

DYSLEXIA AS A RESOURCE FOR DESIGN

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ABSTRACT

Dyslexia as a Resource for Design outlines how the special human condition known as dyslexia can be re-conceptualized and used as a resource for interaction design methodologies. Although there are many challenges associated with dyslexia - there are many advantages - which can be adopted during the design process. By specifically targeting key visual strengths of the dyslexic condition, researchers and designers can look past its shortcomings and utilize this particular and reoccurring form of visual creativity.

To illustrate dyslexic resources this paper, re-conceptualizes dyslexic thinking and misnomers; theoretically discusses how dyslexia can tie into three seemingly unrelated design disciplines, i.e. E-Learning, Universal Access and Critical Design; discusses how three web-based case studies have utilized dyslexic creativity, (i) visualizing spelling creativity when mistaken for mistakes, (ii) using Dyslexic Visual Literacy when verbal literacy fails and (iii) through serendipitous visualization processes discovering 'possibility' where none was expected. Lastly, this paper briefly suggests how a non-dyslexic person can utilize Dyslexic Visual Literacy through the Dyslexic Prism - and in return, begin to use the dyslexic condition for inspiring creativity and innovation during the design process.

KEY WORDS

Methodologies, Disabilities, Non-Verbal Interfaces, Visualization, Creativity

1. Introduction

In 1975 the United States Congress passed the *Individuals with Disabilities Education Act*, and since then the United States of America has formally acknowledged that people with dyslexia are considered "Learning Disabled". [7] Not surprisingly, the HCI community has addressed this issue and taken the needs of dyslexic people into account. Multimedia technologies have proven crucial when reaching people who may struggle with verbally based technologies [8][13]. For example, the International Dyslexic Association features gamming technologies and high-resolution graphics to reach and teach dyslexic children by appealing to their visual skills. Visually based languages and technologies have played an important role in finding a way to reach a particular kind of user. [17]

This paper is not concerned with what HCI can do to assist people who are considered "Learning Disabled". The primary focus of this paper is concerned with what dyslexia

can do to assist HCI. Dyslexia and its highly developed visual competencies can extend the scope of creativity in design. By approaching dyslexia in this way, this special human condition can make important contributions to HCI, which until now has been a condition to remedy or correct.

People with dyslexia have strengths associated with their "disability". The strength is a highly developed visual competency or Dyslexic Visual Literacy (DVL). This paper observes dyslexia or DVL in three areas. First, it briefly discusses the functional mechanisms of visual thought - visual thinking, spatial ability, pattern recognition and creative problem solving. Secondly, this paper explores how DVL can influence seemingly unrelated design disciplines such as E-Learning, Critical Design and Universal Access. And lastly, this paper discusses three case studies in which a) dyslexia can be re-conceptualized as mistaken creativity, b) DVL can be used when verbal literacy fails and c) can be used to discover design solutions where there thought to be none.

2. The Challenges of Dyslexia

There are several basic challenges and difficulties a person with dyslexia must face. They include learning to speak correctly (pronunciation), organizing written and spoken languages (grammar), learning letters and their sounds (phonetics), memorizing number facts, spelling, reading, leaning foreign languages and correctly doing math problems [8][2]. These difficulties can be frustrating and obviously challenging for anyone, dyslexic or not. However, people with dyslexia are challenged at very young ages to learn prescribed verbal skills. This challenge arrives at pre-school as our society highly values verbal literacy and its traditions. In verbally literate societies dyslexic people are prescribed to think verbally and much of our natural visual development are left un nourished [16].

While non-dyslexics are able to grasp basic verbal skills with general ease, dyslexics are faced with a daunting challenge. This is not to say that people of non-dyslexic backgrounds are not challenged in early childhood. However, for dyslexic children, reading and writing is a very specific and difficult challenge. This challenge is sometimes so great that dyslexic children often suffer emotionally from low self-esteem and low confidence [13][2][8]. However, there are benefits [16].

Ironically, due to these early specific challenges of reading and writing, verbal traditions may have forced those with dyslexia to act creatively. Learning difficulties and the need

to surmount obstacles posed by verbal literacy creates well-practiced problem solvers, capable of discovery in areas where others have known discovery was possible. [19]

According to several sources [13][19][8][16], dyslexic people have multiple strengths associated with their “handicap”. These strengths include high energy, drive, ambition, willingness to work hard and the ability to focus for long periods of time on tasks that interest them. Ironically, these strengths – combined with many verbal challenges – collaborate to nurture creativity and to influence ‘out-of-the-box’ thinking. This contributes to sharpened problem solving skills. Thomas West, in his book, *“In the Minds Eye”*, explains that the “handicap” is the very mechanism that attributes to overcoming difficult challenges, which can produce great achievement.

“A handicap of one sort or another may intensify motivation, mold characters, or help one to learn many things, but it would appear to me wholly insufficient to explain the most towering and unexpected achievements, such as Einstein’s theories or Edison’s inventions. On the contrary, what is being suggested here is that for a certain group of people the handicap itself may be fundamentally and essentially associated with a gift” [19, p19].

3. The Advantages of Dyslexia

Although many researchers, neurologists, teachers and even parents may have diverse views on what dyslexia is – for better or for worse – and although dyslexia manifests itself in many ways in many different people; many researchers argue that most dyslexics do share one commonality. Time and time again, people with dyslexia often demonstrate enhanced and highly developed visual competencies. These developed visual competencies are not something learned later in life, these visual abilities are often developed naturally and at very young ages. Evidence of this can be identified in very young children before a traditional verbal education begins. [16][19]

Naturally developed visual competencies found repeatedly in the dyslexic condition are the advantages of being dyslexic. These highly developed visual competencies are apart of a larger literacy and the foundation of dyslexia as a resource for design.

Visual Literacy (VL) is a vast field of study. The meaning of VL varies due to impact it has on so many disciplines. In 1969, John Debes coined the term and his definition is as follows:

“Visual Literacy refers to a group of vision-competencies a human being can develop by seeing and at the same time having and integrating other sensory experiences. The development of these competencies is fundamental to normal human learning. When developed, they enable a visually literate person to discriminate and interpret the visible actions, objects, symbols, natural or man-made, that he encounters in his environment. Through the creative use of these competencies, he is able to communicate with others. Through the appreciative use of these competencies, he is able to comprehend and enjoy the masterworks of visual communication [18].”

In a very broad sense VL is the cognitive ability to read, digest and understand visual information/metaphors. To become visually literate, people do not have to be creators of art or graphical gurus, but there are challenges. Many people are visually illiterate due to society emphasizing education systems that bias verbal traditions [20].

Evidence of VL can be traced into the genius of human history – before the invention of verbal traditions such as the written word. Being dyslexic is nothing new in the spectrum of human history. In ancient societies, dyslexic visual competencies may have been well suited for daily survival, starlight navigation, hunting and gathering [16]. During the Middle Ages and Renaissance dyslexics were at an advantage in otherwise verbally illiterate societies. Only when society put a greater emphasis on verbal literacy (one hundred years ago) dyslexia became problematic [19].

4. Dyslexic Visual Literacy (DVL)

This paper entitles the natural visual competencies of dyslexia – Dyslexic Visual Literacy (DVL). DVL is an abstracted, perhaps, distorted version of VL. Unlike VL, which can be acquired and developed through a visual education – DVL is naturally acquired through being dyslexic. This visual ability is continuous and integrated into everything a dyslexic person does in daily life [14].

DVL has four key visual mechanisms – visual thinking, spatial ability, pattern recognition and problem solving. Subsequently, these mechanisms work in a non-sequential continuum that internalizes the creative interaction of an integrated cognitive experience afforded by vision - with or without the use of ocular vision - and does not require full consciousness [19][5].

Visual Thinking or pre-visualization, is the first mode of thought which, shapes, forms concepts, and metaphors, are associated and balanced, restructured, distorted, and manipulated. [19] An example of this can be observed through the dyslexic thinking of Alfred Hitchcock. He was able to pre-visualize his stories so well that, to him, the actual filming process seemed boring as the film was already completed [4]. Another dyslexic thinking was Albert Einstein who was also known for visual thinking practices, he stated:

“The words or the language, as they are written or spoken, do not seem to play any role in my mechanism of thought. The psychical entities, which seem to serve as elements in thought are certain signs and more or less clear images which can be “voluntarily” reproduced and combined.” [19, p.26]

Spatial Ability or understanding three-dimensional space is the second mode of thought that emphasizes the spatial relationship between objects and ideas. This mode of thought is evident in architecture, sculpture and even has its place on the athletic field. On the basketball court, Michael Jordan, another person with dyslexia, possessed a keen sense of spatial awareness [4]. His ability allowed him to jump or shoot the ball from long distances, balancing hundreds of variables, force, angle, spin, distance, timing, etc. all the while solving other variables such as location, the location of teammates and opponents [19][5].

Pattern Recognition is the ability to uncover relationships in unrelated data. In a basic sense, human pattern recognition is the ability to see similarities or differences between seemingly unrelated things. For the purposes of this paper, the word “unrelated” is key, because it signifies how people with dyslexia use this particular mode of thought. This does not imply that non-dyslexics cannot identify patterns in unrelated data [19][5].

Problem Solving in DVL is the creative usage of pattern recognition. These capabilities derive from observation, insight and the understanding of data that seemingly does not relate [19][5]. This aspect of DVL is not dissimilar from Gardener’s theory of spatial intelligence. Gardener argues that spatial intelligence is based on understanding three-dimensional space through problem solving – by focusing on more than one dimension of a problem, through cognition, visual/verbal metaphors, insight and reasoning. All of which could lead to a deepened wisdom [5].

DVL does two things for this paper; it recognizes dyslexic creativity and makes it available for designers to use within their methods. Until recently, design methods have mostly been dominated by verbal/sequential traditions. DVL does not intend to replace other design methods, but aims to enhance them. For these reasons, DVL is an important visual resource when aiming for creative problem solving and bringing seemingly unrelated design disciplines together. With higher visual competencies designers – dyslexic or not – could enhance the dynamics and rhetorical analysis of imagery through multimedia platforms, thus deepening their arguments or messages visually [11].

4.1 DVL and Universal Access

Universal Access provides opportunity when designing for “word blindness”. This paper takes a unique perspective in that the dyslexic condition can be re-conceptualized into systems and devices, which could be of general for all. UA has already proven that designing for “blindness” has proven useful for users who are not blind [3].

The discipline of Universal Access is widely known to be concerned with designing systems, services, technologies and telecommunications that include all people. Usability and usefulness are critical factors when reaching a vast user group [15]. Systems should be designed to allow information to be readily available and satisfy accessibility requirements set by socio-economics and politicians [10]. Devices and systems should be prepared to allow use in the broadest verity of contexts and situations in order to manage human diversity and abilities. These devices and services should be designed to include the most effective interaction methods as possible, to compensate for personalization factors and diverse user scenarios [3]. Commonly, this is particularly aimed at, not only the everyday users, but also, people with disabilities such as, the blind, the deaf and the elderly and dyslexic.

“Enabling communication with others and with your self can be considered the overall goal of HCI. People with “special needs” have no basic needs – what is special for them is that they have specific difficulties and consequently, needs for special solutions. But sometimes,

these solutions are of more general value – for all. [9, p.1]

Although Jonsson’s argument seems to address design needs for users with severe handicaps, he does make an important point that designing for one group of users could benefit all. For example, assisted audio technologies have been created to fit the requirements of the blind user and make accessibility possible. These technologies have been used elsewhere, in devices not intended for the blind. Consider the everyday driver – the activity of automotive driving creates a situation where the driver should not be looking at a computer or secondary console while driving. Assisted audio technologies, intended for the blind, has been re-used and adapted for the situational “blind” automotive driver [3], via audio satellite navigation, hands free devices and radio accessibility.

The search for a single configuration of systems and services is the exploration of new knowledge. [3] The true value of “*designing for all*” is that in the pursuit of challenges, difficulties and possibilities there are unforeseen opportunities e.g. designing for blindness. Designing to include every user, and those we label as “disabled” is “*not only a matter of good will*” but developmental in scientific and technological research. Simply, “*all necessary knowledge and technology is not yet available.*” [3, p215]

The pursuit of designing technologies for a particular highly visually literate group - the overall general value could be of more value for all. If researchers and educators stopped putting most of their energy in “correcting” the dyslexic condition, stepped back, and put their energy into cultivating the condition; then perhaps the dyslexic “disability” could be turned to benefit the vast majority of users who are visually illiterate [20] or those who have poor undeveloped visual competencies – designing for DVL can be used to benefit all.

4.2 DVL and E-Learning

E-Learning provides an interesting opportunity to explore how dyslexic special education experiences relates to new multimodal hand-on interactions and the learning experiences of our great grandfathers.

A platform usually intended for assisting people with dyslexia, new multimedia technologies are becoming an important field for visual proficiencies in design. For example, E-Learning is becoming an invaluable outlet for providing a habitat for visual information that combines multimedia, animation, video sound and graphics. E-Learning and digital media as a whole has created an important context to expand the potential of the visual language within E-Learning.

The strength of the E-Learning discipline is that it has used the visual material in a responsible way. The image should not be decorative (bad use), but rather the image should be explanative (good use) to the text [1][12]. Usually, the text is more or less dependent on the image and the image is more or less dependent on the text. This application is well validated, but this dependency can be limiting. The E-Learning discipline may not harbor this concept for it simply may not be the most efficient way to fulfill its goals. To expand the possibilities of the visual language - the

visual information needs to stand alone.

In many ways E-Learning is an example of a modern day bridge between verbal and visual forms of communication [1][20]. The experience is in the application and utilization of multiple languages – verbal and visual – but if less employed by the sequential/analytical values of verbal traditions and driven by visually based hands-on interactive multimodal experiences; then the overall E-Learning experience could be taken to new opportunities. This is especially prudent when transmitting knowledge in new ways without the aid of a teacher. The suggestion here is that the visual language/images are not better or stronger than the verbal language/words. The suggestion here is that in certain contexts, the image is more powerful in communicating through sensory cognitive skills. As technologies become more multimodal, the written word may not be enough or in some scenarios too much.

Multimedia technologies such as gaming, mp3 players, mobile communication, etc... are becoming more hands-on, visually based and thrive on learning through the experiences of the interaction, rather than, simply reading about its use in the system preferences, in books, pamphlets and manuals. Ironically, history is repeating itself through this shift to multimedia and multimodal experiences.

Historically, learning based on interaction is reminiscent of the learning experiences of generations past. Our great grandfathers lived in times when a verbal education was commonly reserved for the rich and privileged. Hands-on learning experiences, apprenticeships, skilled labor, working through daily repetition, or even “trial and error” experiments were all based on interactions of non-textual, hand-on activity [19]. This was the way to learn – through the experience of tactile interaction – perhaps the only way. Ironically, today’s interaction design disciplines are fostering apprenticeship like approaches for multimodal learning. Technology based societies - recently based on the verbal tradition - is returning to a seemingly interactive visual past of doing while learning.

Once again, people with dyslexia have an advantage. From very young ages they are commonly taught and schooled through doing [16]. To teach a dyslexic child verbal traditions some special education programs use methods that cater to visual proficiencies [13]. These visual competencies are reinforced through visual means, but also through sensory interactions such as spelling/writing on lunch trays filled with shaving cream and colored sand. The repeated integration of hands-on interaction into the learning process, not only mirrors that of an apprenticeship, but also reflects the importance to properly teach to the dyslexic condition. The implication is that a special education could have made dyslexic children be far better prepared, adapted to learn and interact as systems increasingly expand the dynamic of the visual language and as technologies increasingly become more multimodal, interactive and tangible [19].

4.3 DVL & Critical Design

Critical Design provides an important environment for dyslexic creativity to materialize. Design is primarily

developed through visual methods, which, in many ways, reflects the nature of being dyslexic. According to Gaver, Beaver, and Benford, in their paper, “*Ambiguity as a Resource for Design*”:

“Ambiguity can be frustrating, to be sure. But it can also be intriguing, mysterious, and delightful. By impelling people to interpret situations for themselves, it encourages them to start grappling conceptually with systems and their contexts, and thus to establish deeper and more personal relations with the meanings offered by those systems.” [6, p.1]

Frustrations are nothing new to anyone – especially people with dyslexia, but in certain contexts, ambiguity like dyslexia is resourceful. There are several beneficial, visually based aspects of ambiguity; engages the user without giving exact direction in how to respond; allows openness for the designer to be expressive, while enabling the user to discover his or her own interpretations and; ambiguity can be suggestive – it can stimulate the user’s imagination to overcome technical limitations of systems [6]. With these elements of ambiguity, interaction designers coming from traditions such as art, architecture, physiology, ethnology and even someone verbal learning difficulties can find CD particularly hospitable.

Critical Design utilizes the visual language in unique and dynamic ways. One reason for this is that designers of this discipline use the visual language in various areas the design process. The suggestion is that designers could learn from the dyslexic condition and utilize various elements of DVL when approaching design. Designers with highly developed visual competencies could explore the potential of higher forms of visual content throughout the design approach, method and product. When implementing complicated elements of the visual language such as ambiguity, the dyslexic condition is well acclimated.

In order to continue the discussion of ambiguity and dyslexia as resources for design, this paper explores three case studies created by the author. The following case studies are designed to highlight dyslexic creativity through ambiguous web-based visualizations as visual literature.

5. DVL Case Studies

These case studies fall at the creative end of the interaction design discipline; they are not traditional GUI representations; and they do not tackle traditional issues of HCI. In many ways these case studies are the result of a collision between verbal and visual literacy instigated by dyslexic thinking.

The first case study is “*ABCDyslexia*”, which demonstrates spelling mistakes as a form of creativity by contrasting the inexactness of words against the exactness of images. The second case study, “*La Teoria degli Spazi Antropologici*”, explicitly uses DVL in a classroom scenario - when verbal literacy was unavailable. The third case study, Unified Modeling Language, uncovers ‘possibility’ where none was expected, through serendipitous visualization processes.

ABCDyslexia

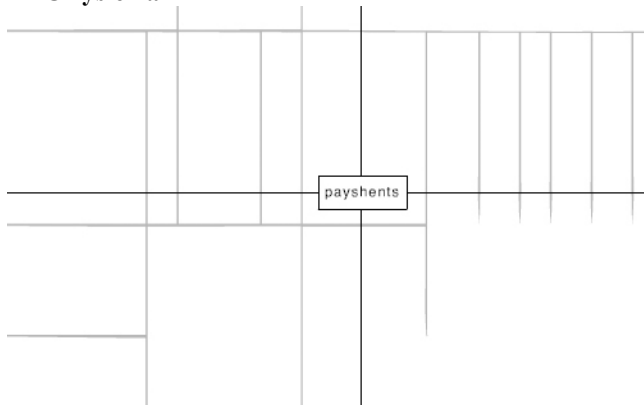


Figure 1. Still from ABCDyslexia: "Payshtens"

'ABCDyslexia' is designed to highlight how spelling mistakes can be considered small glimpses of creativity when associated with being dyslexic. This case study relates to earlier discussions that deal with challenging the notion of dyslexia as a condition to correct or remedy. This case study visualizes dyslexic creativity in the guise of a spelling mistake. The overall premise of 'ABCDyslexia' is to graphically and verbally dissect the expected functionality of the verbal language with the visual language by utilizing exact graphics with inexact word spelling. The following case study is supported by using graphics, tactile input, animations and sound via *'The Queen's English'*, See figure 1.

This case study can also be considered a satire between the pronunciation of *'The Queen's English'*, contrasted against the 'misspellings' of a dyslexic young adult. The content and context *'ABCDyslexia'* delivers a unique perspective into dyslexic creativity, one that is based on keyboard interactions that uncovers naturally occurring 'mistakes' during the writing process. The execution of this case study supports this concept graphically, interactively, with sound and animation.

Supporting concepts Graphically: Structure, precision, exactness, sharp edges, numbers, black and white colors were instruments to reinforce the environment of the verbal language when concerned with spelling. Counters on the top, bottom, left and right quadrant are placed to calculate exact location of each letter on the vector based map.

Supporting concepts Tactilely: The keyboard provided tactile feedback and enabled interaction with 26 English letters. Words are assigned to each letter e.g. when 'o' is pressed the word "ove" is displayed, when 'p' is pressed the word "payshtens" is displayed and so on. There is a distortion effect if multiple keys are pressed at once.

Supporting concepts with animation: Easing, sweeping, and slight inaccurate animations also assisted in supporting the goals of this case study. After the map image sweeps into place, the location never sets comfortably onto a corner or intersection. The final target destination of the animation stops a little outside or just off target. The suggestion is that there is something a bit off or something that needs to be adjusted, hinting that something is amiss, even though the graphic design layout seems structured.

Supporting concepts with Sound: Pronunciation as the *'The Queen's English'* and phonetics further supports the contrast between proper pronunciation and phonetic spelling. Although inaccurate to the crown, there is creativity in dyslexic spelling. After presenting this work to users, one English user suggested that these spelling mistakes seemed so incorrect that she admitted that she could not spell so inaccurately even if she tried. The suggestion here is that once a user learns one way of doing, that person finds difficulty seeing other avenues of doing.

With elements such as *'The Queen's English'*, precise graphics, keyboard interactions, pronunciation vs. phonetics metaphors, sweeping animations, and calculative numbers, the student was able to contrast the spelling tradition against the creative solutions in dyslexic spelling. This is often subject to being categorized as a mistake. This case study begins to demonstrate, *'Dyslexia as a Resource for Design'*, by using various multimedia elements to visually and verbally outline an abstract concept.

5.1 The Exam: University of Florence, Italy

The following two case studies follow the work of a former PhD student who is dyslexic. He attended the Università degli Studi di Firenze, Italia: anno accademico 2003–2006. The PhD student faced several obstacles, he was foreign, a native English speaker and not fluent with the Italian language. The student was responsible for informatics and computer engineering courses e.g. Java, Document Modeling, Web Services, UML, Semantic Web, etc. all of which were taught in the Italian language. These courses were followed by a final exam at the end of an eight-month period. Consequentially, he had to respond.

Instead of following written academic traditions, the student delivered a visual explanation of his findings or, visual literature based on his experiences. The submission was based on web and multimedia technologies including interactive photography, graphics and sounds.

Controversial at the time, the visual interactive submission or response to *"The Exam"* consists of eight lessons visually explained by non-traditional GUI. The dyslexic student was forced to find solution to a complex situation; he was taking a PhD in a new and foreign country, in a different culture of education, and was not proficient in the Italian language.

The following two case studies, *"La Teoria degli Spazi Antropologici"* and *"Unified Modeling Language (UML)"* ironically, is explained through verbal traditions to discuss its contributions to dyslexia as a resource for design. These are just two case studies out of eight total courses attended during the first year of his PhD. Further case studies of the *"The Exam"* can be found online at <http://adesignedpath.com/EXAM>. *Note: these case studies are not user-friendly and do not indented to be. Try to have fun and turn up your speakers.*

La Teoria degli Spazi Antropologici



Figure 2. Still from “La Teoria degli Spazi Antropologici”

“La Teoria degli Spazi Antropologici” is an example of DVL combining ambiguous graphics, animations and sounds to creatively respond to an exam. This case study is abstract and on the surface, does not make sense. That is the point. This case study is the manifestation of a lesson completely unabsorbed by traditional verbal learning practices and completely absorbed by DVL. See figure 2.

This course provided many challenges for the student; the language barrier and the content was so advanced that even the native Italian students had difficulty following the material. The student was completely lost. The only information obtainable was through his DVL. In order to respond to the final exam, he needed to be creative.

When he could not rely entirely on verbal literacy, information was absorbed through the visual means of the experience. In order to compensate for his lack of verbal understanding, the student relied on his visual competencies; hundreds of images were taken during the course, capturing everything from teachers, other students, computers, computer monitors, tables, keyboards, and power point slide presentations. All-available information was captured and recorded in fragmented bits. These became the student’s class notes - this included various sounds, squeaking of chairs, opening of doors and voices.

With these visual notes the designer stitched together the fragmented sound bits and photographs in order to capture the overall lesson of the experience. In this case study the student selected three images that best captured the expressive actions of his professor. These images were then randomized and animated in and out of transparency. In attempts to capture the way the professor explained himself to the class, the student spliced audio segments of the course and mixed them randomly to further resonate feeling of being lost in this experiences.

The professor had a wealth of information to teach, but the student was not able to grasp the original intentions of the lesson. With the creative configuration of visual and audio fragmented bits, the student discovered to find a creative way to solve a complex problem - respond to an exam only using DVL because the verbal competencies failed.

Unified Modeling Language (UML)



Figure 3. Still from “UML”

“Unified Modeling Language (UML)” is an example of learning through serendipitous visualization processes and the insight of primarily visual observations or DVL. This case study is based on learning something important when the lesson itself seemed to do nothing. Like the previous case study, “UML” uses visual information gathered in the classroom. See figure 3.

At first, the student did not feel that UML had anything to do with his pursuits. He thought that UML was for software engineers - and it is. Frustrated in having to report on this seemingly unrelated subject, the student created a UML flow chart of “Doing Nothing” because he thought learning UML does nothing for a future interaction designer.

To create a UML flow chart based on “Doing Nothing”, the student used a scenario to metaphorically encapsulate the experience of the lesson’s significance. The flow chart scenario begins with a “Person Sitting”, e.g. ridding on a bus, train or car. The flow chart describes the activities of a person sitting, while “Doing Nothing”. In the process of mapping the UML flow chart of this scenario, the student realized that people can do something while “Doing Nothing”. The flow chart goes on to model involuntarily bodily movements, the twitch, adjusting position, the passing of gas, the nose pick or the gaze off into the sunset. Then, in the process of “Doing Nothing” a person could have a “Realization”. Maybe that realization is that he or she is bored “Doing Nothing”. The UML flow chart scenario continues to the person who starts to consciously “Think” about what is going around them. In the process of “Doing Nothing” or UML not being applicable for an student interested in interaction design, led to a moment of Zen “Lao Tzu: Within Nothing, Everything Exists”.

In the process of addressing a topic, which seemingly did nothing, the serendipitous visual activities of the student enabled him to be productive while maintaining his creative ambitions, artistic expression and re-conceptualize UML in an abstract Zen-like way. But more importantly the student also learned something he did not expect, that something could be found out of nothing. Visual activities such as these demonstrate how DVL can be useful during the process of searching for design solutions.

6. The Dyslexic Prism

The Dyslexic Prism is essentially an altered perspective for designer wishing for another point of view. This can help initiate and influence designers within their existing design approaches and methodologies. To utilize DVL, the designer needs step back and to become pseudo dyslexic by practicing various sides of the Dyslexic Prism. The Dyslexic Prism has six themes; child-like view, backwards thinking, spatial senses, metaphor relationships, create obstacles and visual language.

DVL is essentially one mode of thought that visually blends metaphors, intuitively digests spatial relationships, and creatively sets the stage for emerging problems. DVL can be re-conceptualized to influence the designer, but there are fundamental obstacles.

Obstacles: The first obstacle is that the foundation of DVL starts from being visually literate, and unfortunately, visual illiteracy is socially accepted. The book “*VizAbility: Learn to Communicate Visually*” by Woolsey, Kim, Curtis [20] is a good starting point. The second obstacle is that a person without dyslexia is not dyslexic. Being dyslexic is a life-long condition, which over time creates well-practiced problem solvers.

The primary goal of the Dyslexic Prism is to break down sequential thought. The Dyslexic Prism is designed to be only a starting point for non-dyslexic designers practicing the potential of DVL. The following suggestions are subjective, but it has to be for the purposes of this paper. Ironically, the diagram is followed by a list in an ordered sequence, but there is no specific order. See figure 4.

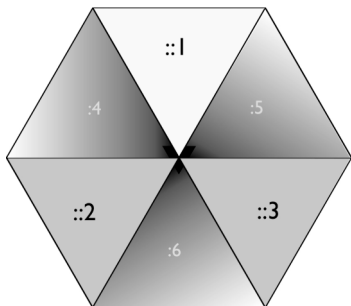


Figure 4. The Dyslexic Prism

::1 Being Dyslexic: (*child*) A childlike view of the world should never be underestimated. Immature activity is common amongst dyslexics. The goal is to look at something with fresh eyes.

::2 Visual thinking: (*backwards*) Practice non-sequential thought. Start at the end of an idea, project or activity and work backwards. The goal is to think out of sequence.

::3 Spatial ability: (*senses*) Try to navigate without the use of any technologies, GPS, street signs, maps or compasses. Only rely on your own sense of direction. The goal is to relay only what you can provide.

:4 Pattern Recognition: (*metaphors*) Turn on the TV and systematically flip through the channels never stopping for more than three seconds. Then with written observations create a story to explaining how these images relate to each other. The goal is to create stories from visual metaphors.

:5 Problem Solving: (*obstacles*) Find something you are good at then do it in several completely different ways. The goal is to produce the same quality of work and to discover that there could be better ways to reach the end of a goal.

:6 Being Visual: (*language*) Talk to a tree. Try to have a conversation based on your natural visual abilities. Perhaps this activity can give insight to show you just how far, you may be or may not be, from dyslexic visual thought.

The Dyslexic Prism in practice: Aspects of the Dyslexic Prism are being implemented at the Centre of Interaction Design, Napier University (UK). This author and interaction designer at the centre is utilizing the resources of this paper in an EC project called COMPANIONS. DVL has been applied to a new design-centered methodology entitled ‘*Designing by Lifestyles*’ (DBL). DVL is a part of DBL, which aims to utilize the various skills and talents of the designer. DBL is useful for the designer when making appropriate and critical decisions regarding the challenges and choices posed by the development of new multimodal, speech driven technologies that turns human companion interactions into relationships.

7. Conclusion

The author of this paper is dyslexic and his contributions to design are made evident though various theoretical discussions and interactive case studies. The objective of this paper is to highlight various strengths and contributions of this special human condition to design. UA – Since technologies intended for the blind have made important contributions “*for all*”, then word blindness could make important contributions for all. EL – Dyslexic special education methods relate to new multimodal hand-on interactions as technology and learning becomes more hands-on. CD – Although abstraction and ambiguity are often used in the fine arts, designers using dyslexia can continue to make significant contributions to the development of interactive technologies.

Over the centuries people with dyslexia have made major contributions to the arts and sciences; and within the design community people with dyslexia have already made significant contributions. The founder of the MIT Media Lab, Nicholas Negroponte is dyslexic and at the Media Lab, dyslexia is often called the ‘*MIT Disease*’ because so many of the researchers are dyslexic themselves [19]. The irony is that what is currently considered a “*disability*” - in future societies people without dyslexia may find themselves at a disadvantage as technology shifts to visual simulations of learning and more sophisticated means of interacting with devices and systems.

“*They (referring to dyslexics) may have had difficulty learning from books and lectures, but with future changes*

they may find themselves far better adapted to learning from simulations of reality as education and testing programs begin to emphasize interactive computer simulation over the verbal description of reality traditionally provided in books and lectures... In the near future, creative visual thinkers with some learning difficulties might very well find themselves far better adapted to certain fundamental changes.” [19 p. 12]

The contributions of this paper not only explores, discusses and demonstrates through various case studies that dyslexia is a resource for design - but more importantly, dyslexia should be viewed as a resourceful “ability” as opposed to a “disability”. Not for the simple reason of merely disassociating itself with a “handicap”, but rather to highlight and prepare for future hands-on design and interactive technologies. As society puts a greater focus on interactive visual technologies it will be those who are NOT dyslexic or those without developed visual competencies that could be experience a “handicap”.

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