

# A sensory-friendly learning environment through design: user experience and implementation

Vilja Kirk 2025



Figure 1. Untitled - (LUMA center finland)

A sensory-friendly learning  
environment through  
design: user experience and  
implementation

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# Abstract

Creating inclusive and accessible learning environments is essential for the academic success of all students, particularly those who are neurodiverse. This research examines the sensory design requirements of STEM learning environments at the LUMA Center Päijät-Hämeen, Helsinki University, focusing on user experiences and data related to neurodiverse learners. Sensory-friendly design, aimed at reducing sensory overload and improving engagement, is identified as a key strategy for fostering inclusivity in education.

By applying service design principles, the study explores how user-centered design processes can be used to develop adaptive and inclusive STEM classrooms. The research combines qualitative interviews with users and benchmarking data from existing sensory-friendly design practices. Findings highlight the importance of adaptable classroom layouts, multisensory materials, and assistive tools in supporting neurodiverse students and promoting engagement in STEM education.

Additionally, the study proposes various teaching modules that allow educators to select the most effective approach for students' unique needs, whether through hands-on learning or visual methods. The study concludes with actionable recommendations for developing sensory-friendly learning environments, aimed at enhancing the educational experience for students with sensory processing differences.. These recommendations promote a flexible, inclusive, and supportive classroom environment, contributing to the success of neurodiverse students. The proposed concept combines Explicit Teaching (clear, step-by-step instructions with visual aids) and Teach-Back (where students demonstrate their understanding) to create an interactive, structured, and engaging learning experience.

Keywords: Service Design. Inclusive Learning Environments. Sensory-Friendly Design. Neurodiverse Learners. STEM Education. User-Centered Design.

# Tiivistelmä

Inklusiivisten ja esteettömien oppimisympäristöjen luominen on olennaista kaikkien opiskelijoiden, erityisesti neurodiversiteettiä omaavien opiskelijoiden, akateemiselle menestykselle. Tämä tutkimus tarkastelee LUMA-keskus Päijät-Hämeen, osana Helsingin yliopisto, STEM-opetustilojen aistien suunnittelun vaatimuksia, keskittyen neurodiversiteettiä omaavien opiskelijoiden kokemuksiin ja tarpeisiin. Aistiystävällinen suunnittelu, joka tähtää aistiärsykkeiden kuormituksen vähentämiseen ja sitoutumisen parantamiseen, tunnustetaan tärkeäksi strategiaksi inklusiivisuuden edistämiseksi opetuksessa.

Palvelumuotoilun periaatteita soveltaen tutkitaan, kuinka käyttäjälähtöiset suunnitteluprosessit voivat auttaa kehittämään sopeutuvia ja inklusiivisia STEM-luokkahuoneita. Tutkimuksessa yhdistyvät kvalitatiiviset haastattelut käyttäjien kanssa sekä vertaisanalyysi olemassa olevista aistihyväksyvistä suunnittelukäytännöistä. Tutkimuksen tulokset korostavat mukautettavien luokkahuoneiden järjestelyjen, moniaististen materiaalien ja

apuvälineiden merkitystä neurodiversiteettiä omaavien opiskelijoiden tukemisessa STEM-opetuksessa.

Lisäksi tutkimus ehdottaa erilaisia opetussuunnitelmia, jotka mahdollistavat opettajille parhaan lähestymistavan valitsemisen opiskelijoiden yksilölliset tarpeet huomioiden, olipa kyse käsin tekemisestä tai visuaalisista menetelmistä.

Tutkimus päättyy toimenpide-ehdotuksiin aistiherkkyksiä omaavien opiskelijoiden koulutuskokemuksen parantamiseksi aistihyväksyviä oppimisympäristöjä kehittämällä. Ehdotukset edistävät joustavaa, inklusiivista luokkahuoneympäristöä, joka tukee neurodiversiteettiä omaavien opiskelijoiden menestystä. Konsepti yhdistää selkeän opettamisen (askel askeleelta -ohjeet visuaalisilla tukimateriaaleilla) ja Teach-Back-menetelmän (opiskelijat osoittavat ymmärryksensä) luodakseen interaktiivisen, jäsennellyn ja mukaansatempaavan oppimiskokemuksen..

Avainsanat: Palvelumuotoilu. Inklusiiviset oppimisympäristöt. Aistille ystävällinen suunnittelu. Neurodivergentit oppijat. STEM-opetus. Käyttäjälähtöinen suunnittelu.

# Table of Contents

1. Introduction	7	4. Benchmark	20	6.1 Service Blueprints	37
1.2 LUMA Center Finland	8	4.1 Sensory-Friendly Learning Environments	21	6.2 LUMA Center Päijät-Häme Service blueprint	38
1.2.1 LUMA Center Päijät-Häme	9	4.2 The Inclusive classroom	22	6.3 LUMA Centre Päijät-Häme: Axonometric Perspective	39
1.2.2 Neurodiversity in STEM	10	4.3 Inclusive interior design	23	6.4 SOLU concept zones	40
		4.4 Interview	24	6.5 SOLU sensory friendly features	42
2. Design process and Service Design	12			6.6 Visualisation	45
2.1 Service Design Thinking	13	5 Data Analysis	26		
2.2 Sensory Design	14	5.1 Affinity diagram	26	7. Conclusion	47
2.3 Designing for Neurodiversity	15	5.2 Empathy Mapping	26	7.1 Reflection	48
		5.3 Design drivers	30		
3. Megatrends	17			References	
3.1 Megatrends and Neurodiverse Learners	18	6. Concept	32	Appendices	

# 1

- 1. Introduction
- 1.2 LUMA Center Finland
  - 1.2.1 LUMA Center Päijät-Häme
  - 1.2.2 Neurodiversity in STEM

# 1. Introduction

Creating inclusive learning environments is a critical goal in contemporary education, especially when addressing the diverse needs of different learners. Sensory-friendly design, which aims to alleviate sensory challenges such as overstimulation and discomfort, has emerged as a key strategy for promoting accessibility and engagement in educational settings. This research focuses on the implementation of sensory-friendly learning environments, emphasizing the importance of collaboration between educators, special needs specialists, and designers. By applying service design principles, this study explores how user-centered, intentional design can transform educational spaces and teaching modules into supportive, adaptable, and inclusive environments.

The research is grounded in the lived experiences of users, bridging the gap between theoretical concepts and practical applications in sensory-friendly design. The study aims to provide actionable insights and best practices for educators seeking to create learning environments that embrace inclusivity and foster a welcoming atmosphere for all students.

Sensory-friendly learning environments are particularly crucial for addressing the needs of neurodiverse learners, including those with

neuropsychiatric disorders. Neurodiversity refers to the natural variation in neurological and cognitive functioning among individuals.

*Someone who is neurodivergent behaves, thinks and learns differently compared to those who are neurotypical. This term can be used to describe an individual whose brain functions differently to what we consider “typical”. This includes people with autism, ADHD, Tourette’s, dyslexia and a range of other neurodiverse conditions.*

*(Exceptional Individuals 2024)*

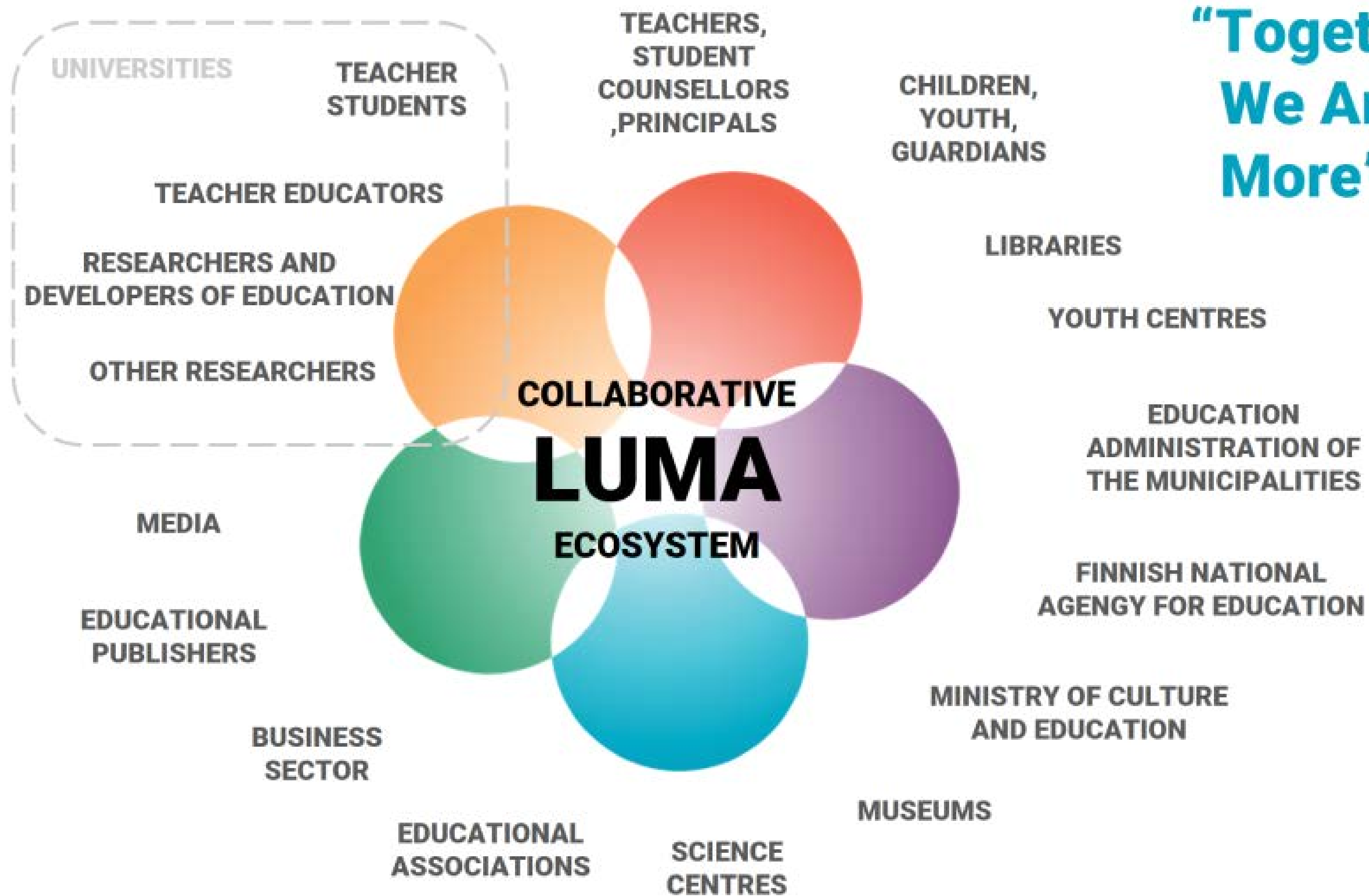
This research contributes to the development of sensory-friendly environments specifically designed to meet the needs of neurodiverse individuals. By considering unique sensory profiles and learning styles, such spaces can effectively motivate and support all learners, particularly those within the neurodiversity spectrum.

This study is underpinned by three key frameworks: Service Design, Neurodiversity, and Sensory Design. These approaches provide the foundation for creating sensory-friendly, flexible, and inclusive learning environments.

**The research aims to answer the following questions:**

- What specific requirements and expectations do teachers and specialists have for customized learning environments for students with varying needs?
- How can practical classroom design solutions integrate flexibility and inclusivity to meet the needs of all learners?
- What would be the practical implementation of these solutions?

This research employs a mixed-methods approach, including both interviews and data research through benchmarking. Interviews with users, will provide qualitative insights into the practical challenges and needs for sensory-friendly learning environments. Additionally, benchmarking will allow for the analysis of existing practices and design solutions from similar educational environments. The data collected through these methods will inform the development of concrete design recommendations for inclusive learning spaces, ensuring they are adaptable, inclusive, and responsive to the needs of neurodiverse students.



**“Together  
We Are  
More”**

## 1.2 LUMA Center Finland

LUMA Centre Finland promotes expertise in LUMA subjects (mathematics, science, and technology). The network consists of 13 centers, which operate in connection with 11 universities. The mission of the LUMA Centre Finland network is to enhance scientific and technological knowledge among pupils, students, and teachers, while ensuring a steady supply of skilled professionals in science and technology across Finland.

To achieve this goal, LUMA Centre Finland engages and inspires children and young people in mathematics, science, and technology through innovative educational methods and activities. The centre also supports the ongoing professional development of teachers at all educational levels, from early childhood education to universities, and contributes to the advancement of research-based teaching practices. (LUMA Centre Finland, 2024.)

Figure 2. LUMA Center Finland Ecosystem (LUMA, 2024)

## 1.2.1 LUMA Center Päijät-Häme

LUMA Center Päijät-Hämeen supports and promotes the teaching, learning, and interest in natural sciences, mathematics, and technology in the Päijät-Häme and Kanta-Häme regions. They organize educational visits, camps, clubs, courses, and training, as well as events for the whole family. At the heart of our activities is the Science lab SOLU, located on the Niemi campus in Lahti.

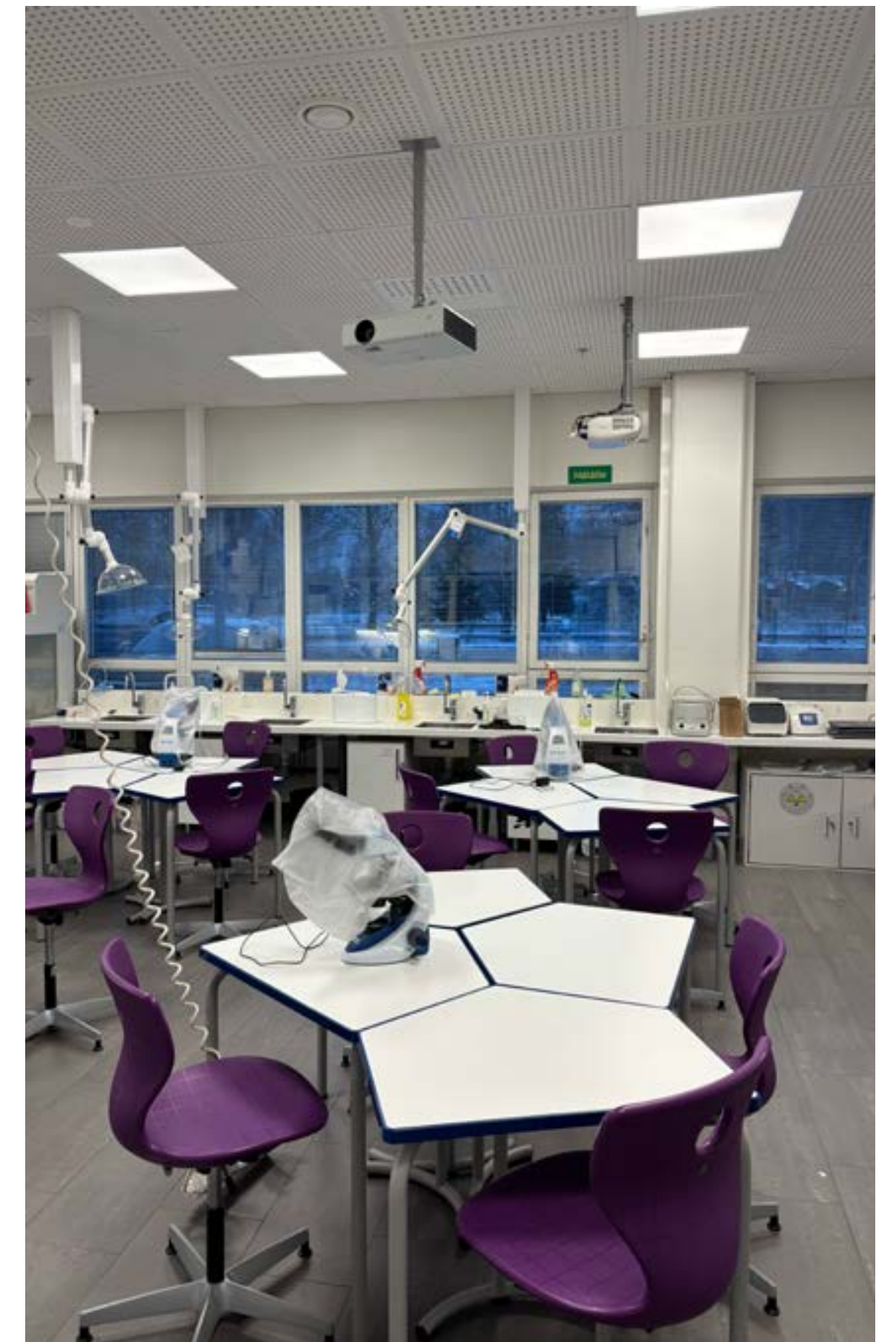
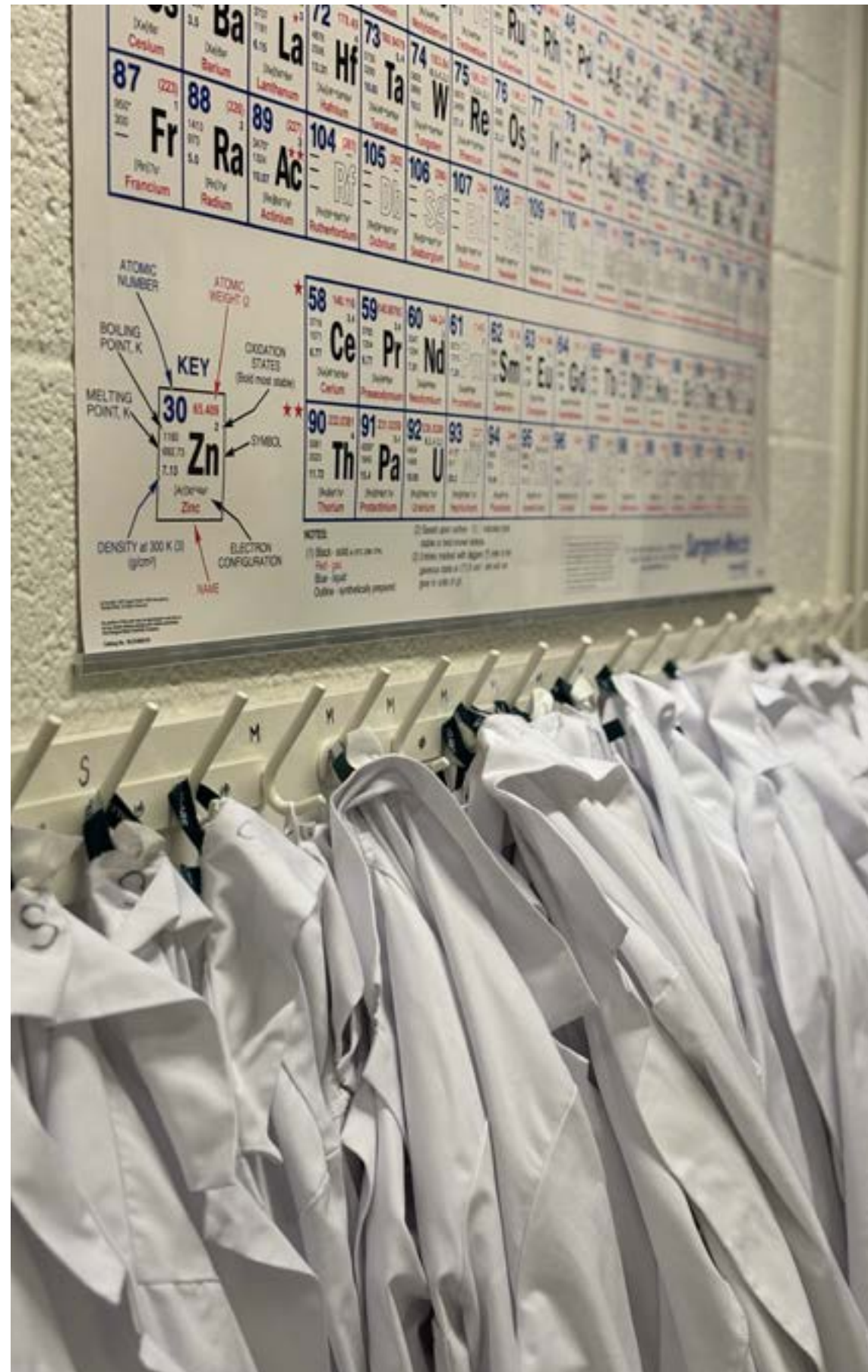


Figure 3, Pictures from Science lab SOLU (Kirk, 2024)

## 1.2.2 Neurodiversity in STEM

Incorporating neurodivergent individuals into STEM (science, technology, engineering, and mathematics) fields is not just about representation, but also about creating a more innovative, inclusive, and diverse environment. The experiences and insights shared by neurodivergent individuals are invaluable in challenging traditional norms and driving positive change in these fields.

As seen on platforms like Neuro Inclusion in STEM, neurodivergent people are actively sharing their stories, offering advice, and highlighting the opportunities that exist within STEM careers. These shared experiences are crucial in reshaping the narrative around who belongs in STEM. By openly discussing their challenges, successes, and strategies for navigating STEM environments, neurodivergent individuals are not only validating their place in these fields but also encouraging others to pursue similar paths (Neuro Inclusion in STEM, 2024).

At Alpha School, it is demonstrated how STEM Empowers Confidence. STEM education goes beyond just acquiring knowledge—it's about fostering self-confidence. When students with special needs engage in STEM activities, they uncover new skills and passions, which, in turn,

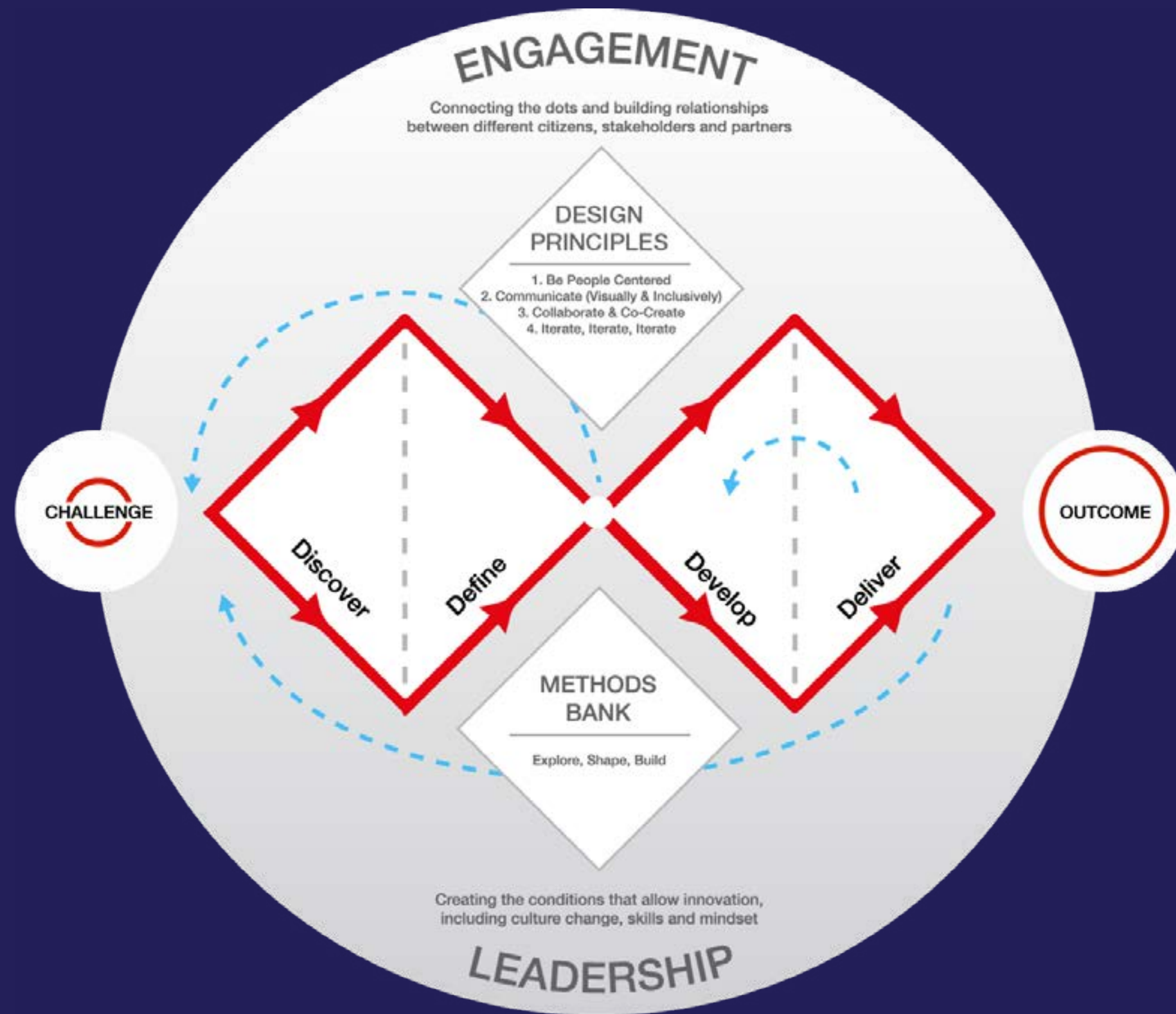
boosts their confidence and self-worth (Alpha School, 2024).

*This boost in confidence is multifaceted. Firstly, there's the pride that comes from solving a complex problem or completing a challenging project. STEM subjects are often perceived as difficult, so succeeding in these areas can be particularly empowering for students. Secondly, as students engage in hands-on, practical work, they see the real-world applications of their learning, which reinforces their sense of purpose and capability.*

(Alpha School 2024)

# 2

- 2. Design process and Service Design
- 2.1 Service Design Thinking
- 2.2 Sensory Design
- 2.3 Designing for Neurodiversity



## 2. Design process and Service Design

Service design is a multidisciplinary approach to creating and improving services by focusing on the needs of users and the overall service experience. It employs design thinking and methodologies to develop solutions that are functional, efficient, and enjoyable for users, while also being feasible and sustainable for service providers. Service designers conceptualize and craft innovative service solutions for challenges that may not yet exist, analyzing user needs, behaviors, and contexts to design services that align with future possibilities. This approach emphasizes creativity, strategy, and adaptability. (Stickdorn and Schneider, 2011, pp. 28–33.) As a problem-solving approach, service design also draws valuable insights from frameworks like The Design Council’s Framework for Innovation, which helps deepen the understanding of key elements within service design. This framework emphasizes a people-centered, iterative approach, providing a broader perspective on how innovation can be integrated into service design processes. As shown in Figure 3, both service design and the Design Council’s framework share common principles, such as putting people first, collaborating with stakeholders, and iterating solutions, the Design Council’s framework offers additional insights into how these principles can drive innovation and enhance service design practices.

Figure 4. Design Council’s Framework for Innovation: The Process of Service Design (Design Council, 2024)

## 2.1 Service Design Thinking

### TEST

Experiment with prototypes, gather feedback, and iterate on the designs to refine and improve the service based on real-world interactions.

### IDEATE

After gaining insight into the challenges, we shift focus to finding solutions. At this stage, no idea is off-limits. It's all about free-flowing creativity. What might the target group genuinely be seeking?

### EMPATHY

Building a deeper understanding of the target group. What do they want and how?



### DEFINE

What do we know about the target group? Reviewing the data helps to clarify the needs and narrow down the endless options.



### PROTOTYPE

The best ideas move into the prototype phase. These prototypes don't need to be fully refined—just ready for testing.

Figure 5. Visualizing Service Design Thinking (Kirk, 2024)  
This figure illustrates the iterative, human-centered process of Service Design Thinking, which includes the phases of Empathy, Define, Ideate, Prototype, and Test. The approach emphasizes creativity, collaboration, and experimentation to develop solutions that address user needs. By fostering a deep understanding of users, Service Design Thinking ensures solutions are effective, engaging, and meaningful.

## 2.2 Sensory Design

Human perception is inherently multisensory; however, in design practice, the term “multisensory” typically refers to the intentional enhancement of sensory experiences through products, environments, services, and media to make encounters more immersive and inclusive. (Lupton & Lipps, 2018.)

Figure 6: “Ranges of Senses” illustrates how various sensory inputs—sight, sound, touch, taste, smell, as well as the skin’s sense of air, haptic feedback, and kinesthesia—are integrated and perceived in design. This figure highlights the complex interplay of senses and emphasizes the importance of considering all sensory modalities, including the subtler senses, to create inclusive and engaging experiences for diverse users.

This approach is valuable for understanding how environmental factors can either support or hinder students’ ability to learn and engage. By incorporating sensory design into my research, I aim to provide insights into how the LUMA Center can create more inclusive, adaptive, and engaging learning environments.

Furthermore, sensory design ensures that all individuals have the opportunity to access information, explore their surroundings, and experience joy, curiosity, and social connections, regardless of their sensory capabilities (Lupton & Lipps, 2018). The goal of a sensory-friendly learning environment is to create a space where students can thrive by minimizing environmental stressors that may distract or overwhelm them. This involves balancing stimulating sensory inputs—such as visual, auditory, and tactile elements—with quieter, soothing aspects that help students feel more comfortable and engaged (Design Tastemaker, 2024). These environments are often adaptable, offering students the option to customize their surroundings to meet individual needs.

Ultimately, sensory-friendly learning spaces are designed to promote inclusivity and accessibility, ensuring all students, particularly those with sensory sensitivities, have equal opportunities to participate in and benefit from educational experiences (Sensory Friendly, 2024).

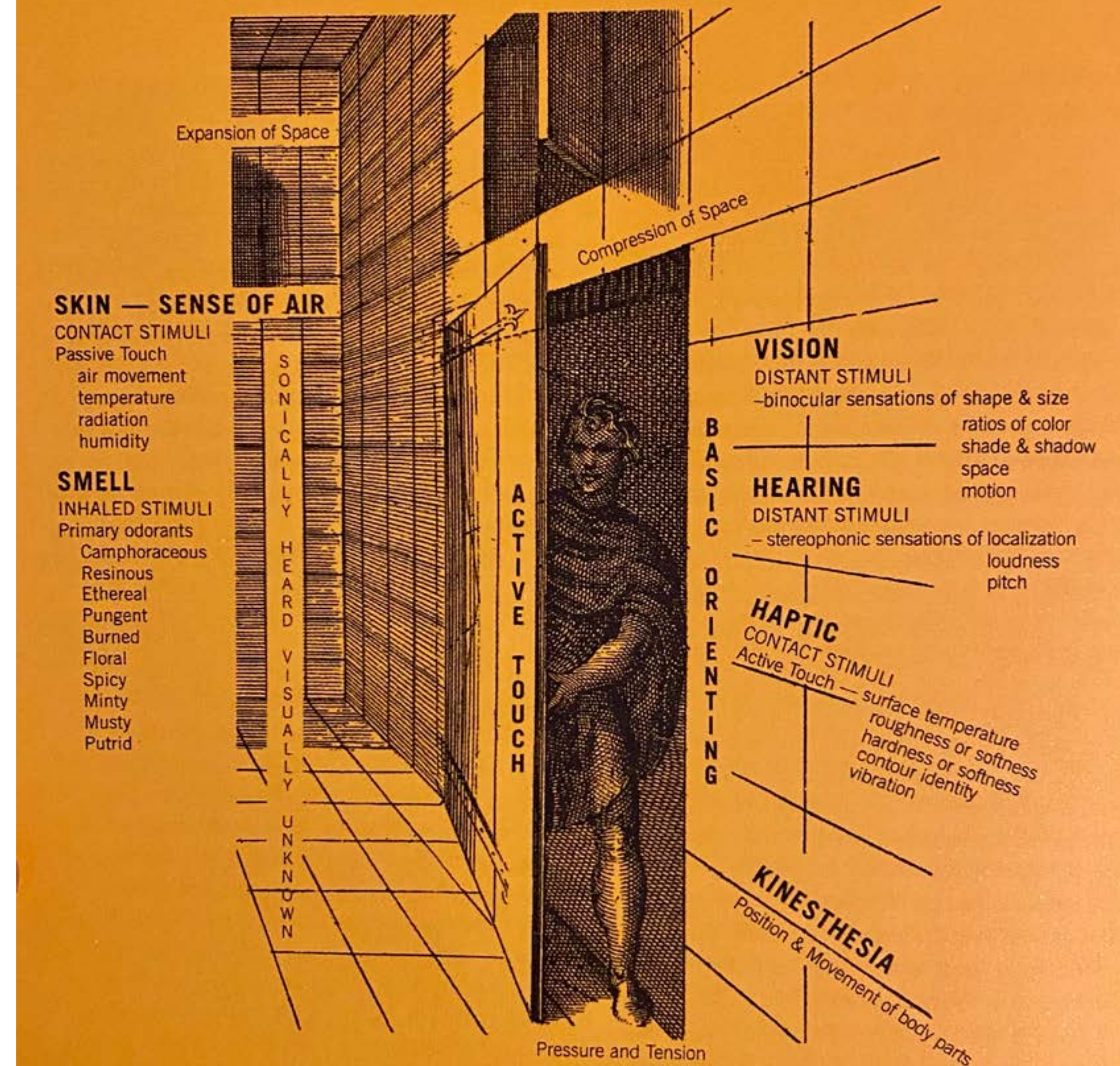


Figure 6. "Ranges of Senses" (Malnar & Vodvarka, 2004, as cited in Lipps & Lupton, 2018, p. 8) (Kirk, 2024)

## 2.3 Designing for Neurodiversity

Neurodiversity is a concept that recognizes and celebrates the natural variation in human brain function and behavior. It emphasizes that neurological differences, such as autism, ADHD, dyslexia, dyspraxia, and others, are simply variations of the human experience, not deficits or disorders (Neurobridge). In the context of my thesis, neurodiversity plays a key role in understanding how neurodivergent students—those who process information or experience sensory input in different ways—engage with and learn in educational environments.

Figure 7: The image illustrates the concept of neurodiversity. This visual metaphor underscores the idea that each person may experience the world in multiple, distinct ways, rather than just one form.

I will examine how specific aspects of learning environments—such as lighting, acoustics, seating arrangements, and sensory elements—can be designed to accommodate neurodivergent students.

The goal is to shift away from a “one-size-fits-all” approach to education and towards a model that recognizes and supports students’ unique neurological needs. This means not only addressing challenges like sensory overload or difficulty with focus but also fostering environments that allow neurodivergent students to thrive (Ohana Health Consulting, 2024).



Figure 7. Diverse minds (AI and Kirk, 2024)

# 3

3. Megatrends

3.1 Megatrends and neurodiverse learners

### 3. Megatrends

“Through megatrends, we can understand the changes that are happening in the present and reflect on the future we want to be build.”

(Sitra 2024)

While megatrends cannot predict the future with certainty, reviewing them offers a valuable framework for understanding and discussing the changes occurring in the world. They can inform decision-making, guide learning, shape strategy, and even frame the narrative of a news story (Sitra, 2023). I will explore how megatrends and development trends are interconnected with our well-being..

#### Mental health problems are increasing

- Mental health problems are on the rise. Absenteeism and disability are increasingly caused by mental health issues. Stress is being heightened by various crises, information overload, and the competitive nature of society. Meanwhile, deprivation is accumulating. (Sitra 2023)

Living as a neurodivergent person in

a predominantly neurotypical world can present challenges that elevate the risk of stress, anxiety, and depression. Research shows that neurodivergent individuals are more prone to experiencing mental health difficulties compared to their neurotypical counterparts (NHS Dorset, 2024).

#### The concept of well-being is broadening

- The view of individual well-being is expanding. Well-being is now understood not only in terms of quality of life but also in relation to sustainable lifestyles, social relationships, and experiences of meaningfulness. (Sitra 2023)

The neural basis of well-being highlights how certain brain processes can contribute to higher levels of well-being and mental health, which can have a direct impact on learning and

personal development (Dolcos, Moore & Katsumi, 2018). Understanding these mechanisms allows us to create environments helping individuals, including neurodiverse students, adapt, and thrive.

#### Mindsets about health are changing

- Resistance to diseases and zoonotic diseases are increasing. Human health is recognized as being linked to the well-being of nature and the environment. Increasing biodiversity and preventive methods for air and noise pollution are crucial. (Sitra 2023)

Creating healthier, nature-rich environments benefits both physical health and mental well-being, especially for individuals who may be more vulnerable to stress.



Figure 8. Sitra Megatrend Cards (Kirk, 2024)

### 3.1 Megatrends and Neurodiverse Learners

As we explore the megatrends shaping our world—such as the blurred boundaries between the physical and virtual realms, and shifting mindsets around health—it becomes clear that education must adapt to this changing landscape. For neurodiverse learners, such as those with autism, ADHD, and dyslexia, the challenges and opportunities presented by these megatrends are significant. These students need more than just physical health support; they require environments that nurture their mental, emotional, and sensory well-being.

One of the most pressing challenges for neurodiverse students is sensory overload. Traditional classrooms filled with noise, bright lights, and rapid activities can overwhelm those with sensory sensitivities. As our understanding of health expands to include emotional and sensory needs, it is evident that designing sensory-friendly learning environments is crucial. This shift aligns with the broader megatrend of redefining well-being and understanding that health encompasses more than just the physical realm.

In her article *What Does Neurodiversity Really Imply for Education?* (2023), Naomi Fisher points out the limitations of a one-size-fits-all educational model. Many neurodiverse students face systemic barriers where their needs are either misunderstood or ignored. Fisher advocates for a flexible, inclusive

approach that recognizes neurodiversity as a spectrum—one that aligns with the broader trends toward personalized, adaptable learning experiences. By redesigning learning environments to embrace these shifts, we create spaces where neurodiverse students can engage with education on their own terms, helping them thrive.

Ultimately, sensory-friendly learning environments are not just about academic success. They represent a broader commitment to the health and well-being of all students, aligning with the megatrends that are reshaping the future of education. When we design classrooms that cater to sensory and emotional health, we contribute to an inclusive educational system where every student can succeed, regardless of their neurodiversity. This is not just an evolution of teaching methods; it is a necessary response to the societal shifts shaping our world.

# 4

- 4. Benchmark
- 4.1 Sensory-Friendly Learning Environments
- 4.2 The Inclusive classroom
- 4.3 Inclusive interior design
- 4.4 Interview

## 4. Benchmark

Benchmarking is a structured approach to identifying and adopting best practices in order to enhance organizational performance. It involves comparing an organization's practices, processes, products, or services with those of industry leaders, competitors, or recognized industry standards to identify areas for improvement (BRIP 2024). This research method will allow me to draw on existing knowledge and real-world examples to inform the design of sensory-friendly environments that meet the needs of neurodivergent students. From my findings, I want to bring to light key concepts that play a crucial role in fostering inclusive learning environments: Sensory-Friendly Learning Environments, the inclusive classroom, and inclusive interior design.

## 4.1 Sensory-Friendly Learning Environments

Sensory-friendly classrooms are designed to support students with diverse sensory needs by reducing sensory overload and creating inclusive, comfortable learning spaces. These environments foster engagement, focus, and emotional well-being for all learners, particularly those who experience sensory sensitivities. Key strategies for designing such environments include adjusting lighting, improving acoustics, offering flexible seating, organizing the space through zoning and wayfinding, and incorporating sensory tools that help students self-regulate.

Lighting plays a crucial role in reducing visual stress and creating a calm, inviting atmosphere. Soft, adjustable lighting, such as dimmed artificial lights or alternatives to harsh fluorescent lighting, can alleviate anxiety and enhance focus, especially in classrooms without abundant natural light. By modifying lighting according to the needs of students, the classroom becomes more comfortable and supportive, providing a conducive environment for learning (Modulyss, 2023).

In addition to lighting, the acoustic environment of the classroom significantly impacts student focus. Noise is a common stressor, and it can be especially distracting for students who are sensitive to sound. Incorporating sound-absorbing materials like carpets, acoustic panels, or curtains can effectively reduce ambient noise and create a quieter, more focused space (Modulyss, 2023). This, in turn, helps students regulate their emotions and concentrate better, which is crucial for maintaining productivity and fostering a positive learning atmosphere. Flexible seating is another important element in sensory-

friendly classrooms. Traditional desks and chairs may not suit every student, particularly those who need more movement or different types of seating to maintain focus (Modulyss, 2023). Providing options such as stability balls, floor cushions, or standing desks allows students to choose seating arrangements that are comfortable and conducive to their learning style. These choices empower students to take ownership of their environment and improve their engagement with the material.

Equally important is the way the classroom is organized. Clear zoning and wayfinding tools, such as color-coded areas or visual cues, help students easily navigate the space (Modulyss, 2023). This reduces stress, particularly during transitions between activities, by providing structure and predictability. Organized spaces create a sense of security, allowing students to move from one task to another with greater ease, which is vital for maintaining focus and minimizing anxiety.

Soft flooring also plays a role in enhancing the sensory experience. Carpets or padded mats not only improve acoustics but also increase safety by reducing the risk of injury from falls (Modulyss, 2023). Additionally, soft flooring contributes to a more inviting and comfortable classroom, making students feel at ease and supported. A safe, comfortable physical environment is crucial for helping students feel secure and ready to engage with the content.

Another key feature of sensory-friendly classrooms is the inclusion of sensory break areas. These designated

spaces allow students to self-regulate when they feel overwhelmed by sensory input. Equipped with calming tools such as fidget toys, sensory bins, or weighted blankets, these areas offer a retreat where students can take short breaks to decompress and return to learning tasks feeling refreshed. Sensory breaks are essential for emotional regulation, ensuring that students can continue their learning without becoming overstimulated (Model Teaching, 2023).

Finally, assistive sensory tools are an important part of a sensory-friendly classroom. Tools like fidget toys, noise-canceling headphones, visual timers, and tactile objects help students manage sensory overload and stay focused. For example, noise-canceling headphones can block out distracting sounds, while visual timers provide structure and predictability, reducing anxiety and helping students manage time more effectively (Model Teaching, 2023). By offering a variety of sensory tools, educators can meet the unique needs of each student, ensuring that all learners have the support they need to thrive.

Incorporating these strategies into the classroom design not only helps students with specific sensory needs but also creates a more inclusive environment for all learners. Sensory-friendly classrooms promote engagement, academic success, and emotional well-being by ensuring that every student can learn in an environment tailored to their needs. By reducing sensory distractions and providing tools for self-regulation, these spaces support students in their ability to focus, participate, and succeed.

## 4.2 The Inclusive classroom

An inclusive classroom is a general education environment where students, both with and without learning differences, learn alongside one another (Incredible Years, 2024). Figure 9: Based on strategies from Incredible Years (2024), this diagram illustrates the principles of creating inclusive learning environments that cater to the diverse needs of all students.

Each student brings their own background and experiences to the classroom, and similarly, they have individual learning styles that work best for them (Affinity Workforce, 2024).



Figure 9. Based on strategies from Incredible Years (2024). Tailoring methods to support students with learning differences (Kirk 2024)

## 4.3 Inclusive interior design

Imagine a world where the spaces we live and work in are truly designed for everyone—no barriers, no restrictions, just inclusive accessibility and comfort for all. While it may seem like an unrealistic goal, it shouldn't be. An estimated 1.3 billion people experience significant disability. This represents 16% of the world's population, or 1 in 6 of us (World Health Organization, 2024). This data emphasizes the significance of design that caters to functional needs while celebrating the full spectrum of human diversity.

In interior design, inclusion has shifted from being a choice to an essential principle. Designing accessible spaces goes beyond merely meeting legal requirements—it involves rethinking environments to ensure positive experiences for all individuals, regardless of their physical, sensory, or cognitive abilities. This responsibility is both technical and ethical, pushing professionals to innovate by blending functionality, aesthetics, and empathy (Alma de Luce, 2024).

Most of us are familiar with sensory overload, which happens when there's an overwhelming amount of stimuli—bright lights, loud sounds, or crowded spaces, for instance. This can be overwhelming and uncomfortable, especially for those who are more sensitive to these elements. However, neurodivergent individuals may also experience sensory underload. This occurs when there is a lack of sensory stimuli, leading to feelings of boredom, disconnection, or disengagement. This is where neuro-inclusive interior design becomes crucial in addressing these challenges.

Spaces that offer choices—such as adjustable seating, movable elements, or customizable sensory tools—enable individuals to modify their surroundings to meet their unique needs. This flexibility is essential in accommodating not only those with sensory sensitivities but also those who require varied levels of stimulation to feel engaged and focused (Southpaw, 2024).

*“We believe that designing for the minority will benefit the majority”*

(Modulyss 2024)

## 4.4 Interview

In order to gather in-depth insights into which aspects of sensory-friendly learning environments are most impactful for students, in-depth interviews will be employed as a data collection method. In-depth interviews are often conducted with relevant stakeholders to understand different perspectives. These interviews can provide researchers with valuable information, helping them learn more about experiences, products, services, operations, concerns, as well as attitudes, challenges, needs, or ideas (Stickdorn et al., 2018, p. 122).

By consulting with special needs teachers and education specialists, I will be able to directly inform the design of sensory-friendly classrooms, ensuring that the proposed solutions are not only evidence-based but also practically relevant and attuned to the needs of both students and educators.

I interviewed a total of five individuals, including both regular classroom teachers and special needs educators. An interview framework was created for the interviews, which was adjusted and applied during the conversation (see Appendix 1). The goal was to establish a relaxed and friendly atmosphere to encourage teachers to openly share their experiences with sensory challenges in the classroom. The interviewees

were free to discuss sensory-related issues in the classroom, and the conversation focused on the aspects they found most significant.

The interviews were recorded and transcribed to ensure the accuracy of the information gathered. The purpose of the interviews was to understand the sensory challenges teachers face in the classroom and how they adjust the environment. The focus of the study was to investigate the sensory challenges some students might experience. Additionally, the interviews aimed to explore what tools and strategies teachers currently use to support students with sensory difficulties, and what features, from the teachers' perspective, should be included in a sensory-friendly space.

The sensory issues identified by the teachers appeared to align closely with one another, with noise and visual distractions emerging as the main challenges in the classroom. Many teachers highlighted how these sensory factors can significantly affect students' ability to focus and engage. Additionally, the importance of taking time to understand each student as an individual was emphasized. Teachers noted that addressing sensory challenges requires patience and a personalized approach to truly meet the needs of students, helping them thrive in the classroom.

# 5

- 5 Data Analysis
- 5.1 Affinity diagram
- 5.2 Empathy Mapping
- 5.3 Design drivers

## 5 Data Analysis

To analyze data from benchmarking and user research, I used **Affinity Diagrams** and **Empathy Mapping** to organize insights and better understand the needs for customized learning environments.

I began with Affinity Diagrams, grouping findings and interview responses on post-it notes to identify key themes, such as the need for flexible classroom spaces, multisensory materials, and assistive tools. This method highlighted recurring challenges, including resource shortages and the importance of adaptable environments. Next, I applied Empathy Mapping to capture the thoughts, feelings, and pain points of teachers and specialists, gaining deeper insight into their emotional struggles. Together, these methods helped categorize both practical needs and the emotional context, revealing the need for more support and customizable resources.

### 5.1 Affinity diagram

An Affinity diagram is to categorize, arrange, and systematize data, information, or individual components based on their relationships and contexts to identify patterns, connections, and insights that inform the design process (Design Methods Finder, 2024). Using this process, the interview results were systematically organized by grouping data into coherent themes. This approach enabled the analysis of relationships, providing insights into user needs, pain points, and opportunities.

### 5.2 Empathy Mapping

An empathy map helps you gain insights into your user's needs while building a deeper understanding of the people you are designing for. A visual tool used by designers to better understand and empathize with a target audience. It helps teams gather insights into the thoughts, feelings, needs, and behaviors of users by breaking down information into specific areas (Dam and Teo, 2024).



Figure 10. Data Analysis at the home office (kirk, 2024)

most common sensory or environmental challenges



What are the most important insights/experience you have gained while working with neurodiverse students?



sensory-friendly changes to your classroom



Before attending learning in a place other than their own classroom

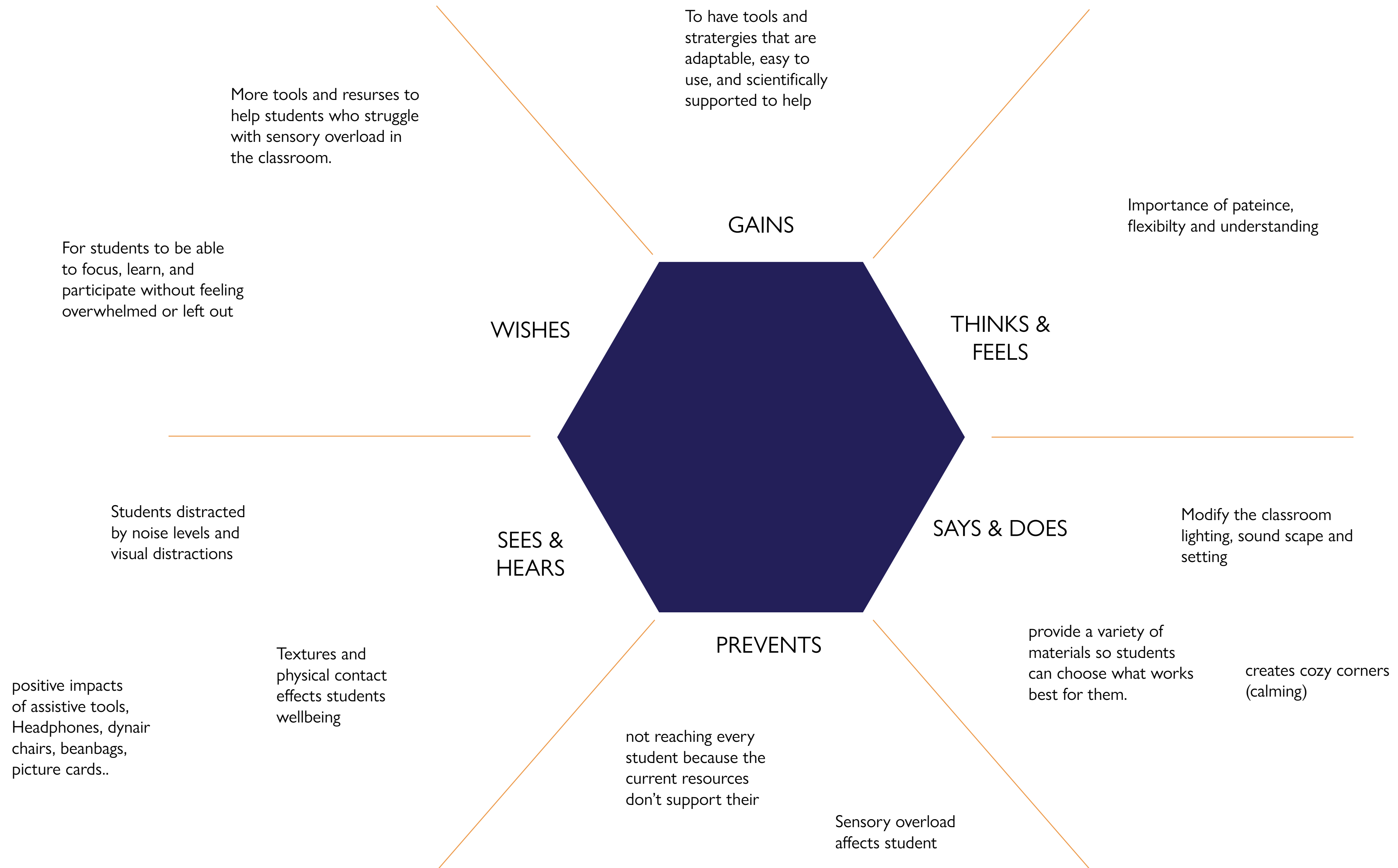


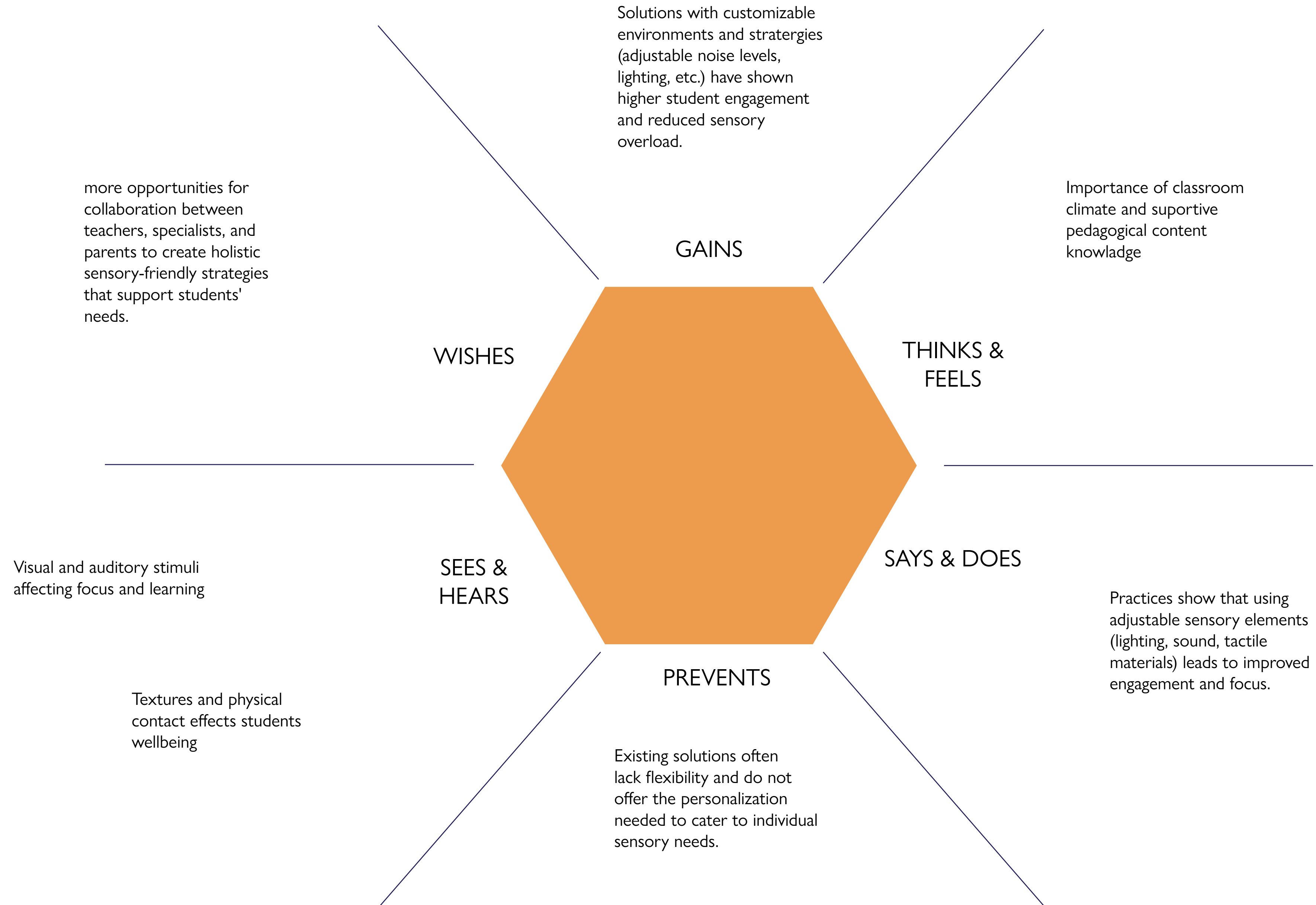
Assistive tools



What strategies or adjustments have been most effective in supporting your students?

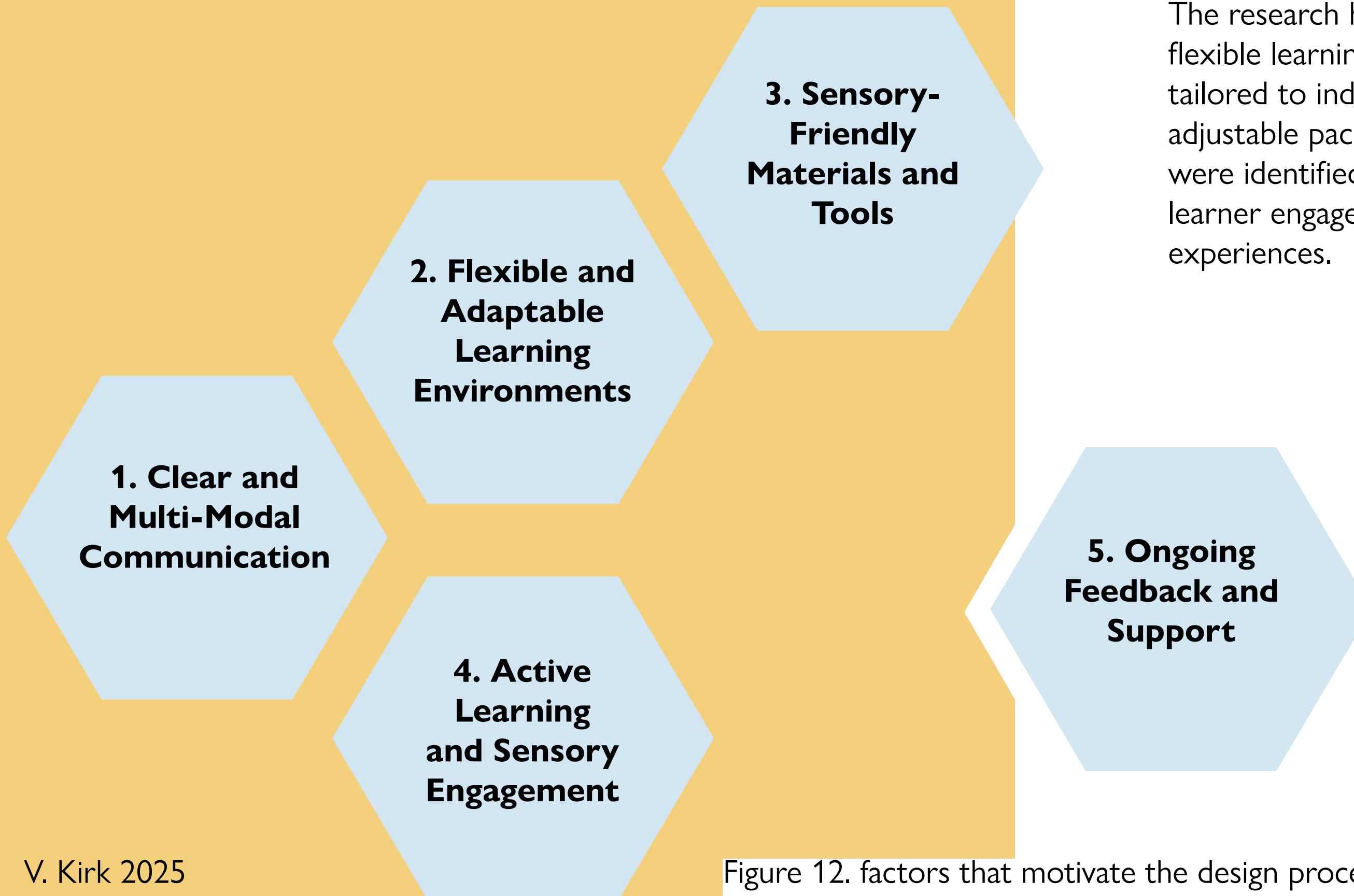






## 5.3 Design drivers

In the design process, key drivers are essential to creating effective design results. Drivers such as clear communication, flexibility, sensory sensitivity, active engagement, and ongoing feedback guide the design, ensuring that the environment is adaptable, inclusive, and responsive to the diverse needs of learners. This approach enhances engagement and supports better learning outcomes.



### 1. Clear and Multi-Modal Communication

Insights from interviews and benchmarking reveal that multi-modal communication—using verbal, visual, and tactile formats—is crucial for engaging diverse learners. This approach ensures content is accessible to all students, accommodating various learning styles and enhancing comprehension in STEM environments.

### 2. Flexible and Adaptable Learning Environments

The research highlighted the importance of flexible learning environments that can be tailored to individual needs. Customizable seating, adjustable pacing, and multisensory elements were identified as key features for improving learner engagement and providing personalized experiences.

### 3. Sensory-Friendly Materials and Tools

Data gathered from interviews and benchmarking practices emphasized the need for sensory-friendly tools to support learners with sensory sensitivities. Tools like noise-canceling headphones and textured surfaces were found to help reduce distractions and maintain focus, ensuring a more comfortable learning environment.

### 4. Active Learning and Sensory Engagement

Active learning strategies that incorporate sensory engagement emerged as effective methods for enhancing retention and understanding. These approaches create immersive, hands-on learning experiences that cater to the needs of neurodiverse learners in STEM education.

### 5. Ongoing Feedback and Support

The findings underscored the significance of ongoing feedback to support learner progress. Real-time check-ins, personalized feedback, and adaptive tools were identified as essential in ensuring that learners receive timely, relevant support, which helps maintain motivation and engagement.

Figure 12. factors that motivate the design process (Kirk, 2024)

# 6

## 6. Concept

### 6.1 Service Blueprints

### 6.2 LUMA Center Päijät-Häme Service blueprint

### 6.3 LUMA Center Päijät-Häme: Axonometric perspective

### 6.4 SOLU concept zones

### 6.5 SOLU sensory friendly features

### 6.6 Visualisation

## 6. Concept

Based on my study, I developed a concept that allows special needs teachers to select tailored teaching models created by LUMA professionals. This enables them to choose the best approach for their students' unique needs, whether through hands-on learning or visual-based methods. The concept combines Explicit Teaching (clear, step-by-step instructions with visual aids) and Teach-Back (where students re-explain or demonstrate their understanding) to create an engaging, structured, and interactive learning experience, particularly for neurodiverse students.

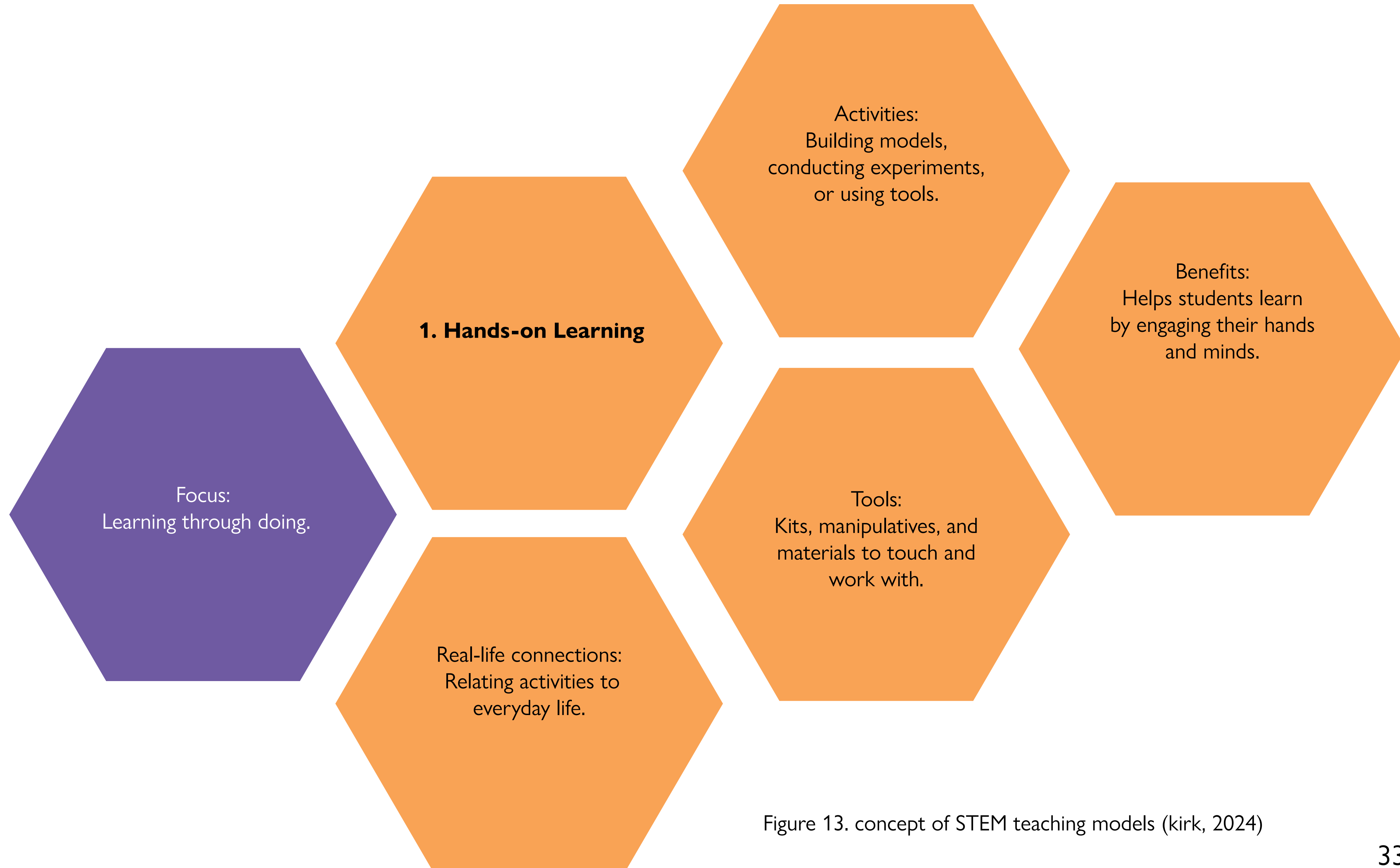
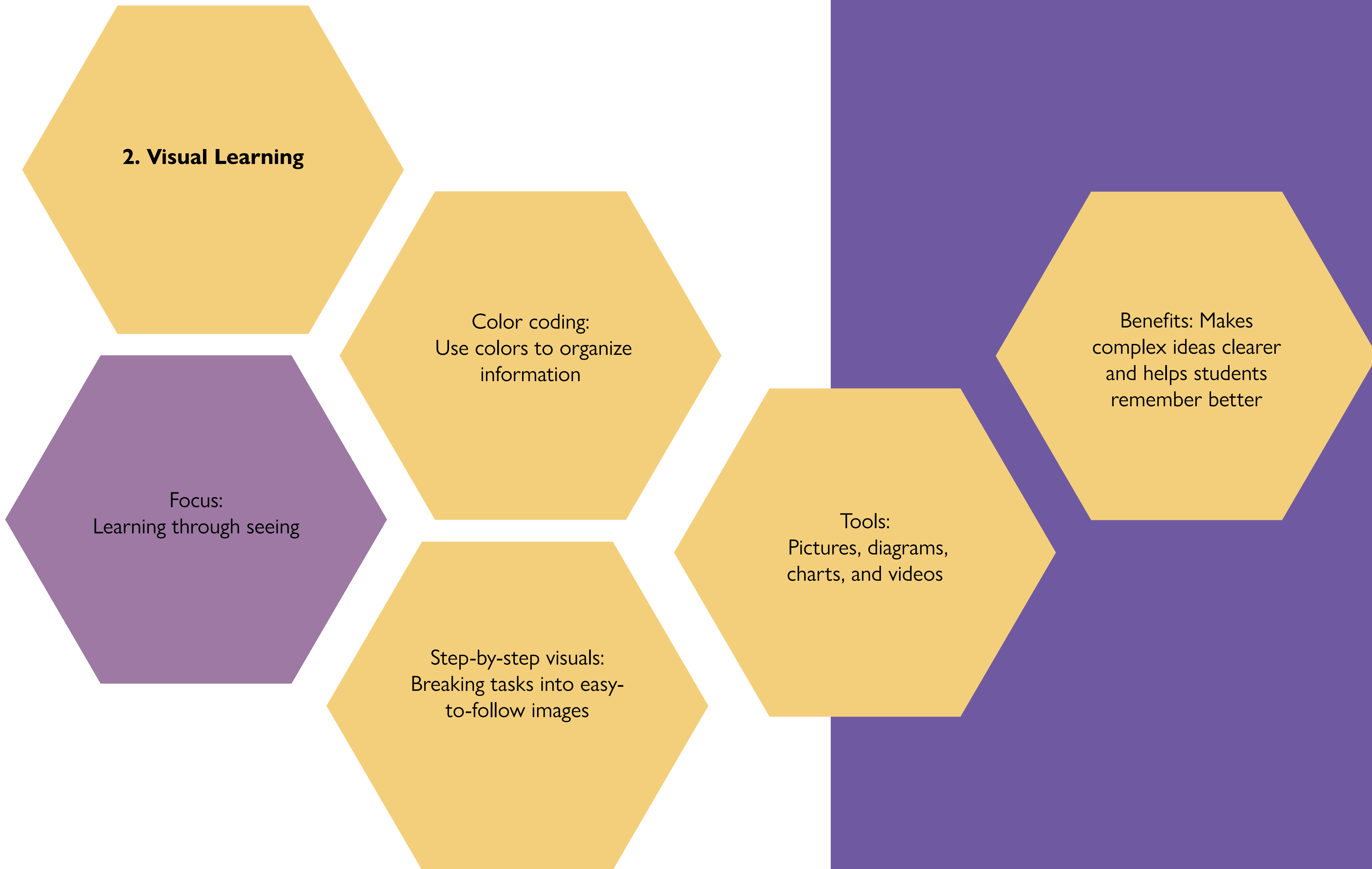


Figure 13. concept of STEM teaching models (kirk, 2024)



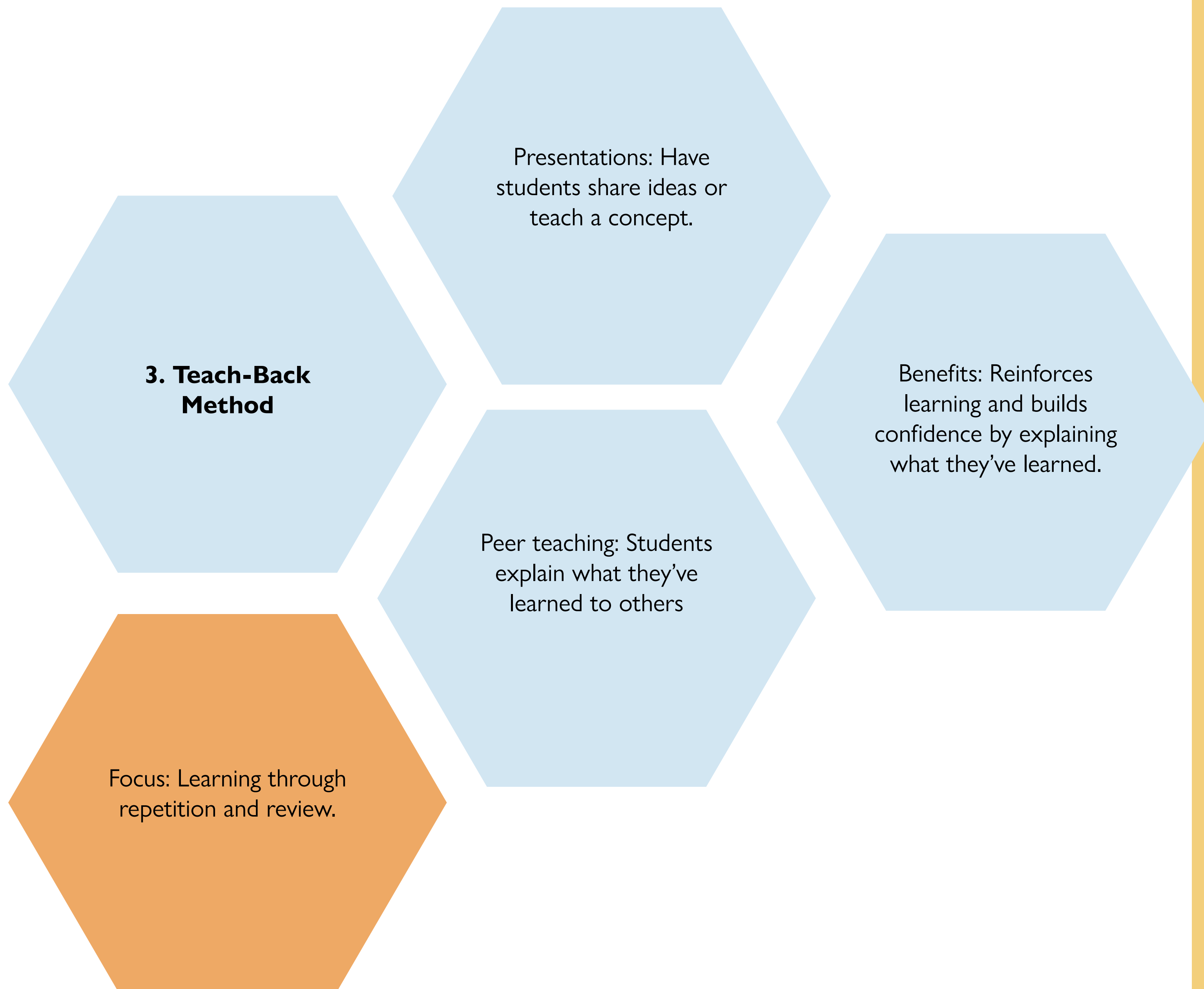


Figure 15. Visualising Teach back method (kirk, 2024)

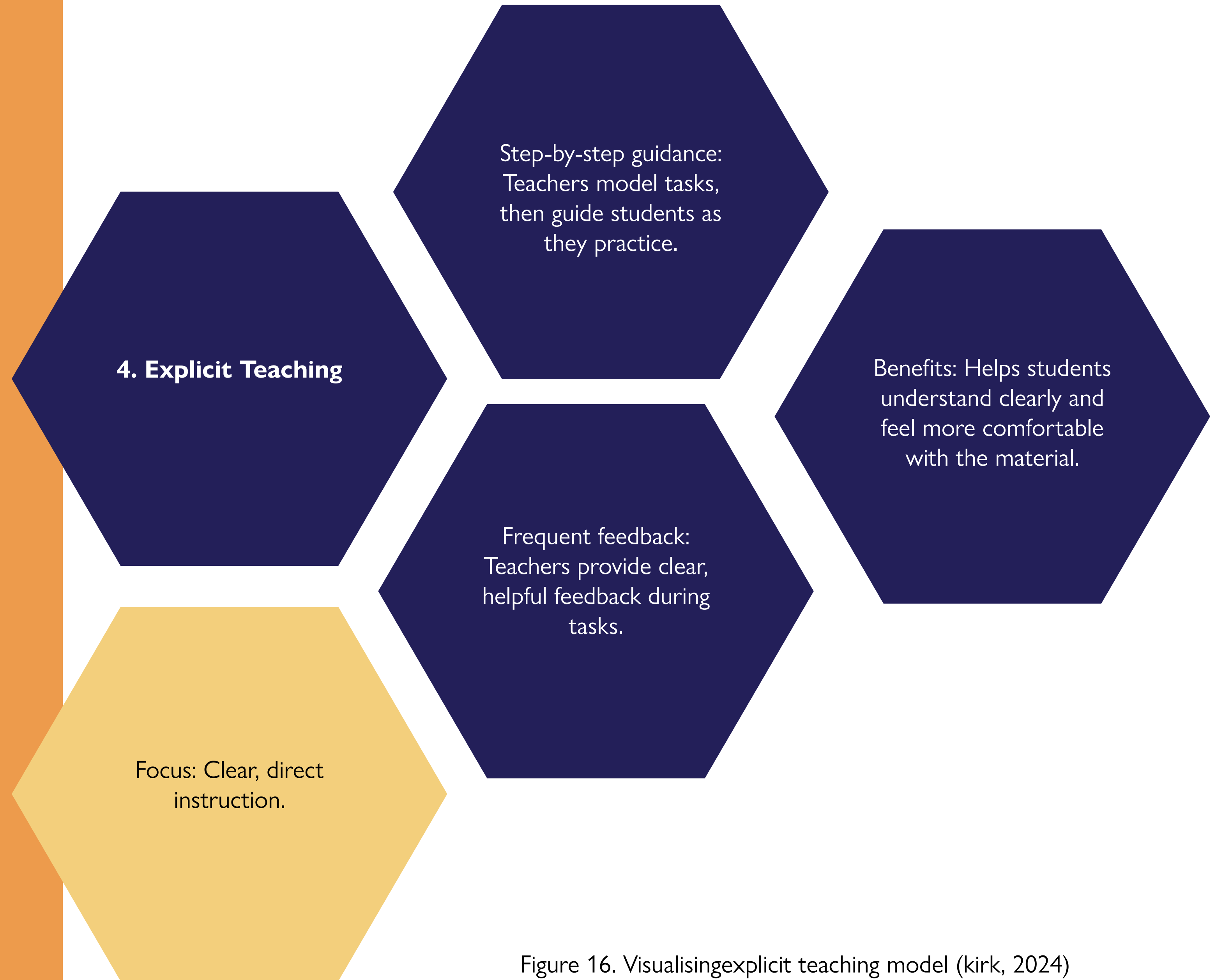


Figure 16. Visualising explicit teaching model (kirk, 2024)

## 6.1 Service Blueprints

Service blueprints are designed to link customer experiences with both frontstage and backstage employee actions, as well as supporting processes (Stickdorn et al., 2018, pp. 54-55).

"Frontstage" refers to the people and processes directly interacting with the user, while "backstage" encompasses the people and processes that remain hidden from the user. Support processes include activities carried out by other parts of the organization or external partners.

A service blueprint expands on the frontstage elements depicted in a customer journey map, adding additional layers that illustrate the connections and interdependencies between frontstage and backstage processes (Stickdorn et al., 2018, pp. 54-55).

# 6.2 LUMA Center Päijät-Häme Service blueprint

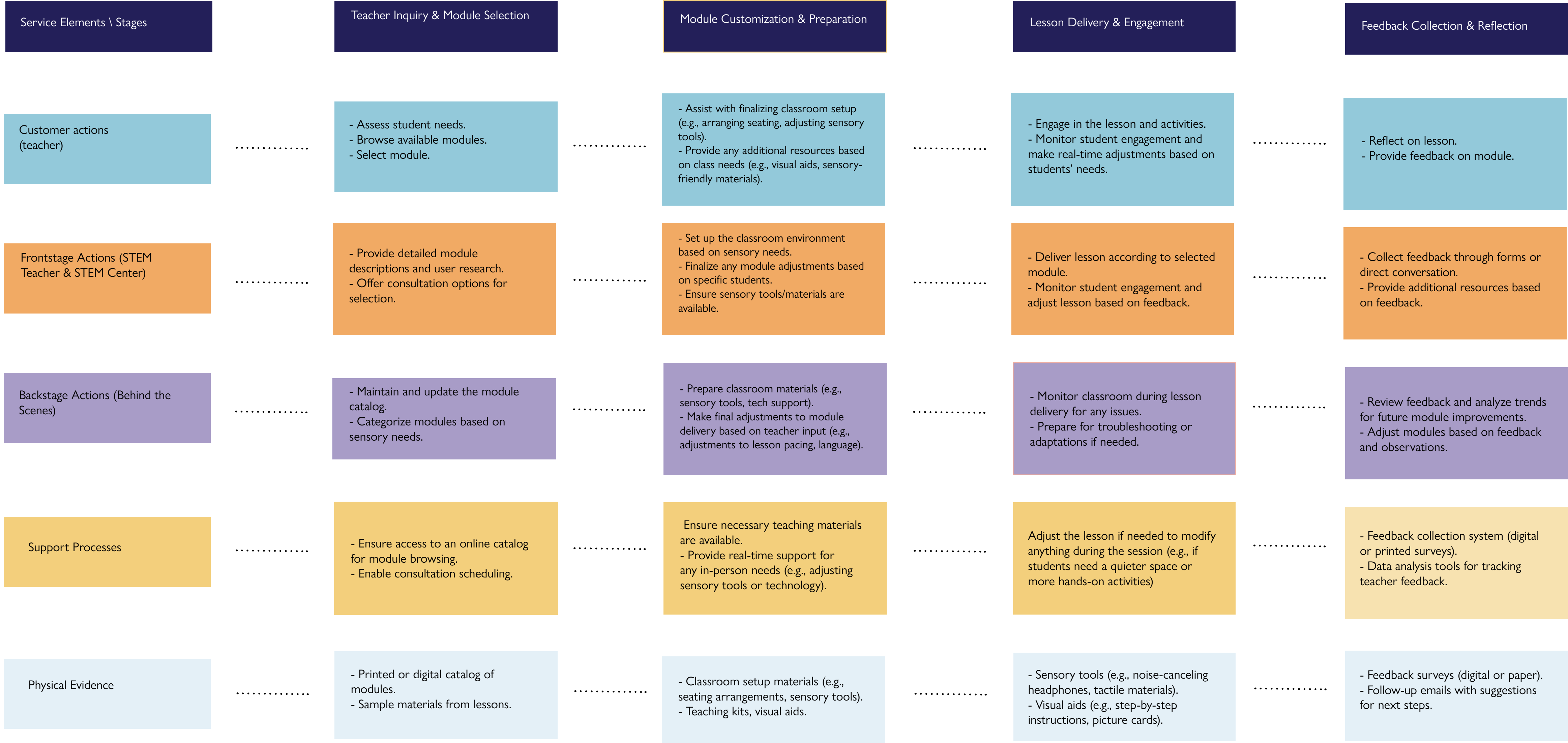


Figure 17. Service Blueprint of Concept. (Kirk, 2024)



## 6.3 LUMA Centre Päijät-Häme: Axonometric Perspective

The axonometric model provides an overview of the Science Lab “SOLU” at the Niemi campus, designed to help teachers and their groups familiarize themselves with the space. It aims to offer insights into the room’s accessibility and layout. This floor plan is created based on approximate measurements and visual estimation.

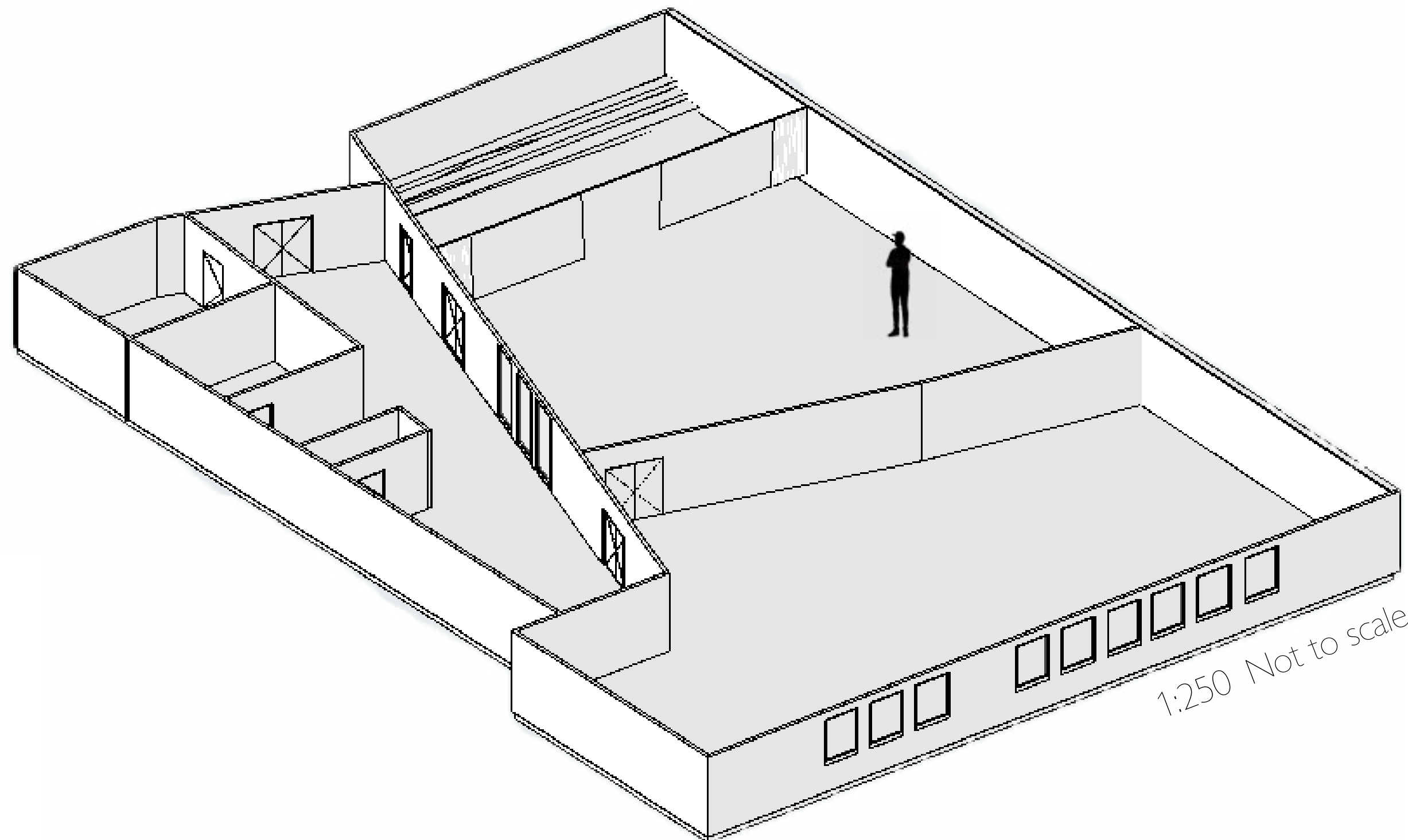
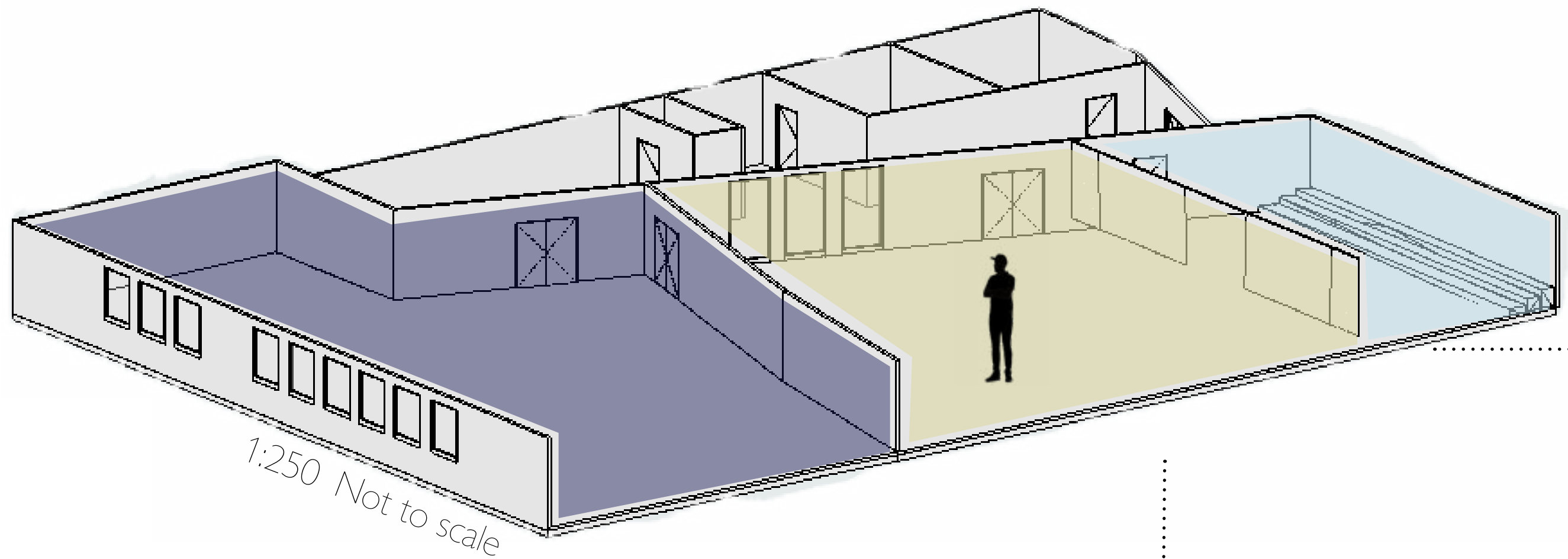


Figure 18. Axonometric drawing of SOLU Lab, LUMA Center päijät-Hämeen (kirk, 2025)

# 6.4 SOLU concept zones



**Sensory Awakening Zone**  
Space with Windows and Natural Light  
Students benefit from a stimulating, open, and visually enriched environment.

**Cozy Corner.**  
This space can be used for relaxation, reflection.  
Perfect for sensory breaks, or a calm place for students.

**Focused, Screen-Free Teaching Space**  
for minimal distractions.

Figure 19. Science Lab SOLU with colour-coded zones (Kirk, 2025).

## Cozy Corner

The Cozy Corner as a calming space for students to take sensory breaks or engage in quiet reflection. With comfortable seating and a soothing atmosphere, it provides a peaceful retreat within the classroom, offering students a chance to reset and recharge before returning to their activities.

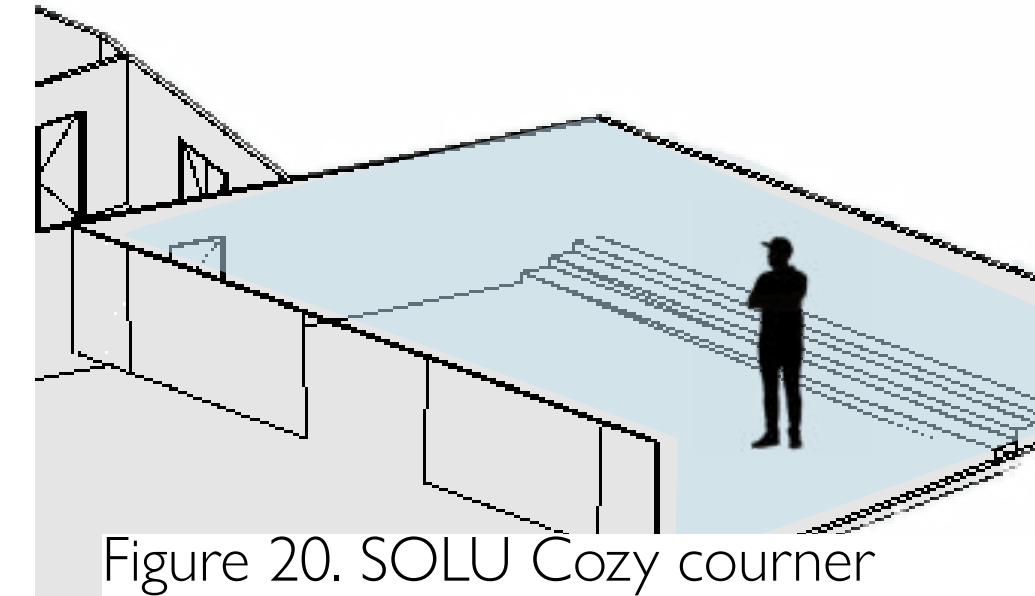


Figure 20. SOLU Cozy corner (Kirk, 2025).

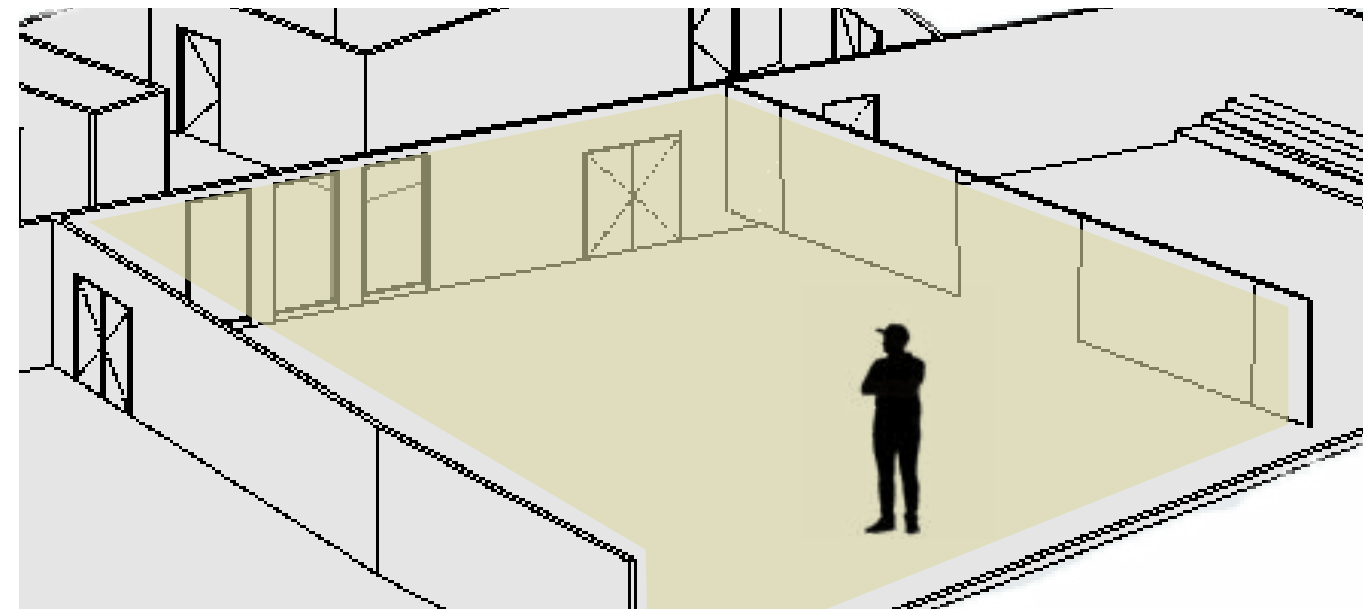


Figure 21. SOLU Sensory friendly Zone (Kirk, 2025).

## Sensory-Friendly Zone for Focused, Screen-Free Learning

This sensory-friendly zone within the Science classroom, to minimize distractions and provide a calm, focused space for students. With a screen-free environment, soft lighting, and soothing colors, the area helps reduce sensory overload. The layout and materials to be selected to support students with sensory sensitivities, offering a quiet, comfortable setting where they can engage with the subject matter without unnecessary distractions.

## Sensory-Awaking Zone Space with Natural Light

This space incorporates windows and natural light to create a visually enriched, open environment. Students that benefit from the stimulating effects of daylight, which can enhance mood, focus, and overall well-being, making the learning atmosphere feel more inviting and connected to the outside world.

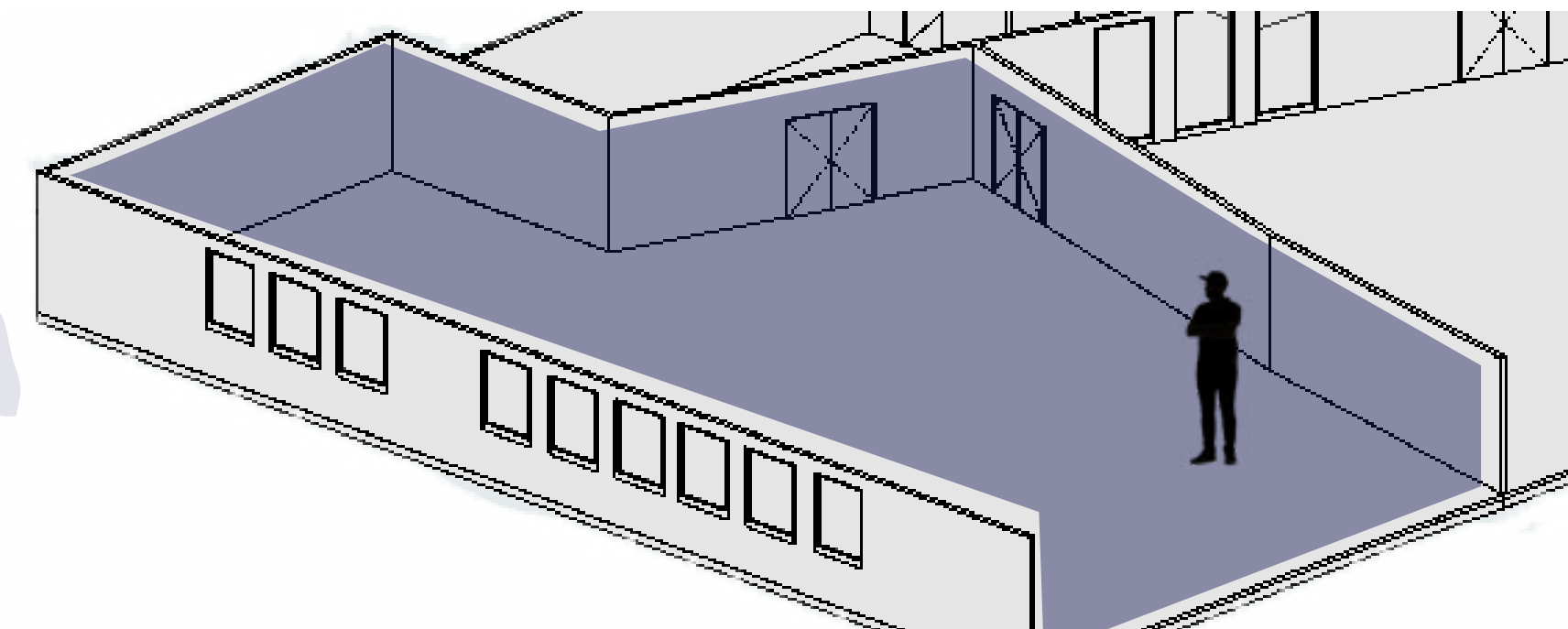


Figure 22. SOLU Sensory Awakening Zone (Kirk, 2025).

## **6.5 SOLU sensory friendly features**

The following sensory-friendly features were selected based on insights from the data, with the aim of enhancing the learning environment. These features address the sensory needs of neurodiverse students, while promoting inclusivity, flexibility, and engagement. By incorporating these practical design features, classrooms can be transformed into more supportive and adaptive spaces.

## Features:

- Dimmable lighting to adjust the brightness for comfort.
- Create quiet areas where students can take a break if needed.
- Use different sensory textures (soft, rough, smooth) to help with focus.
- Movable walls could help create spaces for group work or individual study.
- Adjustable furniture, like standing desks and ergonomic chairs, allow students to choose what works best for them.



Figure 23. Collage illustrating design features for a inclusive classroom (kirk, 2025)

### Clear Zones and Navigation:

- Color-coded areas could help define spaces for group work or quiet zones.
- Clear signs might help students find their way around easily.

### Biophilic Design:

- Add plants or water features (nature-inspired wallpaper or pictures) to make the space calming.
- Use earthy colors like greens and browns to make the room feel more natural.
- Materials like wood or stone enhance the feel of nature in the classroom.



Figure 24. Collage illustrating design features for a inclusive classroom part 2. (kirk, 2025)



## 6.6 Visualisation

This visualization demonstrates how small adjustments can transform a space into a calming environment. By incorporating elements like scenic wallpaper, calming wall colors, and comfortable seating (such as bean bags), the space can easily be adapted into a tranquil “Cozy Corner.” These simple features work together to create a peaceful atmosphere, ideal for sensory breaks, relaxation, or quiet reflection—without the need for major renovations.



Figure 25. Before visualization of SOLU cozy corner (Kirk, 2024)



Figure 26. After visualization of SOLU cozy corner (Kirk, 2024)

# 7

7. Conclusion  
7.1 Reflection

## 7. Conclusion

This study has explored the key aspects that contribute to creating inclusive learning environments, particularly for neurodiverse learners. The investigation highlighted the importance of sensory-friendly design, flexibility in teaching methods, and the integration of various learning models tailored to the unique needs of students. Central to this is the recognition that neurodiversity encompasses a broad spectrum of learning styles, sensory preferences, and cognitive processes, all of which require thoughtful consideration when designing educational spaces and curricula.

In order to effectively support neurodiverse learners, it is essential to take into account factors such as sensory needs, the physical layout of the learning environment, and the need for flexibility in teaching approaches. Sensory-friendly environments, with features like adjustable lighting, noise control, and tactile materials, help to reduce overwhelm and foster engagement. Additionally, personalized teaching models, such as explicit instruction, hands-on learning, and visual aids, offer multiple entry points for learning, ensuring that all students can access the content in a way that suits their strengths.

Furthermore, teaching strategies such as Teach-Back and active engagement through project-based learning can promote deeper understanding and confidence, while also fostering social inclusion. Collaboration between educators, specialists, and designers is key to developing environments that are not only accessible but also empowering for neurodiverse learners.

Ultimately, creating inclusive learning spaces for neurodiverse students is not just about addressing specific needs, but about fostering an atmosphere where all students feel valued, understood, and supported. The findings of this research underscore the importance of continued collaboration, flexibility, and empathy in shaping educational practices that embrace the full diversity of learners. Moving forward, integrating these insights into educational practice will help ensure that neurodiverse students can thrive academically, socially, and emotionally, in spaces that truly support their individual needs.

## 7.1 Reflection

My investigation has provided valuable insights into the development of inclusive educational spaces for neurodiverse learners, with a focus on the integration of sensory-friendly design and flexible teaching methods. However, several challenges and limitations influenced the scope and depth of the study.

One significant challenge was the vast amount of data available on the topic. The wide range of research and case studies made it difficult to narrow down the material. At a certain point, I had to stop exploring additional sources. While the abundance of information helped deepen my understanding of the elements involved in creating inclusive environments, it also presented difficulties in synthesizing and distilling the key findings.

Another limitation I encountered was the inability to conduct direct observations or interviews with students. I did not have the time to apply for the necessary research permissions to engage students directly, and as a result, I was unable to gather first-hand insights into the lived experiences of the learners. This would have significantly enriched the study. I had originally planned to include user profiles to better represent the diverse needs and experiences of students. However, I ultimately decided that

it would be unethical to make assumptions or generalizations without involving the students in the research process. While this decision was necessary, it did limit the depth of the user-centered approach I had envisioned. Despite the absence of direct student involvement, I believe the research still emphasizes important principles for designing inclusive learning environments. It highlights the need for flexibility, collaboration, and a deep understanding of sensory and cognitive diversity. In future research, I would recommend integrating student voices early in the design process, as their direct experiences would provide a more comprehensive understanding of their challenges and the strategies that best support them.

While the study faced these challenges, it has nonetheless offered useful insights into how to create spaces that are not only accessible but also empowering for neurodiverse learners. Moving forward, I suggest exploring opportunities for more participatory, in-depth research—possibly in the form of workshops—where students themselves can play an active role in shaping the creation of inclusive learning spaces. Additionally, fostering active collaboration with specialists and utilizing available data would further enrich the design process.

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# Appendices

1.

Interview question with Special needs teacher and education specialists

## 1. Background and Experience

Objective: To gain insight into the teacher's experience working with neurodiverse students.

Questions:

How long have you been a teacher, and how much experience do you have working with neurodiverse students?

What types of neurodiversities (e.g., autism, ADHD, dyslexia) have you encountered?

What key insights have you gained from working with neurodiverse students?

## 2. Sensory and Learning Needs of Students

Objective: To understand the sensory and learning challenges faced by students.

Questions:

What are the most common sensory or environmental challenges you have noticed in your students?

How do these challenges affect learning and participation in the classroom?

Can you give an example of how you've adapted teaching to accommodate your students' sensory and learning needs?

## 3. Teaching Strategies

Objective: To explore the methods and practices used to support neurodiverse students.

Questions:

What strategies or changes have worked best in supporting neurodiverse students?

Can you provide an example of a successful teaching method you have used?

How do you take into account the individual needs of students in your teaching?

Explicit Teaching:

How do you structure lessons to ensure that instructions are clear and accessible? Do you use any specific visual aids or step-by-step approaches?

How do you check that the students have understood the instructions clearly?

Teach Back:

Do you use the "Teach Back" method, where students re-explain or demonstrate their understanding of the lesson? If so, how does this work in your classroom?

Can you share an example of how "Teach Back" has helped students reinforce their learning?

## 4. Sensory-Friendly Environment

Objective: To learn about creating sensory-friendly classrooms.

Questions:

Have you made any sensory-friendly changes in your classroom (e.g., lighting, seating arrangements, quiet areas)? How have they worked?

How do you balance the sensory needs of neurodiverse students with those of other students?

What changes or resources would you wish for in the classroom?

## 5. Challenges and Barriers

Objective: To identify obstacles teachers face when supporting neurodiverse students.

Questions:

What are the biggest challenges you face when teaching students with special needs?

Do you feel there are structural barriers preventing you from supporting students effectively?

Are there any strategies you've used to overcome these challenges?

## 6. Collaboration and Resources

Objective: To understand the role of collaboration and the resources available.

Questions:

How do you collaborate with parents, specialists, and other teachers to support students?

What resources have been most helpful in your work?

Would you like more support or resources?

7. Suggestions and Improvements

Objective: To gather suggestions for better practices and changes.

Questions:

What advice would you give to new teachers working with neurodiverse students?

Open-ended comments.

## 8. Useful Tools and Learning Spaces for NEPSY Youth in LUMA Education

Objective: To explore helpful tools and space designs for neurodiverse students in LUMA (STEM) education.

Questions:

What types of tools or space designs would be useful in teaching NEPSY youth (e.g., visual cards, timers, bean bags, etc.)?

2.

Figure 1. Untitled - LUMA Center finland

Figure 2. LUMA Finland Center Ecosystem (LUMA, 2024)

Figure 3, Pictures from Science Lab SOLU (Kirk, 2024)

Figure 4. Design Council's Framework for Innovation: The Process of Service Design (Design Council, 2024)

figure 5. Visualizing Service Design Thinking (Kirk, 2024)

Figure 6."Ranges of Senses" (Malnar & Vodvarka, 2004, as cited in Lipps & Lupton, 2018, p. 8) (Kirk, 2024)

Figure 7. Diverse minds (AI and Kirk, 2024)

Figure 8. Sitra Megatrend Cards (Kirk, 2024)

Figure 9. Based on strategies from Incredible Years (2024). Tailoring methods to support students with learning differences (Kirk 2024)

Figure 10. Data Analysis at the home office (kirk, 2024)

figure 11. Affinity diagram (Kirk, 2024)

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Figure 20. SOLU Cozy courner (Kirk, 2025).

Figure 21. SOLU Sensory friendly (Kirk, 2025).

Figure 22. SOLU Sensory awaking Zone (Kirk, 2025).

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