The Multi-Sensory Design of a Synesthete's Everyday Experience

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Honors Thesis
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Department of Art & Design
Misty Thomas-Trout, MFA
April 2021
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Abstract
Perception—which can be defined as becoming aware of occurrences in the world through the senses—is different for every person (Merriam-Webster). My thesis deals with perception in the form of a condition called synesthesia and the communication of this condition using graphic design. Synesthesia is a condition that involves the involuntary crossing of the senses, resulting in multi-sensory experiences every time a synesthete absorbs the world and visible language. Utilizing the field of graphic design, I created several projects to communicate my three goals of conducting research on synesthesia, sharing what I experience every day, and educating others about synesthesia. I used the inspiration of many important sources about synesthesia to create a graphic design-centered action plan that resulted in a book titled A Story of Synesthetic Discovery, several research posters, and a visual song that utilizes my visual perception of the world as a synesthete.

Disclaimer
This thesis began with the Berry Summer Thesis Institute of the University of Dayton Honors Program in 2019 and was originally published in the Proceedings. Pieces of the Proceedings research and descriptions have been adapted and updated in this publication of the thesis titled The Multi-Sensory Design of A Synesthete’s Everyday Experience.

Dedication
This thesis is dedicated to my mom, sister, grandparents, advisor and professor Misty Thomas-Trout, and all friends who have helped make this possible.
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Introduction

Have you ever wondered the reason certain people feel the need to associate specific subjects, songs, or even people with a color? Or questioned the possible meanings for phrases such as ‘white noise’ and others associated with color and texture (Kinsler, 2018)? Well, there is a psychological reason for these curious connections. It comes from a neurological condition called synesthesia, which involves the involuntary crossing of the senses that affects a small percentage of the population. This condition occurs when a certain gene does not snip the connections between the different areas of the brain during childhood. This condition develops during childhood as the individual creates connections between different senses that are learned, as well as connections that are already formed from infancy. After years of development, the results include a multi-sensory experience every time a synesthete absorbs the world through all of their senses.

I am a synesthete and consider it a gift. In my childhood years the condition led to many struggles and learning difficulties in school because of my lack of awareness. The summer between my 7th and 8th grade year, my mother’s friend (who happened to be a reading specialist) gave me a list of books to assist with my reading ability, interest, and comprehension. I chose a book by Wendy Mass called A Mango-Shaped Space which changed the course of my life. One evening while reading before bed, I read a part where the main character of the book—a girl about my age at the time—was explaining what colors her numbers and letters were. I remember being so amazed that she had several different colored letters and numbers than I did. I ran downstairs with great excitement, “Mom! What color is your ‘a’?” To which I received a confused, concerned, and surprised look. She asked, “What do you mean?” I explained that the character in the book I was reading associated different colors to her letters and numbers than I did. I wanted to know what colors other people saw too. Although, when I asked my mom, she explained that she did not see any colors with her letters and numbers. This led to us conducting a great deal of research which ultimately determined that I had a condition called ‘synesthesia.’
Using the “Synesthesia Test” online, we learned that I have several types of synesthesia, including: **grapheme**, where letters and numbers each have their own color and texture associated with them; **chromesthesia**, where all sounds have colors, shapes, and textures; **smell to color**, in which scents have a color, shape, and texture; **temperature to color**, in which each temperature that I feel has a distinct color and/or shape; **pain to color**, where different pains and feelings I experience have a color and shape associated with them; **taste to color**, where only some different tastes have a color linked with them; and a **spatial form of synesthesia**, where I am more easily able to visualize spaces and objects (Dean 2014; “Home: Auditory-Tactile Synesthesia” 2017).

Additionally, there are two different types of synesthetes when referring to the grapheme type; associators and projectors. Associators “report experiencing their photisms ‘in the mind’s eye,’” while projectors bring the color or experience into “external space” and use the spatial part of the brain to do this (Dixon 2004). With my grapheme synesthesia I am a ‘projector,’ which allows me to project all of my colors and textures on top of each letter and number I see. I use the spatial part of my brain more than other synesthetes. Approximately 90 percent of synesthetes are associators, making the chance of being a projector much less likely (Dixon 2004).

Looking back at various experiences and struggles I had as a child, I now recognize how my synesthesia affected my learning. Despite the difficulties that I have experienced with synesthesia, this gift makes my life significantly richer in color than most could even imagine. This is one of the reasons I chose to pursue a thesis on the subject and participate in the Berry Summer Thesis Institute (BSTI), because it would provide the means to deepen my understanding of synesthesia. The BSTI created an avenue to visually represent these experiences as a synesthete in order to educate others about the condition. I am now more aware of how I process information and learn, which has helped me utilize my gift to flourish in school, life, and in a creative capacity as a graphic designer. Understanding how I view graphic design as a synesthete has been particularly helpful, as I must adjust how I approach my designs in order to achieve what others actually will see when viewing my work. This deeper awareness about synesthesia is
something that I have enjoyed sharing with others as well as researching, writing, and designing about.

**Background Research**

At the onset of the thesis process, I immersed myself in research about the condition of synesthesia beyond my own initial understanding, including its scientific background, causes, and other types of synesthesia. During the Berry Summer Thesis Institute, I gathered numerous resources and met with Dr. Susan Davis, Associate Professor in the Psychology Department. This provided a secondary layer of understanding about synesthesia and in what ways the University of Dayton’s faculty have explored the subject.

Two very important researchers in the field of neuroscience and synesthesia are Richard E. Cytowic and David M. Eagleman. Their books, *Synesthesia* and *Wednesday is Indigo Blue*, offered me considerable assistance in understanding how synesthesia develops in children based on how these connections between centers of the brain are made. This led me to understand there were many more types of synesthesia than I had originally thought.

The field of synesthesia has not been extensively studied. Recently, however, there has been an influx of books and studies published that explore the subject, as well as, the causes, different types, and experiences of synesthetes. This has really assisted the credibility of the condition. In the past, it was not considered a reputable field of study. This is partially due to the idiosyncrasy of the condition, meaning that synesthesia presents itself in a different way amongst each person. Over the years, I have read several different sources by neurologists and artists who explore synesthesia and how it can be present in everyone through our language and through the connection of our senses.

At its core, synesthesia is a condition that involves connections between the senses and perception. When a synesthete experiences one sense, or ‘trigger,’ another sense or experience is activated as a result (Cytowic 2018, 3). Using grapheme synesthesia as an
example, the ‘trigger’ would be considered the letter, number, or character, and the ‘response’ would be the color or texture that is associated or appears on the figure. Richard E. Cytowic, who is a neurologist and one of the founding members of the field of synesthesia, defines the condition as “a triggering stimulus [evoking] the automatic, involuntary, affect laden, and conscious perception of a sensory or conceptual property that differs from the trigger” (Cytowic 2018, 3). This can come in many different forms, such as grapheme-to-color in which letters and numbers each evoke a color. There are around forty different types of synesthesia that have been found, which contain both a trigger and the stimulus or experience that have been evoked (Eagleman 2009, 24).

Synesthetes often are not aware that they have synesthesia because they assume that everyone else sees the world in the same way as they do. As a synesthete, I was unaware until I read *A Mango-Shaped Space*. If synesthetes do discover they have the condition, it is often not until much later in their life. Synesthesia is genetically inherited and is a function of nature. In addition, it requires nurturing because the connections that are essential to the condition are formed during childhood and then remain constant throughout life (Eagleman 2009, 6, 215). Synesthesia is most likely transferred via the X-chromosome, as it is more common in women. The gene that causes synesthesia essentially increased the communication between the different parts of the brain (Eagleman 2009, 6). Therefore, if the gene is not sustained when the synesthete is a child, then they will no longer have the condition. With grapheme-to-color synesthesia, the area of the brain that is activated because of synesthesia is called the V4 (Eagleman, 6). This is the part of the brain that is vital for recognizing the ‘color’ of the trigger, which can come in the form of letters and numbers (Eagleman 2009, 6). Synesthesia is also more common in children than in adults. It is possible that children lose their synesthesia during puberty because the brains of young people are constantly changing and reorganizing themselves, which can cause synesthesia to fade. Specifically, the concentration of hormones during puberty can cause young synesthetes to lose their gift, even as young as the age of six or seven. If the condition of synesthesia lasts past puberty, then it will stay for the remainder of their lives.
The number of people with synesthesia has changed constantly throughout the ages, which has become evident through conducted studies. It is also difficult to estimate the amount of synesthetes as those with the condition are sometimes not aware that they have it. The most recent statistics include one in twenty-three persons have some type of synesthesia and one in ninety for grapheme-to-color—which is the second most common form of synesthesia (Eagleman 2009, 7).

Synesthesia is a growing field that has sparked continued research studies and publications in an effort to educate others. This has also helped remove misconceptions about the condition, such as that synesthesia is too strange or “New Age” that it should not be studied because it is not a respectable field (Eagleman, 4). This has helped synesthetes understand that what they experience is in fact, not strange and there is a concrete reason for its occurrence.

Goals

From the conception of my thesis, I developed three specific goals that have kept my research on track in order to optimize the overall desired impact of my thesis to function as an educational tool. My goals included; conducting research on the condition of synesthesia, including types, history, and the overall logistics; sharing my direct first-hand experience as a synesthete through various means that engage multiple senses to provide others with an idea of what I experience; and finally, educating others about the condition through graphic design-centered projects that engage all components of my thesis work.

Design Plan

The medium of graphic design became the vehicle to provide awareness and information about synesthesia. I first began by brainstorming how I could visually represent synesthesia through my own experiences. I developed the idea of completing a book that would help tell my story of how I discovered that I have synesthesia, with the aim that it would prompt the discovery of others’ synesthesia and provide them with resources. I
wanted to utilize the drawings of the colors and shapes that I see in this story to further communicate how a synesthete experiences the world. Additionally, I wanted to communicate the research that I have done on synesthesia to explore more of the details and possible causes for the condition. Finally, I wanted to focus on exploring how to make visual connection for non-synesthetes to show how a synesthete might hear sounds and music with a song.

My thesis goals informed the graphic design centered action plan. This action plan was comprised of three separate parts. One part included a storybook, titled *A Story of Synesthetic Discovery*, in which I photographed, designed, and wrote about my synesthetic discovery. Another part included poster designs that would be research-centered with information that educates people around the logistics of synesthesia. The third part included a painting of a specific song that visually conveyed the way I experience the specific sounds. This goal-oriented action plan enabled me to explore multiple ways to use visual communication as way to educate, inform, and understand the condition of synesthesia.

**Products**

The research and process has resulted in a culmination of three different forms: a book titled *A Story of Synesthetic Discovery*, three research posters, and a visual song painting.

In 2019 with the Berry Summer Thesis Institute, I created my first prototype of *A Story of Synesthetic Discovery* to achieve part of my designed action plan. I photographed, wrote, and designed elements for the storybook. I explored the materials and meaning behind each component of the book in order to explore which outcome would best represent my own personal discovery as a synesthete. The story begins in my 7th and 8th grade year of middle school. I recall vividly how greatly I struggled while reading, especially when I was having trouble keeping up with all of my work. It took me a very long time to comprehend the material, which often resulted in re-reading the material over and over again. My mom’s friend, who is a reading specialist, recommended some books for me to read over the summer. It was this connection that led me to a life-changing moment as I
read *A Mango-Shaped Space*. Throughout the Berry Summer Thesis Institute, I explored how to utilize transparent paper in my final book as a way to visually represent how my letters, numbers, and characters had colors. This transparency paper allowed the viewer to still be able to read the text, while also viewing the text in the same way a synesthete might.

The following photographs (Figures 1, 2) were taken from a printed version of the *A Story of Synesthetic Discovery* as well as some of the inside spreads (Figure 3). One shows the transparency paper overlaid on the right spread of each page.

![Figures 1, 2](image)

![Figure 3](image)

The storybook continued to develop, change, and transform over my junior and senior year with mentorship and guidance from Professor Misty Thomas-Trout. When I began
to take upper-class graphic design courses, the knowledge and learned lessons constantly informed the books transformation. I began to understand best practices of book design and how to use image and typography to create a beautiful form that functioned well. I wanted to make the storybook more accessible, which was possible by publishing through eCommons at the University of Dayton. This provides a global audience for my storybook. It also provided me with another layer of learning how to create an accessible PDF file for onscreen access that is translatable to an eBook. This resulted in a partial redesign of the text with limited ability to only coloring certain words or quotes. The outcome is different than the printed version, however, the viewer now experiences and understands how a synesthete views text on a digital platform as well as in print. The eBook of *A Story of Synesthetic Discovery* can be found at [https://ecommons.udayton.edu/stu_facselected/3/](https://ecommons.udayton.edu/stu_facselected/3/)

Below are the pages for the digital version of the book. It starts with a foreword (Figure 4) written by my mother, Anne Spicer, which gives more context to the story as she shares her perspective on how helpful it has been to understand my synesthesia. She explains beautifully about our discovery of me having the condition. It then transitions into the preface (Figure 5) to provide the reader with my intentions behind the storybook, as it is meant to serve synesthetes, those supporting synesthetes, and those wanting to learn more about the condition. The story then begins with a transition (Figure 6) that places the reader back in time to when I was in middle school and discovered synesthesia.

The photographs and content on the right page of the spread share the story of my discovery and shows specific resources that were really significant to learning about my condition. This includes the book, *A Mango-Shaped Space*, which was the connection that led me to a life-changing moment. Additionally, there is an image of the test I took that determines the different types of synesthesia. Several books were included that aided in my understanding, as well as the people that have been very significant in my process of discovery. The left page of the spread is painted imagery that represents the color of the page number.
This storybook ends with a quote (Figure 7a, 7b) from a well-known synesthete and artist that I had the privilege of meeting after my personal synesthesia discovery. Additionally, there are resources (Figure 8) for the reader which provide more information about synesthesia.

(Front cover)
For my words and love everyone which helped me through my own disease for all the children also shown from the gift to whom it may given from your gift.

"Could a greater miracle take place than for us to look through each other's eyes for an instant?"

(Figure 4)
Preface

Welcome synesthetes and those desiring to learn more about synesthesia. I would like to invite you to this space of discovery, creation, and collaboration. Whether you are a synesthete desiring to learn more about synesthesia, or someone who is curious, this book is for you. This book is a playground, a place where the world of synesthesia meets the world of creation. From various techniques to self-exploration, we will delve into understanding the unique mind-body connection that is synesthesia.

This book is a journey to explore the many ways that synesthesia can affect our lives, and how we can leverage these experiences to our advantage.

I hope this book serves as a guide for everyone, but especially those who live with synesthesia. It is my hope that this book will be a tool for others to discover and embrace their unique abilities.

—Middle Spar

And now you shall see, through my middle school eyes, a story of a synesthete discovering her colorful gift...

(Figure 5)

(Figure 6)
And now you shall see, through my middle school eyes, a story of a synesthete discovering her colorful gift...

but they already got all of the color not a good stain.

the main character of the book is named Blue.

MOM! What color is your name?
So, it turns out everyone has colored letters, numbers, sounds, smells, days of the week, tastes...

And... we happened upon synesthesia. Apparently, I have about 13 different senses of synesthesia. Who knew?

Then, we were told that synesthesia is some sort of mixing of the senses, which is why saw the colors all the time.
So, I started keeping track of what I see in this special book my mom gave me.

To share with others what I experience, I drew what the connections of the senses look like to me, such as points, sounds...

...and...
...and smell... everyday smells, sounds...

day, painting... art

and when I dream... things

and even more...

plant inside my house... paint

tastes, smells, pain...

temperatures, and smells.
In addition, I color all of my letters.

I also colored my numbers and characters.

In order to understand more about synesthesia, I decided to consult some of the guides of the field.

WEDNESDAY IS INDIGO BLUE

(covering the highs of synesthesia)
Her name is Carol Seen.
She has synesthesia as well.

Synesthesia: Art and the Mind

She helped me and my family understand more about synesthesia, which definitely made my mom feel better.

Over the years,
I have continued researching how synesthesia and other sensory experiences can influence our lives.
(Figure 7a)

“Could my synesthesia be the reason why I felt driven to work in certain ways?”

(Figure 7b)

“Could my synesthesia be the reason why I felt driven to work in certain ways?”
Endnote
It has been incredibly helpful to me to understand and share my own experiences. I hope this book can be a valuable resource for others, as my aim is to help others make sense of the world of experiences we inhabit in our own unique way. I have used this book as a tool to explore and develop my understanding of experiences and sensations. There are a number of other resources for those wanting to learn more about the world of experiences and sensations.

Resources
The analogy of sensory synesthesia to art and science
- Sensory Stamps
- Wednesday Mottled Blue
- Discovering the Scent of Synesthesia
- Richard Cavan and David Eagleman
- Synesthesia
- Richard Cavan
- The Man Who Tasted Shapes
- Richard Cavan
- Synesthetic Design: Handbook for a Multi-sensory Approach
- Richard Cavan
- Synesthesia: The Fascinating World of Blended Senses
- Richard Cavan
- A Merge—Shared Space
- Richard Cavan
- The Epoch Who Created Blinds: Synesthesia and the Making of the Sense
- Sean Vilard
Future physical prints of the book will be printed on Neenah Environment® Papers, PC 100 White, which uses 100% post-consumer fiber. It is our duty as graphic designers and citizens to care for the environment and not partake in practices that further degrade, pollute, and overall harm the earth and its inhabitants.

The second part of my design plan included research posters (Figures 9, 10, 11). I used a similar design as my book to create the posters, which included a photograph of the book that I found particularly helpful. I then surrounded the pictures with information about synesthesia or the senses that are helpful to understanding the condition and how our senses are more connected than people realize. With the physical printed posters, I overlaid my colored letters and numbers using transparency paper to visually represent what I see in order for others to understand (Figures 9b, 10b, 11b).
The visually painted song (Figure 12), “It’s Time” by the band Imagine Dragons is shown below. I chose this song as it was the first song that I drew for my mom after we discovered my synesthesia. I began by designing how the song looked in my head using Adobe Illustrator. Ultimately, I discovered the best process was to paint the visual outcome. Painting felt more natural and allowed for the ability to mix colors—a necessary component that most accurately translated what was in my head.

(Figure 12)

**Future Plans**

In conclusion, I never imagined the incredible impact that this condition would have in all aspects of my life. This thesis enhanced my own understanding of synesthesia, as well as providing me with the resources to create the multitude of projects for others to see how I see. Sharing the resulting product, *A Story of Synesthetic Discovery* and talking
with people about synesthesia remains a consistent goal. The field of synesthesia is
growing, and I plan to continue being a part of that development. Understanding that I
have synesthesia and how it has altered the ways in which I comprehend and see the
world has helped me recognize how to adjust my learning. I am a better graphic designer
when I utilize this condition as a gift—an asset—instead of feeling it be a hinderance.
One of my deepest hopes is that my storybook empowers you, other synesthetes, and
people wanting to know more about the condition to recognize how incredibly unique
everyone’s perspective is, and what a colorful gift synesthesia is.

Acknowledgements
I would like to acknowledge the many people that helped me through my thesis over the
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