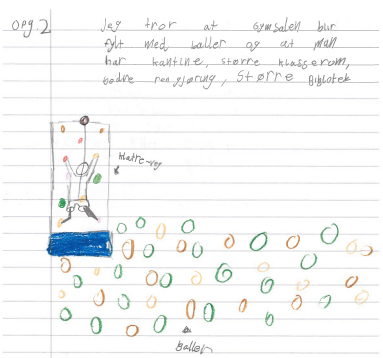


Fig. 32: Extract of tool results

Students answered the questions in a diverse way. They expressed themselves with words and sketches. Favourite spots are mostly based on physical activities with other students, like the gym or outdoors. Some children also expressed their need for a good kitchen where they get food as well as learn about food and make food by themselves. The library was for some students the favourite place in school which shows that a space where children can read, be calm, and learn what they want to learn is important. More results can be found in the appendix, page 187ff.

Inclusion of Stakeholder in making a new Learning Space

In participatory design, the stakeholders “are a valuable source of information and ideas” (Cipan, 2019). Different methods and tools can be used to let stakeholders participate in the developing process of a new learning space. Some of these methods and tools are common for designers and researchers or have been mentioned earlier in this thesis and will not be discussed further. Therefore, a list of methods and tools was created to give an overview of which methods and tools make sense to use for the purpose of creating a new learning space in different country settings. An idea of a project plan was created to structure the use of different methods and tools for developing a new learning space.

Before including stakeholders in the developing process of a new learning space, an analysis of potential stakeholders needs to happen. The potential stakeholders in education are collected through research, and have not been discussed with all stakeholders of this thesis and with people in the field of education and architecture.

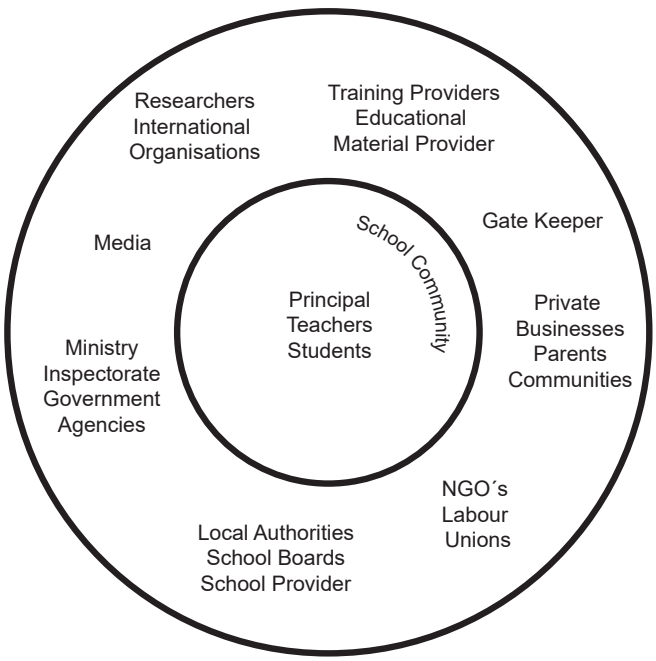


Fig. 33: Potential stakeholders in education

After gathering potential stakeholders, it is important to group and prioritise them. A satisfying tool to group and prioritise stakeholders is the priority-involvement grid which clusters stakeholders in four different groups depending on the level of priority and involvement in building a new learning space.

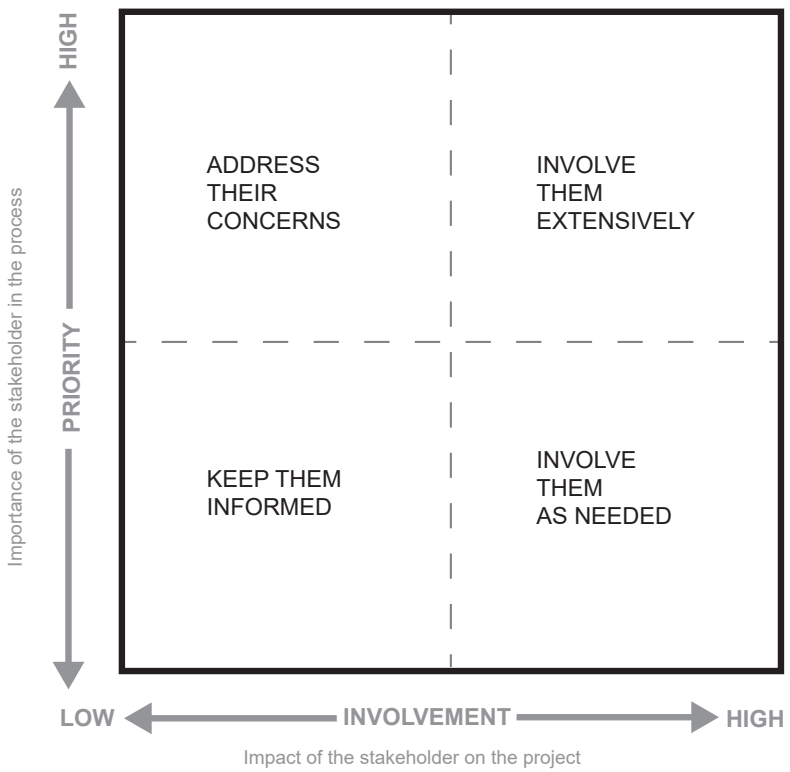


Fig. 34: Stakeholder mapping tool

For each project of developing a new learning experience, the stakeholder map has to be reviewed, added to, and restructured. Every new project can have different stakeholders which have different priority and involvement structures. Reviewing the stakeholder map is therefore necessary to include the right and important people in the developing process of a new learning space.

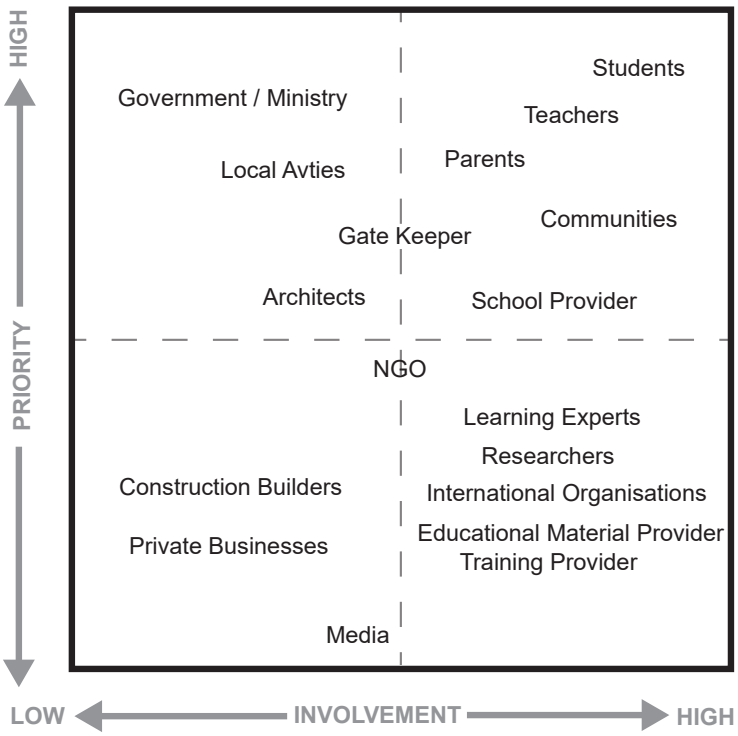


Fig. 35: Stakeholder map with potential stakeholders

The role as a facilitator of the inclusion of stakeholder and children needs to be situated with people who understand the methods and tools as well as have knowledge about school architecture and cultural differences. A good facilitator can be an architect who specialised in participatory design, or a communication professional who knows the basics of architecture. All in all, facilitating methods and tools to include people in a design process is not something that should be done by just one person. A team of people with different skill sets and specialisations is helpful to succeed in the process of developing a new learning space.

A good way to include stakeholders in the development and design process are different sets of methods and tools which act on different levels of participation. The following list of methods and tools are ideas which can be included in the project plan and describe how they let stakeholders participate in the developing process:

- **Community Board** to share information with the community

- **Interviews** to get insights from important people, like mayor, school provider, parents, teacher, educator, …

- **Survey** to include the whole community and give everyone the chance to share their opinion, needs and wishes for the community in general and the school

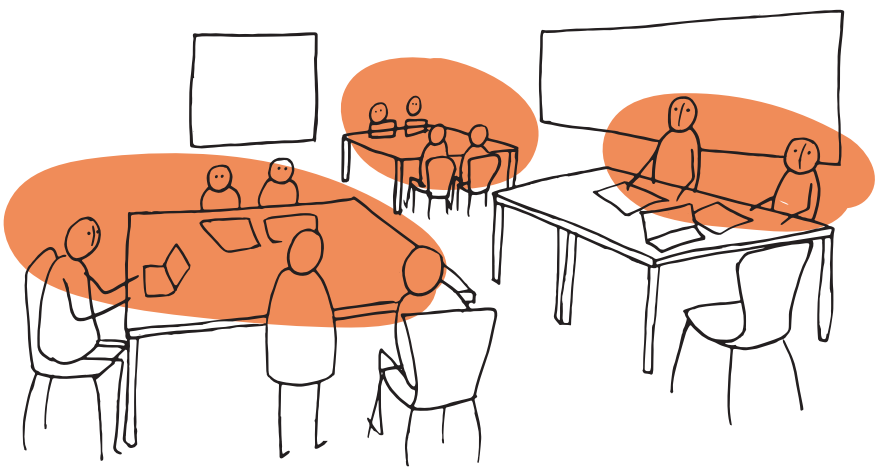
- **Focus Groups** are helpful to get deeper knowledge regarding specific knowledge. A core group that knows the whole process and is involved throughout makes it easier to work with and develop good results. The core group are part of the decision-makers.

- **Co-Creation Workshops** to generate ideas, review user and stakeholder insights and develop in detail

- **Evaluation and Reviews** are important to keep track of the goals and vision the project has. Is the process following the guiding principles? Are all user needs included in the project? Are there any problems? How can problems be fixed?

- **Building Performance Evaluation** is a good tool to evaluate existing buildings in the pre-developing phase or can be used as a tool after implementing the new school to evaluate the use of the school and to assess whether the school needs to be adapted due to a lack of fulfilling the vision, the architectural expectancies, natural influences etc.

The structured process of developing a new learning space concluded in a project plan based on insights from architecture and my own work experience. The developed project plan is an idea of how to develop new learning spaces that includes children and other stakeholders in the development process, as well as uses guiding principles to ensure quality education. The results can be found in the third part of the thesis „Design“.



From Research to Guiding Principles

The findings and insights from different perspectives which have been discovered in the first part of the thesis create an overview of the challenges and problems regarding children, education, and school buildings. The findings also show important aspects for creating the best learning space possible. These important aspects can also be described as values. The values are used to phrase guidelines for action that needs to take place before, during, and after creating and building the best learning space possible.

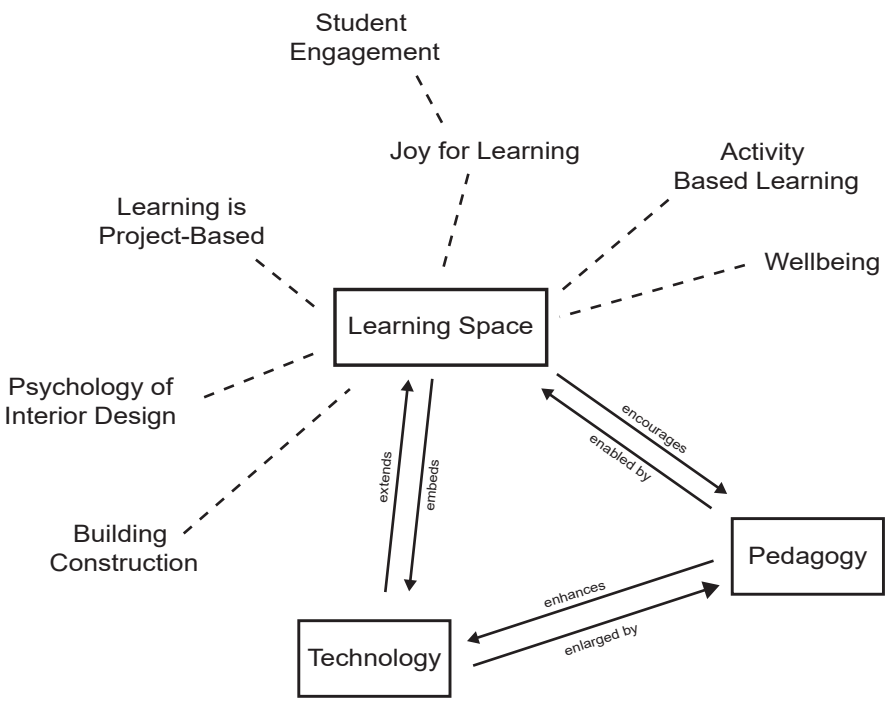
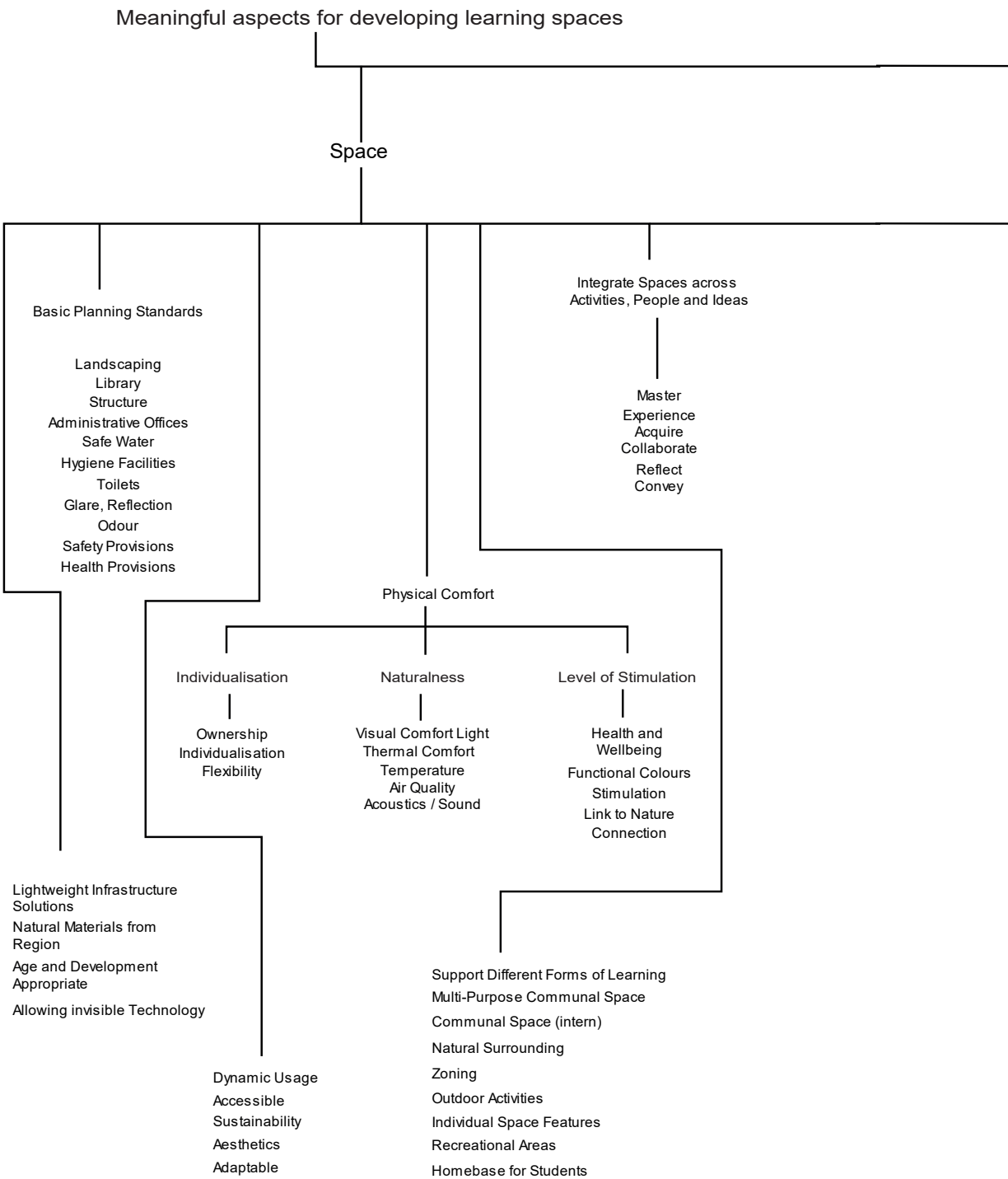


Fig. 36: Topics influencing the learning space

The findings build the foundation for the next steps towards creating a learning space that can sustain in the future. The findings also show some challenges that need to be solved in order to make a good learning space. The following chapter explains the thought process and approaches to tackle these problems and challenges. One approach to solve the problems discovered in the main findings is to define guiding principles that are helpful for creating a good learning space. Guiding principles are statements that encompass beliefs and values and guide an organisation throughout their work and processes (Broudly, 2011).

Process of developing guiding principles

Step no. 1 after research: cluster the research findings.



Mind maps are a good tool for sorting thoughts and ideas into different groups to make sense of everything and to visualise possible important features that can be forgotten if not written down. The following mind map shows different aspects that are meaningful for developing learning spaces.

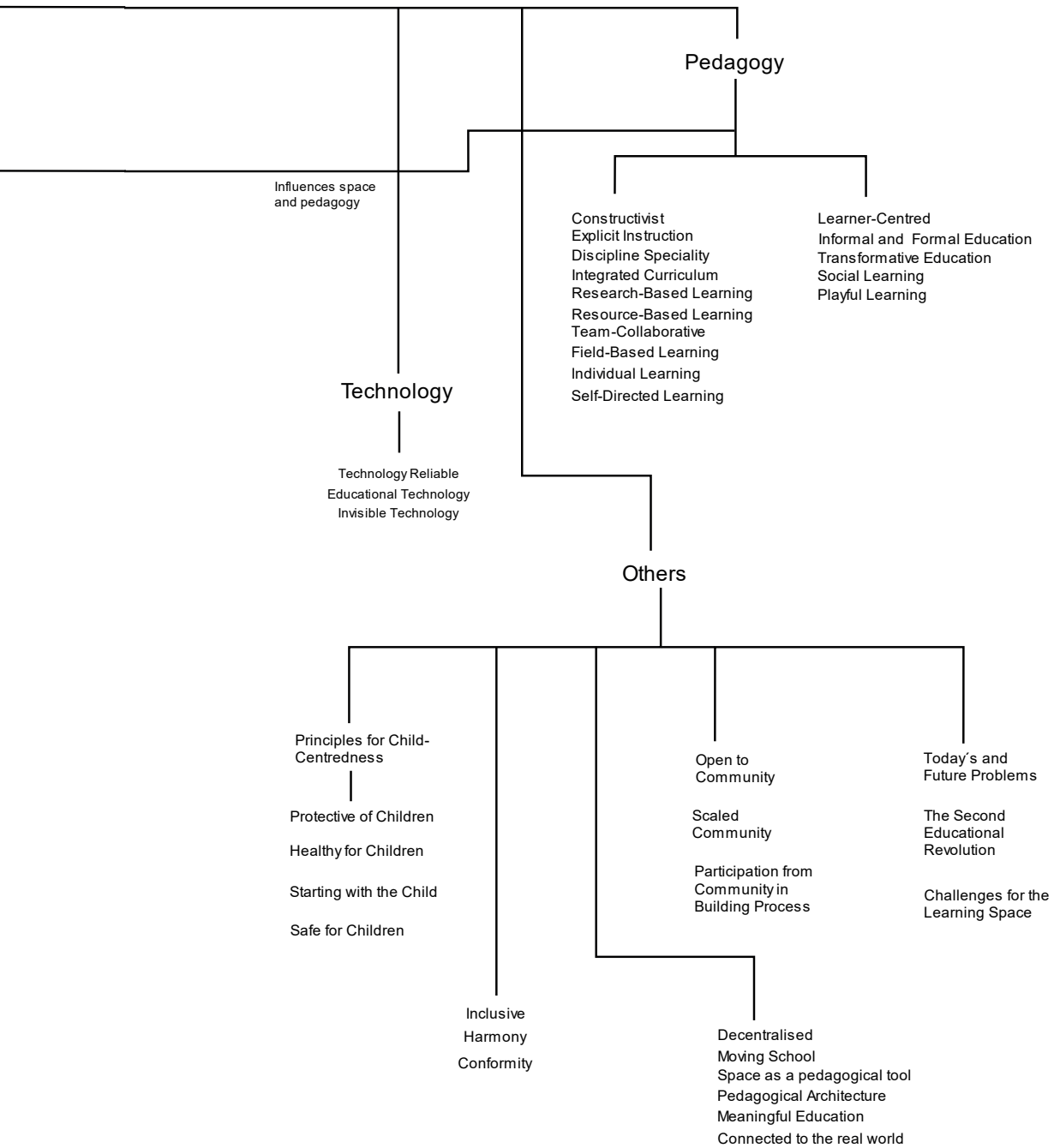


Fig. 37: Meaningful aspects for developing learning spaces

Step no. 2 prioritise the aspects and reflect on outcome

"Good things happen when you get your priorities straight"
– Scott Caan (Meier, 2010)

To ensure quality education the learning space needs to solve problems and challenges found in the exploration phase. Clustering the main aspects of the research findings into different levels of requirements, is a helpful method to create an overview of the most important aspects to ensure quality education through learning space design.

As a clustering tool, an adaptation to the must-should-could-list is a good way to figure out the different levels for quality education.

Must: The learning space must have this requirement to meet the needs of the user and to ensure quality education.

Should: The learning space should have this requirement if possible, but quality education does not rely on it.

Could: The learning space could have this requirement if it does not affect anything else

The must-should-could list was created in a workshop session with the overview of the research findings. After letting the list sit for a while and sending it out to stakeholders of the thesis for a review and feedback session, the must-should-could-list was reflected upon. The result shows important aspects to ensure quality education.

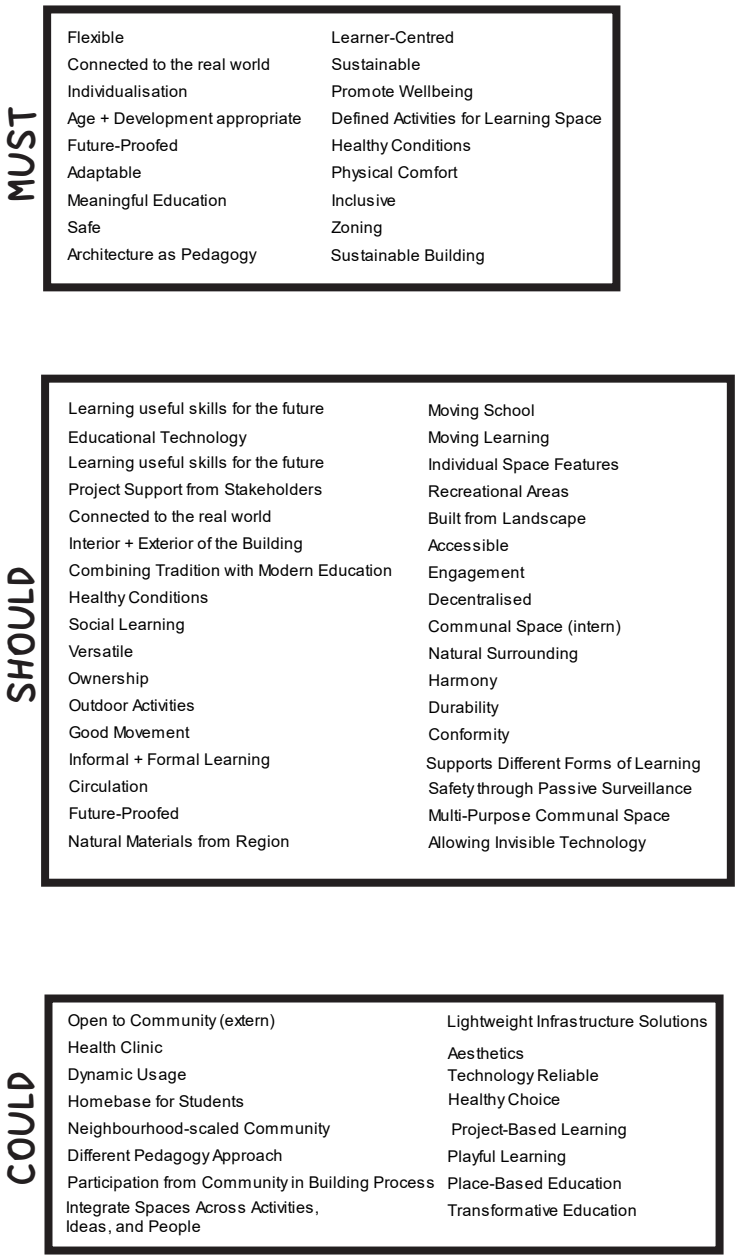


Fig. 38: Clustered topics through must-should-could

Step no. 3 extract values from aspects

After reflecting, reviewing, and restructuring the must-should-could list, the aspects of the must-haves for a learning space to ensure quality education were reviewed again in order to identify the most important values with the biggest impact for the best learning space possible.

The most important values are:

- **Child-centred**
    - Protective of children
    - Healthy for children
    - Starting with the child
    - Safe for children
- **Learner-centred**
    - Fostering students
    - Focus on individual learners with a focus on learning
    - Individual learners and their heredity, experiences, perspectives, backgrounds, talents, interests, capacities, and needs
    - The best available knowledge about learning and how it occurs
    - Teaching practices that are most effective in promoting the highest levels of motivation, learning, and achievement for all learners
- **Space as a pedagogical tool**
- **Space for different learning activities**
- **Psychological comfort**
    - Developmental and age appropriate
    - Inclusive
    - Inspirational
    - Accessible

- **Physical comfort**
    - Naturalness
    - Individualisation
    - Stimulation
- **Dynamic usage**
    - Zoning
    - Versatile
    - Open to community use
- **Sustainability**
    - Local materials
    - Low and renewable energy use
    - Waste collection and recycling
    - Composting
- **Basic planning standards**
- **Flexibility**
- **Adaptability towards future changes**
- **Participation** from overall community (user + stakeholder) in planning and building process
- **Educational technology**

Step no. 4 create statements and guiding principles

After extracting the most important values with the biggest impact on learning space design, a way to show and tell that those values are important and how they influence the learning space was needed. Creating statements and guiding principles are a good way to create more substance around values which is easier for people to understand and comprehend. Guiding principles are “an idea that influences you very much when making a decision or considering a matter” (Cambridge Dictionary, n.d.). Therefore, having statements which lead the way to the best learning space possible, and which are there to reflect upon when making bigger decisions, is a good method to develop new schools all over the world.

All the collected findings from the research part influenced the values that are important for a new learning space. The developed guiding principles are one idea of how discovered challenges and problems can be tackled by improving old schools and building new schools. The guiding principles are just a part of the process of creating new learning spaces.

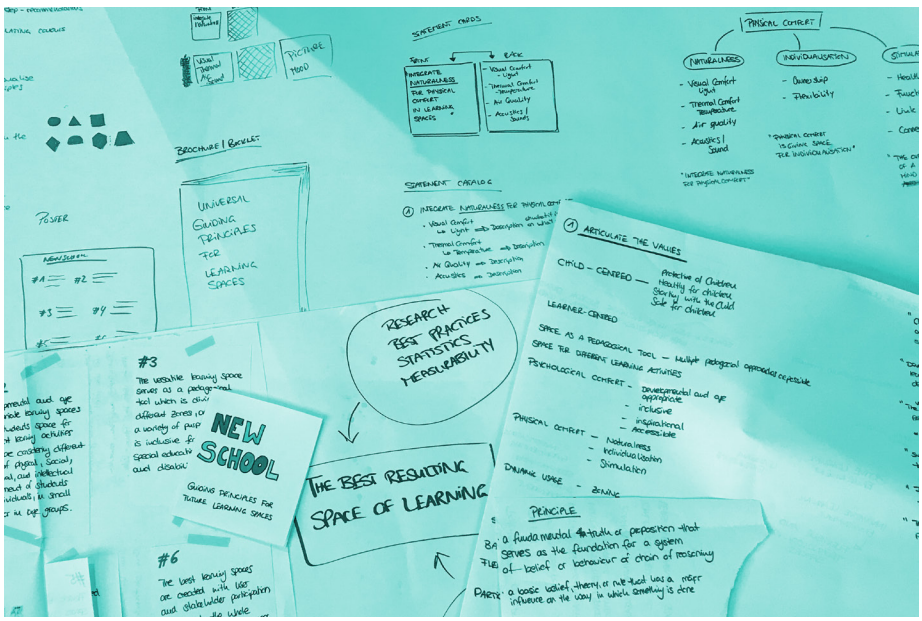


Fig. 39: Iteration process of developing guiding principles and how they can be presented

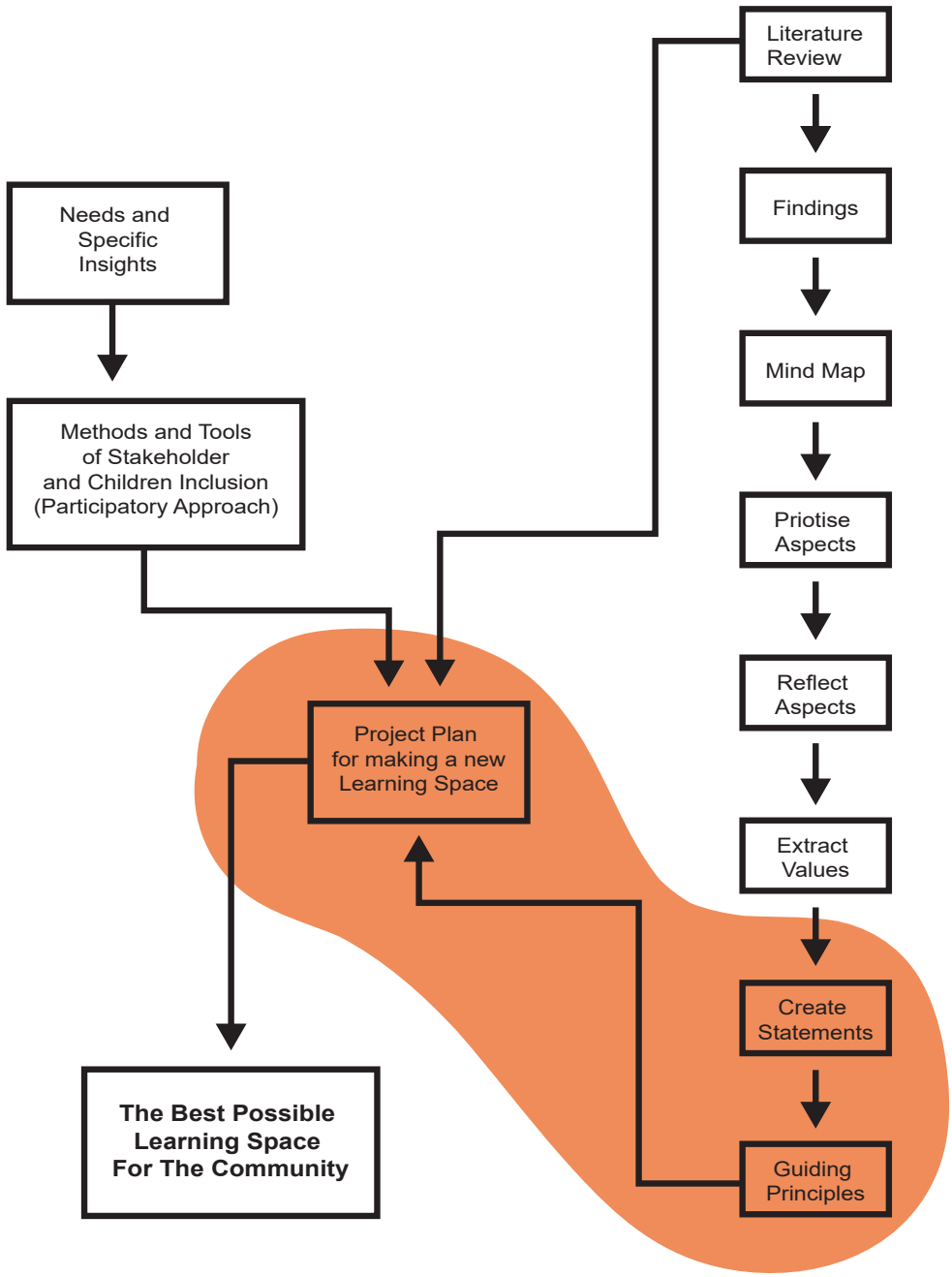
Design

Design Intention

Many problems and challenges related to education. Undereducated populations leave countries in poverty, and many developing countries risk falling behind in a fast moving world. The underrepresentation of girls in schools leads to even more problems. One way the field of design can contribute to better quality of education, is within the design of learning spaces.

To tackle the challenge of quality education, relevant fields of research have been explored through literature review. Some relevant topics that intersect the field of education are Childhood Studies, Participation in Space Design, Technology for Education and Education Studies. In addition, case studies of three current schools have led to interesting findings.

The goal is to create a process of developing new learning spaces to ensure quality education. A relevant way to present this process is by creating a project plan. The project plan must include children as well as other stakeholders in the process of developing new learning spaces. People with background knowledge in facilitating workshops, research, social anthropology, and architecture are typical users of the project plan. The target audience could be organisations and NGOs working with school development. In addition to a project plan, the findings of the research and literature review needed to be presented in a usable format. Therefore, creating guiding principles for learning space design has been a goal throughout the work on this thesis.


Literature Review
Findings
Mind Map
Priotise Aspects
Reflect Aspects
Extract Values
Create Statements
Guiding Principles
Needs and Specific Insights
Methods and Tools of Stakeholder and Children Inclusion (Participatory Approach)
Project Plan for making a new Learning Space
The Best Possible Learning Space For The Community

RESULT 1

Project Plan to develop new learning spaces

Process of developing a new learning space

The approach of the project plan and its structure are based on the design researcher´s experiences and are influenced by colleagues, architects, work experience, and opinions about what a good strategy approach is.

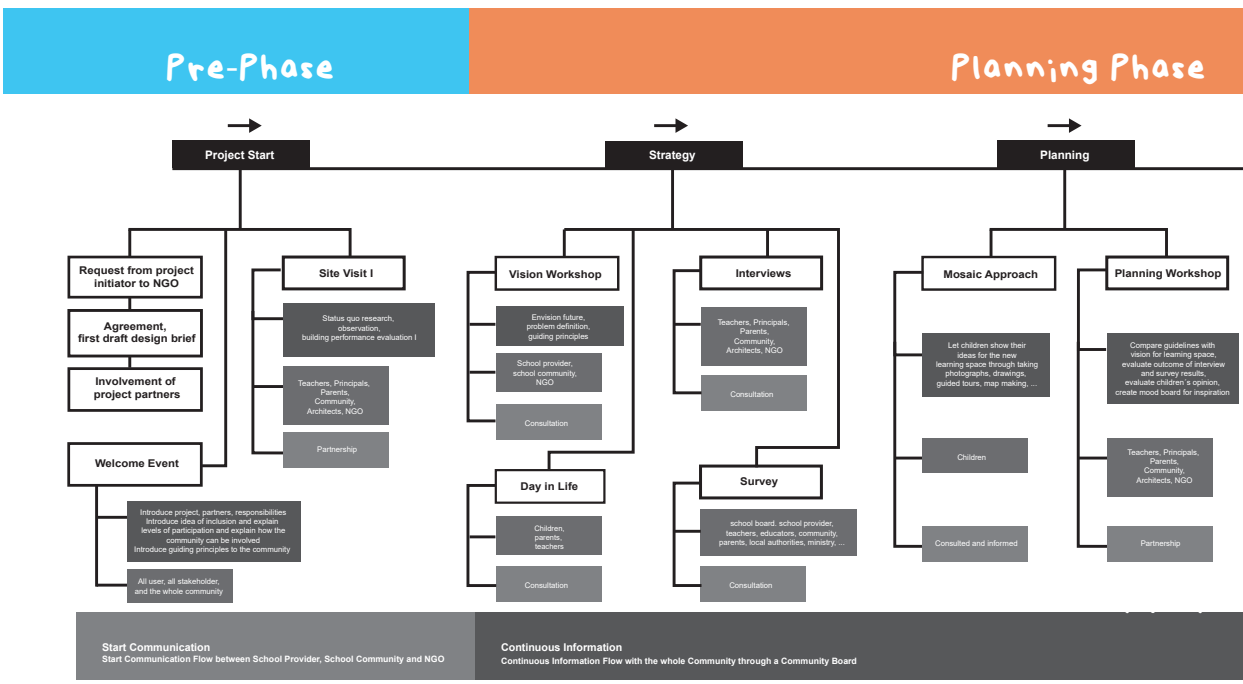
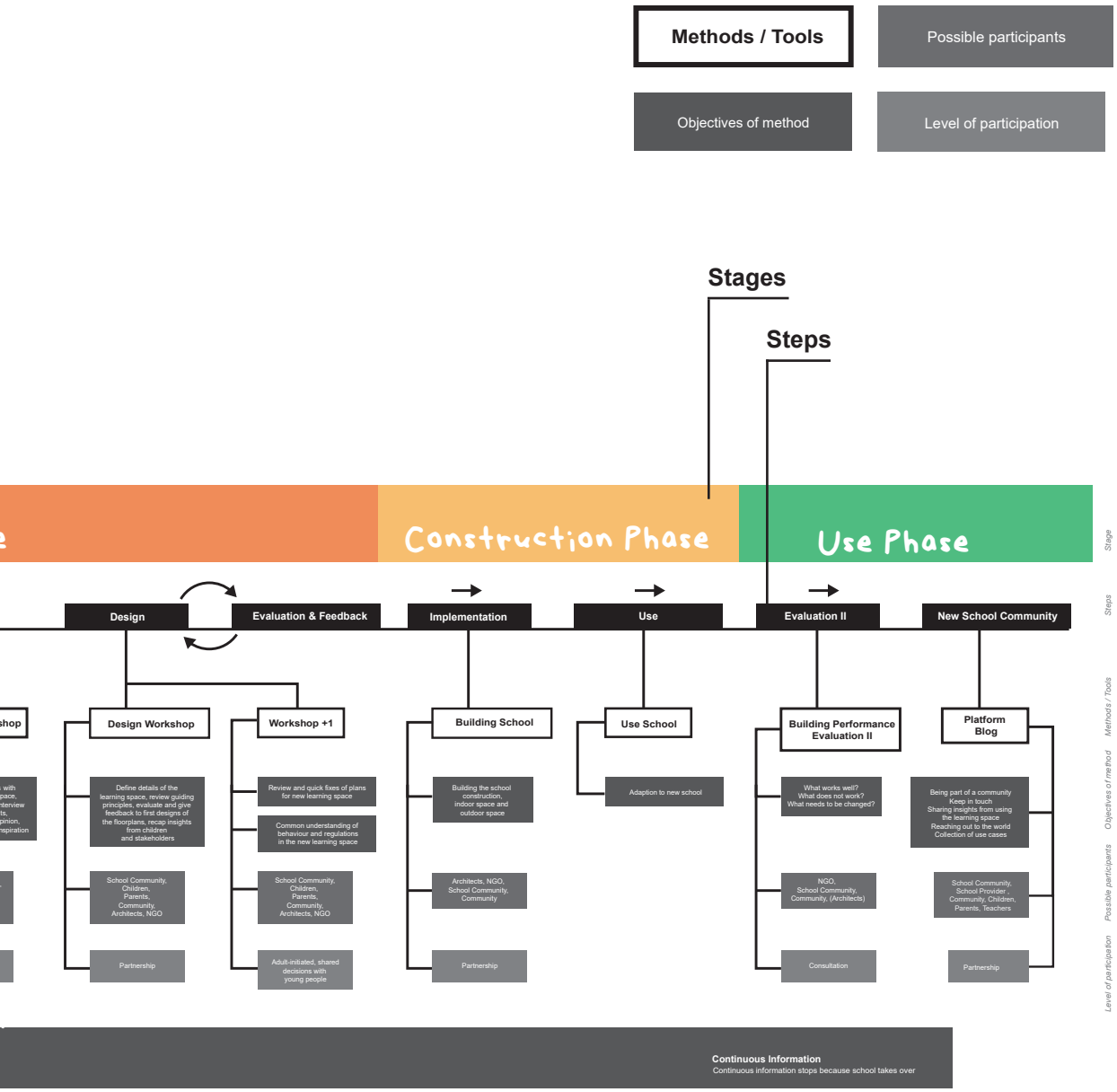
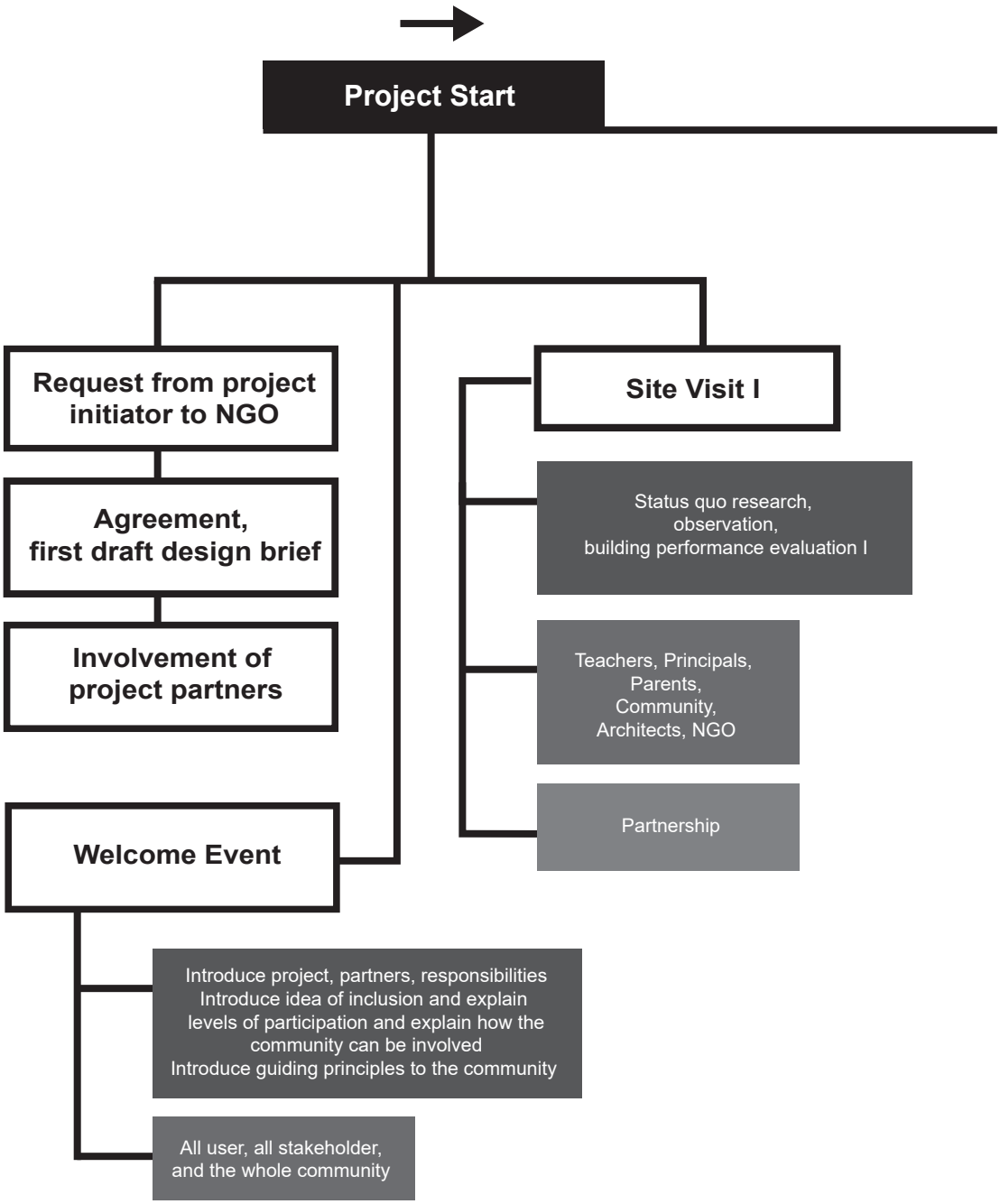


Fig. 40: Overview project plan



The project plan is divided into four phases – pre-phase, planning phase, construction phase, and use phase. From experience these are the main phases for developing buildings. The overview of the project plan also shows who is participating in which phase and steps, including an anticipated level of participation.

Pre-Phase



Start Communication

Start Communication Flow between School Provider, School Community and NGO

Planning Phase

Stage

Steps

Strategy

Methods / Tools

Objectives of method

Possible participants

Level of participation

Vision Workshop

- Envision future, problem definition, guiding principles
- School provider, school community, NGO
- Consultation

Interviews

- Teachers, Principals, Parents, Community, Architects, NGO
- Consultation

Day in Life

- Children, parents, teachers
- Consultation

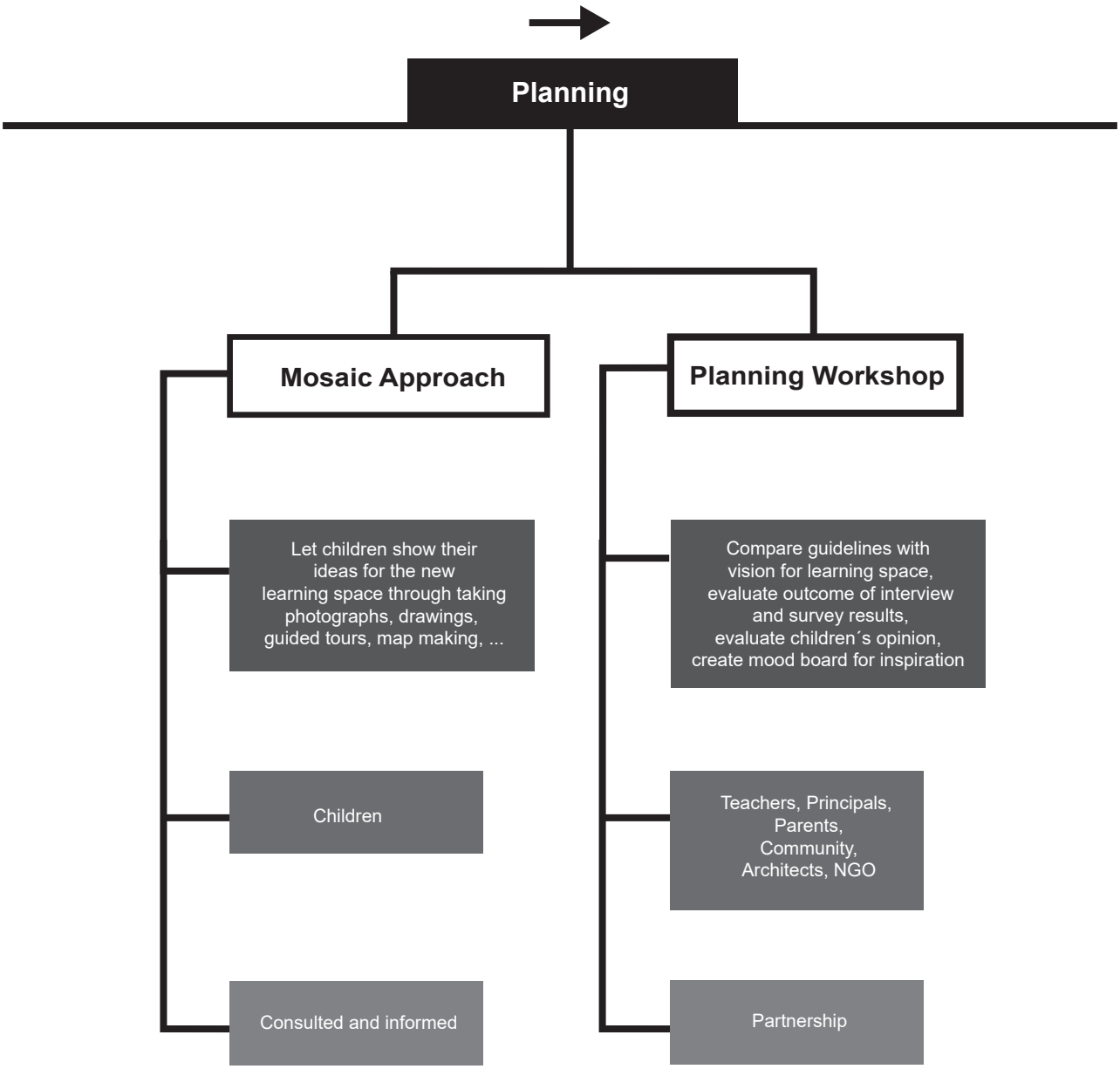
Survey

- school board. school provider, teachers, educators, community, parents, local authorities, ministry, ...
- Consultation

Continuous Information

Continuous Information Flow with the whole Community through a Community Board

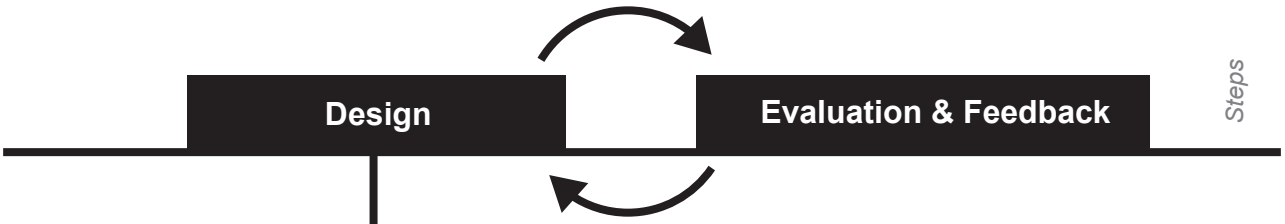
Planning Phase



Continuous Information

Planning Phase

Stage

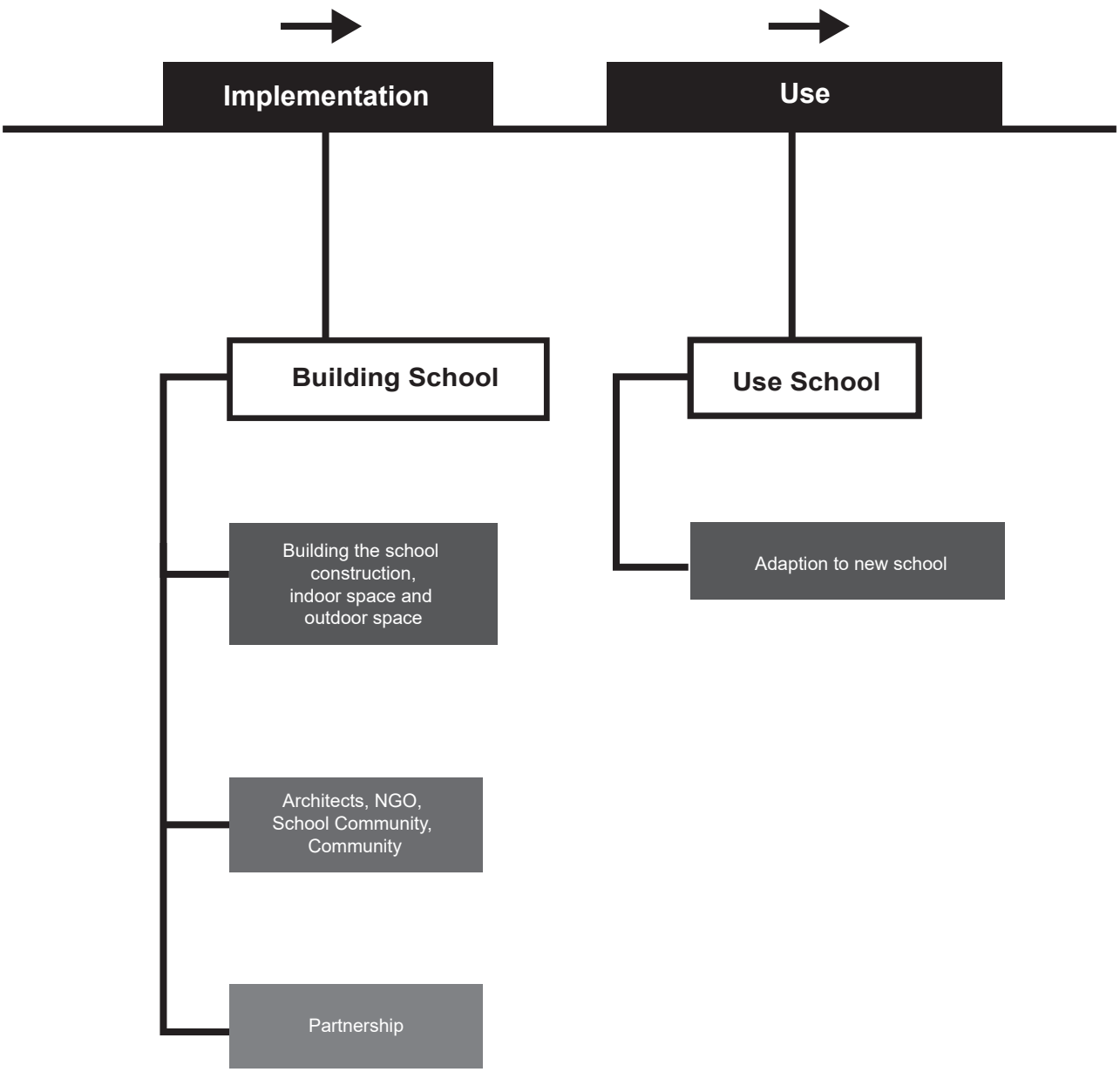


Steps

	Design Workshop	Workshop +1
Methods / Tools		
Objectives of method	Define details of the learning space, review guiding principles, evaluate and give feedback to first designs of the floorplans, recap insights from children and stakeholders	Review and quick fixes of plans for new learning space Common understanding of behaviour and regulations in the new learning space
Possible participants	School Community, Children, Parents, Community, Architects, NGO	School Community, Children, Parents, Community, Architects, NGO
Level of participation	Partnership	Adult-initiated, shared decisions with young people

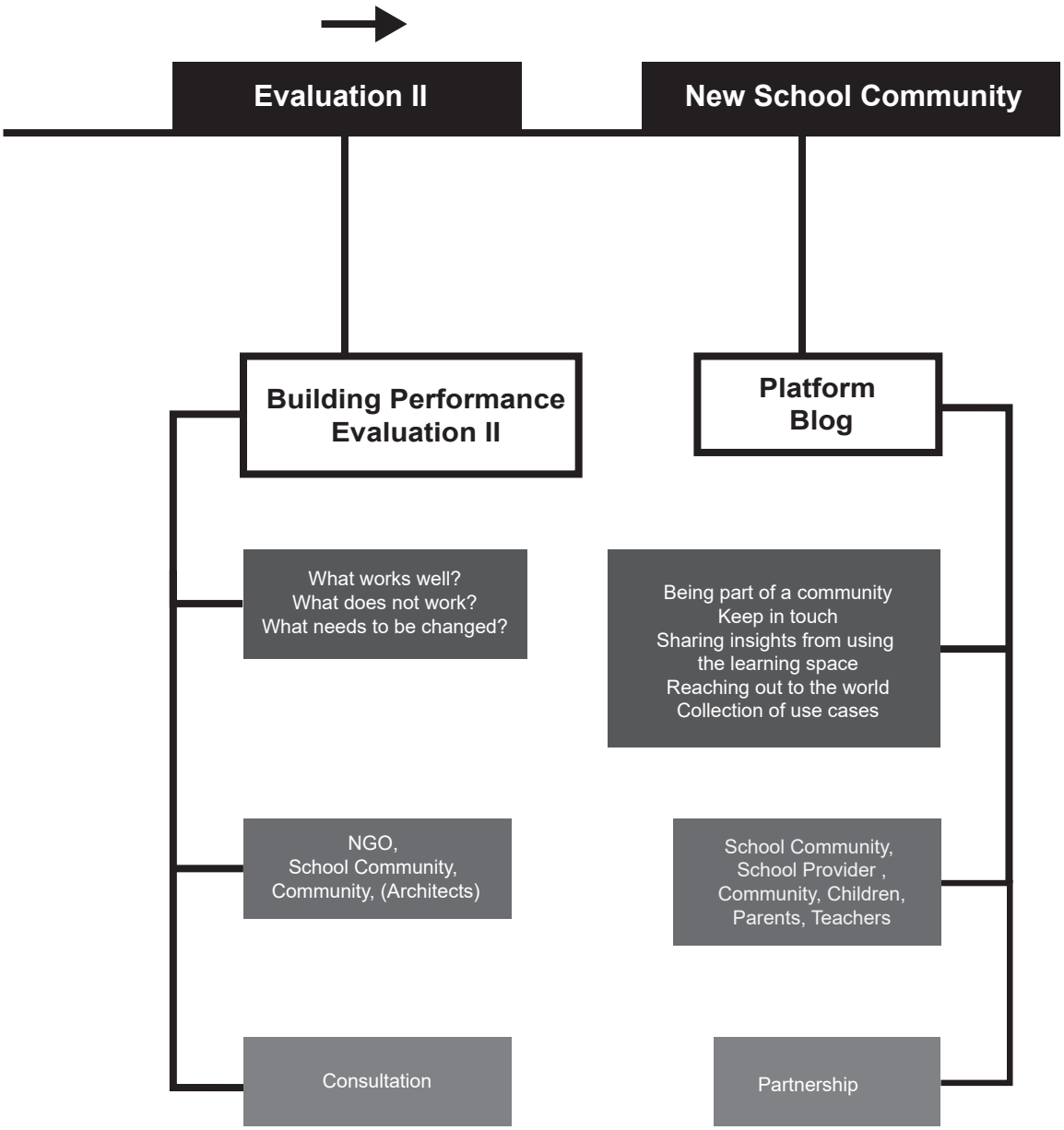
Continuous Information

Construction Phase



Continuous Information

Use Phase



Continuous Information
Continuous information stops because school takes over

The pre-phase includes recognizing the problems and the needs for a new school. It involves the search for project partners, like financial support, school developers, architects, educators, and other stakeholders that are important for the development process of a new learning space. The pre-phase structure depends on the school project and the partners. It depends also on specific approaches and is not generic. The presented pre-phase is an example.
A welcome event is a good opportunity to introduce the project and the people involved to the community. At the welcome event, responsibility will be explained as well as how the community can be involved. Levels of participation are helpful to understand what is possible for the community and explains potential stakeholders how to be involved in the project. At the welcome event the guiding principles will be introduced to establish a common understanding of how the school can be developed and how quality education can look.

The planning phase is clustered in specific steps that are necessary to define the details about the learning space. The planning phase serves also as a method to gain deeper insights from the people the building is for, and to get to know their needs, wishes, as well as problems and challenges that exist. In this phase the guiding principles are being addressed and compared with the needs and thoughts of the user. The construction phase sets the time when the school building can be implemented. How long it takes to build the school depends on the regional circumstances and weather conditions and of course the size of the new school. The use phase in this process is divided into three parts which have different goals. Using, evaluating, and communication is in focus here.

Strategy
The strategy is influenced by the collected information from research, and observation. To define the strategy to develop and build the new learning space, it is good to start with defining the problem of the school and community, and to envision the future. In this step, interviews with users and stakeholders provide additional information that are important to design the best learning space possible. A tool to include children and get deeper insights from them is to let them create and summarize a day in their life. Conducting a survey with the whole community includes people‘s ideas, opinions, and needs to make the new learning space attractive for the community and give them more ownership towards it.

Planning
In the planning step, methods from the Mosaic Approach are used to listen to the children‘s voices and get to know what they want and need to learn and grow up. A co-creation workshop is helpful to compare the guiding principles with the vision of the learning space as well as with the evaluated outcome of interviews and survey results, and children´s opinion. In this workshop different tools would be used to stimulate creativity and to figure out what the learning

space could do for the user. In this step, it is necessary to set the basis of the learning space. This means structuring the area, zoning, and sketching floor plans, as well as defining requirements for the new learning space.

Design
The next step “design” is all about defining the details of the learning space. In a co-creation workshop, users and stakeholders define materials, colours, and review floorplans. It is also important to review the guiding principles and the insights from children and stakeholders to see if the development of the learning space is proceeding in the right direction.

Feedback & Evaluation
Reviewing floor plans, design, defining furniture and other equipment and where everything will be placed, needs to be done in a continuous way until everyone can accept the resulting development. In this evaluation round it can be beneficial to create, in a workshop, a common understanding of the behaviour and regulations in the new learning space. It is also relevant to include the financial aspects of the project continuously in order to stay within the budget.

Implementation
After the floorplans are defined and “signed” the building phase starts and the learning space will be shaped into its visioned form.

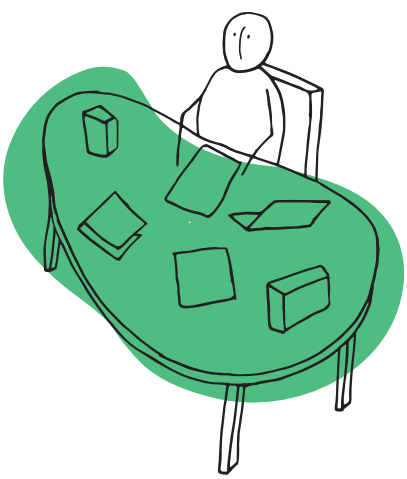
Use
In the use phase the adaption towards the school is important and a main goal.

Evaluation II
To make the adaption happen better, a second evaluation of the building performance is a good measure. The building performance evaluation has the goal to figure out what works well, what does not work, and what needs to change.

New School Community
The last step of the project plan is to include the newly developed learning space, its users and stakeholders into the New School Community by creating a platform and blog, where different New School projects can share insights from using the learning space, and adapt to changes in the future. The community platform is a good tool to keep in touch with projects, to reach out to the world and share experiences. It is also a collection of use cases which can be important for the development of future new learning spaces.

User Experience Journey

The following user experience journey describes the experience of a nine-year-old child in Dhoksan. The persona in this created scenario is involved in the planning process of building a digital school. The decision to make an example for Nepal was influenced by the fact that there is more information on how the school is at present, and what the ideas for the future are. The user experience journey is divided into stages (planning phases) and steps (e.g., day in life). The goal of this user experience journey is to show where certain needs of the children can be observed, what the doings of children in the planning phase are, and what kind of opportunities for the project developers occur when using the described tools in the planning phase.



Scenario: Children Inclusion in planning phase
Extension of the Shree Shila Devi School, Dhoksan
Goal: Building a digital middle school
Persona: Student, age 9, 4th grade

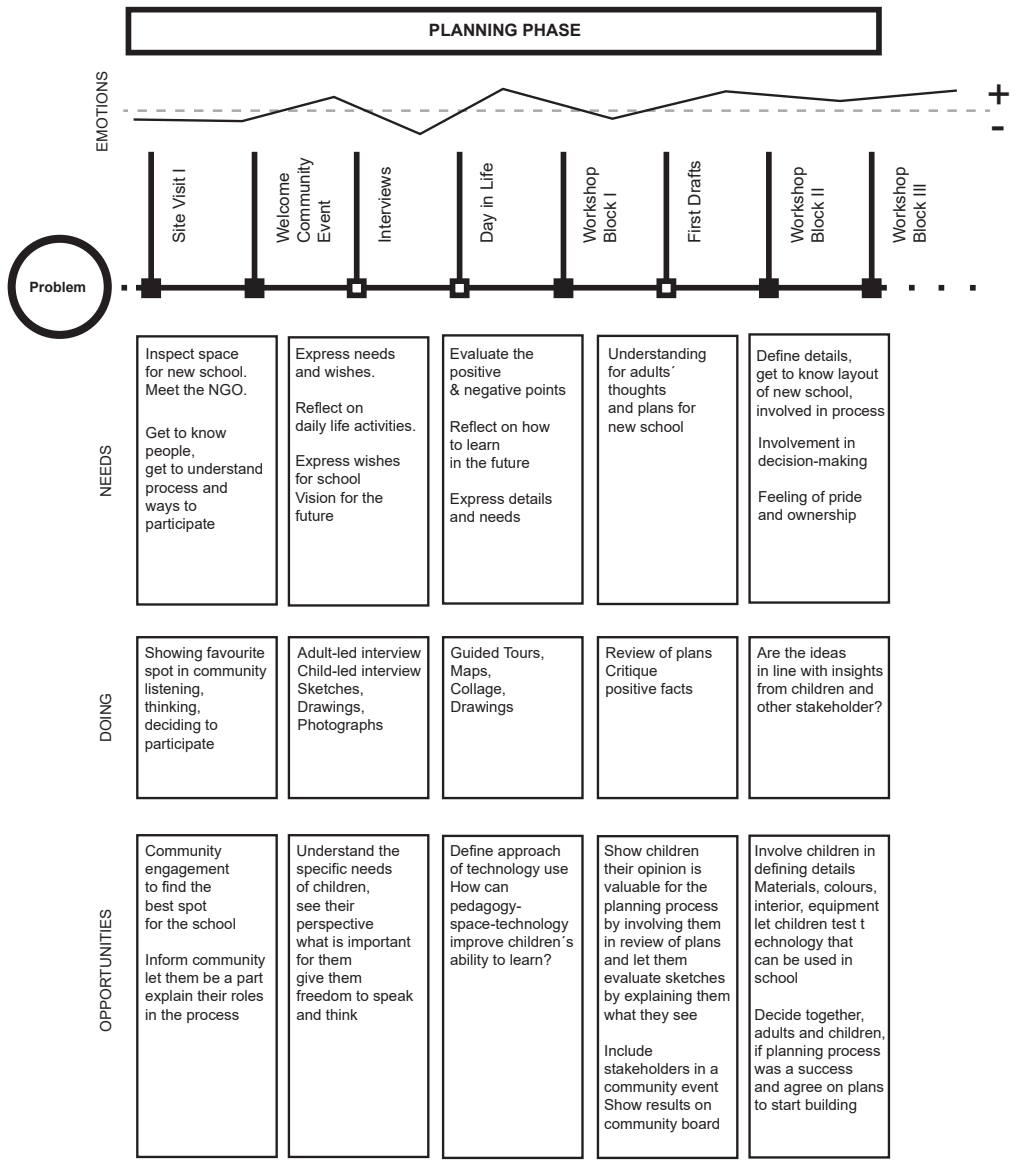


Fig. 41: User Experience Journey

Guiding principles can be used to evaluate suggested solutions in the process of developing learning spaces.

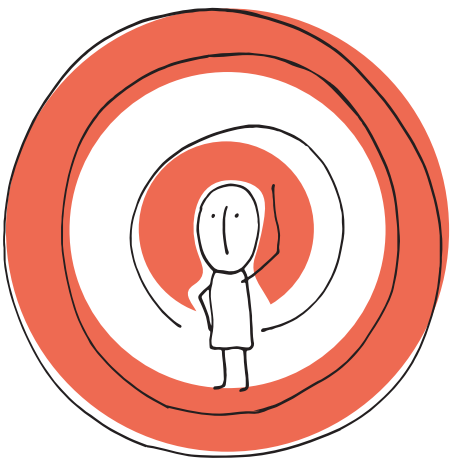
The following guiding principles are created in the iteration process of re-writing, reviewing, feedback from PCF, the supervisors of the thesis, and people who are the best when it comes to language and expression. In addition to the principles, a description of what the principles mean in detail and how to implement those principles in the learning space was captured.

RESULT II

Guiding Principles to ensure Quality Education through Learning Space Design

Child-centred spaces

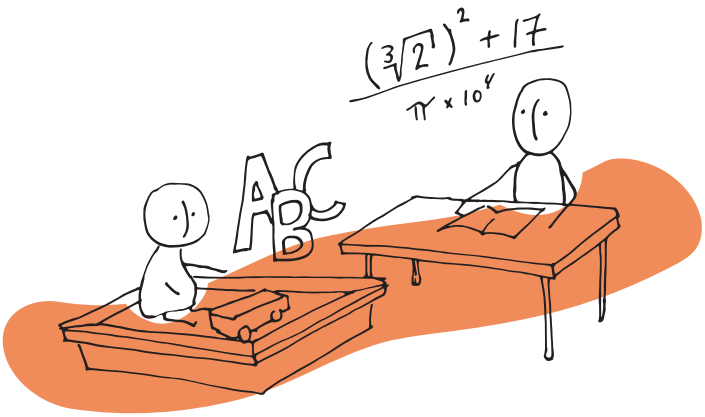
Child-centred learning spaces support health, wellbeing, and safety of children.
Good child-centred spaces give each child comfort, stimulation, and space for individualisation.



To create a child-centred space, the school developers need to follow the basic planning standards on building schools as well as developing schools where children and people in general feel safe. Safe means therefore to provide sanitary facilities separated for each gender and between children and staff. It also means to provide fresh water, hot water and means to clean (especially hands). Nutrition is important for a child‘s development, thus a kitchen with seating possibilities or a lunch break room is needed. To provide comfort in the learning space, school developers need to plan the learning space considering the requirements for thermal comfort, visual comfort, air quality and acoustics. The learning space can stimulate children with colours and with engaging equipment and space to present learning results. Each child should have the possibility to use the learning space in different ways as the learning space can provide a place for reading and learning, and at the same time for communication and playing. Each child should have a dedicated storage space to call their own.

Age-appropriate spaces

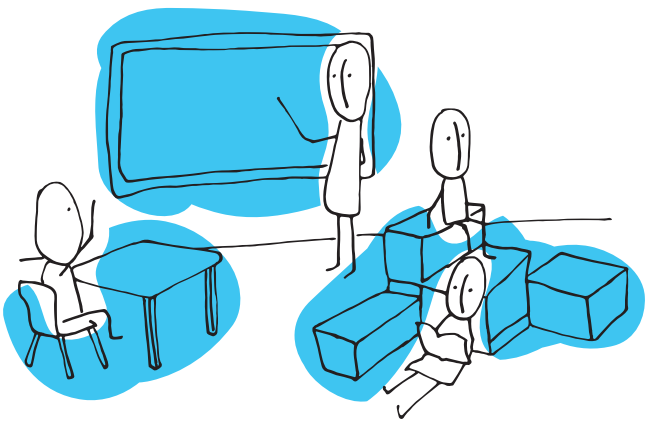
Developmental and age-appropriate learning spaces give students space for different learning activities. Therefore, good learning spaces consider different levels of physical, social, emotional, and intellectual development of students.



To create an age-appropriate space, the school developers need to understand the learning habits of each age group of students. They need to provide a set of learning activities in their space, so children have flexible learning experiences and learn in different ways. By learning in diverse and interconnected ways children build deep and durable knowledge. The age-appropriate learning space understands the different needs of children and provides children with materials, equipment and other supporting tools that are useful for their learning outcome, their abilities to learn, and the social circumstances.

Versatile spaces

Learning spaces that are versatile serve as good pedagogical tools because they are divided into different zones, accommodate a variety of purposes, and are inclusive for children with special educational needs.



To create a versatile space, the school developers need to understand that a learning space is divided into different zones which can be spread all over the school grounds and overlap with other age-groups and grades. A versatile space gives all children access to learning and space. Materials, methods, tools and furniture are flexible and inclusive. The children can decide which place is best for their way of learning and the content of their learning subject. A versatile space is a multi-use space which allows other groups of people to use the space outside school hours and on weekends. The outdoor area is accessible for all children, and gives children shelter and a breakout zone even after school and on weekends.

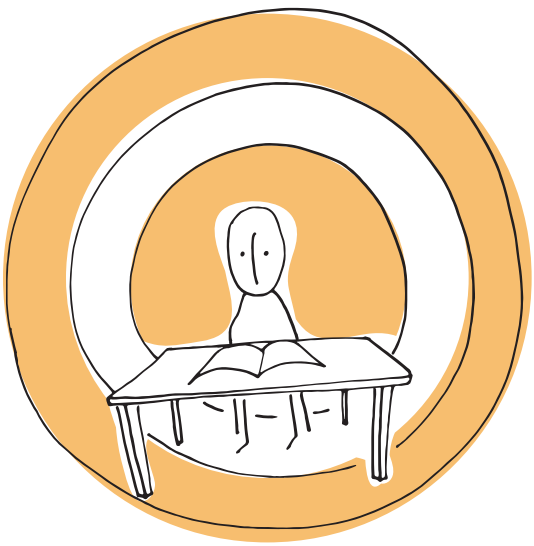
Sustainable spaces

Good learning spaces are sustainable because they ensure an optimal and long-term use of the facility. The sustainability aspect includes the whole life cycle of materials with the focus on circular economy and regionality. Sustainable spaces give the whole community a safe space and central spot to meet.

To create sustainable spaces, the school developers need to develop and build the school building with consideration to the topography and the given properties of the country. A sustainable space considers available materials in the region without long transports and is able to recycle materials. A sustainable space is made for longevity and ensures use and maintenance for many years with low effort. It is also important to understand the use of renewable energy (solar for electricity and hot water) and to implement water tanks to save rainwater. A vegetable garden on school grounds teaches students about food and harvesting, and supplies the school with vegetables to prepare school meals. In addition, a compost heap that can be used as fertilizer for the garden and food waste can be reused. A sustainable space is not just a school, it is a space for the whole community and gives refuge for people in need.

Learner-centred spaces

Learner-centred spaces give students access to their own learning and enable them to make decisions. Learner-centred spaces provide educational technology and adapt to meet future needs.



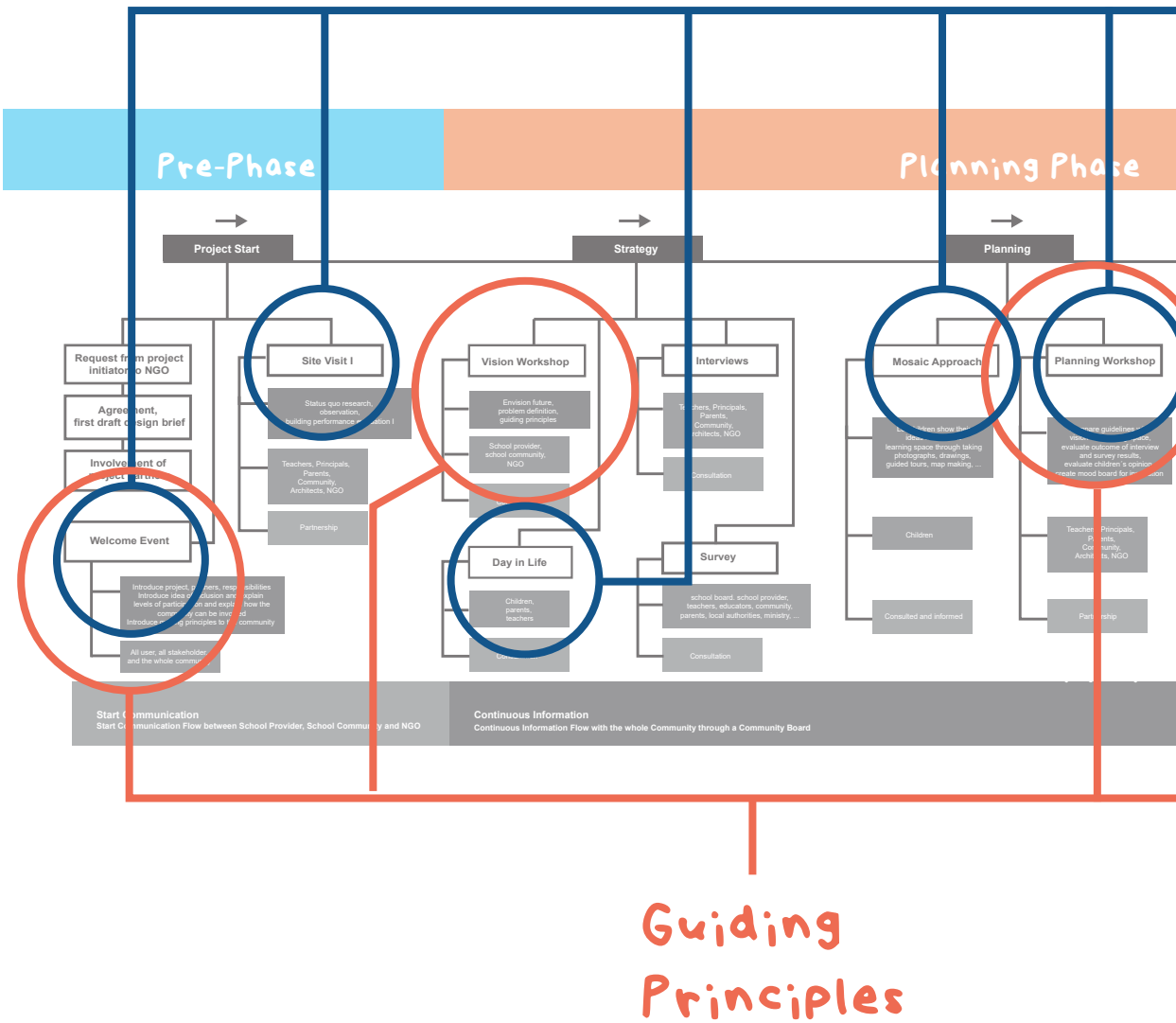
To create learner-centred spaces, the school developers need to give students the ability to include their experiences, backgrounds, their talents and needs. The focus lies on the individual learner and the learning itself. The learning space needs to reflect and support different preferences. The pedagogical approach is flexible and open, it puts the teacher in an expert and supporter role and lets the students develop projects and acquire knowledge that is in their interest and helpful for their respective futures. A good tool to support the learner-centred space is the implementation of educational technology. Educational technology gives students the necessary tools to acquire knowledge. Giving students tablets and e-readers are fast measures with a small impact on the budget. Other applications on tablets can foster the learning experience either in school or if needed, at home. Apps can support the learning experience in different ways and can be created in a collaboration with universities and developers.

Participation leads to ownership

The most welcomed learning spaces are created with user and stakeholder participation. Including stakeholders in the building process ensures that the learning spaces are well looked after by the community.

When different people, users and important stakeholders participate in creating learning spaces, people have the feeling of a growing responsibility towards that place because they invested in the project with time, energy, and creativity. The feeling of being responsible also creates a feeling of ownership towards a place. Ownership can prevent vandalism, as people want to take care of a space. School developers need to include users and stakeholders in the process of development and decision-making. This creates a sense of responsibility and ensures the longevity of the learning space and the user-centredness.

Together with the project plan, the guiding principles are needed to ensure quality education through the learning space. The guiding principles are introduced in the beginning of a new project and will be addressed and evaluated throughout the project plan. Where guiding principles can be addressed is marked with a red circle below. To develop the best possible learning space includes children into the development process. Where children´s participation and their opinion is needed and wanted throughout the process is marked with a blue circle below.



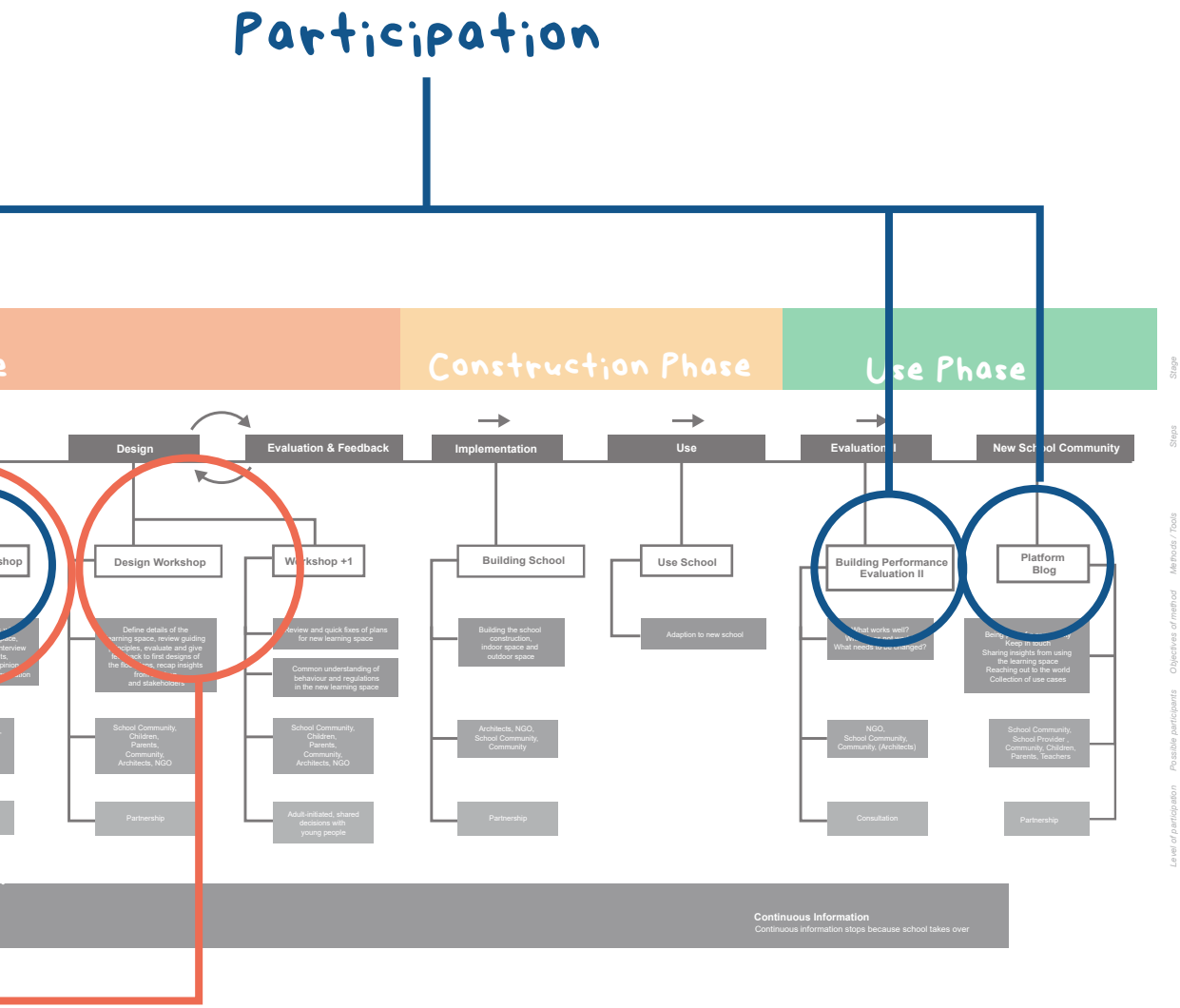
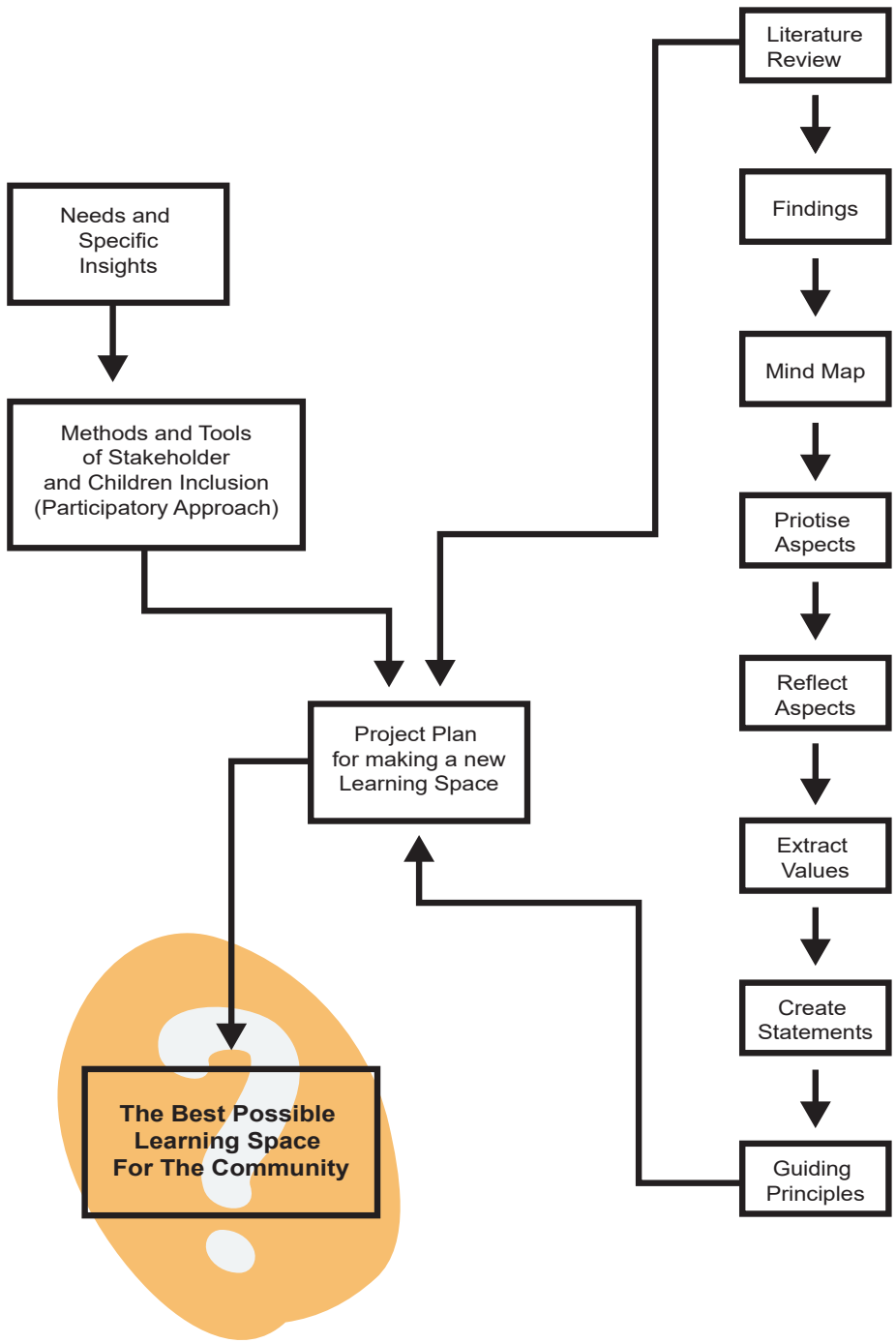


Fig. 42: Implementation of inclusion of children and guiding principles into the project plan

Epilogue

More work is needed to implement the process of developing new learning spaces. More work is also needed to use the project plan in different organisations. The project plan is, however, a strong general concept that can be adapted by other organisations and architects who work within the education sector. The project plan is an approach to build learning spaces which ensures quality education.

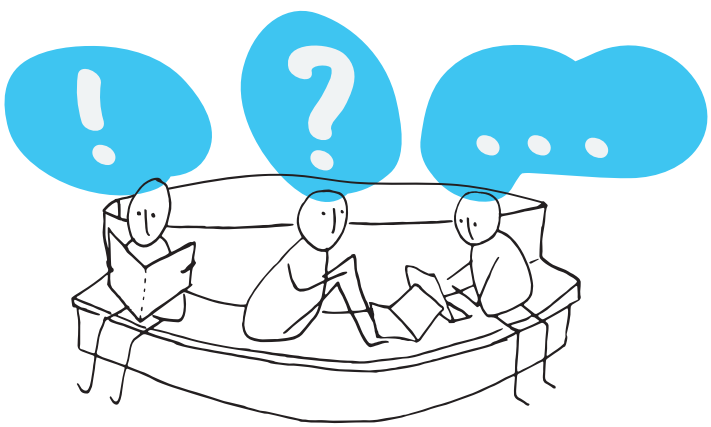

Literature Review
Findings
Mind Map
Priotise Aspects
Reflect Aspects
Extract Values
Create Statements
Guiding Principles
Needs and Specific Insights
Methods and Tools of Stakeholder and Children Inclusion (Participatory Approach)
Project Plan for making a new Learning Space
The Best Possible Learning Space For The Community

Future Work

The thesis outcome is based on broad research and presents my opinion on the topic of quality education and learning spaces. In order to use the developed guiding principles and the developing process, more work needs to be done. Future work:

- Obtain feedback on the guiding principles and the process of developing new learning spaces from relevant stakeholders.
- Develop tools for the process of developing new learning spaces and supplement with more tools if needed after testing.
- Test the process of developing new learning spaces and the guiding principles by using the project plan.
- Test if the guiding principles can be used to improve existing schools.
- Test and evaluate whether guiding principles are universal.
- Refine the process based on tests and feedback.
- Use process to generate closer collaboration with stakeholders

Researching what it means to create a good learning space that provides quality education, made me think of how the schools in Rwanda, Cameroon and Nepal can be improved to ensure a better quality education.



Scenarios to Improve Schools in Rwanda, Cameroon and Nepal

The following scenarios show a picture of new schools in the case countries taking into account provided information, worldwide trends, access to quality education and good school equipment. Scenarios are normally made in collaboration with stakeholders. The following scenarios only state my opinions on how the future schools might look in Rwanda, Cameroon, and Nepal. To create the scenarios, I used my project plan as a guideline. Regarding the information flow during the thesis, the scenarios are built with „if"-statements based on the approach of the project plan. To create the scenarios, I used not yet confirmed challenges and problems I found in my research.

If the curriculum in Cameroon´s schools are insufficient, then the solution could be to create a project-based educational approach which gives students the freedom to solve problems found either through collaboration or as individual work. This project-based approach helps students gain knowledge in fields of interest and at the same time develop new skills and improve already established skills.

If the schools in Nepal do not have proper textbooks, the solution could be to provide educational materials through technological devices. Therefore, giving each child a tablet pc with good tools and apps that are developed to educate children is a good starting point. Collaborations between university students and school communities could be a way to develop new applications. Such applications can be used to transfer knowledge to children and give them other opportunities to learn and develop. Another aspect of collaboration would be to collaborate across borders to transfer specific knowledge and equip people with different skills. The learning content and the language would have to be adapted to be able to use it in many different countries and regions. Building an international open source platform could be a way to approach this.

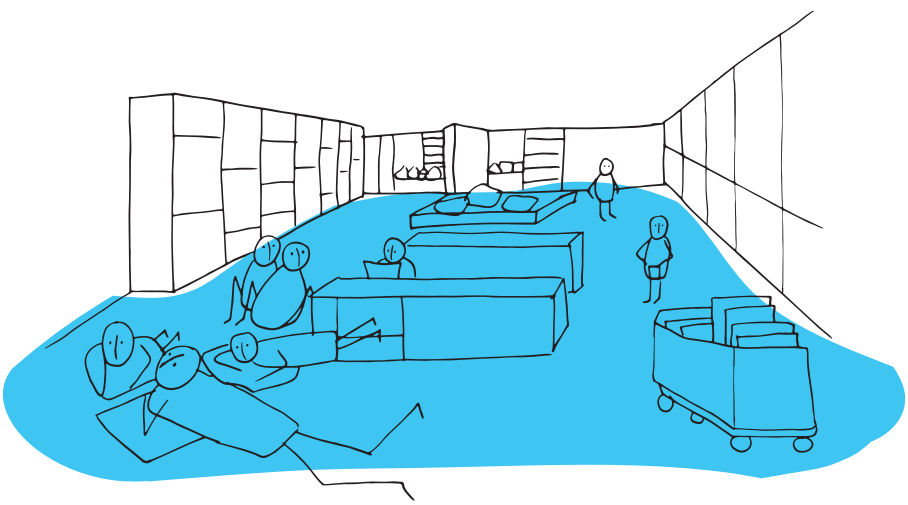
If the schools lack accessibility to the learning space and materials in combination with low understanding of learning needs and differentiating learning plans, the solution could be to investigate what the current state of the school is and how the space can be improved to give all children better access.

If girls are underrepresented in schools a simple solution can be to provide sanitary facilities for girls and a health service. Another solution could be to employ more female teachers so girls have a female role model and an adult to trust at school.

If the problem is overcrowded classrooms then a solution could be to have more open spaces with flexible furniture. In addition to an adapted pedagogic approach, more children could learn more freely with more space, and decide for themselves where to learn. If children have more space and can change the learning setting, they can concentrate better which results in increasing productivity and better school results.

If early childhood education in Rwanda is limited, the solution could be to integrate early childhood education in existing schools by giving young children the possibility to learn from older children. This would create many opportunities for all children when playing or learning together. The pedagogic approach of such schools needs to be flexible and integrate different types of learning and teaching like crossover learning, blended learning and activity based learning.

In my opinion the project plan is not only useful for creating new learning spaces. I believe that the project plan and insights from this thesis can be used to improve existing schools. However, as the project plan describes, specific cultural context is necessary to give relevant suggestions for improvement. To implement changes in schools, participation and ownership from the community is needed. Therefore, all suggestions are limited and are an evaluation through the lens of the guiding principles. The above stated suggestions for improving schools consider the guiding principles “versatile spaces”, “child-centred spaces”, and “learner-centred spaces”. To improve the schools with the other guiding principles requires more information and access to the school communities.



Reflection on the thesis

One of the main topics of the thesis is participation and how to include users and stakeholders into the developing process. Although the aim of the thesis was to create a democratic way of developing learning spaces, the thesis process itself did not include as much participation as originally planned. At the start of the collaboration with the PATRIZIA Children Foundation we intended to have a close collaboration because we wanted to develop ways to make schools future proof together. However, throughout the work on this thesis our collaboration has been difficult. Reaching out to the organisation as well as to other stakeholders was challenging. In addition, I have not yet received feedback on the discovered topics and created outcomes. I believe that the COVID-19 pandemic has influenced the nature of collaboration. It would for example have been relevant to travel and conduct workshops with children and communities in the work on the topic of quality education.

Through the brief collaboration we had, it was not possible to get deeper insights into how the case schools work in detail, how they are equipped and what they can offer the children. The limitations of specific insights and information to the case countries and schools made it difficult to suggest specific improvements. This is why my approach to the future of learning spaces is more generic.

My original master brief was quite specific. After starting to work on the thesis I adapted my master brief to give me more freedom and space to experiment. For example, lack of insight made it impossible to analyse the financial aspects and in-depth aspects of the three case schools. This also made the research part of the thesis as large as it is. The approach of transition design was used to create scenarios and suggestions, but was not a main part of the thesis as described in the brief. It became clear that the focus should be to research broad topics and to conclude with guiding principles and a process of how to develop new learning spaces that ensure quality education. To include the approach of transition design would be relevant in future work.

I believe that a strength of my thesis is that it gives a good overview of problems that exist within the domain of education. It is a general overview from literature, media and problem descriptions by other researchers. The thesis collects different perspectives and describes the meaning of quality education from several angles. The insights from working on the thesis can contribute to make better learning spaces and will definitely influence how I approach future projects.

Conclusion

The aim of this thesis was to develop universal principles and a generic process to create new learning spaces which ensure quality education. The large part of secondary research in this thesis was needed to discover problems and challenges in education. The problems and challenges in the case countries are similar to each other. Nevertheless, culture and the social environment, as well as the political stability influence the size of the problems and their influence on children‘s lives. Some problems and challenges can be improves upon by the guiding principles and the process of creating a new learning space. Some problems are however, too big and have deeper roots which cannot be solved only by improving education for children.

Cameroon is facing problems regarding the Anglophone and Francophone regions, with two different educational systems and two different languages. The political differences in Cameroon cannot be solved by education alone. In the last four years the situation for people in Cameroon has become worse and 2019 and 2020 were by far the worst. Many people fled the country, schools were recently attacked, and civilians are killed almost daily.

Rwanda is still fighting with its past although it is changing and developing with positive impacts on its people. 25 years after the genocide, the country heals step by step and improves its economy and political stability. Doing an activitiy together as a community, like the monthly “Umuganda”, are seen as the key to those positive developments. Challenges that Rwanda has to tackle to improve the quality of education, such as high drop-out rates because of failing an important exam after primary school, are challenges that cannot be solved by the thesis approach.

The research findings for Nepal show that much is done and ongoing to improve the quality of education. But it also shows the massive differences between rural and urban regions, a key challenge in most countries of the world.

Through the developed process of making learning spaces it is possible for organisations to understand the specific problems and challenges of communities they work with, and the root of their problems. To understand problems and their causes, it is necessary to talk to people and include them in the process of tackling the challenges. Otherwise, many problems will not be discovered and solved.

The thesis and approach to develop new learning spaces is a contribution to the Sustainable Development Goal No. 4 “Quality Education”. This goal states to “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all“ (UN 2, n.d.).

Fig. 43: Sustainable Development Goals

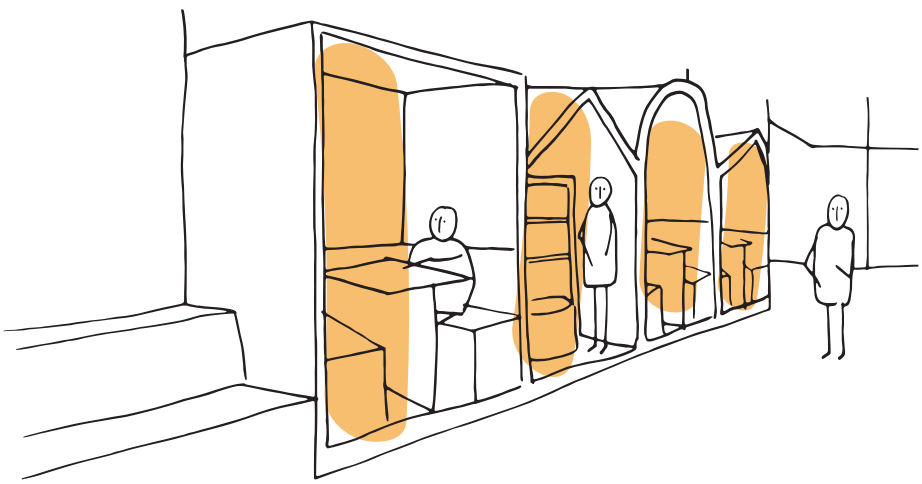
The thesis directly influences other topics of the Sustainable Development Goals - No. 3 Good Health and Wellbeing and No.5 Gender Equality. The thesis also indirectly influences on the Sustainable Development Goals No.1 No Poverty, No.2 No Hunger, No.6 Clean Water and Sanitation; No. 8 Decent Work and Economic Growth, No. 10 Reduced Inequalities, No. 11 Sustainable Cities and Communities, and No.16 Peace, Justice and Strong Institutions.

To research such a broad topic was an interesting experience. Several countries all over the world face similar problems. It does not matter where those countries are, how stable the political system is, if they are a developed country or a developing country. The lack of quality education is a worldwide problem. The main reason is the lack of ability to change and adapt towards a changing world. Most school systems are outdated and will not handle future challenges and requirements. Research and observations in the thesis showed that some trends are being discovered and used to form new schooling systems, but this is a slow process in a fast-changing world.

Education can be a game changer in bettering the world. As stated in my introduction to this thesis, education is one of the main ways to bring people out of poverty, and leads everyone to a better standard of living. Education starts from childhood, and is lifelong learning that is necessary to manage tasks, change habits, solve problems and challenges.

Successful education is the result of good collaboration between many different people. The best products, services and systems are designed with insights of users and stakeholders. Therefore, children need to be included in the developing process of new learning spaces. They are the main user and are heavily influenced by the learning space. A well-designed learning space has included the community in the design process. In this way all users and important stakeholders are heard and problems and challenges can be discovered and tackled.

This new approach to the design of learning spaces is a contribution to improving the quality of education.



„Education ... is the practice of freedom, the means by which men and women deal critically and creatively with reality and discover how to participate in the transformation of their world.“ - Paulo Freire

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Appendix

Page 40 - Trends in Education

Year of Publication	2018	2019	2017	2019
Trends	An aging world	The changing role of a teacher	Practical learning strategies	Artificial Intelligence
	Labour market shifts	Artificial Intelligence Learning	Focus on students´ choice and preferences	Augmented Reality / Virtual Reality
	Skills mismatch	Augmented Reality Training	Collaboration (The powerful tool of sharing and connecting with others)	Personalized Learning
	Rapid Urbanisation	Cultivation of Empathy	Edutainment (The novel concept of blending entertainment with learning)	Internet of Things
	Stricter immigration policies	Hybrid Homeschooling	The emergence of a holistic change	Gamification
	Economic shifts	Blended Learning	Skill-based education paves way for trained professionals	Dynamic Mindfulness
	Capacity imbalance		Learning on the go is fun	
	Budget pressures		Appreciating the competencies of students	
			Internships (Another promision tool for career readiness)	
			Adaptive learning platforms will gain prominence	
Source	https://blog.fullfabric.com/8-trends-shaping-the-future-of-education	https://www.myschoolr.com/blog/top-6-trends-that-will-shape-future-education-in-2020.html	https://www.edsys.in/trends-defining-future-education/	https://yourstory.com/mystory/upcoming-educational-trends-that-will-change-the-f

2019	n.d.	2020	2012	2020
Digital responsibility	Tablets in Classrooms	Micro-schools/pods	Tablets	Universal secondary is the new universal primary
Life skills and workforce preparation	Assistive Technology	Adding creativity back to the classroom	my learning network is a social network	Progress on universal primary stagnated
Innovation pedagogy	Augmented Reality / Virtual Reality and Voice Platforms	Personalisation	lost and found in translation	Private schools continued to grow, but slower, and lots of people still hate them
Computational thinking		Changing teaching methods	the great firewall of … everywhere	Higher education in China expanded at a breaking rate
Student-led learning		Emerging technologies	earlier use of technology	The promise of edtech is yet to be fulfilled
Collaborative classroos		Virtual Learning	special needs	We discovered the learning crisis
Connecting guardians and schools			all this tech is going to my waste	Media scandals forced attention on safeguarding
Emerging technologies			open data, big (brother?) data	Everyone loved RCT (randomized controlled trial)
			getting school leadership on board	Education in crisis situations became a priority
			`maker´ movement (educational robotics movements)	the need to strengthen education system was recognised
			bring your own device / technology	
https://edtechnology.co.uk/latest-news/future-of-the-classroom-eight-top-education-trends-revealed-by-google/	https://online.maryville.edu/blog/future-ed-tech/	https://su.org/blog/6-key-trends-shaping-the-future-of-learning/	https://blogs.worldbank.org/edutech/some-more-trends	https://www.cgdev.org/blog/review-decade-ten-trends-global-education

Page 80 - Life-cycle stage I: Conception and Design

- Overall
    - What is the motivation for the initiative?
    - What initiated the project?
    - Who are the proponents and opponents?
    - Who has to be persuaded about the idea? Why?
    - What lessons were learned for the future?
- Pedagogy
    - What type(s) of learning and teaching are we trying to foster? Why?
    - Why is this likely to make a difference to learning? What is the theory & evidence?
    - What plans will be made to modify programs or courses to take advantage of the new facilities?
    - What education or training for academics and other staff is built into the plan?
- Space
    - What aspects of the design of the space and provisioning of furniture and fittings will foster these modes of learning (and teaching)? How?
    - Who is involved in developing the design brief? Why?
    - Which existing facilities will be considered in developing concepts? Can we prototype ideas?
    - Who is involved in the assessment of concepts and detailed design?
- Technology
    - What technology will be deployed to complement the space design in fostering the desired learning and teaching patterns? How?
    - What is the relationship between the design of the space and the selection and integration of technology?
    - What pedagogical improvements are suggested by the technology?

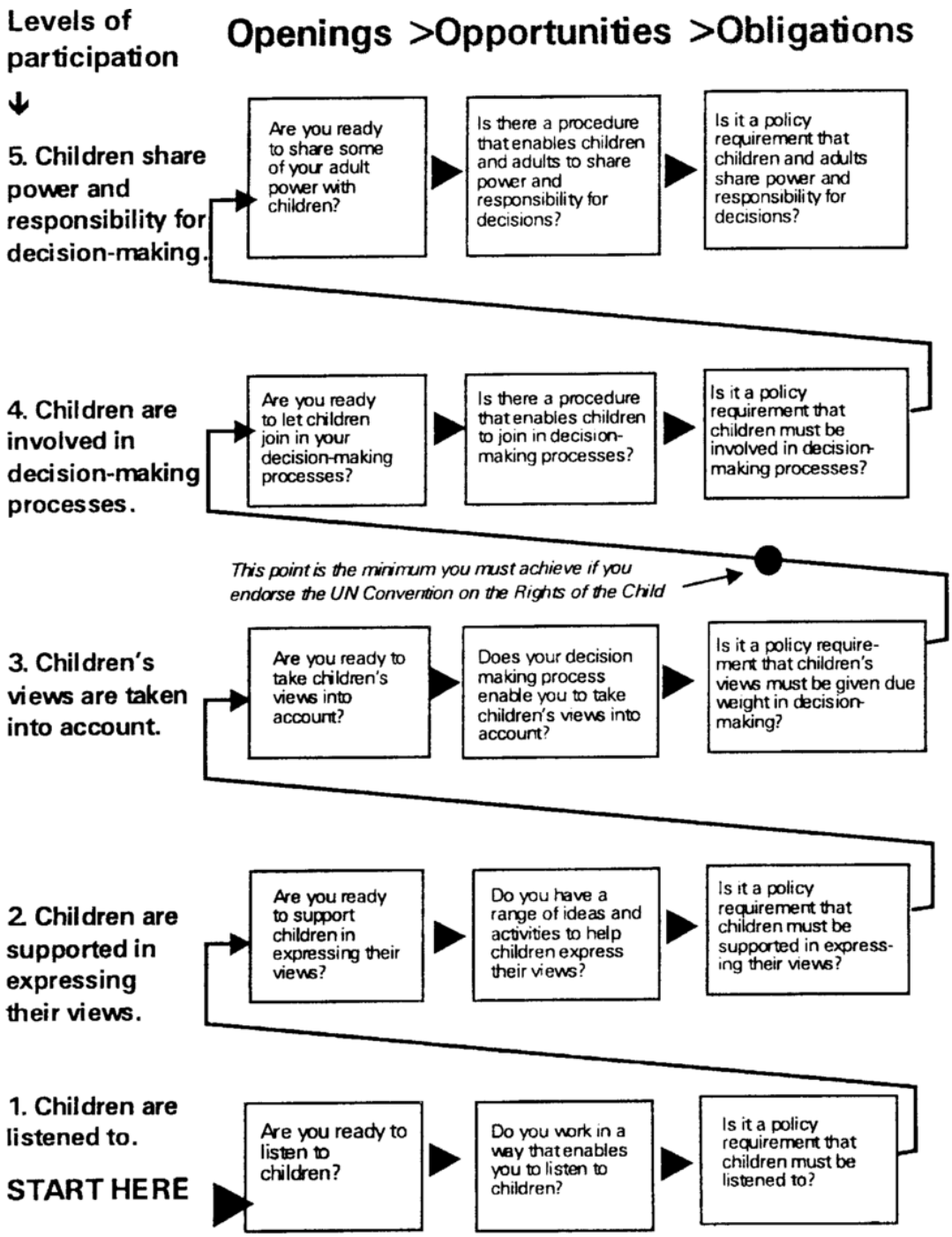
Page 82 - Benchmark analysis

School	Agora School	Anglican Church Grammar School	Stonefields School
PICTURE			
Year of Start	2014 (Pilot with 30 students within another more traditional school)	2013 / 14	2013
Number of Students	250 (2019)		
Age Group	12 to 18 years	12 to 18 years	4 to 13 years
Location	Roermond, Netherlands	Brisbane, Australia	Auckland, New Zealand
"School Type"	Secondary School Centred around projects. School is focused on learning, not teaching. Each student is given control over their own educational journey. Teachers are coaches -> they challenge and guide the exploration process. 1 guide = 17 students; responsible for tangible results and genuine development, also they work with each student on ways to continue developing the learning journey. Agora is a blend of a university (knowledge), a Buddhist monastery (think), a theme park (play), a communal marketplace (trade and swap)	Grammar School for Boys (Secondary School) Problem-solving and project-based setting for creativity, collaboration, innovation and enterprise; technology-mediated learning	Primary School everyone is a learner, project-based approach Vision Principles: - Building Learning Capacity (know, believe and stretch as a learner) - Collaborating (relate, participate and value diversity. Make a contribution) - making meaning (use tools, strategies and knowledge to break codes, understand and take action) - breaking through (strive to achieve success and happiness in learning in life) Collaborative learning culture
Pedagogical Approach			
Space Approach	Full of happy clutter; personalized / custom desks: each student is encouraged to customise their desk Wood Workshop Textiles Room Metal workshop Kitchen Computer Room Auditorium and canteen Meeting rooms (bookable via phones) to work on things or meet people	Partnership with Melbourne University´s Learning Environments Applied Research Network. Aim to redesign learning space (Creative Precinct) that are evidence based, shall match with an evaluation of the effect of change on teaching practices and student learning. = Retrofitting the existing film and media, design, drama, and visual art building "Open Studio" approach = allows students to occupy and transit between didactic teaching spaces, specialist technology-enabled wokshop areas, highly flexible indoor and outdoor communal spaces. dynamic and social learning environments	flexble space with different zones for different approaches / tasks creation of a co-operative space for teachers to engage in continous professional learning collective teacher capacity ensures the elements the space are used to enhance teacher practice
Technology Approach	Free Chromebooks for all students	Integration of technology from curriculum-based, pedagogical and spatial perspectives; Removing of the front teaching position by a combination of visual technologies (whiteboard and screen), which allowes greater teacher movement to actively enagage with students and moderate their behaviour and focus	Computer use iPad Initiative for Years 3&4; Chromebooks from 5 on Builidng Cyber Smartness is a priority
A day in life	Dagstart: outline the challenges of the day, hopes for achievement, need for help, chance for other students to suggest things, offer advice or join in Project Time: each student decide what to do and where Lunch Break Quiet Time: students are encouraged to read or think Older students can choose flexible start and end times	Development of collective teacher capacity in the optimal use of traditional classrooms and innovative learning spaces to enhance learning experiences	
Problems	Finding the right sort of teacher		
User / Student Inclusion Involvement of Stakeholder in:	High	High teacher / low student	High value of students voice

Glömsta School	Gateway School	Kvernhuset School	Primary School Höchst
			
2016	2008	2002	02/2017
720	180	450	200
4 to 13 years	5 to 14 years	6 to 14 years	
Huddinge, Sweden	New York City	Fredrikstad, Norway	Höchst, Vorarlberg, Austria
Kindergarten to 9th grade Top-down philosophy	Elementary and Middle School for children with special needs direct, multisensory instruction and guided by an integrated curriculum; small classes, divers and inclusive community -> students learn / get experienece in academic and social success, recognize their strengths and are empowered to become independent learners Co-ed day school, individualized work in collaborative groups = students become problem-solvers and confident self-advocats	sustainability is a crucial aspect of the pedagogy. Space teaches pupils about sustainability	Primary school with 8 classrooms + one preschool class Teaching in small groups
learning community identified a solution to cluster classrom around a common space classrooms with views, complement the activities that occur in the common areas Furniture. Aim to have a natural sparse and simple design that will last for several years; Compact 4 story building, central atrium / stairwell with many windows to each floor = provides a feeling of connectivity in the building; Entrance towards the school yard = open visibility from inside and outside; back of the groundfloor is built into the landscape; second floor is for music, drama, home economics, arts and craft; all can be used outside school hours; closed working areas in the 3rd and 4th floor + teachers room, nurse and curator space, library, science labs => designed for collaboration within research themes; terrace with a view of the surrounding fields; no long corridors, teaching rooms are grouped around irregular spaces that can be refurbished in different ways to complement the essential facilities	Innovative learning environments are neither open-plan nor a series of differentiated classrooms and breakout spaces -> these are rather interconnected and defined activity settings; these spaces provide opportunities to reinvent the use of communal or shared spaces outside the classroom	site and building are in a symbiosis and architectural unity nature embraces the building and comes into or penetrates it school areas are flexible, space can change from year to year natural thermal ventilation, anatural daylight system, natural wastewater cleaning facilities	each classroom has an adjoining outdoor realm, playground, local population has free access to the playground which is connected to the city through many paths generous "cluster" school type developed with teachers and community; four cluster each of them has 2 classrooms, a central common room, rest room, group room, a sanitary core, large areas of glazing create visual links between the individual spaces and the external realm
mid level involvement	no inclusion	high teacher / low student	

School	Agora School	Anglican Church Grammar School	Stonefields School
A day in life	Dagstart: outline the challenges of the day, hopes for achievement, need for help, chance for other students to suggest things, offer advice or join in Project Time: each student decide what to do and where Lunch Break Quiet Time: students are encouraged to read or think Older students can choose flexible start and end times	Development of collective teacher capacity in the optimal use of traditional classrooms and innovative learning spaces to enhance learning experiences	
Problems	Finding the right sort of teacher		
User / Student Inclusion	High	High teacher / low student	High value of students voice
Involvement of Stakeholder in:			
Planning Process	Students were consulted on what the school should contain, look like and do.	Engagement of teachers and administratior in defining the educational brief for the space and curriculum needs of the subjects	survey to create strategy of school (inclusion of stakeholders [community, teachers and staff, ki
Education	Involvement of parents: Guideance for learning new skills Measure of progess was decided and developed by students: software designed by three students to track students´s challenges and progress.		Principal of "leadership group" to re-define stra for 2 school years; various data is involved
Daily Life	Teachers work five days per week: four days with children, one day to observe other teachers and give them feedback; they are encouraged to go outside (businesses, laboratories, museums) to obeserve, gain knowledge and tell about the findings.		communication via hub (online plattform: Hub Comms)
Special Feature	WhatsApp use to manage messaging students and parents		coaching program for teachers; teachers are guardians Health, wellbeing and social service access

p.98 - Pathway to Participation (Shier, 2001)



p. 100 - 100 languages of children
(https://debikeytehartland.files.wordpress.com/2016/08/1.gif)

No way.
The hundred is there

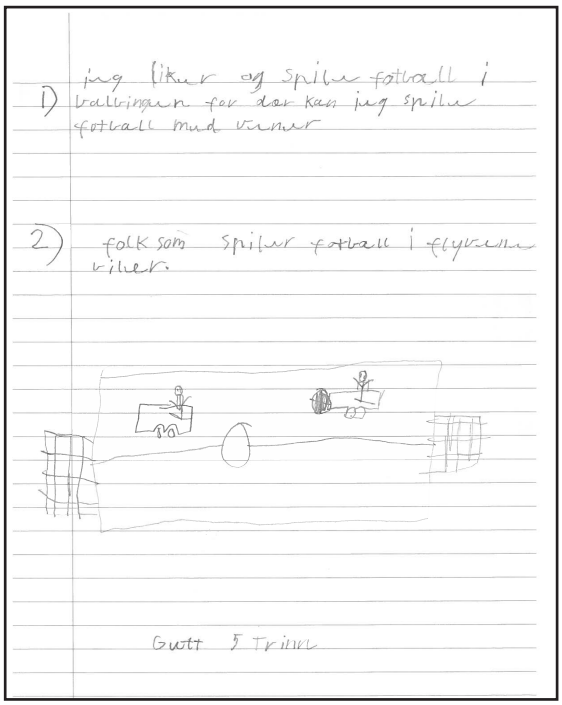
The child
is made of one hundred.
The child has
a hundred languages
a hundred hands
a hundred thoughts
a hundred ways of thinking
of playing, of speaking.
A hundred always a hundred
ways of listening
of marveling of loving
a hundred joys
for singing and understanding
a hundred worlds
to discover
a hundred worlds
to invent
a hundred worlds
to dream.
The child has
a hundred languages
(and a hundred hundred hundred more)
but they steal ninety-nine.

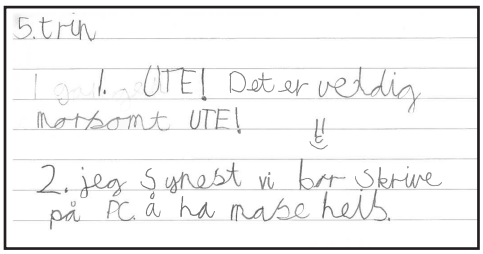
The school and the culture
separate the head from the body.
They tell the child:
to think without hands
to do without head
to listen and not to speak
to understand without joy
to love and to marvel
only at Easter and at Christmas.
They tell the child:
to discover the world already there
and of the hundred
they steal ninety-nine.
They tell the child:
that work and play
reality and fantasy
science and imagination
sky and earth
reason and dream
are things
that do not belong together.
And thus they tell the child
that the hundred is not there.
The child says:
No way. The hundred is there.

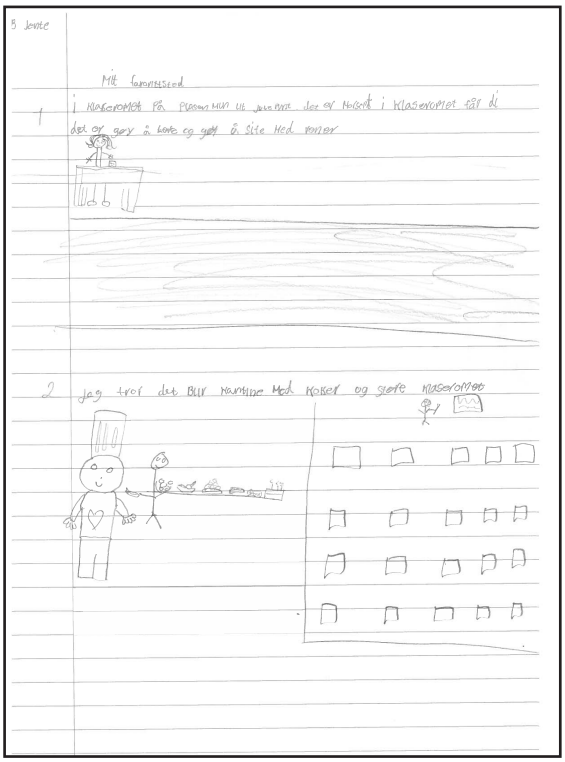
Loris Malaguzzi

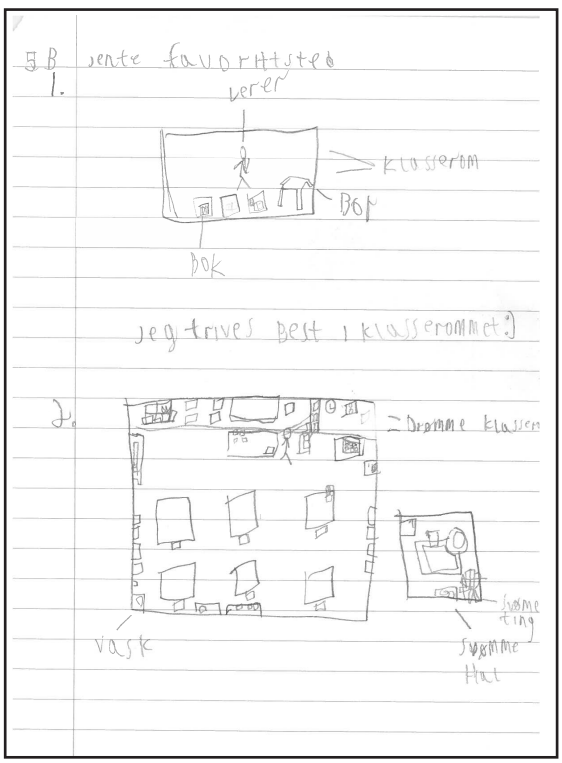
translated by Lella Gandini

p.107 - Results tool test voices of children





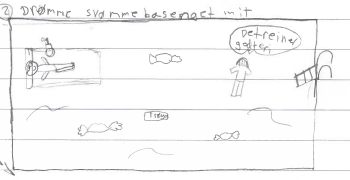




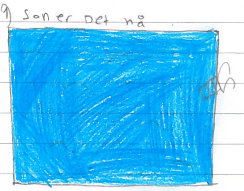
Svømmehallen Jente 5klassen

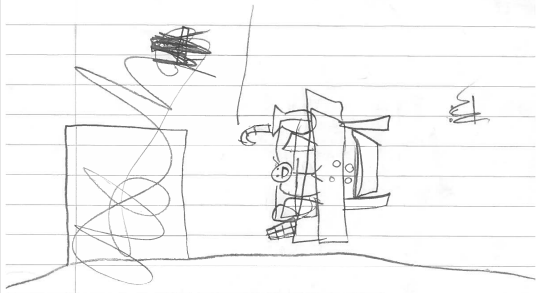
1) Jeg liker svømmehallen fordi du kan svømme og du lærer bedre å svømme
Det er inne.
Jeg er med de i klassen.
Det er fint at det er altid varm nok til stede.

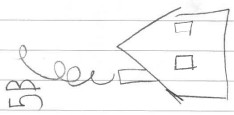
2) Drømme svømmebasenget mitt



3) Sånn er det nå







Jente 5B

Jente 5.trinn Favoritt stedet på skolen

1. mitt favoritt sted på skolen er Krogh rommet pordi Jeg elsker å lage ting og er ganske kreativ

2. at Krogh rommet har mye mere moderne redskaper og roboter som hjelper deg. og at det blir kantine og skoleuniformer.

Jenter kan også gå med denne

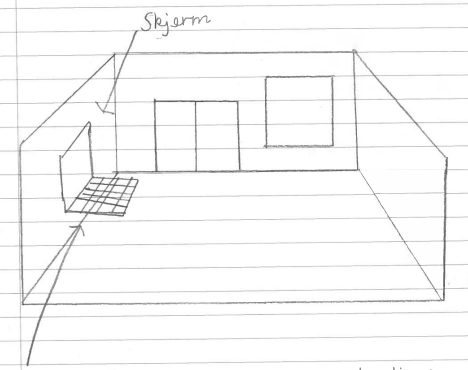
Gutter kan også gå med denne

Gutt 5.trinn Mitt favorittsted på Skolen

1. Garderoben er mitt favorittsted for at det er varmt om vinteren. og at man kan bytte klær og leke litt. :)

Fremtiden av skolen.

2. At det blir Større og bedre klasserom og at vi bruker mere data. og det blir lettere.



Trykk på en knapp for at rommet blir som du vil.

7. trinn

Favorittstedet mitt er Gymsalen. Jeg har gym der. Vi ha forskjellige aktiveter der. Jeg er sammen med klassen og jeg er sammen med vennene mine. Vi har også læren der som underviser oss. Vi får prøve på forskjellige ting. Noen ganger så får vi være med å bestemme hva vi skal gjøre. Jeg liker å være der fordi jeg liker å være i bevegelse. Jeg er ca en time i uka.

Jeg tor at klasserommene kommer til å være forskjellige ut. Og kanskje det er grupperom på alle klasserommene. At elever som trenger ekstra hjelp.

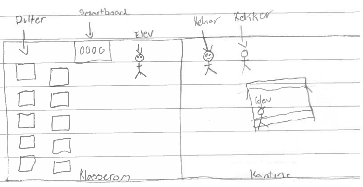
Mitt favoritt sted

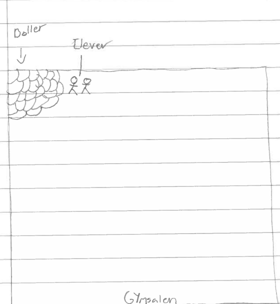
1) Mitt favoritt sted tror jeg er mat og helse kjøkken. Det er gøy å lage mat, og det er veldig gøy å se på de forskjellige Sausene fra til de andre. Jeg bruker å være der ved klasse (Maten)

2) Jeg tror en skole i framtiden vil se mer moderne ut og at nesten alle jobber ved chromebook/P.C.

Min skole i fremtiden

Jeg tror gymsalen blir fylt opp med baller.
og klasserommene blir større og bedre.
og kantine med kelnere og kokker.





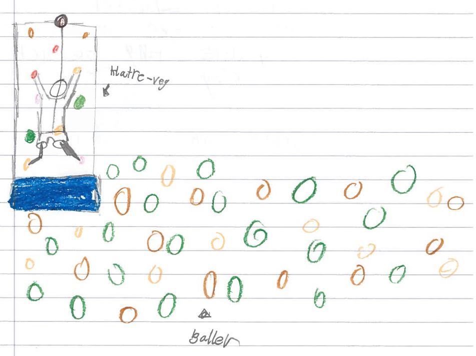
Jente 5 klasse

Biblioteket

Biblioteket på skolen er favorittstede mitt, selv om jeg ønsker at den kunne vært større.
Jeg bruker å dra til biblioteket når jeg har lest ut en eller to bøker.
Til vanlig bruker jeg til å låne meg 2-4 bøker sånn at jeg kan lese mye og lenger.
Probleme med biblioteket vårt er at det er for smått og for lite. Der for trives jeg mere på Bygåsen folkebiblioteket. Der kan jeg Dra en eller to ganger i måneden.
Når jeg drar til et bibliotek føles det som et pallas for meg.

- I framtiden håper jeg at biblioteket skal bli mye mye mer større i framtiden.
- Jeg syns at et bibliotek er viktig for alle, sånn at dem finner ting å gjøre i fritiden, men også sånn at dem kan lære noe nytt

Opg. 2 Jeg tror at gymsalen blir fylt med baller og at man har kantine, større klasserom, bedre rengjøring, større Biblotek



Wanda Filarowski

Guidelines for making learning spaces

NTNU
Kunnskap for en bedre verden