

Eryn Voogt

220460

BA Honours in Visual Communication

Teddy, Penny, Chip & Bean:

***Using Interactive Digital Storytelling to Help Educators
Recognise and Respond to Sensory Overload in Learners with
ASD***

Supervisor:

Wessie van Der Westhuizen

November 2025

STELLENBOSCH ACADEMY
OF DESIGN & PHOTOGRAPHY

TABLE OF CONTENTS

DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
LIST OF FIGURES	vi
CHAPTER 1: INTRODUCTION.....	1
1.1 Background and Context.....	1
1.2 Problem Statement and Research Question(s).....	2
1.3 Aims and Objectives	3
1.4 Research Methodologies	4
1.5 Scope of Project (and Limitations)	6
1.6 Outline of Chapters	6
CHAPTER 2: LITERATURE REVIEW	9
2.1 Introduction	9
2.2 Background and Context.....	9
2.3 Sensory Overload and Its Connection to Neurodivergent Experience	10
2.4 The Social Model of Disability	12
2.5 Systems Thinking and How it Relates to Inclusive Design.....	13
2.6 Empathy as a Design Tool	14
2.7 Narrative, Immersion and Storytelling in Digital Space	15
2.8 Conclusion	17
CHAPTER 3: VISUAL ANALYSIS	19
3.1 Introduction	19
3.2 <i>Life (Re)Sounding</i> (2024).....	20
3.3 <i>(UN)TRAFFICKED</i> (2018).....	26
3.4 Conclusion	31
CHAPTER 4: LINKING THEORY TO PRACTICE	33
4.1 Introduction	33
4.1 Linking Theory to Practice.....	34
4.2.2 Application of Theory	36
4.2.3 Character and Scenario Development.....	36
4.3 Execution of the Project	37
4.3.1 Technical Implementation	38

4.3.2	Visual Design Decisions	38
4.3.3	User Experience and Agency.....	39
4.3.4	Designing the User Journey: Contextual Onboarding and Personalisation.....	40
4.3.5	Decision-Making Complexity.....	40
4.3.6	Time Pressure and Feedback Systems	41
4.3.7	Audio Design	42
4.3.8	Extended Resources.....	42
4.4	Conclusion	43
CHAPTER 5: CONCLUSION		46
REFERENCE LIST.....		49
APPENDIX		52
ADDENDUM A		61

DECLARATION

I, Eryn Voogt (220460), hereby declare that this thesis for a BA Honours in Visual Communication is my own work and that it has not previously been submitted for assessment or completion of any postgraduate qualification to another University or for another qualification.

A handwritten signature in black ink, appearing to be 'Eryn Voogt', written over a horizontal dotted line.

Eryn Voogt

ABSTRACT

This research paper explores how interactive digital storytelling can support public primary and secondary level school educators in recognising and responding to sensory overload in learners with Autism Spectrum Disorder (ASD). Drawing on the Social Model of Disability, Systems Thinking, and Dunn's Model of Sensory Processing, this study examines how empathic design and interactive storytelling address the lack of accessible tools to help educators understand neurodivergent experiences. A Visual analysis of *Life (Re)Sounding* (2024) and *(UN)TRAFFICKED* (2018) informs the development of an original, interactive experience designed to support educators in addressing the sensory and social needs of neurodivergent students.

The practical component, *Teddy, Penny, Chip & Bean* (2025), is a browser-based experience placing educators in virtual classrooms to make real-time decisions during moments of sensory overload. Each character represents one of the four sensory processing patterns in Dunn's Model of Sensory Processing, ensuring that the experience reflects a spectrum of sensory experiences. Through branching narratives, educators' choices either supporting self-regulation or heightening distress, providing practical insights for creating learning environments that are inclusive, responsive, and supportive. Downloadable classroom materials extend the project's impact beyond the digital experience, enabling educators to apply the knowledge gained in their everyday teaching environments.

Keywords: Neurodiversity; Autistic Spectrum Disorder (ASD); Sensory Overload; Empathic Design and Interactive Digital Storytelling

ACKNOWLEDGEMENT

I would like to express my deepest gratitude to my parents, Cathryn and Gordon Voogt, for their unwavering love, encouragement, and sacrifices that have made my studies and achievements possible. I am also grateful to my family and friends for their continuous support throughout my academic journey at the Stellenbosch Academy of Design & Photography. Their encouragement and understanding have been essential throughout this process.

I would like to express my sincere thanks to my supervisor, Wessie van der Westhuizen. Your insight and guidance have been invaluable in strengthening both the practical and theoretical aspects of this project. Your critical feedback challenged me to refine my ideas, explore new directions, and experiment with tools and approaches that have significantly contributed to my growth as both a designer and researcher. I am also grateful for your support, along with that of my parents and family, in pursuing my honours degree and navigating times of uncertainty during the project's development.

I would also like to acknowledge the educators who provided valuable perspectives on working with autistic learners. Their expertise helped shape the focus and practical relevance of this project, ensuring it addresses real world needs.

LIST OF FIGURES

		Page
Figure 1.	Eryn Voogt, <i>Teddy, Penny, Chip & Bean: Graph of Dunn’s Model of Sensory Processing</i> . 2025.....	52
Figure 2.	University of South Australia, <i>Life (Re)Sounding: Arrange the ducks in order task</i> . 2024.....	52
Figure 3.	University of South Australia, <i>Life (Re)Sounding: Arrange the blocks in order task</i> . 2024.....	53
Figure 4.	University of South Australia, <i>Life (Re)Sounding: Find your seat task</i> . 2024.....	53
Figure 5.	University of South Australia, <i>Life (Re)Sounding: Take the elevator task</i> . 2024.....	53
Figure 6.	The Kailash Satyarthi Children's Foundation, <i>(UN)TRAFFICKED: “What is her name?” screen</i> . 2018.....	54
Figure 7.	The Kailash Satyarthi Children's Foundation, <i>(UN)TRAFFICKED: “Do you send Alisha with the agent?” screen</i> . 2018.....	54
Figure 8.	The Kailash Satyarthi Children's Foundation, <i>(UN)TRAFFICKED: “Alisha is scared” screen</i> . 2018.....	55
Figure 9.	The Kailash Satyarthi Children's Foundation, <i>(UN)TRAFFICKED: Alisha’s heart bar</i> . 2018.....	55
Figure 10.	Eryn Voogt, <i>Teddy, Penny, Chip & Bean: Select a student screen</i> . 2025.....	55
Figure 11.	The Kailash Satyarthi Children's Foundation, <i>(UN)TRAFFICKED: “A man from a placement agency visits Alisha’s family” screen</i> . 2018.....	56
Figure 12.	Eryn Voogt, <i>Teddy, Penny, Chip & Bean: Teddy overwhelmed in his scenario</i> . 2025.....	56
Figure 13.	Eryn Voogt, <i>Teddy, Penny, Chip & Bean: Experience’s opening sequence</i> . 2025.....	56
Figure 14.	Eryn Voogt, <i>Teddy, Penny, Chip & Bean: “What is your school’s name?” screen</i> . 2025.....	57

Figure 15.	Eryn Voogt, <i>Teddy, Penny, Chip & Bean: Bean’s “Engaged” Regulation Bar.</i> 2025.....	57
Figure 16.	Eryn Voogt, <i>Teddy, Penny, Chip & Bean: Classroom Materials page.</i> 2025.....	57
Figure 17.	Eryn Voogt, <i>Teddy, Penny, Chip & Bean: Awareness Posters.</i> 2025.....	58
Figure 18.	Eryn Voogt, <i>Teddy, Penny, Chip & Bean: Language Guide.</i> 2025.....	58
Figure 19.	Eryn Voogt, <i>Teddy, Penny, Chip & Bean: Calming Posters.</i> 2025.....	59
Figure 20.	Eryn Voogt, <i>Teddy, Penny, Chip & Bean: Communication Cards.</i> 2025.....	59
Figure 21.	Eryn Voogt, <i>Teddy, Penny, Chip & Bean: Teacher’s Reference Guide.</i> 2025.....	60

CHAPTER 1: INTRODUCTION

This research paper explores how interactive digital storytelling can be used to inform and support educators with the necessary knowledge to understand, recognise, and respond when a learner with Autism Spectrum Disorder (ASD) experiences sensory overload. The study aims to examine how interactive, digital experience and storytelling can evoke empathy and create awareness and an understanding of the lived experiences of ASD learners in primary and secondary level public schools. This study will be informed by key concepts including sensory overload, neurodivergence, the Social Model of Disability, Dunn's Sensory Processing Framework, systems thinking, inclusive and empathic design, and narrative immersion in digital spaces.

1.1 Background and Context

According to the CDC's Autism and Developmental Disabilities Monitoring (ADDM) Network, around 1 in 36 children have been diagnosed with Autism Spectrum Disorder (ASD, 2024). ASD learners are receptive to sensory experiences that can make the classroom environment overwhelming, potentially resulting in sensory overload. Sensory overload occurs when one or more of the body's senses are overstimulated due to the brain receiving more information than it can process (Diena, 2025). Factors such as bright lights, loud noises, and strong smells can easily overwhelm their senses, leading to stress, anxiety, and further mental and emotional distress (Noel, 2024).

As ASD exists on a spectrum, there are diverse experiences and ways that learners with ASD can process sensory information (Dunn, 2007). This experience can often be misunderstood as these learners being disruptive or disobedient. While publicly funded schools have made considerable progress in recognising and supporting neurodiversity, there is still work to be done as neurodiverse students often require extra support at school to thrive academically and socially. However, the challenge faced by public schools in

meeting these needs includes limited resources, varying levels of educator preparedness and the need for more comprehensive support systems (Linden Neuropsychological Services, 2025). For educators to understand and meet the needs of these learners, a multifaceted approach is required.

For educators to effectively support the diverse sensory needs of each of their students, they require an understanding of sensory processing. Without this understanding, an educator's response to a learner experiencing sensory overload may unintentionally escalate the situation, leading to further dysregulation or exclusion. Without individualised support across the school environment, it is highly unlikely that learners with ASD will make the academic and social progress that they should (Aspris, 2025). Providing educators with the necessary knowledge to identify the triggers, emotional responses, and behavioural reactions to different patterns of sensory overload can help them in innovating strategies that meet the needs of each of their learners.

1.2 Problem Statement and Research Question(s)

Primary and secondary educators in the public sector have limited access to interactive, digital resources to assist them in supporting students with ASD. This results in educators not being able to understand and support learners with ASD when they experience sensory overload, which often leads to students feeling stressed, anxious, and having meltdowns (Noel, 2024). As education plays a fundamental role in child development, the education system and educators need to be equipped with the knowledge and tools to be able to accommodate children with Autism Spectrum Disorder (ASD) within the framework of publicly funded schools, ensuring that they make the academic and social progress that they should.

The problem statement has informed the following questions for this research:

- How can interactive digital storytelling be used to support primary and secondary public educators in recognising, understanding, and responding to sensory overload in learners with ASD?

- Can Dunn's Sensory Processing Framework inform the design of empathic educational tools for educators of learners with ASD within public secondary and tertiary classrooms?
- Can interactive designs communicate and portray the diverse sensory processing differences in learners with ASD?

1.3 Aims and Objectives

The aim of this research paper is to explore how interactive digital storytelling can be used to support public primary and secondary level educators in understanding and responding when learners with ASD experience sensory overload. Through the visual analysis of *Life (Re)Sounding* (2024) and *(UN)TRAFFICKED* (2018), this study will examine how interactive digital experiences can create awareness and understanding of the lived experiences of ASD learners within public funded schools. This study will be informed by key concepts such as sensory overload and its connection to neurodivergent experiences, the Social Model of Disability, and Dunn's Model of Sensory Processing. Furthermore, this study explores systems thinking and how it relates to inclusive design as well as empathy as a design tool. Finally, this study assesses the role of narrative, immersion, and storytelling in digital spaces. Interactive digital storytelling is proposed as an effective method to turn these insights into a meaningful, immersive tools that provide educators with a space to better understand, empathise with, and respond to the diverse sensory needs of learners with ASD in real-world classroom experiences.

The objective is to implement the research findings to inform the development of the interactive digital experience. The aim of this experience is to expose educators to the diversity of ASD by using Dunn's Sensory Processing Framework¹ to illustrate how sensory differences manifest in everyday classroom situations. Through a series of interactive scenarios featuring different ASD characters, educators will be required to adapt their responses

¹ Dunn's Sensory Processing Framework simplifies the complex ways in which individuals process sensory information into four, understandable, patterns of sensory processing (Dunn, 2007).

based on each character's unique sensory profile and the specific context, highlighting that effective support must be individualised rather than one-size-fits-all. Understanding the various experiences of sensory overload can help educators identify triggers, emotional responses, and behavioural reactions, allowing them to implement strategies that can support each of their learners' specific needs. This will allow learners with ASD to navigate the sensory and emotional challenges they face and engage more comfortably in their daily lives and the classroom.

1.4 Research Methodologies

The research methodology for this project will consist of both theoretical and practical research. The theoretical research will inform the academic foundation for this paper, while the practical research will provide contextual insights into the classroom experiences of learners with ASD. Additionally, the practical component offers valuable user feedback on the interactive experience developed as part of this project. These research methods will consist of a combination of both qualitative and quantitative research methods, with an emphasis on exploratory research to accommodate the evolving and complex nature of the topic.

Exploratory research is an approach used in examining problems that are not clearly defined. It aims to gain insights into these problems that can form the foundation for future, more in-depth research. Robert A. Stebbins, in *Exploratory Research in the Social Sciences* (2001), describes exploratory research as “broad-ranging, purposive, systematic, prearranged undertaking designed to maximize the discovery of generalisations leading to description and understanding of an area of social or psychological life” (2001:3).

The theoretical research will be conducted through qualitative methods, specifically through a literature review and a visual analysis. A literature review is the process of engaging with and synthesizing existing academic work by scholars, which helps researchers refine, define, and express their own academic perspective (Harris, 2020:20). Dave Harries, in *Literature Review and*

Research Design: A guide to Effective Research Practice, explains that this is an example of an exploratory practice as it allows the researcher to deal with the uncertainties and changes that come with learning new ideas and new perspectives (2020:20). This literature review will explore and synthesizes existing peer-reviewed and online academic sources relating to sensory overload, neurodiversity, the Social Model of Disability, systems thinking, inclusive design, empathic design, narrative, immersion, and interactive digital storytelling. These sources were gathered from the Stellenbosch University Library and from online libraries such as JSTOR and Taylor and Francois. Sources were also gathered through desktop research, including Google Scholar, journal articles, websites, and other online resources which allowed for a more comprehensive understanding of the research topic. This theory will be expanded on further through the visual analysis, which examines how semiotic materials are used to communicate meaning (Candy, 2018:84). In this study, the visual analysis will examine two case studies and explore how interactive digital experiences can be used to create awareness and understanding of the lived experiences of neurodivergent students within mainstream schools.

The practical research for this project made use of an empathic design approach. This approach encourages designers to engage closely with real users, making it easier to recognise and transform their user's motivations, barriers, and needs into functional and appealing design solutions (Mattelmäki *et al.*, 2014). This approach combines both qualitative and quantitative research methods. Qualitative data was gathered through exploratory and practice-based research, as well as from a consult with a specialist in neurodivergent education. Practice-based research, according to Lindy Candy and Ernest Edmonds in *Practice-Based Research in the Creative Arts*, is a research method where new knowledge is gained through practice and the outcomes of that practice (2006:63). Quantitative data was gathered through online questionnaires distributed to primary and secondary school educators in Cape Town and Johannesburg using Google Forms (Addendum A). These research methods ensure that design decisions are grounded in the perspective and experience of the user.

1.5 Scope of Project (and Limitations)

This research project forms part of a year-long Visual Communications Honours degree that explores how interactive digital storytelling can be used to support educators in recognising, understanding, and responding to sensory overload in learners with ASD. This study will only focus on primary and secondary level educators, at public institutions. However, this does not exclude educators at private or homeschool scenarios as the insights and tools developed through this research may be applicable across a variety of educational environments.

As there are diverse ways that learners with ASD can process sensory information, this project will make use of Dunn's Sensory Processing Model to inform the development of its representation of how sensory overload presents itself within a classroom environment. However, there are limitations to consider. Given the project's one-year timeline, the study cannot portray every representation of sensory overload or reflect the full spectrum of neurodivergent experiences. This paper will only represent the four extreme sensory patterns outlined in Dunn's framework (sensation avoiding, low-registration, sensation seeking and sensory sensitivity) to provide educators with a foundational understanding of sensory processing with a specific focus on the experience of learners with ASD (Dunn, 2007).

It is also important to acknowledge the limitations of the researcher. While this project was guided by the researcher's interest in neurodiversity, the educational system and game development, this study falls within the realm of visual communication. However, there is potential for further development with more skills in game development, alongside more in-depth research, and collaboration with professionals, to create a more informed and meaningful interactive experience in the future.

1.6 Outline of Chapters

To clearly structure the progression of this research topic, the thesis is divided into three chapters: a literature review, a visual analysis, and a chapter that links the theory to the practical component of this research project.

Chapter Two provides a literature review that explores and defines key concepts related to sensory overload and its connection to neurodivergent experiences, the Social Model of Disability, systems thinking and how it relates to inclusive design, empathy as a design tool and narrative, immersion and storytelling in digital spaces. Scholars such as Judy Singer, Steve Silberman, Winnie Dunn, and Mike Oliver provide a comprehensive background to sensory processing models, understanding sensory overload in relation to neurodivergent lived experiences and the complexity of ASD from the perspective of affected individuals. Empathy-driven and interactive digital storytelling, discussed by Kate T. Anderson and Puay Hoe Chua, provides ways to creating supportive tools that enhance educator engagement with ASD learners, while interaction and design principles from Don Norman, Adream Blair-Early and Mike Zender provide further guidance for developing effective, user-centred interactive experiences.

Chapter Three presents a visual analysis of two interactive, digital experiences, *Life (Re)Sounding* (2024) and *(UN)TRAFFICKED* (2018), that align with the theory discussed in the literature review. The purpose of this chapter is to examine how interactive digital experiences can create awareness and understanding of the lived experiences of neurodivergent students in public schools, with a specific focus on the role of empathic design. Through the visual analysis of these case studies, a deeper understanding will be gained into how interactive, digital experiences can be designed to represent complex social systems and evoke empathy in players. The conclusions drawn from this chapter will inform the development of the practical component of this research project.

Chapter Four links the theory and insights discussed in both the literature review and visual analysis to the practical component of this research project, the development of an interactive digital experience designed to support public

primary and secondary level school educators in recognising, understanding, and responding to sensory overload in learners with ASD. This chapter will outline the key design, interaction and narrative decisions made throughout the development process, explaining how each was informed by the theoretical framework and research findings.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

To establish and design an interactive experience that helps educators to better understand sensory overload in learners with ASD, this study will explore and define certain concepts. These include sensory overload and its connection to neurodivergent experiences, the Social Model of Disability, systems thinking and how it relates to inclusive design, empathy as a design tool, as well as narrative, immersion, and storytelling in digital spaces. Judy Singer (2017), Steve Silberman (2015), and Winnie Dunn (2007) provide a comprehensive background to sensory processing models, understanding sensory overload in relation to neurodivergent lived experiences and the complexity of ASD from the perspective of affected individuals. The effects of environmental triggers on neurodivergent individuals will be further explored to inform the designing of an interactive experience. Mike Oliver's Social Model of Disability, systems thinking, and inclusive design further contextualises the position of neurodivergent individuals in social environments. Empathy-driven design and interactive digital storytelling provide immersive tools, as explored in the work of Kate T. Anderson and Puay Hoe Chua, which can be used to establish supportive tools to improve educator engagement with neurodivergent learners. Additionally, the fundamentals of psychological principles of interaction from Don Norman and practical design principles from Adream Blair-Early and Mike Zender provide guidance for creating effective, user-centred interactive experiences.

2.2 Background and Context

Autism Spectrum Disorder (ASD) impacts 1 in every 100 children worldwide (WHO, 2023). In South Africa, 0.08% of school students are affected by ASD (De Goede, 2022). Many South African students with ASD attend schools which can support the needs of neurodivergent students (De Goede, 2022). However, 10% of learners with ASD attend public funded schools (Dreyer & Pienaar,

2024). This percentage of learners increased by 76% between 2012 and 2016, a yearly average increase of 15.18% (De Goede, 2022). Educators at publicly funded schools face various of challenges when working with learners with ASD, as there is insufficient training on how to support their needs (Dreyer & Pienaar, 2024).

Learners with ASD experience sensory overload when they receive more information from sensory input than their brains can effectively process (Noel, 2024). This often leads to them feeling irritable, anxious, and experiencing emotional distress. This results in learners with ASD struggling in class as they are unable to focus, regulate their emotions and engage with learning tasks (Noel, 2024). It can result from students exposed to bright lights, loud noises, and strong smells that can easily overwhelm them. As ASD exists on a spectrum, there are diverse experiences and ways that learners with ASD can process sensory information (Dunn, 2007). For educators to effectively support the diverse sensory needs of each of their students, they require an understanding of sensory processing. This knowledge will help educators in recognising their learners' behaviours, allowing them to develop innovative ways of providing them individualised support. Without this support, learners with ASD may face challenges in making academic and social progress throughout their educational career (Aspris, 2025).

2.3 Sensory Overload and Its Connection to Neurodivergent Experience

Sensory processing occurs within everyday life. Neurological thresholds are a key concept in understanding how the nervous system processes sensory information. A threshold refers to the point at which sensory input is sufficient to activate a nerve cell or neural system. When a stimulus reaches this point of intensity, it triggers a response within the nervous system (Dunn, 2007:85). Sensory overload occurs when the intensity or volume of sensory input exceeds an individual's neurological threshold, making it difficult or impossible to process the information effectively. It is based on the idea that humans are

“open systems” that must constantly adapt to their surroundings (Scheydt *et al.*, 2017:113). The term “overload” refers to the failure of an individual’s coping mechanisms in response to stimuli and is not determined by the number of incoming stimuli (Scheydt *et al.*, 2017:114).

Stimuli input that may be manageable for one person may be experienced as overload by another. The factors which result in sensory overload are often described as excessive, overwhelming, or unusually stimulating input (Scheydt *et al.*, 2017). These factors become problematic when a person can no longer process the information. As sensory overload is linked to impaired cognitive capacity to process information, it often affects people with neurodivergent conditions (Dunn, 2007). Dunn's Model of Sensory Processing (Figure 1) provides a way of understanding how everyone has individual patterns of processing sensory information. According to Winnie Dunn (2007), individuals can be classified into distinct categories based on their responses to sensory input, ranging from those who are extremely sensitive (sensory avoidant) to those who actively seek sensory input (sensory seeking) (Dunn, 2007: 85). This will specifically inform the practical component of this research, as the different sensory processing patterns described by Dunn can be translated into characters and narrative scenarios within an interactive experience, ensuring an accurate representation of the different sensory processing experiences.

Judy Singer has been accredited with the origin of the word “neurodiversity” by Steve Silberman in his book, *NeuroTribes: The Legacy of Autism and the Future of Neurodiversity* (2015). Neurodiversity is the idea that conditions like ASD, dyslexia and Attention Deficit Hyper Disorder (ADHD) should be seen as natural differences in cognitive behaviour, with unique strengths rather than being seen for their limitations (Silberman, 2015). Within this movement, ASD is understood using the social model of disability (den Houting, 2019:271). Using this model, disability results when a person's physical, cognitive, or emotional characteristics do not fit within the characteristics of their social context. Meaning, a person is not disabled due to their impairment, but rather by the failure of their environment to meet their needs (den Houting, 2019:271).

Therefore, disability results not from those who are neurodivergent but instead from a world that has been designed for neurotypical people. Disability can often be reduced or prevented by changing physical and social environments as well as providing appropriate assistive tools. Medical interventions focus on reducing or eliminating autistic traits as a key priority (Singer, 2017:36), however, the autistic community advocates for solutions that aim to improve quality of life and well-being, while respecting and preserving autistic ways of being, but only at the request and with the consent of the autistic individual (den Houting, 2019:272).

ASD presents itself differently in each person, with most people having their own genetically unique factors that affect their processing of sensory input (Silberman, 2015). Identifying and addressing sensory overload requires professionals to work closely with each patient's unique experiences. It is important to identify and address a patient's triggers early to prevent possible "psychedelic" or "psychic" episodes. Both patients and professionals need to identify and address sensory overload at early stages, as if it continues, existing symptoms may worsen, leading to "psychedelic" or even "psychic" states. This can reduce a person's ability to make decisions or seek help, highlighting the importance of recognising and managing sensory overload early on (Scheydt *et al.*, 2017:117). The idea that there is a "cure" for neurodivergent conditions will not be found through medication, but through supportive and understanding communities (Silberman, 2015).

2.4 The Social Model of Disability

Microsoft's *Inclusive Design Toolkit* (2016) explains how the definition of disability has changed since the World Health Organisation's (WHO) original 1980 definition. In 1980 the WHO first defined disability as a personal attribute; an individual's restricted ability to perform an activity in a manner which is considered 'normal' (Shum *et al.*, 2016:18). In 2016 the WHO redefined disability as a complex phenomenon which reflects the interaction between an individual's body features and the features of their social environment (WHO in Shum *et al.*, 2016:18).

A similar definition of disability has been used in both *Neurodiversity: The Birth of an Idea* (Singer, 2017) by Judy Singer and *Neurodiversity: An Insider's Perspective* (den Houting, 2019) by Jacqueline den Houting. However, both sources refer to the definition by leading disability scholar, Mike Oliver. Oliver (1990:11), despite the WHO's published definition, defined disability as the exclusion of people with impairments from society due to social restrictions that overlook their needs.

A model is a method by which an idea can be transformed into practice (Oliver, 2004:20). Mike Oliver, leading Social Model of Disability theorist has further expanded on the Social Model of Disability shifting focus to society, rather than individuals with disabilities, for professional intervention and practice. The Social Model of Disability was first introduced in *The Fundamental Principles of Disability* (1976) by the Union of the Physically Impaired Against Segregation (UPIAS). The goal of the union was to shift conventional definitions of disability to drive awareness that those who are impaired were only 'disabled' by society-imposed norms that excluded them from participating in regular social practices (Oliver, 2004:19). The Social Model opposed the original ideas of the Medical Model of 1980 which promoted the 'curing' of impaired individuals (Singer, 2017) rather than encouraging further exploration into identifying societal problems that created, disabling environments, barriers, and cultures. To acknowledge the Social Model does not mean that one disregards the benefits of medical intervention for impaired individuals. It acknowledges that the act of isolating or othering impaired individuals creates disabled lifestyles (Oliver, 2004).

2.5 Systems Thinking and How it Relates to Inclusive Design

A system is made of interconnected parts that are structured to work together to create patterns of behaviour. These parts are called elements; they are connected in a specific way to serve a purpose. A system cannot exist without elements, interconnections and a function or purpose (Meadows, 2008). Systems can be nested within one another, meaning that they can have

purposes within purposes. A system is more than the sum of its elements. The behaviour of a system is defined by how its elements function as a whole (Meadows, 2008:15). The flow of information determines how systems function and holds them together. While outside forces can affect a system, the way its response to those forces is unique to that system and can be complex (Meadows, 2008).

Systems thinking can help in understanding how systems work, why certain systems produce poor results and how to improve them. Systems thinking focuses on understanding the interconnections and underlying causes within a system, and how the various parts impact each other, rather than focusing on isolated elements. In today's interconnected world, systems thinking is a valuable tool in addressing global environmental, political, social, and economic challenges (Meadows, 2008). This approach is important when addressing the challenges faced by neurodivergent individuals, as they are not disabled due to their impairment, but rather by the failure of their environment to meet their needs (den Houting, 2019).

Inclusivity begins with a change of perception. By understanding why and how people are excluded from their environment, actional steps towards inclusive design can be identified (Shum *et al.*, 2016). Inclusive design, like systems thinking, addresses exclusion as a problem within the system, not with the individual. Inclusive design is a methodology that acknowledges and addresses the full range of human diversity, drawing on insights from people with different perspectives. It does not involve creating a single solution for all individuals but rather designing in a diverse way that allows everyone to participate and feel a sense of belonging in their environment (Shum *et al.*, 2016).

2.6 Empathy as a Design Tool

Empathy is the ability to stand from another person's point of view, gain understanding of how they feel and their situation and share their emotion (Guo, 2022). This is an important ability for designers to have today as it encourages human-centred innovation when dealing with complex sociotechnical issues

that humanity faces (Tellez & Gonzalez-Tobon, 2019). An in-depth understanding and insight into human experiences ensures that designers have the knowledge to create products, environments, experiences, and systems that meet the needs, expectations, and aspirations of their end-user. This ability helps designers to move beyond seeing the world from only their perspective and designing based on their own needs, experiences, desires, and preferences (Tellez & Gonzalez-Tobon, 2019).

Empathic design is a branch of human-centred design². At the heart of this design process is role immersion (Mattelmäki *et al.*, 2014). It involves design practices that encourage designers to become closer with the real user. The easier it becomes for the designer to step into their user's world, the more they can live and experience their user's social environments, emotions, behaviours, and desires. This makes it easier for designers to recognize and transform their user's motivations, barriers, needs, and requirements into appealing and pleasing design solutions that are functional and understandable (Mattelmäki *et al.*, 2014). Empathic design first focused on informing and inspiring the design process by understanding human experience. It later began to actively involve users in the design process through co-design and participatory design methods. More recently, empathic design has been used to foster imagination and explore new possibilities for the futures (Gonzalez-Tobon, 2019).

2.7 Narrative, Immersion and Storytelling in Digital Space

Narratology is the study of how narrative creates meaning and the methods and structures that are common to all forms of storytelling (Barry, 1995:214). Narratology is a branch of structuralism which believes that things cannot be understood independently, only within the context of the broader structures that they are a part of (Barry, 1995:38). Narratology's attempt to understand the nature of storytelling, as a concept and cultural practice, by not focusing on the reading and interpretation of a single story, but rather how it is told.

² Human-centred design: a design process that places people's needs, capabilities and behaviours first, by designing solutions that are understandable, usable and can accomplish desired tasks, ensuring that the experience is positive and enjoyable (Norman, 2002).

Digital stories are immersive, participatory experiences that use narrative structure to support thinking, memory, and empathy through interactive features (Andersen & Chua, 2010). Digital storytelling combines images, sounds and text on a multimedia computer-based platform to create short, personal narratives. The use of digital storytelling is to navigate information and find meaning. A key characteristic of digital storytelling is how these stories can be shared and published on the Internet (Andersen & Chua, 2010). This allows these stories to be shared from anywhere to audiences everywhere. This expansion of audience changes accountability, motivation, and the types of meanings that can be found from digital stories.

Interactive digital storytelling has become a popular choice for presenting information in various fields, including the media industry, education, games, visual arts, and business visualisation. In *User Interface Design Principles for Interaction Design* (2008), Adream Blair-Early and Mike Zender define a user interface as “how users interact with content for a purpose” (2008:104). Interactive digital storytelling enables users to influence the events of the story (Rizvic *et al.*, 2018). In *The Design of Everyday Things* (2002), Don Norman, often referred to as the father of user experience (UX) design, emphasises the importance of the experience of a design as it determines how fondly someone remembers and emotionally responds to their interaction with it. He explains that when a user understands an experience, they may feel a sense of control and satisfaction. However, if an experience confuses the user, this may lead to them feeling frustrated. This illustrates how cognitive and emotional aspects are closely intertwined, and that designers should always consider both when creating meaningful and effective user experiences.

Both *The Design of Everyday Things* (2002) and *User Interface Design Principles for Interaction Design* (2008) provide fundamental principles for effective interaction design. Norman focuses on the fundamental psychological principles of interaction: affordance, signifiers, constraints, mappings,

feedback, and most importantly, the conceptual model³ of the system, providing a true understanding of how the system works. Meanwhile, Blair-Early and Zender focus on practical design principles such as an obvious start, clear reverse, consistent logic, observing conventions, feedback, landmarks, proximity, adaptation, interface as content, and help to achieve an effective interface.

The narrative of experiences provides users with the context that they need to understand their role within the story and to identify with its characters (Guo, 2022). This increases the users' immersion and identification with that story. This shows how narrative is a persuasive technique that evokes empathy in users. There is a tight relationship between narrative and empathy because of transportation. Transportation is when a user has become so immersed within the experience, they have been transported into a narrative world and have left reality behind. Only within this narrative can users understand how the characters are feeling (Guo, 2022). This highlights the emotional and cognitive effect that interactive digital storytelling has on users, making it an effective tool for understanding diverse human experiences.

2.8 Conclusion

To understand the sensory challenges that learners with ASD face in primary and secondary level public schools, educators need to have knowledge on sensory processing. Educational systems should acknowledge that the challenges which learners with ASD face is not because of their neurodivergent condition, but because of the lack of training and understanding which educators have on sensory processing and how to respond to sensory overload. This prevents them from being able to support their students diverse, sensory needs.

³ A conceptual model: an explanation, usually highly simplified, of how something works (Norman, 2002:42).

Frameworks like Dunn's Model of Sensory Processing, the social model of disability, systems thinking, and empathic design provide a deeper understanding of these challenges, why they occur and the need to redesign environments to become more inclusive, directing informing the design and development of the practical component of this research. Interactive digital storytelling provides an effective method to turn these insights into a meaningful, immersive tool that provide educators with a space to better understand, empathise with, and respond to the diverse sensory needs of learners with ASD in real-world classroom experiences.

CHAPTER 3: VISUAL ANALYSIS

3.1 Introduction

This chapter presents a visual analysis of two interactive, digital experiences that align with the theory discussed in the literature review. The purpose of this chapter is to examine how interactive digital experiences can create awareness and understanding of the lived experiences of ASD students within public primary and secondary schools, with a specific focus on the role of empathic design.

The first case study, *Life (Re)Sounding* (2024) developed by the University of South Australia (Figures 2 to 5), will be analysed to provide insights into how the game's environments, interactions, and sound design effectively communicate the challenges encountered by neurodivergent individuals in navigating daily tasks within systems designed primarily for the neurotypical. The analysis will explore how narrative and game mechanics work together to influence player responses, including the development of empathy. This case study examines theories related to neurodivergent experiences, the social model of disability, systems thinking about inclusive design and the use of empathy as a design tool.

The second case study, *(UN)TRAFFICKED* (2018), created for the Kalisha Satyarthi Children's Foundation (Figures 6 to 9), is not focused on the neurodivergent experience but provides a comparative perspective through its use of empathic design, immersive storytelling, and systems-based representation of oppression. While the character is not neurodivergent, the game's narrative highlights systemic barriers like those described by the social model of disability. This case study examines theories related to systems thinking, inclusive design, the role of narrative, immersion, and storytelling in digital spaces, as well as empathy as a design tool.

Through the visual analysis of these case studies, a deeper understanding will be gained into how interactive, digital experiences can be designed to represent complex social systems and evoke empathy in players. The conclusions drawn from this chapter will inform the development of an original, interactive digital experience designed to support educators in understanding and addressing the sensory and social needs of ASD students during sensory overload.

3.2 *Life (Re)Sounding (2024)*

Life (Re)sounding is an interactive, 3D games developed by the University of South Australia using Unreal Engine 5⁴ and the MetaMIDI Toolkit⁵. The project was led by Game Design and Digital Media lecturer, Dr. Susannah Emery, as well as with George Martin, Digital Media, and Game Design Tutor, as the project's programmer and technical artist. The game provides players with an immersive, interactive environment that simulates the experience of growing up in the mind of someone who is neurodivergent from childhood to adulthood. The player is required to complete tasks, and scenarios that are commonly encountered in daily life. Figures 2 and 3 show early childhood learning tasks at home, such as number recognition and pattern identification. In both figures, the player is in their childhood room and is asked to arrange specific objects, numbered ducks, and blocks, in order. In Figure 4, the player is tasked with finding their seat in a classroom, while in Figure 5, the character is in a workplace setting and must locate and use the elevator positioned across the room. While these tasks may appear straightforward to neurotypical people, the game is designed to 'hijack' the player's controls. The challenges in the game were designed to place the character into the mind of someone who is neurodivergent within an environment that was not designed for them, but rather for the neurotypical. This offers the player an insight into how these environments may impact the emotions and behaviours of those who are neurodivergent, forcing them to navigate challenges that may not be apparent

⁴ Unreal Engine 5 is the latest version of Unreal Engine, a game engine built by Epic Games to create immersive 3D video games and virtual experiences (Coursera, 2024).

⁵ MetaMIDI Toolkit is an open-source collection of MetaSounds Blueprints for Unreal Engine 5.4, designed for adaptive music manipulation for game designers without technical musical expertise (Whiting *et al.*:17).

to the surrounding world and the complexities that come with this. Neurodivergent conditions seen in the game include ADHD, ASD, and dyslexia.

This digital experience was designed for both neurotypical and neurodivergent players, but for different reasons. For the neurodivergent player, the game was designed to provide a relatable representation of the everyday challenges and experiences which they face, including moments of sensory overload (Emery, 2024). However, the main objective for the development of this game was targeted towards the neurotypical player. For the neurotypical player, the game was designed for them to gain a deeper understanding of the neurodivergent experience, the challenges that they face, which are often overlooked or unrecognisable to others, and what it means to grow up in spaces which are not designed for people with different ways of looking at the world (UniSA, 2024). However, like Silberman (2015), who explains that ASD presents itself differently in each person due to unique genetic factors, Emery recognises that the neurodivergent experience portrayed in this game does not represent the lived experiences of all neurodivergent individuals. This is also evident in Dunn's Model of Sensory Processing (2007), as it explains how there are a variety of patterns of processing sensory information based on how someone responds to sensory input, which is dependent on their sensory thresholds and ability to self-regulate. *Life (Re)sounding* acknowledges both Dunn and Silberman's claim that the neurodivergent experience exists along a spectrum.

The narrative and objective of the game make use of theories that have been discussed in chapter 2, specifically Neurodiversity, the Social Model of Disability and Systems Thinking. Emery's aim in developing the project was to challenge discussions about neurodiversity that often focus on medical diagnostic criteria, which she argues focus on how neurodivergent traits affect others. Singer's (2017:36) writing agrees with this statement as she argues that medical interventions often focus on reducing or eliminating neurodivergent traits as a key priority. Silberman (2015) continues this point by further explaining that a "cure" for neurodivergent conditions will not be found through medication, but through supportive and understanding communities. Similar to how Oliver (2004) shifted the focus of the Social Model of Disability to society rather than

the individuals with disabilities, *Life (Re)Sounding* demonstrates that the challenges which the character faces in the game are a result of the character's cognitive and emotional characteristics not fitting within the characteristics of their social system. Social structures, environmental factors, and societal expectations are often built on the assumption that all individuals within a system are neurotypical, which contributes to the exclusion of neurodivergent individuals. The game recognises that neurodiversity should be seen as a natural difference in cognitive behaviour rather than a limitation, and it encourages open dialogue about what it means to live within systems and environments that are not designed for neurodivergent needs, how this has affected them and what can be done to make environments more inclusive. By understanding why and how people are excluded from their environment, steps towards inclusive design can be identified (Shum *et al.*, 2016). The game becomes a tool for empathy, not just a representation.

Video games play a vital role in allowing players to embody something that is not themselves, to embody a character with different traits, or even to embody things that are not necessarily human (Martin, 2024). In *Life (Re)Sounding*, the context which explains to the player that they are seeing the world from a neurodivergent perspective is created through the perspective of the camera. As seen in Figures 3, 4 and 5, the camera is placed in such a way that the player is seeing the world from the eyes of the character. In Figure 2, the camera is positioned lower compared to Figures 4 and 5, representing that the player is experiencing the character's perspective as a child. The height of the camera's position grows higher in Figures 4 and 5 as the child grows up and enters their educational and working years. Additional context provided to the player, which gives them information on their role in the game, is the prompts seen on the top left-hand corner of Figures 2 to 5.

These prompts aim to clarify the player's objective in each challenge and guide them as they make decisions throughout each environment. *Life (Re)Sounding* acts as a tool of empathy as it provides the players with the ability to stand from another person's point of view to gain an understanding of how they feel and their situation (Guo, 2022). As the game's narrative evokes empathy, the player

has become transported into the narrative and has left reality behind, allowing them to understand how the character is feeling. This transportation highlights the emotional and cognitive impact of interactive digital storytelling, as in *Life (Re)Sounding* the player begins to think and respond as if they were the character. This shift from passive observer to active agent deepens the player's engagement in the narrative and places them responsible for their choices and outcomes. This strengthens their sense of empathy with the character's experiences and challenges.

The visual style of the game plays a crucial role in immersing the player in the experience. Unreal Engine 5 was used in developing the game's 3D, realistic visual style, allowing players to engage with the environments through elements such as light, texture and sound. This enhances the sense of immersion and transportation, simulating the feeling of physically being in those environments. This 3D visual style strengthens the player's ability to empathise with the character and not only observe how the character is feeling but also share in the discomfort and confusion of each scenario with them. However, the realism of this style can become visually overwhelming and distracting when trying to identify triggers and signs that are resulting in the character experiencing sensory overload. For the practical component of this project, a more simplified and stylised visual approach will be used to emphasise to educators the different triggers, signs and behaviours seen in students during sensory overload.

The design and layout of the game's environments play a crucial role in communicating to the player how spaces are designed purely for the neurotypical individual. This is evident when looking at what is in those spaces, what the character is drawn to and what they do or do not want to interact with in those spaces. Figure 2 shows the character's childhood bedroom, which is warmly lit. This environmental challenge is to arrange the ducks placed on the table in the centre of the room in order, depending on the number displayed on each duck. In Figure 3, the character is in the same room as the one tasked with completing the same challenge; however, they are tasked to order blocks instead of ducks. It is visible that the character's attitude towards the room and

the challenge has changed based on the task given, as in Figure 3, the room appears greyer and colder. It is also visible that the colour of the bedroom walls has changed from yellow in Figure 2 to a light grey in Figure 3. These changes make the environment in Figure 3 appear less comfortable and inviting when compared to Figure 2. This shows how small sensory changes, which may not be visible to others, can impact how a neurodivergent individuals engage with a task, their environment and can contribute to sensory overload.

As the character grows older, the game's environments become increasingly unengaging and more serious when compared to Figure 2. In Figure 4, the player is tasked with finding their seat in a classroom; however, there are no clear visual clues which assist the player in identifying which chair belongs to them. The bright light from the left window casts strong shadows and causes intense reflections, making the environment visually overwhelming. This can confuse the character, especially as neurodivergent individuals are more sensitive to sensory inputs like bright lights. In Figure 5, the player is tasked with finding and using an elevator in a workplace. This environment makes use of colours, such as the grey walls with black furniture, and cold lighting, which reflects the serious and professional tone of the environment. Similar to Figure 3, the enhanced lighting and reflections draw attention to the brightly lit glass-walled office near the elevator, which can distract from completing this task, especially if additional characters are visible inside the room, as the character would be more engaged and stimulated by the interactions between those characters than with their surrounding environment. This level reflects the difficulties neurodivergent individuals may face when navigating unfamiliar environments independently. The countdown timer placed in the top right corner of Figures 2 – 5 may also suggest the social expectations and pressure experienced by neurodivergent individuals to complete tasks and navigate their environments at the same pace as their neurotypical counterparts.

The second crucial component to creating empathy in the game is the interactions between the player, the character, and their environments. What the player can and cannot do, and the emotional experience the player has when interacting with the environment in the game. Certain principles of design

and interaction, as outlined by Norman (2013) and Blair-Early and Zender (2008) in the literature review, can be found throughout *Life (Re)Sounding*. The prominent principles shown are affordance, signifiers, feedback, constraints, and the concept model. The prompts for each task, displayed in the top left-hand corner of Figures 2 to 5, are examples of the affordances and signifiers within the game which guide the player and help them understand what to do.

Feedback is given when the user interacts within each environment. An example of the feedback given is when the game 'hijacks' the game, indicating to the user what the player can and cannot do, as well as their experience within that environment. One of the ways the game 'hijacks' the player's controls is by taking over the game's camera, making it difficult to complete tasks as the characters' focus would constantly change depending on what they are drawn to in each environment and what they want to avoid. For example, in one scenario, the character is tasked with completing a written task, writing the same sentence multiple times, as a punishment for not concentrating in class. However, the character's desk is placed right next to the classroom window. The game 'hijacks' the character's point of view, the camera, and forces the character to look out of the window instead of completing the task in front of them. However, while 'hijacking' the player's controls does align with the design and interaction principle of feedback, it intentionally goes against the principles of affordance and conceptual models as it was designed to confuse and frustrate the user. This interaction simulates the feeling of sensory overload and the internal conflict and attentional divergence often experienced by neurodivergent individuals. This allows the player to experience the frustration and helplessness of what it feels like to involuntarily lose control over their focus and be unable to meet expected behavioural norms.

In addition to visual cues, sound offers another form of feedback by portraying and amplifying the character's emotional reactions based on their interactions and surroundings. The MediMINI Toolkit allowed the developers to incorporate in-game events such as going near or touching objects and how the character is feeling as they progress through challenges (Emery, 2024). This created a more immersive experience for the player and gave a deeper understanding of

the emotions that the character feels throughout the game, as the audio would adapt and change in response to how the character was feeling. For example, a growing sense of frustration with an activity would be evident to the player as there would be a gradual increase in the sound's tempo or stability as the player struggles with a task (UniSA, 2024). These changes in the game's audio not only reflect the character's emotions but also guide the player's emotional response, helping them empathise with the character's struggles and recognise how sensory or emotional stress builds over time.

While *Life (Re)Sounding* immerses users in a first-person simulation of the neurodivergent experience, the practical component of this research positions the user as an educator assisting a student in self-regulation during sensory overload. This perspective is better suited for the project's objectives as it shifts the focus from feeling what the student feels to recognising triggers, signs, and behaviours of sensory overload. This perspective equips users with strategies that they can apply in real classrooms.

However, this case study still will influence the practical project as it highlights how narrative immersion, aesthetic treatment, interaction design, and emotional pacing can be used to evoke player empathy. It has informed how environmental, visual, and sound cues (such as colour, lighting, and ambient noise) can reflect a character's emotional state, which can assist educators in identifying potential triggers and behavioural patterns that may lead to sensory overload.

3.3 (UN)TRAFFICKED (2018)

(UN)TRAFFICKED (2018) is a browser-based, choose-your-own adventure game which was developed for the Kalisha Satyarthi Children's Foundation as part of a larger campaign to raise awareness of child exploitation in India (O'Brien & Berents, 2018). The game's narrative follows a 13-year-old Indian girl, Alisha, throughout one week. During this week, her life changes immensely as she is taken away from her family and is trafficked. As the player continues

through the narrative, they take on the role of the decision-maker for the influential figures in Alisha's life, including her parents, peers, and the police. The game is available on desktop and mobile in both English and Hindi to make it more accessible to Indians. Aditi Mukherji, a spokesperson for the foundation, has said that the main reason that children get trafficked is because so many individuals are either willing to look the other way or are ignorant of the problem (Quartz, 2015). This campaign aims to target a diverse range of people from across India, from parents, the youth and law enforcement, to encourage them to become more engaged citizens and to work together to understand that every action counts towards saving a child from being trafficked.

Trafficking affects thousands of children in India. Using *(UN)TRAFFICKED*, Kalisha Satyarthi Children's Foundation aims at evoking empathy within players for those at risk of being trafficked as they experience one example of how children are exploited through Alisha's story (Putrevu, 2017). Like *Life (Re)Sounding*, *(UN)TRAFFICKED* makes use of a digital story which incorporates immersive, participatory experiences, narrative structure, and interactive features to evoke player empathy through transportation, as mentioned in the previous case study. This allows the player to become so immersed within the experience that they can stand from another person's point of view and gain an understanding of how they feel, their situation and emotion.

The visual storytelling in this experience is a strongly illustrative 2D style that allows for exaggerated emotional expressions and emphasise on important environmental elements. These exaggerated features assist players in focusing on what is happening in each scene and which character are involved. This style aligns with the practical component's objective of helping educators recognise signs and triggers of sensory overload without overwhelming educators with visual information. By prioritising emotion and storytelling over visual realism, an illustrative visual style for the project will ensure that educators can easily identify students' reactions, emotions and environmental triggers that go unnoticed in real life.

Throughout the game, *(UN)TRAFFICKED* provides context that helps the player understand their role within the story, helping them to identify with its characters, increasing the player's immersion and identification within the story (Guo, 2022). Figure 6 shows the start of the game, where the player introduced to Alisha. The player has the option to choose a name for her and to decide the region of India she is from. If the player declines the choice, the character name becomes "Alisha," who lives in "rural Bihar with her family." This is an example of how *(UN)TRAFFICKED* has implemented certain principles of design and interaction, as outlined by Norman (2013) and Blair-Early and Zender (2008) in the literature review. The principles displayed here are Norman's concept of affordance, as the user has a clear instruction of what to do, and Blair-Early and Zender's principle of providing users with an obvious start. Although this choice does not impact the outcome of the game, it places Alisha's responsibility on the player.

In Figure 7, the player is prompt to imagine that they are Alisha's father. As the game shifts perspectives, the player is prompt before each decision to put themselves in the shoes of a key figure in Alisha's life, someone responsible for her well-being. This figure is an example of Norman's principal's affordance, signifiers, mapping, and conceptual model as well as Blair-Early and Zender's principle of clear logic seen through the game. The game ensures that the player understands how to progress by providing them with visual representations, an illustration of the role they are playing, such as becoming Alisha's parents, along with clear prompts and clickable actions. This interface design guides them through the user journey and clearly shows their responsibilities within the game.

This reoccurring interface design shown when the player's role shifts and when they must make a choice, is also an example of Blair-Early and Zender's principle of landmarks. By placing the player in these roles, those who enable the trafficking of a child, the game forces them out of the role of an observer to being an active participant, emotionally engaging with Alisha's situation. This deepens the players' sense of empathy as they begin to feel responsible for their decision and the impact they have on Alisha's life. The game holds the

player accountable by showing the consequences of each decision they make, as seen in Figure 9, revealing how Alisha is feeling emotionally. The 'hearts bar' positioned at the top right of the screen, as seen in Figure 9, is also an indicator to Alisha's emotional state. In a traditional game, the health bar represents the number of lives the player has left. However, in *(UN)TRAFFICKED*, the heart bar represents Alisha's emotions as she is powerless over her situation. When the choice made leads Alisha closer to becoming trafficked, she loses two hearts. These decisions include when a police officer refuses to help or when a bystander chooses to forget what they have seen and remain silent. When Alisha loses two hearts, an animation plays showing the hearts breaking and falling away while the sounds of Alisha crying play. This is the only voice which Alisha has throughout the game. This is an example of both Norman's and Blair-Early and Zender's principle of feedback. This immediate emotional feedback reinforces the impact of the player's actions, reminding them of the consequences of their actions and how they directly influence Alisha.

While child slavery and the Social Model of Disability address different forms of oppression, they connect through systems thinking, which highlights how systemic barriers marginalise groups. Within the narrative of *(UN)TRAFFICKED*, Alisha has no choices or control over what happens to her. The only characters who do have the power to decide what happens to her are the members of her community, the role of the player. If these characters fail to act and make the wrong decisions, their story results in Alisha becoming trafficked. *(UN)TRAFFICKED* uses systems thinking to reveal the interconnected factors and root causes behind trafficking, showing how various parts impact each other and affect an individual's circumstances and opportunities. By examining how various parts of the system (poverty, limited access to education and systemic corruption) interact, the game helps the player understand how child trafficking is not the cause of a single issue, but rather by a network of interconnected factors. By placing the player in the shoes of those who enable child trafficking, the games effectively demonstrate how everyday decisions can impact the lives of others, often in ways that go unnoticed.

The narratives in *(UN)TRAFFICKED* and *Life (Re)Sounding* share a similarity by both serving as a single perspective of diverse, complex experiences. Although Alisha's narrative in *(UN)TRAFFICKED* is based on real, lived experiences of Indian children who have been trafficked, it is not the only narrative. A limitation of the experience in *(UN)TRAFFICKED*, that results from this singular perspective, is the game's reliance on the binary options offered to the player when selecting the decisions and actions of Alisha's community. This use of binary options suggests that every decision only has a purely right or purely wrong answer. For example, in Figure 8, the character takes on the role of Alisha's father, whose only options are either to send her to the city with the strange man or to keep her at home. If the player selects the 'right' choice by of keeping her at home, the game has been 'won' and text that reads, "Well done, Alisha's safe," displays. However, the game proceeds to play out the 'wrong' choice of sending her away as a didactic⁶ exercise, showing the consequences of that decision, as shown in Figure 9. Having the player choose between a "right" or "wrong" decision, makes them responsible for what happens to the character from a learning standpoint. This presents the game's limitations as it oversimplifies the difficult realities faced by those involved within the narrative, reducing complex social decisions to a morality test. This possibility that the game may be perceived as a morality test can reduce the emotional impact of the player's decision-making. The player's decisions may be influenced by a desire to achieve a better outcome or be seen as 'good,' rather than by recognising or understanding the moral complexities and interconnected factors (poverty, limited access to education, gender inequality, and systemic corruption) that influence real-world decisions.

This case study has highlighted both the strengths and limitations of interactive, empathy-driven storytelling. The game demonstrates how a sense of responsibility is assigned to the player by clearly assigning them a defined role and making their influence over other characters known from the start of the game, creating an emotional connection between the player and the characters

⁶ Didactic: designed or intended to teach (Merriam-Webster Dictionary, 2025).

they influence. This is also achieved through feedback, as well as narrative, visual, and audio cues that inform players how their decisions have affected other characters. The limitations which the game draws attention to are the risk of binary choices within a choose-your-own-adventure game. Binary choices can oversimplify the complexity of the neurodivergent experience. This influences the practical project to avoid framing an educator's response to scenes of sensory overload as purely right or wrong and presents educators with a spectrum of choices of helpful actions, which are influenced by the individual needs of students. However, unlike *(UN)TRAFFICKED*'s use of multiple perspectives, this project will focus solely on the perspective of the educator. By doing so, the experience will highlight the influence that educators have on a student's wellbeing and the consequences of their actions.

3.4 Conclusion

This visual analysis of *Life (Re)Sounding* and *(UN)TRAFFICKED* has clearly shown the effectiveness of interactive digital storytelling in evoking player empathy and providing an understanding of complex social systems. Both case studies have demonstrated how assigning the player a defined role through visual cues like camera perspectives or prompts at early stages not only clearly explains the player's objectives but also places responsibilities on them for the characters which they influence, creating an emotional connection between the player and those characters. This connection is deepened through feedback, which is given through the game's narrative or visual and audio cues. This feedback notifies the player of the consequences that their interactions and decisions have on the characters. *Life (Re)Sounding* has specifically informed how environmental, visual, and sound cues (such as colour, lighting, and ambient noise) can reflect a character's emotional state, which can assist educators in identifying potential triggers and behavioural patterns that may lead to sensory overload. *(UN)TRAFFICKED* has informed how a 2D, illustrative style can simplify complex scenarios and use exaggeration to clearly communicate a character's emotional states and the environmental triggers that contribute to sensory overload, without visually overwhelming the user.

A limitation of *(UN)TRAFFICKED* is its reliance on binary choices, which oversimplifies the complexity of real-world decisions. This concern is especially relevant when considering neurodivergent experiences. *Life (Re)Sounding* notably avoids the use of binary choices. Instead, the player's choices are influenced by the character's environment, interactions and audio feedback, demonstrating the complexity of neurodivergent experiences and will directly inform the design of the practical component of this research, presenting educators with a spectrum of choices of more or less helpful actions, which are influenced by the individual needs of students.

CHAPTER 4: LINKING THEORY TO PRACTICE

4.1 Introduction

This chapter critically reflects on the relationship between theory and practice in this research project, examining how the interactive storytelling experience *Teddy, Penny, Chip & Bean* (2025) was influenced by the theoretical frameworks and research methods discussed earlier in this paper.

Teddy, Penny, Chip & Bean was designed to respond to the lack of access to specialised tools and resources in South African primary and secondary level public schools that assist educators in understanding how ASD impacts a child's learning abilities and behaviour. As a result, it can be challenging for educators to recognise and respond to sensory overload. With an increasing number of autistic children attending public schools, educators need access to tools that enable them to build empathy, awareness, and to make informed decisions that ensure that the diverse needs of every child are fully met in the classroom. *Teddy, Penny, Chip & Bean* addresses this need by placing educators in virtual classrooms. Through branching narratives, educators make decisions in response to moments of sensory overload, with each choice shaping the outcome, either supporting regulation or heightening distress. By engaging with these stories, educators gain practical insights to help create learning environments that are inclusive, responsive, and supportive.

This chapter examines how theoretical frameworks - including the Social Model of Disability, Systems Thinking, and Dunn's Model of Sensory Processing - informed the project's approach to inclusion, character development and interaction design. Methodologically, it explores how educator questionnaires and professional consultations guided by empathic design principles shaped the authenticity of each character scenario, and how technical choices in browser-based development and AI-assisted coding informed what was achievable within the scope of an honours project. Creatively, it examines how

insights from the case studies *Life (Re)Sounding* (2024) and *(UN)TRAFFICKED* (2018) influenced visual style, decision-making interactions, audio feedback, and role assignment to create empathy. It also explores how visual feedback systems like colour transitions and the regulation bar translate Dunn's framework into clear, actionable tools to communicate sensory states and educator agency. Finally, this chapter evaluates the extent to which the project achieved its aims within the scope of an honours degree, considers whether new insights emerged as the work evolved, and identifies critical reflections on both the research and making processes.

4.1 Linking Theory to Practice

4.2.1 Conceptual Refinement

This research project began with an interest in accessibility, shaped by previous projects that explored inclusive design, and a desire to identify areas of society that unintentionally exclude those who do not conform to normative standards, particularly individuals with invisible disabilities. This raised an interest in exploring how, according to Oliver (2004:19), those with impairments were only 'disabled' by society-imposed norms that excluded them from participating in everyday social practices. Oliver's Social Model of Disability directly shaped this project's objective by reframing the causes of exclusion faced by neurodivergent individuals. Rather than positioning neurodivergence itself as the problem, this perspective identified inflexible environments and social structures as the disabling factors. The resulted in broader focus on how neurodivergent individuals navigate environments designed primarily for the neurotypical, which often fail to accommodate their needs and can contribute to experiences of sensory overload. Engaging with systems thinking theory clarified how systems function, their interconnections, underlying causes and how the various parts influence one another, rather than focusing on isolated elements (Meadows, 2008). This perspective directly informed the project's intention to address the challenges faced by neurodivergent individuals, as they are not disabled due to their impairment, but rather by failures embedded within educational, social, and cultural structures to meet their needs.

This interest led to the concept of developing an interactive experience that allowed users to step into the shoes of someone who is neurodivergent and understand what sensory overload feels like from the inside. However, this concept evolved after sitting down with a professional who collaborate closely with neurodivergent individuals. These consultations made it clear that while neurodivergence encompasses a wide spectrum which includes ASD, ADHD, anxiety and other cognitive differences, ASD would provide a strong lens to explore issues of inclusion in this project. These consultations also identified that educators play a pivotal role in shaping early developmental experiences and that while there are educators do study ASD, they still struggle to respond appropriately in real time due to a lack of experience with the diversity within ASD.

The initial concept shifted from creating an interactive experience that simulated sensory overload for a neurodivergent individual to an interactive, scenario-based tool that places users in the role of an educator supporting a learner experiencing sensory overload. This shift is theoretically significant as it aligns with empathy-driven design principles such as role immersion (Mattelmäki *et al.*, 2014). Rather than asking users to passively observe someone else's experience, the inclusion of role immersion within the experience positions them as active agents, fully inhabiting the role they have been assigned as the educator with the power to intervene and support a student experiencing sensory overload. Through this perspective, educators can be equipped with a deeper understanding to identify triggers, recognize signs of distress and practical strategies to create inclusive learning environments.

These consultations emphasised that each ASD experience is unique, and no single character or scenario can represent the full spectrum of ASD. This influenced the decision to include multiple characters with differing sensory triggers and responses, allowing users to explore a range of experiences of

sensory overload. This insight led to the discovery of Dunn's Model of Sensory Processing.

4.2.2 Application of Theory

Winnie Dunn's Model of Sensory Processing (2007) provided a solid foundation for developing each character and their corresponding scenarios. The model identifies four sensory patterns (Sensory Avoiding, Low Registration, Sensory Sensitivity, and Sensory Seeking) which recognise that people process sensory information in diverse ways. These patterns depend on an individual's sensory thresholds and their capacity for self-regulation (Dunn, 2007). By having each character (Teddy, Penny, Chip, and Bean) embody one of these patterns, the project can authentically represent a spectrum of sensory experiences in ASD, avoiding stereotypical portrayals.

These insights also informed the use of a multi-branching narrative and non-binary options to challenge the misconception that a single "intervention" can "fix" sensory distress, emphasizing instead the importance of educators adopting flexible, adaptive strategies, rather than formulaic solutions. This design approach reflects systems thinking, as each decision made by the educator influences the student's ability to self-regulate, demonstrating the interconnected nature of decisions within a system (Meadows, 2008).

4.2.3 Character and Scenario Development

In developing the scenarios for each of the four students (Figure 10), an online questionnaire (Addendum A) was sent to primary and secondary level school educators in both Cape Town and Johannesburg, with 36 educators responding. The purpose of the questionnaire was to identify the most common sensory triggers observed in classrooms, signs of distress, and the challenges faced by educators when supporting ASD learners. The insights gained from these questionnaires revealed that loud noises, crowded classrooms, and changes in routine were the most frequently reported triggers, with changes in

routine being the most impactful for learners. When asked about the most difficult aspects of supporting ASD learners in their self-regulation, managing the classroom environment, and responding appropriately during distress emerged as key challenges.

These findings directly informed the design of the scenarios, ensuring that they reflect real-world classroom challenges faced by educators. The scenario for Teddy (representing Sensory Avoiding) involves a rainy day that forces students to have lunch indoors, disrupting the predictable routine Teddy relies on and creating a loud, crowded environment that feels overwhelming. The scenario for Penny (Low Registration) takes place during a collaborative science group assignment, requiring social engagement and attention to subtle experimental and social cues that Penny may miss. The scenario for Chip (Sensory Sensitive) features a surprise musical guest assembly where clapping, movement, and flickering lights combined with an unexpected schedule change contribute to Chip's discomfort. Finally, the scenario for Bean (Sensory Seeking) takes place during a matric-level trigonometry lesson where complex concepts and an in-class assignment challenge Bean's need for stimulation and movement.

By simulating these different experiences, this project aims to help educators understand that sensory overload often arises from more than just obvious disruptions; it can trigger from countless subtle elements in the environment or routines that neurotypical individuals often overlook. For ASD learners, these details can be overwhelming when combined with social and academic demands.

4.3 Execution of the Project

The visual analysis chapter of this paper contributed to understanding how other designers and organisations have applied similar theories into practice through the production of their own interactive digital storytelling experiences,

particularly in evoking player empathy and illustrating methods for portraying complex social systems digitally and through narrative. The two case studies, *(UN)TRAFFICKED* (2018) AND *Life (Re)Sounding* (2024), influenced the execution and style of *Teddy, Penny, Chip & Bean*.

4.3.1 Technical Implementation

Like *(UN)TRAFFICKED*, this experience was developed as a browser-based experience using HTML, CSS, and JavaScript, making it easily accessible to educators online without requiring additional installations. Unlike *(UN)TRAFFICKED*, which supports both desktop and mobile devices, the scenarios and animations in *Teddy, Penny, Chip & Bean* were designed specifically for standard desktop screens and have not yet been optimised for mobile due to the scope of the project as an honours submission.

To improve workflow, the GitHub Copilot Chat extension was integrated into Visual Studio Code. This reduced time spent on repetitive tasks and debugging, accelerating the integration of interactive elements, animations, and scroll triggers in the experience. This enabled stronger focus on the experience's concept, narrative design, and user experience without compromising technical quality. The incorporation of AI-assisted tools reduces technical barriers for designers lacking advanced programming expertise, thereby promoting greater inclusivity in research participation. The use of Copilot encouraged critical evaluation and adaptation of its suggestions rather than blind acceptance, as not all prompts aligned with the experience's aims or aesthetic. This highlighted the importance of oversight and critical decision-making when incorporating AI into the project. It also prompted reflection on which parts of the workflow truly benefit from automation, and which require direct, human input.

4.3.2 Visual Design Decisions

The illustrative style used in *Teddy, Penny, Chip & Bean* (Figure 10) was influenced by the visual approach seen in *(UN)TRAFFICKED* (Figure 11) as

both prioritise simplicity and clarity through stylised forms and minimal detail. This minimal detail helps prevent distraction by reducing visual noise, allowing users to focus on the narrative and decision-making rather than processing unnecessary elements. However, unlike *(UN)TRAFFICKED*'s style which makes use of a tertiary colour within its illustrations, *Teddy, Penny, Chip & Bean* makes use of a monochrome palette during regulated states.

When a character experiences sensory overload, they transition from white to a specific colour which reflects their sensory processing pattern. Teddy turns red when overwhelmed (Figure 12), Penny turns blue, Chip turns yellow, and Bean turns green. As characters become more overwhelmed, their colour intensifies and radiates off them into their surroundings. This colour coding links directly to Dunn's framework and serves as visual feedback, clearly indicating the character's sensory state to educators. This approach reflects Norman's (2002) and Blair-Early and Zender's (2008) principle of feedback, which emphasises that feedback is a core principle of effective interaction design, ensuring users understand the system's status and the impact of their actions. This visual feedback gives educators immediate cues about students' emotional and sensory states, making internal distress more visible and supporting empathy.

4.3.3 User Experience and Agency

Both case studies demonstrated that early visual cues and prompts that assign players a defined role establishes clear objectives and responsibility, creating an emotional connection with the characters. Building on these insights, *Teddy, Penny, Chip & Bean* adopts a hybrid approach: players observe the scenario from a third-person perspective, while still making decisions on behalf of the educator. This design positions users as active decision-makers whose choices directly influence the students' experiences and outcomes, embodying empathy-driven principles that connect understanding with action.

4.3.4 Designing the User Journey: Contextual Onboarding and Personalisation

(UN)TRAFFICKED had a strong influence on the user journey at the start of the experience in *Teddy, Penny, Chip & Bean*. Both experiences introduce the issue being addressed and the user's role in the narrative. In *(UN)TRAFFICKED*, this is explained through two screens that the user clicks through or can skip while *Teddy, Penny, Chip & Bean* integrates it into the experience leading up to the point where educators select a student's scenario to explore.

The design of the introduction, the rising sun representing the start of the school day (Figure 13) and the interactive school bus (Figure 14), immerses the user into the world of the students while allowing them to get to know each student. By having the user "pick up" each student and personalise the school's name (Figure 14), the experience enhances emotional engagement and empathy. This personalisation encourages users to consider the student's experiences within the context of their own professional environment, enhancing both relevance and emotional engagement and understanding.

4.3.5 Decision-Making Complexity

The limitation of the binary choices in *(UN)TRAFFICKED* (Figure 7) highlighted how restricted decision-making can oversimplified the complexity of real-world decisions. This insight informed the creation of the choices given to the users throughout each scenario in *Teddy, Penny, Chip & Bean*. Ideally, the scenarios would resemble those of *Life (Re)Sounding*, allowing educators to respond naturally rather than being restricted to predetermined choices. However, the challenge is that the animations displayed throughout each scenario in *Teddy, Penny, Chip & Bean* need to correspond with the decisions made, and this falls outside the practical scope of an honours-level project.

The final solution was to introduce a third response and implement a fuzzy logic approach, ensuring that no answer is entirely correct or entirely wrong, reflecting human decision-making as closely as possible. This decision is

directly associated with fostering empathy, as it recognises that educators operate within environments characterised by uncertainty and ambiguity. Instead of viewing scenario responses as simply right or wrong, the experience promotes reflection, requiring educators to continually evaluate and learn from outcomes.

4.3.6 Time Pressure and Feedback Systems

The use of a timer (Figure 12) in *Teddy, Penny, Chip & Bean* is another way the game mirrors real-time human decision-making. This design choice, shaped by both *(UN)TRAFFICKED* and *Life (Re)Sounding*, comes into play when educators need to decide on how to assist the student in the scenario. This UI element reinforces the sense of urgency, and the pressure educators face to think on their feet and respond quickly during moments of sensory overload. Instead of allowing unlimited time to make decisions in the experience, this design allows the same, if not more, time than would be available, making the experience feel authentic. This design decision aligns with empathy theory by replicating the time-sensitive circumstances educators face when making decisions. It assists users in recognising the stress and uncertainty experienced by educators as they quickly respond to instances of sensory overload.

The outcome of each choice either then helps the student regulate or escalates their distress, which is visually communicated through the animation and through a “Regulation Bar” displayed in the top-right corner of the screen (Figure 15). This bar displays the student’s internal state through a level indicator, accompanied by an expressive face that reflects their emotion, along with a text label above the bar describing the emotion. Together, these UI elements provide the user with immediate feedback on the impact of their decisions, reinforcing the cause-and-effect relationship between their choices and the student’s sensory regulation.

4.3.7 Audio Design

Life (Re)Sounding also informed the role that sound has in the experience, particularly in how it is used to enhance immersion and portray the emotional state of each student. To achieve this, a custom soundtrack was composed by an outside collaborator. This ensured that the audio composed accurately reflected the tone and atmosphere of each student and their scenario. A unique sound was created for each student, first introduced during the introduction of the experience, and then played again when selecting a student, triggered by user interaction such as hovering over or clicking on the student. The goal of this decision was to help users identify each student more easily and connect with them emotionally through sound.

Within each scenario, the student's unique sound acts as their regulated sound. While *Life (Re)Sounding* uses the MetaMIDI Toolkit to manipulate sound in real time, *Teddy, Penny, Chip & Bean* layers pre-produced audio tracks. As the student becomes more overwhelmed, additional layers are gradually introduced to the soundtrack in according to the level of Regulation Bar, creating an adaptive soundscape that mirrors the student's emotional state. This choice was made to communicate escalation clearly while keeping the experience immersive without requiring complex real-time audio generation. If the educator is successful in helping the student in regulating, these additional layers are removed, returning to the original regulated sound and reinforcing a sense of resolution and progress.

4.3.8 Extended Resources

Beyond the interactive experience, the website also includes additional pages designed to extend its impact and provide ongoing support for educators: Dunn's Model of Sensory Processing and Classroom Materials (Figure 16). The Dunn's Model of Sensory Processing page provides educators with the theoretical context of the experience, explaining what Dunn's Model is and each of the four sensory processing patterns that the students are based on. The Classroom Materials page provides five free downloadable resources that

include awareness posters (Figure 17), a language guide (Figure 18), calming posters (Figure 19), communication cards (Figure 20), and an experience reference guide (Figure 21). These resources are designed for educators to easily access and print and use in supporting sensory regulation and inclusive communication within their classrooms, ensuring that the insights gained from the experience remain accessible at any time.

4.4 Conclusion

The continuous dialogue between theory and practice throughout this research process informed the concept, design, and execution of *Teddy, Penny, Chip & Bean*. Drawing on frameworks such as the Social Model of Disability, Systems Thinking, and Dunn's Model of Sensory Processing, the project translates theoretical concepts into a practical, interactive tool that supports educators in recognising and responding to sensory overload in ASD learners. By immersing users in narratives based on real-world classroom experiences, the experience fosters empathy, reflection, and an understanding of how sensory overload can manifest in diverse ways, as well as strategies to assist students in self-regulation.

The research and design process brought new insights that expanded the project's understanding of sensory processing, inclusion, and interactive storytelling. The shift from simulating sensory overload to placing users in a decision-making role showed that empathy develops through agency and consequences rather than passive observation. The research process refined the project's understanding of sensory processing from being seen as a set of fixed, individual traits to recognising it as a dynamic interaction shaped by multiple factors, including the individual, their circumstances, and the surrounding environment. Additionally, translating Dunn's Model into four distinct characters and narratives demonstrates how interactive storytelling can be used to explain and turn theoretical frameworks into practical tools, making academic concepts accessible for educators.

The theoretical frameworks discussed throughout this chapter, Dunn's Model of Sensory Processing, the Social Model of Disability and Systems Thinking, played a key role in shaping the final concept and execution of this project. Dunn's Model of Sensory Processing guided the design and development of the four different characters and their scenarios, along with the online questionnaires. This ensured that each scenario represented a variety of sensory profiles accurately. The Social Model of Disability informed the ethical framework by reframing disability because of systemic barriers rather than individual deficits, positioning the project's objectives as improving educator practices rather than "fix" ASD learners. Systems Thinking influenced the branching narrative and technical structure by highlighting the need to replicate multiple interconnected decisions and implement fuzzy logic, reflecting the complexity and unpredictability of real classroom interactions.

The final project successfully met its objectives within the scope of a BA Honours in Visual Communication by employing interactive digital storytelling, narrative branching, and visual communication strategies to address the lack of accessible tools that help educators understand and respond to the sensory needs of ASD learners. The inclusion of downloadable classroom materials extends the project's impact beyond the digital experience, enabling educators to apply the knowledge gained in their everyday teaching environments.

Looking ahead, this work could be expanded beyond an honours-level project through collaborating with educational departments within South Africa to develop the tool further for classroom implementation and integrating it into teacher training programs. These collaborations would allow the experience to be further refined and assessed in real learning environments, ensuring that each scenario truly reflects real-world experiences of sensory overload that are commonly faced within primary and secondary level public schools. This approach ensures that the tool not only raises awareness about the sensory

processing challenges faced by ASD learners but also becomes a practical resource for fostering inclusive education nationwide.

CHAPTER 5: CONCLUSION

To conclude, this chapter summarises the key arguments made in this study on how interactive digital storytelling can be used to support educators in public primary and secondary level schools in recognising, understanding, and responding to sensory overload in learners with ASD. This paper investigated how an interactive digital tool can accomplish this through empathy-driven storytelling that provides educators with the support in understanding sensory processing and identifying potential triggers and behavioural patterns that may lead to sensory overload. This is done while also encouraging educators to explore further and identify the societal problems that create disabling environments, barriers, and cultures.

The theory in Chapter Two contextualises Dunn's Model of Sensory Processing, the Social Model of Disability, systems thinking, and empathic design. This has provided a deeper understanding of the need to address the challenges faced by neurodivergent individuals, as they are not disabled due to their impairment, but rather by the failure of their environment to meet their needs. These theories encourage society to shift the focus onto themselves, rather than the individuals with disabilities, for professional intervention and practice. By understanding why and how people are excluded from their environments, actionable steps towards inclusive design can be identified, as inclusivity begins with a change of perspective.

The theory in Chapter Two also revealed how interactive digital storytelling can serve as an effective method to turn these insights into a meaningful, immersive tool that provides educators with the opportunity to better understand, recognise, empathise with, and respond to the diverse sensory needs of learners with ASD. This chapter explored the role of designers in considering both cognitive and emotional aspects of their designs as they are closely intertwined and create meaningful and effective user experiences. Furthermore, this chapter investigated the relationship between narrative and empathy through transportation. Narrative provides users with context to understand their role within a story and to identify with its characters. This shows how

narrative is a persuasive technique that, by increasing a user's immersion with a story, evokes empathy. This highlights how interactive digital storytelling is an effective tool for understanding diverse human experiences.

The visual analysis in Chapter Three of *Life (Re)Sounding* (2024) and *(UN)TRAFFICKED* (2018) provides clear evidence of the theories discussed in Chapter 2, as they clearly show the effectiveness of interactive digital storytelling as a tool for evoking player empathy and providing an understanding of complex social systems. The use of the fundamental psychological and design principles mentioned in the literature review such as affordance, signifiers, feedback, constraints, and the conceptual model shows how the design of these experiences both cognitively and emotionally enhance the player's immersion, empathy and understanding of the game's objectives through its narrative and the emotional responses to their interactions with it. Both case studies clearly explain the player's objectives in the game and assign responsibility for the characters to them through visual cues and prompts. Feedback is also evident in both cases, which is given through the game's narrative or visual and audio cues. This feedback notifies the player of the consequences that their interactions and decisions have on the characters. The use of these principles not only improves the user's experience but also creates an emotional connection between the player and those characters.

Life (Re)Sounding has specifically informed how environmental, visual, and sound cues (such as colour, lighting, and ambient noise) can reflect a character's emotional state, which can assist educators in identifying potential triggers and behavioural patterns that may lead to sensory overload. *(UN)TRAFFICKED* has informed how a 2D, illustrative style can simplify complex scenarios and use exaggeration to clearly communicate a character's emotional states and the environmental triggers that contribute to sensory overload, without visually overwhelming the user. Additionally, while *(UN)TRAFFICKED* does not focus on the neurodivergent experience, the game's narrative highlights systemic barriers like those described by the social model of disability.

Finally, this case study has also revealed the limitations of its reliance on binary choices, which oversimplify the complexity of real-world decisions. *Life(Re)Sounding* notably avoidance of it demonstrates the complexity of neurodivergent experiences and has directly informed the design of the practical component of this research, presenting educators with a spectrum of choices of more or less helpful actions, which are influenced by the individual needs of their learners.

The continuous dialogue between theory and practice throughout this research process informed the concept, design, and execution of *Teddy, Penny, Chip & Bean*. Drawing on the paper's theoretical frameworks and visual analysis, the project translates theoretical concepts into a practical, interactive tool that supports educators in recognising and responding to sensory overload in ASD learners. By immersing users in narratives based on real-world classroom experiences, the experience fosters empathy, reflection, and an understanding of how sensory overload can manifest in diverse ways, as well as strategies to assist students in self-regulation. The inclusion of downloadable classroom materials extends the project's impact beyond the digital experience, enabling educators to apply the knowledge gained in their everyday teaching environments.

The final project successfully met its objectives within the scope of a BA Honours in Visual Communication by employing interactive digital storytelling, narrative branching, and visual communication strategies to address the lack of accessible tools that help educators understand and respond to the sensory needs of ASD learners. This will allow learners with ASD to navigate the sensory and emotional challenges they face and engage more comfortably in their daily lives and the classroom. Looking ahead, collaborations with educational departments would allow the experience to be further refined and assessed in real learning environments. These collaborations could support further development for classroom implementation and integrating it into teacher training programs and promoting more inclusive classrooms.

REFERENCE LIST

- Anderson, K. T. & Chua, P. H. 2010. *Digital Storytelling as an Interactive Digital Media Context*. Educational Technology: 50(5):32-36.
- Aspris Children's Services. 2025. *Unqualified and unstructured – Autism in mainstream education*. Available: <https://www.aspriscs.co.uk/news-blogs/unqualified-and-unstructured-autism-in-mainstream-education/> [2025, 14 May].
- Barry, P. (ed.). 2009. Narratology, in *Beginning theory: an Introduction to literary and cultural theory*. Manchester University Press, (3):214-231.
- Barry, P. (ed.). 2009. Structuralism, in *Beginning theory: an Introduction to literary and cultural theory*. Manchester University Press, (3):38-48.
- Blair-Early, A. & Zender, M. 2008. User Interface Design Principles or Interaction Design. Interaction, in *Design Issues*. The MIT Press, 24(3):85-107.
- Candy, L. and Edmonds, E. 2018. Practice-Based research in the Creative Arts: Foundations and Futures from the Front Line. *Leonardo*. 15(1):63-69.
- Compost Creative. 2023. *Headspace: Interactive*. [Video]. Available: <https://www.youtube.com/watch?v=X9TM0gEF954> [2025, 14 May].
- Coursera. 2024. *What Is Unreal Engine?* Available: <https://www.coursera.org/articles/what-is-unreal-engine> [2025, 20 July].
- De Goede, J. 2022. *Latest Autism prevalence statistics reported in the USA and South Africa*. Autism Resources South Africa. Available: https://www.autismresources.co.za/blogs/getting-started/latest-autism-prevalence-statistics-reported-in-the-usa-and-south-africa?srsid=AfmBOoriX2HB7njxv29oAuGCIyhZf_LohDELLKLjlp4nT2qVczGY-EFW&utm_source=chatgpt.com [2025, 15 May].
- Diena, Y. 2025. *Understanding Sensory Overload*. Ambitions. Available: <https://www.ambitionsaba.com/resources/how-to-manage-sensory-overload-in-autism#:~:text=Understanding%20Sensory%20Overload&text=It%20happens%20when%20the%20brain,%2C%20anxiety%2C%20and%20emotional%20di stress.> [2025, 14 May].
- Dreyer, L. & Pienaar, S. 2024. *Educators want inclusive classes but struggle to assist children with autism*. Mail & Guardian. Available: <https://mg.co.za/thought-leader/opinion/2024-10-03-educators-want-inclusive-classes-but-struggle-to-assist-children-with-autism/> [2025, 14 May].
- Dunn, W. 2007. Supporting Children to Participate Successfully in Everyday Life by Using Sensory Processing Knowledge, in *Infacts & Young Children*. Wolters Kluwer Health: 20(2):84-101.
- Emery, S. 2024. *Dr Susannah Emery - Project Reflections*. [Interview]. Available: https://www.youtube.com/watch?v=1gdYb4_35U4 [2025, 15 July].

- Ferrer, J. 2025. *Fuzzy Logic in AI: Principles, Applications, and Python Implementation Guide*. Datacamp. Available: <https://www.datacamp.com/tutorial/fuzzy-logic-in-ai> [2025, 17 October].
- Harris, D. 2020. *Literature Review and Research Design: A guide to Effective Research Practice*. Routledge: London and New York.
- Guo, Yu. 2022. *Designing Game Narrative to Evoke Players' Empathy*. Uppsala Unniveritet.
- Mattelmäki, T., Vaajakallio, K. & Koskinen, I. 2014. What Happened to Empathic Design?, in *Design Issues*. The MIT Press: 30(1): 67-77.
- itch.io. 2024. *Life (Re)Sounding*. Available: <https://likeglassgames.itch.io/life-resounding> [2025, 14 May].
- Indigo Design Award. 2018. *(UN)TRAFFICKED Indigo Award winner 2018*. Available: <https://www.indigoaward.com/winners/642> [2025, 14 May].
- Linden Neuropsychological Services. 2025. *Do Public Schools Meet the Needs of Neurodiverse Children?* Available: <https://www.lindenneuropsychologicalservices.com/blog/do-public-schools-meet-the-needs-of-neurodiverse-children> [2025, 30 July].
- Martin, G. 2024. *George Martin - Project Reflections*. [Interview]. Available: <https://www.youtube.com/watch?v=iqRwA87PjvA> [2025, 15 July].
- Meadows, D. H. 2009. *Thinking in Systems: A Primer*, edited by D Wright. Earthscan.
- MetaMIDI Toolkit. 2024. *Life (Re)Sounding Game*. Available: <https://metamiditoolkit.com/life-resounding/> [2025, 15 July].
- Merriam-Webster Dictionary. 2025. Available: <https://www.merriam-webster.com/dictionary/didactic> [2025, 20 July].
- Noel, S. 2024. *Autism and mainstream settings*. Essential Education Group. Available: <https://essentialeducationgroup.com/autism-and-mainstream-settings/> [2025, 14 May].
- Norman, D. 2002. *The Design of Everyday Things*. New York: Basic Books.
- Oliver, M. 2004. The Social Model in Action: if I had a hammer, in *Implementing the Social Model of Disability: Theory and Research*, edited by C Barnes & Geof Mercer. Leeds: The Disability Press:18-31.
- Project Lima. 2025. *Understanding Neurodiversity by Project Lima*. Available: <https://projectlima.co/neurodiversity/> [2025, 14 May].
- Putrevu, S. 2017. *How a video game about a 13-year-old trafficked girl is fighting the social evil*. YourStory. Available: <https://yourstory.com/2017/11/video-game-13-year-old-trafficked-girl-fighting-social-evil> [2025, 16 July].
- Rizvic, S., Boskovic, D., Okanovic, V., Slijivo, S. & Zukic, M. 2019. Interactive digital storytelling: Bringing cultural heritage into a classroom, in *Journal of Computers in Education*. Beijing Normal University: 6(1): 143–166.

- Scheydt, S., Müller Staub, M., Frauenfelder, F., Nielsen, G.H., Behrens, J. & Needham, I., 2017. Sensory overload: A concept analysis, in *International Journal of Mental Health Nursing*. 26(2):110–120.
- Shum, A., Holmes, K., Woolery, K., Price, M., Kim, D., Dvorkina, E., Dietrich-Muller, D., Kile, N., Morris, S., Chou, J. & Malekzadeh, S. 2016. *Inclusive design toolkit*. Microsoft.
- Silberman, S. 2015. *NeuroTribes: The Legacy of Autism and The Future of Neurodiversity*. New York, Penguin Random House.
- Singer, J. 2017. *Neurodiversity: The Birth of an Idea*. Lexington, Kentucky.
- Stebbins, R. A. 2001. What Is Exploration, in *Exploratory Research in the Social Sciences*, Qualitative Research Methods. Thousand Oaks: SAGE Publications, 2-17.
- SurveyMonkey. 2025. *Exploratory Research: What It Is And How To Use It*. Available: <https://www.surveymonkey.com/mp/exploratory-research/> [2025, 30 July].
- Tellez, F. and Gonzalez-Tobon, J. 2019. *Empathic Design as a Framework for Creating Meaningful Experiences*. North Carolina: Appalachian State University:2(1),909-919.
- Teddy, Penny, Chip & Bean. 2025. *Dunn's Model of Sensory Processing*. Available: [www. https://www.tpcb.co.za/dunnsModel.html](http://www.tpcb.co.za/dunnsModel.html) [2025, 17 October].
- Teddy, Penny, Chip & Bean. 2025. *The Sensory Classroom*. Available: www.tpcb.co.za [2025, 17 October].
- Teddy, Penny, Chip & Bean. 2025. *Teddy / Sensory Avoiding*. Available: <https://www.tpcb.co.za/teddy.html> [2025, 17 October].
- Union of the Physically Impaired Against Segregation & Disability Alliance. 1976. *Fundamental Principles of Disability*. London: UPIAS and Disability Alliance.
- University of South Australia. 2024. *New video game redefines the neurodiversity narrative*. [Online Video]. Available: <https://www.youtube.com/watch?v=yHxjtbEvJmM> [2025, 15 July].
- University of South Australia. 2024. *Play, learn and empathise: New video game redefines the neurodiverse narrative*. Available: <https://www.unisa.edu.au/media-centre/Releases/2024/play-learn-and-empathise-new-video-game-redefines--the-neurodiverse-narrative/> [2025, 15 July].
- WHO. 2023. *Autism*. Available: <https://www.who.int/news-room/fact-sheets/detail/autism-spectrum-disorders#:~:text=About%201%20in%20100%20children,and%20can%20evolve%20over%20time> [2025, 15 May].
- Whiting, S., Oestmann, J., Martin, G. & Emery, S. 2024. Musical Automation in the Australian Games Industry: Current Perspective, in *Working Paper*. Creative People, Products and Places (CP3):5.

APPENDIX

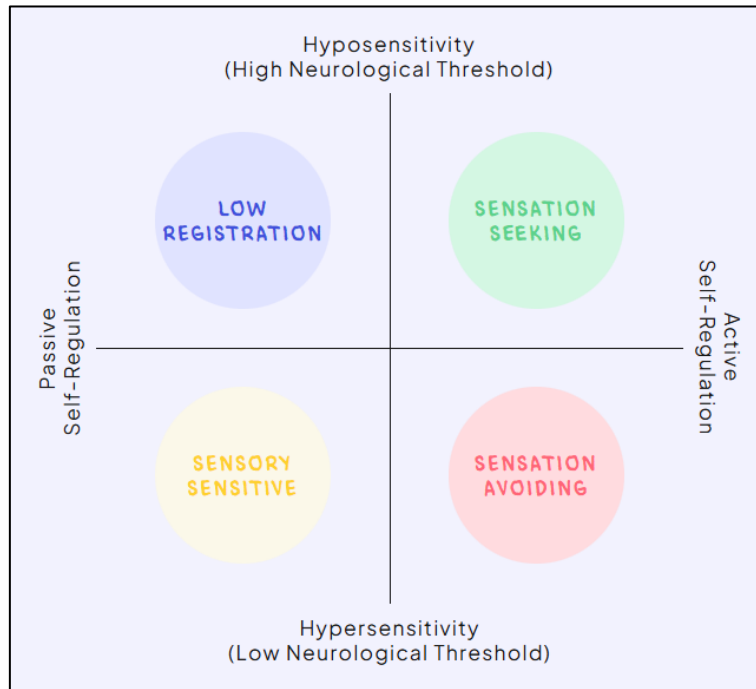


Figure 1: Eryn Voogt, *Teddy, Penny, Chip & Bean: Graph of Dunn's Model of Sensory Processing*. 2025. Screenshot by Author.



Figure 2: University of South Australia, *Life (Re)Sounding: Arrange the ducks in order task*. 2024. (MetaMIDI Toolkit).



Figure 3: University of South Australia, *Life (Re)Sounding: Arrange the blocks in order* task. 2024. (MetaMIDI Toolkit).



Figure 4: University of South Australia, *Life (Re)Sounding: Find your seat* task. 2024. (MetaMIDI Toolkit).



Figure 5: University of South Australia, *Life (Re)Sounding: Take the elevator* task. 2024. (MetaMIDI Toolkit).

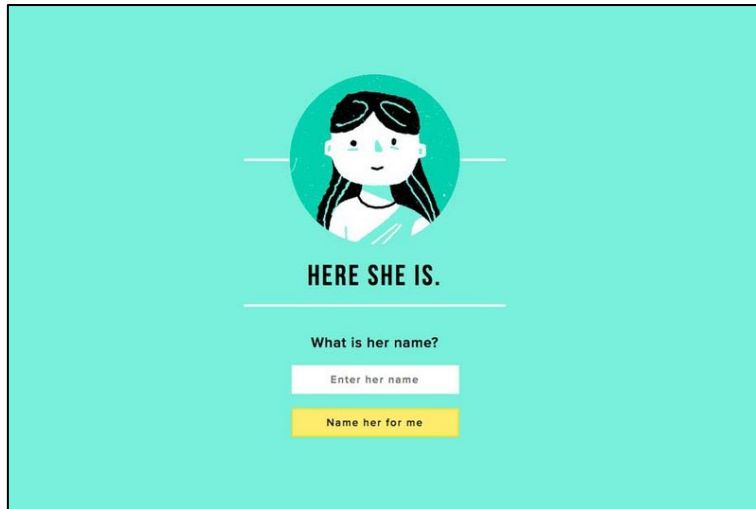


Figure 6: The Kailash Satyarthi Children's Foundation, *(UN)TRAFFICKED*: "What is her name?" screen. 2018. (openDemocracy).

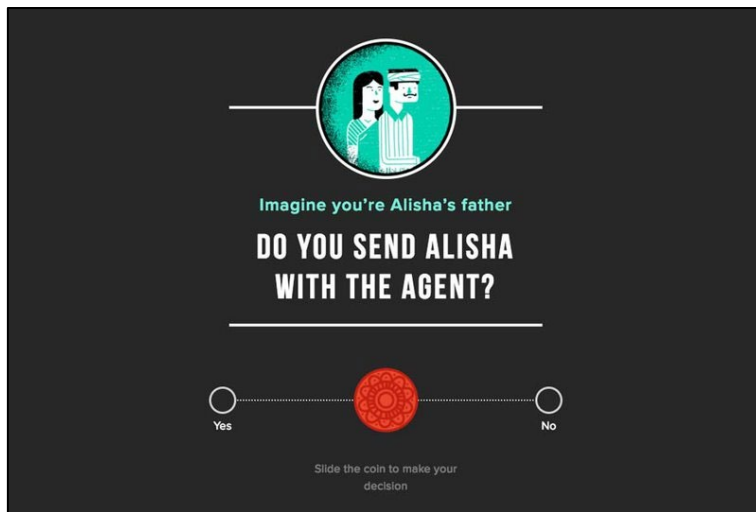


Figure 7: The Kailash Satyarthi Children's Foundation, *(UN)TRAFFICKED*: "Do you send Alisha with the agent?" screen. 2018. (openDemocracy).

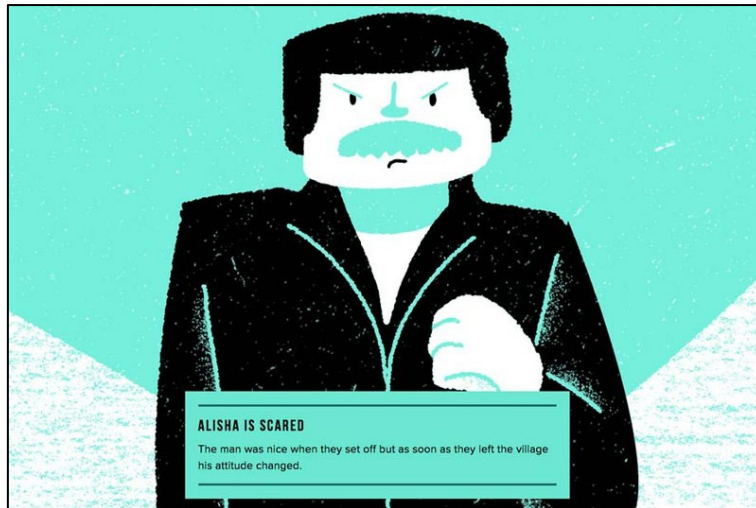


Figure 8: The Kailash Satyarthi Children's Foundation, *(UN)TRAFFICKED: "Alisha is scared"* screen. 2018. (openDemocracy).

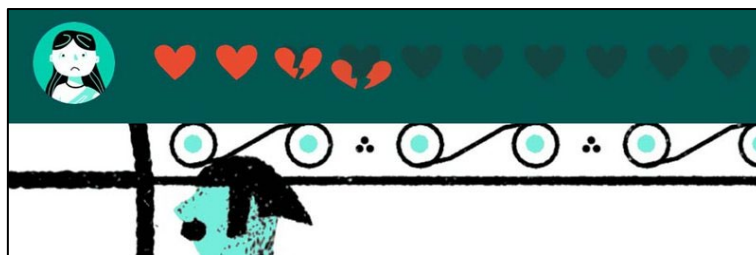


Figure 9: The Kailash Satyarthi Children's Foundation, *(UN)TRAFFICKED: Alisha's heart bar*. 2018. (openDemocracy).



Figure 10: Eryn Voogt, *Teddy, Penny, Chip & Bean: Select a student* screen. 2025. Screenshot by Author.

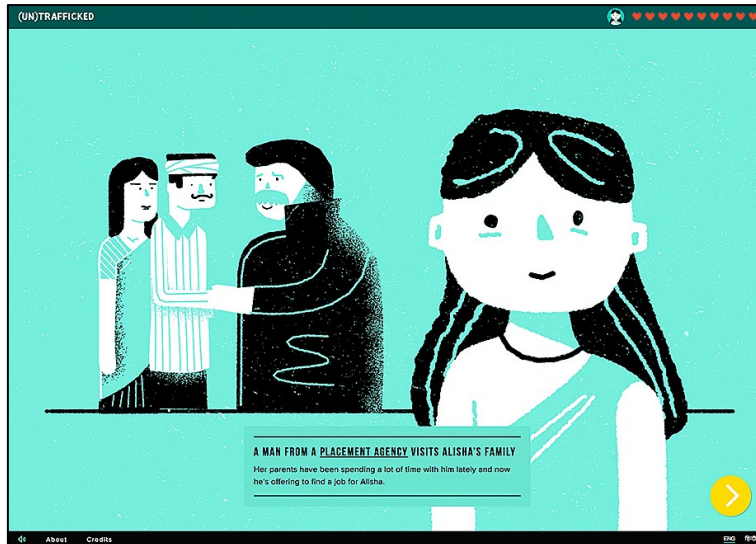


Figure 11: The Kailash Satyarthi Children's Foundation, *(UN)TRAFFICKED*: “A man from a placement agency visits Alisha’s family” screen. 2018. (openDemocracy).

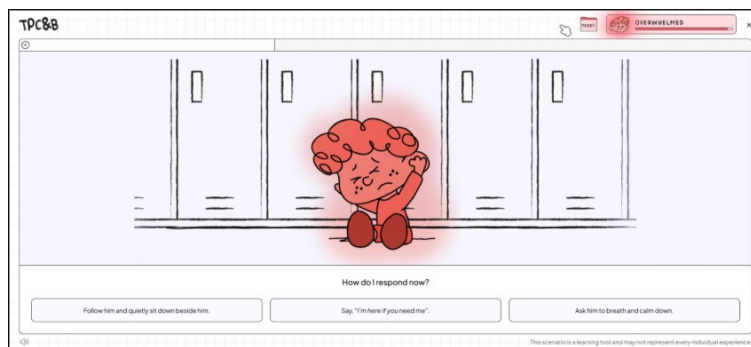


Figure 12: Eryn Voogt, *Teddy, Penny, Chip & Bean: Teddy overwhelmed in his scenario*. 2025. Screenshot by Author.

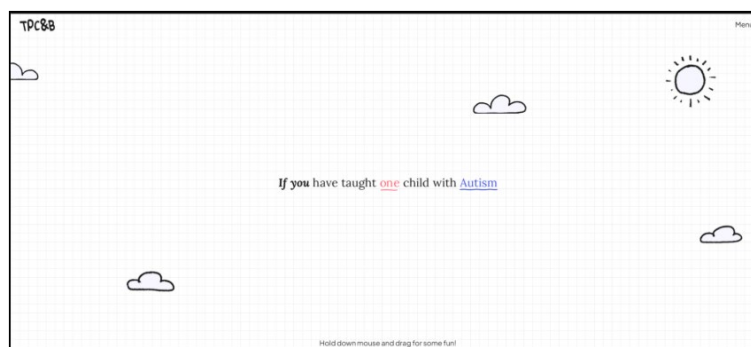


Figure 13: Eryn Voogt, *Teddy, Penny, Chip & Bean: Experience’s opening sequence*. 2025. Screenshot by Author.



Figure 14: Eryn Voogt, *Teddy, Penny, Chip & Bean*: “What is your school’s name?” screen. 2025. Screenshot by Author.

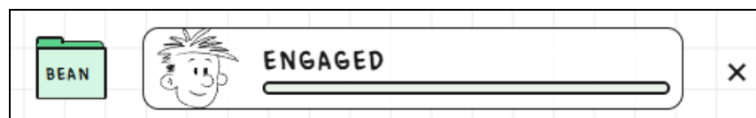


Figure 15: Eryn Voogt, *Teddy, Penny, Chip & Bean*: Bean’s “Engaged” Regulation Bar. 2025. Screenshot by Author.

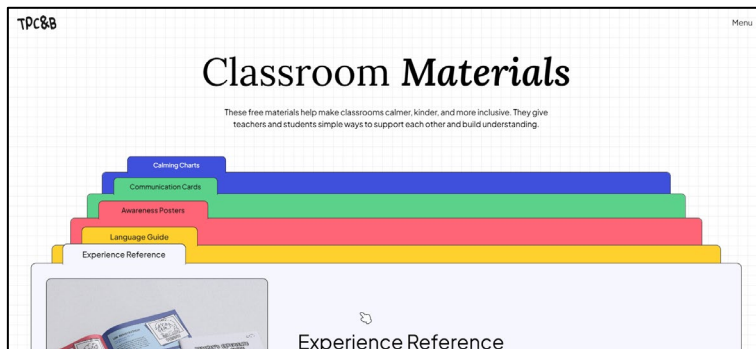


Figure 16: Eryn Voogt, *Teddy, Penny, Chip & Bean*: Classroom Materials page. 2025. Screenshot by Author.



Figure 17: Eryn Voogt, *Teddy, Penny, Chip & Bean: Awareness Posters*. 2025. Image in Possession of Author.



Figure 18: Eryn Voogt, *Teddy, Penny, Chip & Bean: Language Guide*. 2025. Image in Possession of Author.



Figure 19: Eryn Voogt, *Teddy, Penny, Chip & Bean: Calming Posters*. 2025. Image in Possession of Author.



Figure 20: Eryn Voogt, *Teddy, Penny, Chip & Bean: Communication Cards*. 2025. Image in Possession of Author.



Figure 21: Eryn Voogt, *Teddy, Penny, Chip & Bean: Teacher's Reference Guide*. 2025. Image in Possession of Author.

ADDENDUM A

Understanding and Supporting Neurodivergent Learners: A Questionnaire for Teachers

Hi! I'm Eryn Voogt, an Honours student at Stellenbosch Academy of Design and Photography.

This questionnaire is part of my Visual Communication research project into how teachers support neurodivergent learners - especially during moments of overstimulation or distress. Neurodivergence includes conditions like **Autism Spectrum Disorder (ASD)**, **Attention-Deficit/Hyperactivity Disorder (ADHD)**, **Sensory Processing Disorder (SPD)**, **Specific Learning Disorders like Dyslexia (SLD)**, and **Anxiety Disorders (ADs)**. With more neurodivergent students in mainstream classrooms, I'm exploring whether teachers feel prepared and what tools or support could help.

This questionnaire is specifically for teachers who have worked with at least one neurodivergent student.

This questionnaire contains **18 questions** and is **anonymous**.

Thank you so much for your time and for being part of this effort to make classrooms more inclusive and supportive for all learners.

* Indicates required question

1. 1. What type of school do you currently work at? *

Mark only one oval.

- A mainstream school
- A school that provides specialized support for neurodivergent students
- Other: _____

2. 2. Have you received any training or education on working with neurodivergent students? *

Mark only one oval.

- Yes, formal training (e.g., coursework, workshops)
- Yes, informal training (e.g., peer mentoring, on-the-job experience)
- No, but I'd like to
- No, and I don't feel prepared

3. 3. What phase(s) do you currently teach or have taught? *

Check all that apply.

- Early Childhood Development (ECD): Birth to Grade R (ages 0–5)
- Foundation Phase: Grades R to 3 (ages 5–9)
- Intermediate Phase: Grades 4 to 6 (ages 9–12)
- Senior Phase: Grades 7 to 9 (ages 12–15)
- Further Education and Training (FET) / High School: Grades 10 to 12 (ages 15–18)
- Other: _____

4. 4. Which neurodivergent conditions have you encountered in your classroom? *

Check all that apply.

- Autism Spectrum Disorder (ASD)
- Attention-Deficit/Hyperactivity Disorder (ADHD)
- Sensory Processing Disorder (SPD)
- Specific Learning Disorders such as Dyslexia (SLD)
- Anxiety Disorders (ADs)
- I'm not sure / undiagnosed
- None
- Other: _____

5. 5. Which of the following sensory or environmental triggers do your neurodivergent students most commonly experience? *

(Select all that apply)

Check all that apply.

- Loud noises
- Bright or flickering lights
- Crowded or noisy classrooms
- Strong smells
- Physical touch or proximity
- Changes in routine
- Other: _____

6. 6. Out of these, which trigger do you find is the most common or impactful for your students? *

(Select one)

Mark only one oval.

- Loud noises
- Bright or flickering lights
- Crowded or noisy classrooms
- Strong smells
- Physical touch or proximity
- Changes in routine
- Other: _____

7. 7. How do you typically recognize signs of overstimulation or distress in your learners? *

(Select all that apply)

Check all that apply.

- They become visibly anxious or agitated
- They cover their ears or eyes
- They withdraw or avoid interaction
- They show changes in behavior (e.g., aggression, meltdowns)
- They verbalize discomfort or ask for breaks
- Other: _____

8. 8. Which of these signs do you most commonly observe? *

(Select one)

Mark only one oval.

- They become visibly anxious or agitated
- They cover their ears or eyes
- They withdraw or avoid interaction
- They show changes in behavior (e.g., aggression, meltdowns)
- They verbalize discomfort or ask for breaks
- Other: _____

9. 9. How confident do you feel supporting neurodivergent learners during moments of overstimulation or distress? *

Mark only one oval.

- 1 2 3 4 5
-
- Not Very confident
-

10. 10. How would you rate your training or education related to neurodivergence and sensory processing differences? *

Mark only one oval.

1 2 3 4 5

Very Comprehensive

11. 11. In moments of overstimulation, how likely are you to use the following strategies? *

(Rate each from 1 = Never to 5 = Always)

Mark only one oval per row.

	1 (Never)	2	3	4	5 (Always)
Give them physical space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Speak calmly and offer breathing techniques	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Try to talk or reason with them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Remove sensory triggers (e.g., lights, sound)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provide a comforting object or sensory tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Redirect or distract with another activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wait until they're calm to engage or intervene	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12. 12. Can you describe a moment when a neurodivergent student in your class experienced overstimulation? *

13. 13. Have you ever felt unprepared or unsure of how to respond during a meltdown, shutdown, or sensory overwhelm? *

Mark only one oval.

- Yes
 No

14. 14. Do you currently feel prepared and confident to teach neurodivergent students (e.g., with autism, ADHD, sensory sensitivities)? *

Mark only one oval.

- Yes
 No

15. 15. What do you think is the most difficult aspect of supporting students with sensory processing challenges? *

(Select one)

Mark only one oval.

- Identifying sensory triggers
- Responding appropriately during distress
- Accessing adequate resources or tools
- Managing classroom environment effectively
- Communicating with students and families
- Other: _____

16. 16. Do you feel your current school environment adequately supports the sensory and emotional needs of neurodivergent learners? *

Mark only one oval.

- Yes
- No

17. 17. What would help you feel more prepared to support neurodivergent students? *

(Select your top 3)

Check all that apply.

- Clear classroom strategies for sensory regulation
- Peer mentoring or coaching
- Written guides or checklists
- Ongoing training or workshops
- Access to specialist support (e.g., occupational therapist)
- Better understanding of what overstimulation feels like
- Interactive learning tools (e.g., simulations, videos)
- Other: _____

18. 18. Would you be interested in using a visual, interactive tool to better understand how overstimulation affects different students? *

Mark only one oval.

Yes

No

Other: _____

This content is neither created nor endorsed by Google.

Google Forms