

Bridging the Gap:
An Exploration of Visual Design Criteria Found in the
“Accessibility for Ontarians with Disabilities Act, 2005” (AODA)

Arezoo Motavally Abyazani

A Thesis submitted to the Faculty of Graduate Studies in
Partial Fulfillment of the Requirements for the Degree of Master of Design

Graduate Program in Design
York University
Toronto, Ontario

April 2019

©Arezoo Motavally Abyazani, 2019

Abstract

Information and communication technology such as World Wide Web have gradually become implanted in every aspect of individual's life such as education and training, employment, government, health care, and more. Web provides valuable resources and information for web users including people with disabilities and help them tackle several tasks that would otherwise need much more effort to be done. Accordingly, web accessibility creates a guideline with the aim of making the content of each web page available for a wider range of people with disability, has reached a new level of importance. For this importance, the government of Ontario passed a law titled the Accessibility for Ontarians with Disabilities Act (AODA), 2005, in which all internet and digital services must comply with accessibility guideline by 2025.

Several researchers show a gap between professional design work and technically driven accessibility design guidelines. One of the reasons for this gap is an absence of concern for visual design during the process of implementing accessibility guidelines. The aim of this paper is to bridge the existing gap between accessibility and visual design to improve the overall usability and functionality of the system. In order to achieve this, I first identify and explain the visual design related criteria of AODA guidelines, their requirements and their impact on accessibility design. Then I demonstrate my experiment with utilizing visual design elements through the implementation of visual design principles on two selected websites to create an accessible web page that is not only usable but also has an aesthetically appealing interface.

Acknowledgments

I would like to thank my supervisor David Cabianca for his time, guidance, and support. It was an honor for me to have him as my supervisor.

I would like to thank my advisor Angela Norwood for her patience and guidance as well as being part of my supervisory committee.

I would also like to thank my friends specially Sepideh Fallahian and my family for their support in my journey.

Finally, and most importantly, huge thank you to my husband Amin, who has always stood by me and without his support this thesis would not have been possible.

Table of Contents

Abstract	ii
Acknowledgments	iii
Table of Contents	iv
Introduction	1
Aim of Study	3
Web Accessibility	4
Accessibility for Ontarians with Disabilities Act (AODA)	6
AODA and Existing Problems	8
Three Views of Aesthetics	10
Two Views of Interface Design	10
Aesthetics versus Usability	12
Visual Design and Accessibility	14
Visual Design Elements and Principles	16
Theoretical Frameworks	19
Introduction	19
Visual Structure	19
Typography	21
Colour	23
Visual Exploration	24
Content Rearrangement	27
Type	28
Shape	29
Colour	30
Conclusion	31
Future Consideration	32
References	33
Appendix	38

Introduction

Web use continues to increase in daily life. It provides valuable resources and information for people in many different aspects such as education and training, employment, government, commerce, health care, recreation, workplace interaction, and more. Web users including disabled people can conveniently tackle several tasks that would otherwise need much more effort to be done such as e-learning, e-commerce, e-government and etc. In order to facilitate a web system that all forms of public can make use of, web accessibility in particular has reached a new level of importance.

Web accessibility principles make the content of each web page available for a wider range of people with disability, which includes restrictions or limitations of any kind, such as impairment of speech, vision or hearing, cognitive restraint, aging, etc. These principles have been of significant concern to the degree that the government of Ontario passed a law titled the Accessibility for Ontarians with Disabilities Act (AODA), 2005, in which all internet and digital services must comply by 2025 (Government of Ontario, 2015).

Very often websites that emphasize accessibility appear overly simple and without any recognizable design style (Mbipom & Harper, 2011). Several researchers show a gap between professional design work and technically driven accessibility design guidelines (Regan, 2004, Henry, 2002). One of the reasons for this gap is an absence of concern for visual design during the process of implementing accessibility guidelines.

The historical progress of interface design for information systems shows two common schools of thought (Cyr et al., 2009): One emphasizes that system performance should be the primary goal of design. In this view, usability of the system that stresses behavioral or cognitive attributes becomes a key issue (Babu et al., 2010; Palmer, 2002; Reber et al., 2004; Teo et al., 2003; Venkatesh et al., 2012). The second school of thought focuses on hedonic aspects of human-computer interaction (HCI) and addresses human needs such as affect, emotion, and user experience. Agarwal and Karahanna believe that this aspect should be considered equally important along with usability to achieve successful information systems (Agarwal and Karahanna, 2000; Beaudry and Pinsonneault, 2010; Schrepp et al., 2006).

Therefore, visual design for a website or an information system is important. It has the potential to have an impact on user's behavior and responses through its effect on a person's cognitive processes (Adikari et al., 2009; Cyr et al., 2010; Cyr et al., 2009; Cyr et al., 2006).

As noted earlier, accessibility standards are mainly focused on improving the usability aspect of information systems based on research studies that primarily concentrate on user experiences on how to enhance user satisfaction and pleasure of web systems (Nielsen, 1993, Shneiderman, 1997). Other aspects such as visual design and its effects on human cognitive attributes are often neglected. This avoidance causes the wrong assumption among web designers that accessible websites end up with boring designs and that accessibility guidelines constrain creativity (Regan, 2004).

Moreover, with the change in point-of-view from functional concepts to an emphasis on a website's "look and feel," researchers have revisited the role of usability as the only quality for evaluating web systems. They concluded that usability alone, at least as it is currently conceived, is not enough for ensuring high quality user experiences and suggested one should look beyond function (Dillon, 2002, Bevan, 2008). Although, these studies determined that accessibility guidelines are not a limitation for designers' creativity, designers continue to avoid engaging in design accessibility. For example: Designers are not properly familiar with accessibility guidelines and what is approved as a graphic design work for a Web site may present a difficult challenge for usability of system based on accessibility guidelines. Accordingly, design critiques for accessibility considerations may in turn suggest significant rework of the graphic design, possibly necessitating a complete redesign of the site which cause, accessibility guidelines to be seen as limitation of creativity.

Aim of Study

With regards to the afore-said urgency of web accessibility as well as the gap in the literature between visual design and accessibility, in this research I intend to bridge this existing gap to improve the overall usability of the system. In order to achieve this, I will first identify and explain the visual design related criteria of AODA guidelines, their requirements and their impact on accessibility design.

Then I will experiment with utilizing visual design elements through the implementation of visual design principles on two selected websites to create an accessible webpage that is not only usable but also has an aesthetically appealing interface. In this research, I will address how graphic design can be used to improve the usability and functionality of web systems in a visually pleasing and accessible format.

Web Accessibility

One of the best definitions of web accessibility is described by the Web Accessibility Initiative of World Wide Web Consortium (2018). It notes, “Web accessibility means that people with disabilities can perceive, understand, navigate and interact with the web, and that they can contribute to the Web” (W3C_Web Accessibility Initiative, 2018). Indeed, the concept of inclusion for web accessibility refers to those with a disability, restrictions, or limitations of any kind. These users should have the right to be accommodated freely and openly when accessing online services and platforms.

Web accessibility guidelines and AODA principles target three main objectives in any web application:

- **Appearance:** defined by applying a new look and feel to the user interface (UI) with the focus on improving usability and the user experience (UX).
- **Functionality:** defined by improving how users navigate and interact with the site with complete satisfaction or what is referred to as user experience (UX) by enhancing usability, accessibility, and pleasure.
- **Content:** defined by improving the quality and the amount of any information that may be found on a web page or web application, including text, images, forms, sounds and any language that define the structure, presentation, etc. (Government of Ontario, 2017).

It is rather important to note that although the focus of web accessibility particularly focuses on website design for disabled or impaired users, such a design strategy can be beneficial for all users.

The web infrastructure and implementation have a great potential to provide to all people. Tim Berners-Lee, W3C Director and inventor of the World Wide Web, stated in 1997: “The power of the Web is in its universality.” (W3C_Web Accessibility Initiative, 2018). “Universal design” is the process of designing products (devices, environments, systems, and processes) that are accessible by people with different types of abilities, functioning within the widest possible range of situations (environment, condition and circumstances) (Henry et al., 2014). Universal design has correlation with approach called inclusive design which consider human diversity with respect to ability or other form of human differences (culture, language, gender, age and

etc.) during the design process to create wider beneficial impact beyond the intended beneficiary of the design (Inclusive design research center, n.d). All these approaches consider how technology can be accessible to and usable by people with a wide range of abilities, ages, economic situations, education, geographic locations, languages, etc.

While accessibility mainly focuses on design for people with disabilities, recent enhancements in accessibility benefit everyone especially users with situational limitations including device limitations and environmental limitation (Henry et al., 2014). For example, captions for videos provide important audio content to people who are deaf, meanwhile, non-disabled users can benefit from it in certain situations, such as being in a quiet environment (e.g. library).

Accessibility for Ontarians with Disabilities Act (AODA)

As noted in the introduction, most activities in the areas of communication, employment, and education have some Online component. Unequal access to web systems negatively impacts people and especially those with disabilities. Therefore, several legal and educational initiatives such as “Web Content Accessibility Guidelines (WCAG) 2.0” (World Wide Web Consortium, 2008) have been taken to make web developers, user interface designers, and any provider of Information Communication Technology (ICT) resources, integrate accessibility parameters into their web designs.

The Ontario government has already set up a standard guideline in 2005 under WCAG through the “Accessibility for Ontarians with Disabilities Act (AODA), 2005,” to assure that all residents living in the province of Ontario have legitimate and equitable access to all online services and information (Government of Ontario, 2015). All internet and digital services must comply with the AODA regulations by 2025. The AODA became law on June 13, 2005, and applies to all levels of government, non-profits, and private sector businesses in Ontario. AODA aims to “identify, remove, and prevent barriers for people with disabilities” (About AODA, n.d.). “Barrier” is defined as anything that keeps a person with a disability from fully participating in society or accessing any information and services due to lack of web-accessible design. AODA defines the Ontario human right code definition of “disability” as:

- any degree of physical disability, infirmity, malformation or disfigurement that is caused by bodily injury, birth defect or illness and, without limiting the generality of the foregoing, includes diabetes mellitus, epilepsy, a brain injury, any degree of paralysis, amputation, lack of physical coordination, blindness or visual impairment, deafness or hearing impairment, muteness or speech impediment, or physical reliance on a guide dog or other animal or on wheelchair or other remedial appliance or device
- a condition of mental impairment or a developmental disability
- a learning disability, or a dysfunction in one or more of the processes involved in understanding or using symbols or spoken language
- a mental disorder, or

- an injury or disability for which benefits were claimed or received under the insurance plan established under the Workplace Safety and Insurance Act, 1997
- an injury or disability for which benefits were claimed or received under the insurance plan established under the Workplace Safety and Insurance Act, 1997

The AODA guidelines are structured around four major principles (perceivable, operable, understandable and robust), broken down to twelve guidelines (Table 1), that address different types of disabilities such as sensory (e.g. hearing and vision), physical (e.g. limited use of hands), and cognitive (e.g. learning disabilities) to ensure all content is accessible to as many people as possible (World Wide Web Consortium, 2008).

AODA and Existing Problems

Accessibility standards and requirements are mainly focused on improving the usability of web content rather than on aspects of visual design. Although existing research should improve accessibility, there are still many challenges in applying AODA guidelines when it comes to visual design. These challenges are primarily based on a poor understanding of the relationship between accessibility, usability and visual design by web design community.

In recent years, many designers and developers were introduced to the tenets of accessibility through guidelines such as AODA, WCAG or section 508 of the Rehabilitation Act in the US. Designers often associate an accessible web design as “boring design” and assume that accessibility guidelines limit their creativity. The absence of a connection between designers and accessibility promoters represents the greatest failure of accessibility (Regan, 2004). Hence, there is a need to encourage web designers to bring their creative and innovative power to bear on the challenge of accessible design. Likewise, the accessibility community needs to value the power of design and to promote a culture of innovation and creativity. Bridging the gap between accessible standards and design work requires designers to become engaged participants.

Some of the challenges in achieving accessible designs according to Regan (2004) and Henry (2002) are:

- Designers design web systems without considering disabled web users in mind
- As different studies have shown, the guidelines are complicated and unclear
- Accessibility is a process that needs a proper amount of time to understand
- New design approaches and techniques are needed
- Lack of sufficient skills and money on the part of web developers

Moreover, research done by Petrie and Bevan (2009) argues that accessibility should be considered as a new challenge by designers and implementers with the focus on effects of visual design elements and principles, to not only enhance the usability of a system but also to design an interesting and appealing look for all types of

users. It may very well be the area that designers can use their creativity to not only improve usability but also the aesthetics of an accessible website.

Three Views of Aesthetics

There are three general views around aesthetics: objective, subjective and interactionist (Xu, 2013). The objective view looks at beauty as a property of an object that produces a pleasurable experience in any human perceiver, and it is a function of certain attributes of an object. Early studies on objective beauty tried to identify properties of an object such as order, balance, proportion, novelty contrast, clarity, simplicity, complexity and so on to influence aesthetics (Saw & Osborne, 1968; Krufft, 1994). The subjective view suggests that beauty resides with the subject and not in object. From this perspective anything can be beautiful as long as it pleases an individual's senses (Saw & Osborne, 1968). Finally, the interactionist view is placed between objective and subjective views. It suggests that beauty emerges from the relational connections between subject and object (Santayana, 1955).

Two Views of Interface Design

As previously stated, in web design, two schools of thought concerning interface design exist. The first relies on HCI research that has focused on objective performance criteria such as the effectiveness and efficiency of interaction (Norman, 2004). The second school of thought, developed over the past decade, focuses on an experiential point of view and attempts to assist users and meet their needs beyond utility and usability (Tractinsky et al., 2000; Beaudry & Pinsonneault, 2010; Xu, 2013). This point of view is based on a number of research findings highlighting the positive effect of visual design and aesthetics on human cognitive performance. For instance, a study by Tractinsky et al. (2000) reveals a strong relationship between usability and aesthetics and demonstrate that IS aesthetics have strong effects on the pre-use perceptions. More recently, one study has found that emotions such as excitement, happiness, anger and anxiety that arise through information systems usage could be affected by aesthetics (Beaudry & Pinsonneault, 2010).

Moreover, HCI research suggests that visual aesthetics can play a part in usability, trust, ease and effective learning, system performance, and a motivation to learn (Mbipom & Harper 2009; Robins & Holmes, 2008).

Visual aesthetics will lead to user satisfaction, product preference, loyalty, and enjoyment (Van der Heijden, 2003; Dillon, 2002).

Aesthetics versus Usability

Usability is defined in ISO 9241 as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use” (International Organization for Standardization, 1998). In the context of web design, usability is the quality of user’s overall experience of a web system with respect to ease of learning, ease-of-use, and user satisfaction (Rosson and Carroll, 2002).

Though the value of aesthetics was overlooked before the first quarter of the 20th century, this view has changed over the years. Aesthetics were introduced as a value into artifact design by industrial designers Richard Dreyfuss and Raymond Loewy, who promoted the value of aesthetics as key to promoting mass production. Designers viewed aesthetics to be of such importance to the point where it became a concern that such an over-emphasis would lead to a “style over substance” design. Consequently, research has shifted from an emphasis on aesthetics back towards focusing on usability and product functionality (Xu, 2013).

It was through this shift in awareness of usability in the ’70s where HCI started to promote the notion of usability over aesthetics (Xu, 2013). Subsequently, following the 1980s, usability engineering became a fundamental part of HCI. In fact, a considerable research was done in this field to develop a series of usability heuristic that act as guidelines, requirements and tools to help evaluate user interfaces (Neilsen, 1993) (Table 2), with great emphasis on usability aspects as an influential factor on users’ perception to help design a better information systems (Nielsen 1993, Hartmann et al., 2008; Schrepp et al., 2006).

From the 1980s to the early 2000s, a fissure gradually developed between aesthetics and usability in HCI. While aesthetics were considered to be subjective, the information systems discipline viewed usability as an objective measure of the system that valued efficiency and effectiveness as its primary criteria. In short, the value of aesthetics was less respected than objective characteristics (usability) due to the perceived difficulty in measuring subjectivity (Xu, 2013). Following this period, a series of studies were completed to demonstrate the relationship between aesthetics and usability and to bring back aesthetics as an important characteristic in

designing a reputable IS. For instance, studying automated teller machines, researchers have revealed that users find the aesthetics of the interface just as important as its usability (Kurosu & Kashimura, 1995; Tractinsky, N., Katz, A. S., & Ikar, D. 2000). Today, there are a significant number of studies available that examine the true relationship between aesthetics and usability in HCI that lend support to the idea that beauty and functionality are not mutually exclusive (Tractinsky et al., 2000).

The relationship between aesthetics and usability is so strong, that it is described by social psychologists as having a “halo effect.” The halo effect refers a theory that humans tend to believe that attractive people hold better values than others (Dion et al., 1972). Similarly, the same idea is valid for web systems in which well-designed, attractive user interfaces, at the first stage of interaction, are perceived to be more valuable and with more positive qualities. As technology has expanded in recent years, the functionality of a product is expected by users. A pleasurable experience is necessary for user satisfaction. By carefully applying visual design elements and principles to design of a website interface, user experience can be both functional and aesthetically pleasing.

Visual Design and Accessibility

Researchers have now recognized that usability is no longer the only primary factor of user satisfaction (De Angeli et al., 2006; Hassenzahl, M. 2018, Tractinsky et al., 2000). More importantly in this modern era of technology, usability is considered a given quality for every system and good visual aesthetics can be helpful to improve the effectiveness of products including web systems (Liu, 2003). Researchers suggest that we should look at web systems beyond usability. (Dillon, 2002. Bevan, 2008). For example, Dillon (2002), underlines three key levels that users encounter while interacting with web systems:

- Process: is what the user does such as navigation through the website, use of particular features, search, etc. This helps understand user actions, attention and difficulties through interacting with a web system.
- Outcome: is what users achieve by completing a task at the end of the interaction which allows a better understanding of what it means for users to feel a sense of accomplishment.
- Affect: is what users feel which is related to the concept of satisfaction from usability, but it goes beyond that. It also includes all reactions and emotions of users such as feeling annoyed, enhanced or confident. It acknowledges a user's emotional interaction.

From the research above, one can conclude that there has been a change from a functional concept (computers as tools for cognition) towards an experiential concept (computers as a medium for emotions, sociability, and pleasure) in designing web systems. In other words, the interface "look and feel" gradually gains more importance due to its capability to engage the user to experience pleasant interactions and create effective responses.

Mbipom & Harper (2011) investigated the interplay between web aesthetics and accessibility. They surveyed fifty web pages based on Lavie and Tractinsky's classical and expressive web aesthetics framework (2004). "Classical" aesthetics stress order and clarity in design and is defined by adjectives such as "clean," "clear," and "organized." "Expressive" aesthetics emphasizes the designer's skill and is described by adjectives such as "creativity," "originality," "sophistication," and so forth. The results showed web pages categorized as

classical design related to visual design principles such as hierarchy, clarity and orderliness. These websites were perceived to be aesthetically pleasing and easy to use with a positive relationship with accessibility. Mbipom & Harper showed that these visual design principles have a strong correlation with accessibility. Their findings may be used to guide designers to consider these principles in creating an aesthetically appealing and accessible usable system.

As this study focuses on exploring the gap between AODA guidelines and visual design, the next chapter is dedicated to the examination and description of visual design and its potential value in designing an accessible website. It will also explore how applying visual design elements and principles according to accessibility guideline recommendations can create a usable and accessible web interface with an attractive appearance. Furthermore, this paper attempts to engage the design community with accessibility challenges. Such challenges can be seen as positive contributing factors and help to illustrate the substantial role of graphic designers as visual design experts in the early stages of web system design.

To achieve the above, I will select two websites that have not considered visual design related standards listed in AODA guidelines: George Brown College and SickKids Hospital. I will then redesign the interface of their home pages by applying a number of relevant visual design principles and techniques to attain two sample designs that follow visual design related accessibility guidelines. I will show that these two samples are both usable and visually appealing. My goal is to propose to designers that accessible design is not an obstacle that limits creativity.

Visual Design Elements and Principles

Designers use their visual design skills to enhance the experience of the user, with the intent of engaging their cognitive processes by grabbing attention, guiding the eye movement on the page, elicit emotion, etc.

(Edwards, 2004; Krug, 2014; Lidwell et al., 2010). Visual design incorporates a set of elements which are hierarchically related and principles that create a pleasing visual structure. Below is the list of these elements and their brief definition (Usability.gov, n.d.):

- Lines: connect two points and can be used to create shapes, pattern, and textures. All lines have a length, width, and direction.
- Shapes: are self-contained areas. To define the area, the graphic artist uses lines, differences in value, colour, and/or texture. Every object is composed of shapes.
- Colour: palette choices and combinations are used to differentiate items, create depth, add emphasis, and/or help organize information. Colour theory examines how various choices psychologically impact users.
- Texture: refers to how a surface feels or is perceived to feel. By repeating an element, a texture will be created, and a pattern will be formed. Depending on how a texture is applied, it may be used strategically to attract or deter attention.
- Typography: refers to which fonts are chosen, their size, alignment, colour, and spacing.
- Form: refers to three-dimensional objects and describes their volume and mass. Form may be created by combining two or more shapes and can be further enhanced by different tones, textures, and colours.

A successful web system design is created by applying fundamental elements of visual design and effectively implementing visual principles to create its form. The visual design principles are (Usability.gov, n.d.):

- Unity has to do with all elements on a page visually or conceptually appearing to belong together. Visual design must strike a balance between unity and variety to avoid a dull or overwhelming design.
- Gestalt, in visual design, helps users perceive a unified shape as opposed to individual elements. It is related to human eye and brain function. If the design elements are arranged properly, the Gestalt of

the overall design will be very clear. This principle is important as it helps users separate different parts of a website by grouping related content together.

- Space is “defined when something is placed in it,” according to Alex White in his book “The Elements of Graphic Design”. Incorporating space into a design helps reduce noise, increase readability, and/or create illusion. White space is an important part of your layout strategy.
- Hierarchy shows the difference in significance between items. Designers often create hierarchies through different font sizes, colours, and placements on the page. Usually, items at the top are perceived as most important.
- Balance creates the perception that there is equal distribution. This does not always imply that there is symmetry.
- Contrast focuses on making items stand out by emphasizing differences in size, colour, direction, and other characteristics.
- Scale identifies a range of sizes; it creates interest and depth by demonstrating how each item relates to each other based on size.
- Dominance focuses on having one element as the focal point and others as subordinate. This is often done through scaling and contrasting based on size, colour, position, shape, etc.
- Similarity refers to creating continuity throughout a design without direct duplication. Similarity is used to make pieces work together over an interface and help users learn the interface quicker.

Although the AODA guideline’s greater focus is on usability, there are a few criteria that address visual design. For instance, AODA stresses that web-based content and interface components must be presented in ways that all users can perceive, even if they have impaired vision or hearing. Another example is the content of web pages should be understandable and clear for all kind of users especially those with cognitive issues (World Wide Web Consortium, 2008). But these notions are very often neglected by designers and developers in early stages of design.

A study done by Friedman and Bryen (2007) tested 100 websites with 51 disabled users revealed that cluttered and complex page layouts, poor contrast between background and content, and too small a text size were common obstacles. These results were insightful and provided valuable information on how to improve accessibility for these particular users, and also identified a key role that graphic design could play in the process.

Theoretical Frameworks

Introduction

The internet has become the essential source for obtaining information and resources. Websites are the easiest and most available form of information exchange that one can access. Unfortunately, some websites cannot be used efficiently by users with special needs owing to a lack of design consideration for accessibility. Websites that consider accessibility are often functional but uninspiring. It is possible that this could be improved with increased focus on visual design principles and techniques.

This thesis focuses on exploring the visual design measures of AODA guidelines and suggest potential ways to improve usability in accessible websites by employing proper visual design principles. I will demonstrate that such guideline recommendations should not be viewed as limiting for designer ingenuity. After an in-depth study of all AODA guidelines, I have extracted the visual design related principles (Table 3). These principles are divided into three visual design concepts: Visual Structure, Type, and Colour. In the following section, I will explain them and their significance with regard to accessibility.

Visual Structure

The intent of this criteria is “to ensure that information and relationships that are implied by visual or auditory formatting are preserved when the presentation format changes” (World Wide Web Consortium, 2008).

According to web accessibility initiative, two types of disability groups benefit from having a clear structure,

- 1) People with low vision, who use screen magnification and only perceive a portion of the screen at a time,
- and 2) Individuals with cognitive and learning disabilities.

Visual structure is important to the organization of vital web components such as content, navigation, and interface elements (Baguma and Lubega, 2008). It is necessary to establish a clear relationship between these elements to achieve an effective layout and workflow. Page layout is defined as “the art of manipulating the user’s attention on a page to convey meaning, sequence and points of interaction” (Tidwell, 2010). The main

goal of layout is to guide users to obtain the information they require, easier and more freely. This is attained by appropriately applying visual principles such as hierarchy, unity, and gestalt on web visual elements.

In the AODA guidelines, however, the suggested methods associated with the principles above are cited without much explanation as to why and how to apply them within the visual design context. For example, according to Web Content Accessibility Guideline 2.0 (World Wide Web Consortium, 2008), sighted users understand structure and relationship of web content through different visual cues/arrangements such as (1) use of large and bold fonts for headings, (2) use of blank lines to separate them from body text, (3) use of bullets for listed items, (4) considering space to separate paragraph or content from each other, (5) organizing the related content in the same area and same level rows and columns, and (6) use a different font family or bold weights, italics, or underlines for content that has special status. These guidelines support assistive technology and screen readers for those who depend on them, but do not enhance the usability through visual design (Friedman and Bryen, 2007). Applying the appropriate visual design methods through visual design mechanisms could create a web system design that would lessen the need for expensive assistive technology.

Designing good visual structure benefits people with cognitive issues such as deficiency in memory, perception, problem solving, conceptualization, and attention as complex and cluttered pages demand a higher level of cognitive function (Williams & Hennig, 2015; Friedman & Bryen, 2007). For example, users may face difficulties in making the right decisions when facing a lot of menu options, distinguishing foreground (image and text) from background, or understanding and following the text and navigation and other relative components on the web page (Friedman & Bryen, 2007). Therefore, understanding visual design structure and related principles at the early stage of design can be beneficial to improve the usability of the system for this group of individuals in order to perceive the content of webpage better.

In the recent years, cognitive disability has become a critical focus of research for accessibility advocates because, for instance, the Unites States of America alone has a population of over 22 million people with cognitive issues (Friedman and Bryen, 2007). This population is mostly impacted by web visual structure.

Research done by Friedman and Bryen suggested 22 design recommendations (Appendix B, Table 4) based on highest voted problems faced by people with cognitive issues. Their recommendation covered elements of “text size and shape, consistency of navigation and page design, use of icons, picture text writing, style, margins, hyperlinks, line spacing, and screen layout.” It turned out, the highest rated problems ranked by individuals with cognitive challenges were related to the visual structure of the pages. It is a problem which could be improved by considering precise visual design principles by designers at the beginning stage of design.

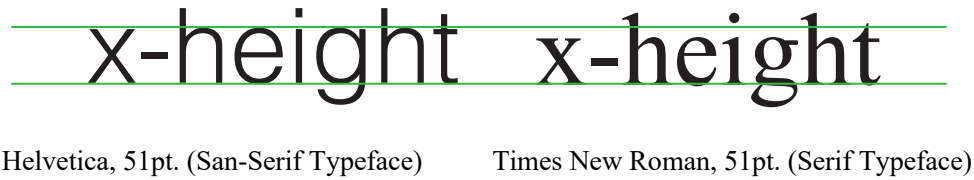
Typography

Typography is an essential part of interface design for web pages. Good typography helps readers distinguish between text and image, headlines, and less significant blocks of text. The intent of this criterion, according to associated accessibility guidelines, is “to provide enough contrast between text and its background so that it can be read by people with moderately low vision” (World Wide Web Consortium, 2008). Reading difficulty is one of the prominent limitations experienced by the large and growing number of elderly people with age-related vision loss (Arditi, 2004).

Using magnification is one of the techniques that low vision people can use to enlarge the text on the screen. However, magnification enlarges the text so much that the number of letters in the reading field decrease which then may decrease the speed and comprehension of reading.

A properly applied typographic technique can increase “readability” and “legibility” and provide clearer access to content while minimizing the need to use any assistive technology such as magnification (Arditi, 2004). Readability is about the relative ease at which one can read words, phrases or blocks of text. Legibility is a quality of how easy it is to characterize one letter from another in a specific typeface. Readability is achieved by changing text size, weight, kerning, and spacing or line height. Factors in typography that improve legibility

are the quality of the typeface, absence or presence of serifs, and x-height – the space between the baseline and the mean line of lowercase letters in a typeface (Figure 1).



Helvetica, 51pt. (San-Serif Typeface) Times New Roman, 51pt. (Serif Typeface)

Figure 1: x-height

AODA guidelines recommend that text size should not be less than 14pt for the body and 16pt for the headline, and that sans serif fonts are more legible than those with serifs. In addition, the guideline provides a list of suggested sans serif typefaces such as Helvetica, Arial, Univers, and News Gothic as recommended by the National Institute on Aging and The National Library of Medicine who help designers make their websites accessible for seniors.

Implementing foundational typographical principles such as hierarchy and contrast in the process of accessible design, will help improve the usability for not only low vision disability people but also those with cognitive challenges.

Colour

Colour plays a fundamental role in design of web content which helps with enhancing aesthetics appeal, its usability, and accessibility. Since colour gives richness to the visual world, colour is highly considered in designing the visual structure of an accessible web system (Yang et, al. 2004). The intent of this criterion is to guarantee that all users can perceive all of the information that is shown through colour variations in a web page. However, individuals that do not see colours or have partial eyesight with limited colour vision will be unable to perceive information that is delivered by only use of colour.

Low colour contrast is one of the most quantified issues among disabled people which requires a higher level of attention and research. In fact, Ware, in his book Information visualization: perception for design (2012), states that 10% of men and 0.1% of women suffer from colour deficiency. He explains that the lack of long-wave-sensitive cones and medium-wave-sensitive cones contribute to missing the red and the green channel, a condition called deuteranopia (Ware, 2012). The use of rich colour for main content may cause people with colour deficiency to suffer from misinterpretation, the true meaning, and level of importance of information (Yang et al., 2004). Some colour-deficient individuals may not be able to see specific colours if there is not enough contrast with other colours. The figures below illustrate the deuteranopia phenomena (Figures 2&3).

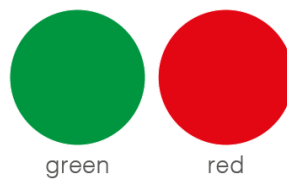


Figure 2: This is how non-colour-blind people detect green and red



Figure 3: This is how colour-blind people see green & red

Thus, there are two core notions regarding use of colour in accessibility: (1) Information delivery, and (2) Sufficient contrast with the focus on visually impaired people including colour blind and elderly individuals

with low vision (World Wide Web Consortium, 2018). Colour implemented with visual design principles, can create harmony and balance in the web page and engage users. Balance plays an important role in perceived usability and appeal of a website and facilitates a psychological sense of equilibrium (Lauer & Pentak, 2002). Designers, by effectively utilizing this visual design element can improve accessibility, inherent, perceived usability, and the look of web page for all types of users.

Visual Exploration

I have selected a total of thirty Canadian websites (Table 5). These websites were selected from various categories ranging from financial, public, retails, and educational organizations. I then examined accessibility errors on these websites via an online tool called “AChecker” (<https://achecker.ca/checker/index.php>).

AChecker is an evaluation tool for web developers to assess the accessibility of a website and is recommended by the Web Accessibility Initiative as a dependable source (Web Accessibility Evaluation Tools List, 2016).

After a careful evaluation of each website via AChecker, the number of errors related to visual design of web accessibility guidelines were recorded in to identify the most defective websites (Table 6). Following this, with consideration of usability, I selected two websites: George Brown College (Figure 4) and SickKids Hospital (Figure 5).

In the next step, I have chosen three major visual elements commonly used in interface design. These elements are type, shape, and colour. I then carefully applied a number of related visual design principles on these elements to explore and produce two completely redesigned home pages. Below, I will describe each phase in detail.

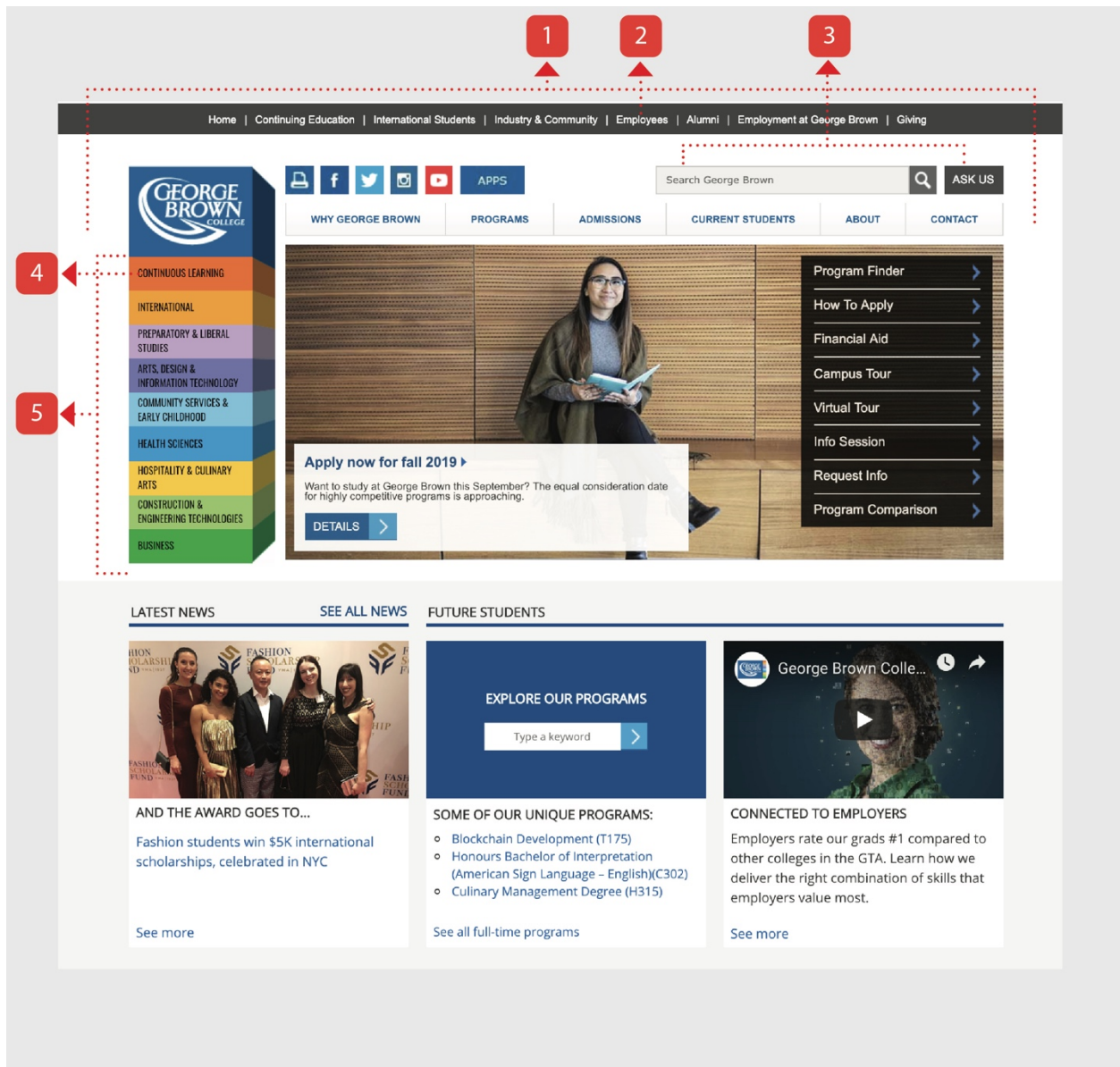


Figure 4: George Brown College, accessed September 10, 2018

1. Cluttered top navigation bar consisting of too many items.
2. Readability: Improper tracking between characters in top navigation.
3. Repeated contents and options with the same functionality.
4. Legibility and readability problem in left menu: No proper use of typeface and weight.
5. Use of too many colours on page causing distraction.



Figure 5: SickKids Hospital, accessed September 10, 2018

1. Cluttered header consisting too many menu options.
2. Lack of enough contrast between items and their background in secondary menu.
3. Use of small font size and lack of enough contrast between main menu text and its background.
4. Presenting too much information and too many sections on one page.

Content Rearrangement

Before employing the related visual design elements and principles, I identified some factors that affected the overall design. Factors leading to clutter and confusion were located, such as repetitive information and imprecise menu content.

Since concise navigation is an essential for usability of a system, I started with the navigation menu. The navigation menu aims to help users find desirable content and makes the process of moving around a website easier and therefore should be kept simple and comprehensible.

Based on each website's target audience, I analyzed all main and secondary menu options and removed the redundant contents. I then categorized them logically based on level of importance and the website's main objectives. In addition, to better simplify the menu items, I rephrased and recategorized them if necessary. My intention was to avoid content complexity and lessen user confusion caused by repeated information. This helps people with cognitive issues to focus on essential content and not be bogged with excess information. In the next step, I shortened the verbiage on the navigation menu items for those disabled individuals that require a screen reader. This addresses individuals with disabilities but benefits all users by reducing the amount of time required to read and find an item on the page (Figures 6-9).

Type

The first step in this experiment was to create visual hierarchy on the web pages. Visual hierarchy, as noted in the earlier chapters, is the principle that is used to show important content, sequence of information, and create flow on the page to help users have a better understanding of content and interactive controls (i.e. buttons and links). Visual hierarchy also helps users to navigate the page and scan contents quicker. I achieved typographic hierarchy by implementing methods such as contrast, gestalt, space, and grouping the content of the pages.

The use of contrast, as identified in the accessibility guideline for elderly and low vision people, can help to increase readability for these target groups. In this experiment, contrast was employed by applying different type sizes, weight, and spacing. According to W3C, the contrast ratio between text and its background should be at least 4.5:1, decreasing to 3:1 with the use of larger and heavier font as they are easier to read at lower contrast. To meet these recommendations, I selected a font size between the range of 40pt to 60pt for menu options, depending on their importance. Accordingly, I used size 20pt and over for body text. In addition, I used different weights such as medium and bold for menu options and regular and light for body text and less important content.

Lack of proper spacing between the many menu items and links in the navigation bar cause visual density. The result is a page that prevents a user's eyes from moving smoothly in the navigation area. To resolve this matter, I included enough white space between each section to help users with the flow of the navigation bar and to draw their attention. With this approach users can focus and access their needs with greater ease.

Grouping was another useful method I used to present a logical relationship between content items. I accomplished this by applying proximity and similarity techniques between related contents. Finally, to improve legibility based on accessibility recommendations, I chose Helvetica, which has an ideal x-height and is one of the suggested accessible typefaces by National Institute on Aging and National Library of Medicine (Figures 10-15).

Shape

The second phase involved the use of shapes alongside text. I used shapes around menu bars and body content to form page structure and create distinction among web contents and to show their functionality. Use of this visual element provides a sense of visual rest. My aim was to help users better perceive the sequence and organization of the content.

The law of similarity is the other principle that I used. This law indicates that elements that are similar to each other tend to be spotted into groups. For the purpose of web design, the elements with the same functionality, meanings, and hierarchy level should visually match. Therefore, I placed related information in similar shapes to show emphasis on their function and relation.

The next principle that was used with regard to shape is grouping. For example, for sub menus that open under main menu, I used long rectangles to define the area and help the users focus on them. Grouping in human perception is apparent in two ways: combine and separate. In the process of combining and separating, I divided the content of the page into several main sections such as main menu, sub menu, main body, and footer. I used rectangular shapes and lines around related items (tab headers, text and links) of each section to distinguish them as one entity. This helps separate each body of content in order to help users identify and concentrate on related information better (Figures 16-21).

Colour

Finally, my last exploration was the application of colour. As noted earlier, colour is an important factor in visual design and should be considered with care to improve accessibility.

The very first step in creating a colour blind-safe website is choosing legible and well-matching colours for my colour palette. Since both website's logos were mainly designed in the colour blue, I chose blue as my main colour but also applied different tones, shades, and brightness to create a proper contrast. In addition, I restricted my colour palette to three to help people with limited colour eyesight. To validate that the colour contrast would be effective, I confirmed this on the WebAIM website (<https://webaim.org/resources/contrastchecker/>). (Figures 22, 23)

Conclusively, this colour palette was used to create strong hierarchy and emphasis. In order to create hierarchy between the main sections (i.e. navigation bar, body, and footer) and emphasize dominance to the navigation menu and footer, I selected darker colours in contrast to the main body. I then applied the colour white to main background (Figures 24-31).

Conclusion

The internet is an important resource in many aspects of people's life. Access to the web for all people, particularly for those with a disability, turns out to be a thoughtful concern. The government of Ontario has set up the guidelines for web accessibility (AODA) to minimize the challenges people with disabilities face while interacting with the web.

Despite of all these efforts, based on the literature review that I have conducted, most of the accessible webpages suffer from a lack of thoughtful concern for visual design, as most designers demonstrate inadequate interest to design for accessibility. Research has shown that this challenge is due to the limited focus on usability, and the devaluing of visual design as a powerful tool to affect accessibility. The absence of effective communication between designers and advocates of accessibility as well as the lack of motivation to create a visually pleasant and accessible websites also contributes to this issue. Nevertheless, bridging the gap between accessibility and design requires that designers become more engaged in the challenge of accessibility.

Future Consideration

The initial aim of this study was to find and address the challenges faced by designers in regard to the visual design aspects of AODA guidelines, the specific requirements and their impact on usability and aesthetics of an accessible webpage.

I redesigned the appearance of two sample website homepages based on visual design elements and related principles with accessibility guideline codes in mind. What this study demonstrated was that AODA is not a limitation for designers' creativity if they consider it in the early stages of their design. I deem that by closing this gap and exploring the visual design criteria of accessibility guidelines, it is possible to improve the usability and aesthetics of all websites and in so doing, improve accessibility for everyone.

In order to meet the criteria required for accessible websites, I have kept in mind the features (functional requirements), appearance of features (graphic design) and the interaction with other features (usability engineering). This process began in early stage of design process, rather than as an afterthought, in order to tie the gap between the design aesthetic and the requirements of accessibility.

More importantly, as a designer, one should take on the responsibility of making sure everyone has access to what they design regardless of their capability or condition. Designers should consider the constraints that accessibility guidelines generate as a positive challenge for design and put effort into utilizing them to explore new design solutions for accessible purposes. To consider the effect of visual design in accessibility requirements at an early stage of every design specification reinforces the important role of graphic designers.

References

- About AODA. (n.d.). Retrieved July 5, 2018, from <https://accessontario.com/aoda/>
- AChecker. (2012). Web Accessibility Checker. Retrieved May 24, 2018, from <https://achecker.ca/checker/index.php>
- Adikari, S., McDonald, C., & Campbell, J. (2009). Little design up-front: a design science approach to integrating usability into agile requirements engineering. In International Conference on Human-Computer Interaction, 549-558.
- Agarwal, R., & Karahanna, E. (2000). Time Flies When You're Having Fun: Cognitive Absorption and Beliefs about Information Technology Usage. *MIS Quarterly*, 24(4), 665-694.
- Arditi, A. (2004). Adjustable typography: An approach to enhancing low vision text accessibility. *Ergonomics*, 47(5), 469-482.
- Babu, R., Singh, R., & Ganesh, J. (2010). Understanding blind users' Web accessibility and usability problems. *AIS Transactions on Human-Computer Interaction*, 2(3), 73-94.
- Baguma, R., & Lubega, J. T. (2008, April). A web design framework for improved accessibility for people with disabilities (WDFAD). In Proceedings of the 2008 international cross-disciplinary conference on Web accessibility (W4A), 134-140. ACM.
- Beaudry, A., & Pinsonneault, A. (2010). The other side of acceptance: studying the direct and indirect effects of emotions on information technology use. *MIS Quarterly*, 34(4), 689-710.
- Bevan, N. (2008, June). Classifying and selecting UX and usability measures. In International Workshop on Meaningful Measures: Valid Useful User Experience Measurement, 11, 13-18.
- Cyr, D., Head, M., & Ivanov, A. (2006). Design aesthetics leading to m-loyalty in mobile commerce. *Information & Management*, 43(8), 950-963.
- Cyr, D., Head, M., Larios, H., & Pan, B. (2009). Exploring human images in website design: a multi-method approach. *MIS Quarterly*, 33(3), 539-566.
- Cyr, D., Head, M., & Larios, H. (2010). Colour appeal in website design within and across cultures: A multi-method evaluation. *International Journal of Human-Computer Studies*, 68(1-2), 1-21.

- De Angeli, A., Sutcliffe, A., & Hartmann, J. (2006, June). Interaction, usability and aesthetics: what influences users' preferences?. In Proceedings of the 6th conference on Designing Interactive systems. 271-280. ACM.
- Dillon, A. (2002). Beyond usability: process, outcome and affect in human-computer interactions. *Canadian Journal of Information and Library Science*, 26(4), 57-69.
- Dion, K., Berscheid, E., & Walster, E. (1972). What is beautiful is good. *Journal of Personality and Social Psychology*, 24(3), 285.
- Edwards, H. (2004). Art and design students employing aspects of the visual and metaphoric to structure and create meaning in writing. An insight from the MA dissertation-writing Intranet site at the Royal College of Art. *Art, Design & Communication in Higher Education*, 3(2), 119-136.
- Friedman, M. G., & Bryen, D. N. (2007). Web accessibility design recommendations for people with cognitive disabilities. *Technology and Disability*, 19(4), 205-212.
- Government of Ontario. (2015, June 3). About accessibility laws. Retrieved September 14, 2018, from <https://www.ontario.ca/page/about-accessibility-laws>
- Government of Ontario. (2017, November 17). How to make websites accessible. Retrieved August 5, 2018, from <https://www.ontario.ca/page/how-make-websites-accessible>
- Hartmann, J., Sutcliffe, A., & Angeli, A. D. (2008). Towards a theory of user judgment of aesthetics and user interface quality. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 15(4), 15.
- Hassenzahl, M. (2018). The thing and I: understanding the relationship between user and product. In *Funology* 2, 301-313. Springer, Cham.
- Henry, S. L. (2002). Understanding web accessibility. In *Constructing accessible web sites*, 6-31. Apress, Berkeley, CA.
- Inclusive design research centre, OCAD University. (n.d.). What is Inclusive Design. Retrieved April 10, 2019, from <https://idrc.ocadu.ca/about-the-idrc/49-resources/online-resources/articles-and-papers/443-whatisinclusivedesign>

- International Organization for Standardization. (1998). *_Ergonomic requirements for office work with visual display terminals (VDTs)_* (Standard No. 9241-11). Retrieved September 1, 2018 from <https://www.iso.org/obp/ui/#iso:std:iso:9241:-11:ed-1:v1:en>
- Kruft, H.-W. (1996). *A history of architectural theory*. New York City, NY: Princeton Architectural Press.
- Krug, S. (2014). *Don't make me think, revisited: A common sense approach to Web usability*. Berkeley, CA: New Riders.
- Kurosu, M., & Kashimura, K. (1995). Apparent usability vs. inherent usability: experimental analysis on the determinants of the apparent usability. In *Conference companion on Human factors in computing systems*, 292-293. ACM.
- Lauer, D. A., & Pentak, S. (2002). Chapter 5: balance. *Design Basics*. Australia: Wadsworth, 75-98.
- Lavie, T., & Tractinsky, N. (2004). Assessing dimensions of perceived visual aesthetics of web sites. *International Journal of Human-Computer Studies*, 60(3), 269-298.
- Lidwell, W., Holden, K., & Butler, J. (2010). *Universal principles of design revised and updated: 125 ways to enhance usability, influence perception, increase appeal, make better design decisions, and teach through design*. Rockport Pub.
- Liu, Y. (2003). Engineering aesthetics and aesthetic ergonomics: Theoretical foundations and a dual-process methodology. *Ergonomics*, 46, 1273-1292.
- Mbipom, G., & Harper, S. (2009). *Visual aesthetics and accessibility: Extent and overlap*. Human Centered Web Lab, School of Computer Science.
- Mbipom, G., & Harper, S. (2011, October). The interplay between web aesthetics and accessibility. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*, 147-154. ACM.
- Nielsen, J. (1993). *Usability engineering*. Elsevier.
- Norman, D. A. (2004). *Emotional design: Why we love (or hate) everyday things*. Basic Civitas Books.

- Palmer, J. W. (2002). Web site usability, design, and performance metrics. *Information systems research*, 13(2), 151-167.
- Petrie, H., Bevan, N., 2009. The evaluation of accessibility, usability and user experience. *The Universal Access Handbook*.
- Reber, R., Schwarz, N., & Winkielman, P. (2004). Processing fluency and aesthetic pleasure: Is beauty in the perceiver's processing experience?. *Personality and Social Psychology Review*, 8(4), 364-382.
- Regan, B. (2004, May). Accessibility and design: a failure of the imagination. In *Proceedings of the 2004 international cross-disciplinary workshop on Web accessibility (W4A)*, 29-37. ACM.
- Robins, D., & Holmes, J. (2008). Aesthetics and credibility in web site design. *Information Processing & Management*, 44(1), 386-399.
- Rosson, M. B., & Carroll, J. M. (2002). *Usability engineering: scenario-based development of human-computer interaction*. Morgan Kaufmann.
- Santayana, G. (1955). *The sense of beauty*. Mineola, NY: Dover Publications.
- Saw, R., & Osborne, H. (1968). *Aesthetics in the Modern World*. New York: Weybright and Talley.
- Schrepp, M., Held, T., & Laugwitz, B. (2006). The influence of hedonic quality on the attractiveness of user interfaces of business management software. *Interacting with Computers*, 18(5), 1055-1069.
- Shneiderman, B. (1997). Designing information-abundant web sites: issues and recommendations. *International Journal of Human-Computer Studies*, 47(1), 5-29.
- Teo, H. H., Oh, L. B., Liu, C., & Wei, K. K. (2003). An empirical study of the effects of interactivity on web user attitude. *International Journal of Human-Computer Studies*, 58(3), 281-305.
- Tidwell, J. (2010). *Designing interfaces: patterns for effective interaction design*. Beijing: O'Reilly Media.
- Tractinsky, N., Katz, A. S., & Ikar, D. (2000). What is beautiful is usable. *Interacting with Computers*, 13(2), 127-145.
- Usability.gov. (n.d.). *Visual Design Basics*. Retrieved September 29, 2018, from <https://www.usability.gov/what-and-why/visual-design.html>
- Van der Heijden, H. (2003). Factors influencing the usage of websites: the case of a generic portal in The Netherlands. *Information & management*, 40(6), 541-549.

- Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS Quarterly*, 36(1), 157-178.
- Ware, C. (2012). *Information visualization: perception for design*. Elsevier.
- Web Accessibility Evaluation Tools List. (2016, March 16). Retrieved June 12, 2018, from <https://www.w3.org/WAI/ER/tools/>
- WebAIM. (n.d.). Color Contrast Checker. Retrieved August 22, 2018, from <https://webaim.org/resources/contrastchecker/>
- Williams, P., & Hennig, C. (2015). Optimising web site designs for people with learning disabilities. *Journal of Research in Special Educational Needs*, 15(1), 25-36.
- World Wide Web Consortium. (2008). Web content accessibility guidelines (Standard No. 40500:2012). Retrieved November 5, 2017 from <https://www.w3.org/TR/WCAG20/#text-equiv>
- W3C_Web Accessibility Initiative. (2018, March 24). Introduction to Web Accessibility. Retrieved July 19, 2019, from <https://www.w3.org/WAI/fundamentals/accessibility-intro/>
- Xu, C. (2013). *Accessing the power of aesthetics in human-computer interaction* (Doctoral dissertation, University of North Texas), Retrieved September 20, 2018, from <https://digital.library.unt.edu/ark:/67531/metadc500128/>.
- Yang, S., Ro, Y. M., Nam, J., Hong, J., Choi, S. Y., & Lee, J. H. (2004). Improving Visual Accessibility for Color Vision Deficiency Based on MPEG-21. *Etri Journal*, 26(3), 195-202.

Appendix

Table 1: AODA main principles and guidelines (World Wide Web Consortium, 2008).

<p>1- Perceivable</p> <p>Information and user interface components must be presentable to users in ways they can perceive.</p>	<ul style="list-style-type: none">• 1.1 Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.• 1.2 Provide alternatives for time-based media.• 1.3 Create content that can be presented in different ways (for example simpler layout) without losing information or structure.• 1.4 Make it easier for users to see and hear content including separating foreground from background.
<p>2- Operable</p> <p>User interface components and navigation must be operable.</p>	<ul style="list-style-type: none">• 2.1 Make all functionality available from a keyboard.• 2.2 Provide users enough time to read and use content.• 2.3 Do not design content in a way that is known to cause seizures.• 2.4 Provide ways to help users navigate, find content, and determine where they are.
<p>3- Understandable</p> <p>Information and the operation of user interface must be understandable.</p>	<ul style="list-style-type: none">• 3.1 Make text content readable and understandable.• 3.2 Make Web pages appear and operate in predictable ways.• 3.3 Help users avoid and correct mistakes.
<p>4- Robust</p> <p>Content must be robust enough that it can be interpreted reliably a wide variety of user agents.</p>	<ul style="list-style-type: none">• 4.1 Maximize compatibility with current and future user agents, including assistive technologies.

Table 2: Nielsen’s usability heuristics (Nielsen, 1993).

Visibility of system status	The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
Match between system and the real world	The system should speak the users’ language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real world conventions, making information appear in a natural and logical order.
User control and freedom	Users often choose system functions by mistake and will need a clearly marked “emergency exit” to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.
Consistency and standards	Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.
Error prevention	Even better than good error messages are a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.
Recognition rather than recall	Minimize the user’s memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
Flexibility and efficiency of use	Accelerators – unseen by the novice user – may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.
Aesthetic and minimalist design	Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility
Help users recognize, diagnose, and recover from errors	Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

Table 3: AODA Visual Design Criteria (World Wide Web Consortium, 2008).

<p>Visual Structure</p>	<p>Guideline 1.3 Adaptable: Create content that can be presented in different ways (for example simpler layout) without losing information or structure.</p> <p>Guideline 1.4 Distinguishable: Make it easier for users to see and hear content including separating foreground from background.</p>	<p>1.3.1 Info and relationship</p> <p>1.4.8 Visual presentation</p>
<p>Typography</p>	<p>Guideline 1.4 Distinguishable: Make it easier for users to see and hear content including separating foreground from background.</p>	<p>1.4.3 Contrast (Minimum)</p> <p>1.4.6 Contrast (Enhanced)</p>
<p>Color</p>	<p>Guideline 1.4 Distinguishable: Make it easier for users to see and hear content including separating foreground from background.</p>	<p>1.4.1 Use of colour</p> <p>1.4.3 Contrast (Minimum) – Colour contrast</p>

Table 4: Top web access design recommendations for users with cognitive disabilities based on frequency cited by existing web design guidelines (Friedman and Bryen, 2007)

1. Use pictures, icons and symbols along with text.	75%
2. Use clear and simple text.	70%
3. Consistent navigation and design on every page.	60%
4. Use headings, titles and prompts.	50%
5. Support screen readers. Use alternate text tags.	35%
6. Use larger fonts, fonts in minimum 12pt or 14pt.	30%
7. Uncluttered, simple screen layout.	30%
8. Maintain white space: Use wide margins.	25%
9. Website customizable, control of: type size, placement of navigation (right, left side) contrast, large print, sound.	25%
10. Use exit, home, help, next page buttons on every page.	25%
11. Use sans serif fonts, such as Arial, Verdana, Helvetica, Tahoma.	20%
12. Navigation buttons clear, large, and consistent.	20%
13. Use numbered lists rather than bullets.	20%
14. Support font enlargement for web browsers.	15%
15. Use color for contrast.	15%
16. Check reading level with automated tool.	15%
17. Don't right justify text; use ragged edge right hand margins.	15%
18. Use lower case, no ALL CAPS.	15%
19. Provide voice captions (audio files) for text.	15%
20. Provide audio/voice-overs where the words are read aloud.	15%
21. Use navigation methods, i.e. 'undo' or 'back button' to help users recover when lost.	15%
22. Give feedback on a user's actions (e.g. confirm correct choices, alert users to errors or possible errors).	15%

Table 5: List of Websites

Name	Uniform Resource Locator	Access Date
1- CIBC	https://www.cibc.com/en/personal-banking.html	24-05-2018
2- RBC	http://www.rbcroyalbank.com/personal.html	24-05-2018
3- PC Financial	https://www.pcfincanancial.ca/	24-05-2018
4- Scotiabank	http://www.scotiabank.com/ca/en/0,,2,00.html	24-05-2018
5- BMO	https://www.bmo.com/main/personal	28-05-2018
6- Canada.ca	https://www.canada.ca/en.html	28-05-2018
7- Access Ontario	https://accessontario.com/aoda/	28-05-2018
8- UPS Canada	https://www.ups.com/ca/en/Home.page	28-05-2018
9- Fedex Canada	https://www.fedex.com/ca_english/index.html	28-05-2018
10- Walmart Canada	https://www.walmart.ca/en	28-05-2018
11- Best Buy	https://www.bestbuy.ca/	05-06-2018
12- Univ. of Guelph Humber	https://www.guelphhumber.ca/	05-06-2018
13- Brock Univ.	https://brocku.ca/	05-06-2018
14- Laurier Univ.	https://www.wlu.ca/	05-06-2018
15- Cambrian College	http://cambriancollege.ca/	12-06-2018
16- George Brown College	https://www.georgebrown.ca/	12-06-2018
17- Ann Taylor	https://www.anntaylor.com/	12-06-2018
18- Home Depot Canada	https://www.homedepot.ca/en/home.html	12-06-2018
19- Fresh Co.	http://freshco.com/?f=9771	12-06-2018
20- ADR Institute	http://adr-ontario.ca/	12-06-2018
21- NY General Hospital	http://www.nygh.on.ca/	12-06-2018
22- Women's College Hospital	http://www.womenscollegehospital.ca/	12-06-2018
23- SickKids Hospital	https://www.sickkids.ca/	20-06-2018
24- William Osler Health System	http://www.williamoslerhs.ca/	20-06-2018
25- International Hotels Group	https://www.ihg.com/holidayinn/destinations/us/en/canada/ontario/toronto-hotels	20-06-2018
26- Four Season Hotel	https://www.fourseasons.com/toronto/	28-06-2018
27- Sheraton Hotel Toronto	http://www.sheratontoronto.com/	28-06-2018
28- Groupon	https://www.groupon.com/	28-06-2018
29- Oxford Learning	https://www.oxfordlearning.com/top-16-canadian-educational-websites/	28-06-2018

Table 6: Websites' errors related to visual design of web accessibility guidelines

Websites	Guideline Errors				
	1.3.1	1.4.1	1.4.3	1.4.6	1.4.8
1- CIBC	X	X	X	X	
2- RBC	X	X			
3- PC Financial	X	X			
4- Scotiabank	X	X		X	
5- BMO	X	X	X		
6- Canada.ca	X	X			
7- Access Ontario	X	X			
8- UPS Canada	X	X			
9- FedEx Canada	X	X	X		
10-Walmart Canada		X	X		
11-Best Buy	X		X		X
12- Univ. of Guelph Humber	X	X	X		
13- Brock Univ.	X	X	X		X
14- Laurier Univ.	X	X			
15- Cambrian College	X	X			X
16- George Brown College	X	X		X	
17- Ann Taylor	X	X	X		
18- Home Depot Canada	X	X	X		
19- Fresh Co.	X	X	X		X
20- ADR Institute	X		X		
21- NY General Hospital		X	X		
22- Women's College hospital	X		X		
23- SickKids Hospital	X	X	X	X	X
24- William Osler Health System	X	X	X		
25- International Hotels Group		X	X		
26- Four Season Hotel		X	X		
27- Sheraton Hotel Toronto	X	X	X		
28- Groupon	X	X	X	X	
29- Oxford Learning	X	X	X		
30- Nipissing University	X	X	X		

Home Continuing Education International Student Industry & Community Employees Alumni Employment at George Brown Giving					
WHY GEORGE BROWN	PROGRAM	ADMISSIONS	CURRENT STUDENTS	ABOUT	CONTACT
Overview	Overview	Overview	Overview	Overview	After Hours Urgent Contacts
Awards	Program Availability	How to Apply	Blackboard Login	Administration	Campus Maps & Directions
Location	Program Comparison	Accept Your Offer	STU-View Login	Board of Governors	Campus Security, Fire & Emergencies
Hands-on Learning	Program Finder	Program Requirements & Fees	Student Email	Community Partnerships Office	Information Sessions
Alumni Stories	Program Roadmaps	Admissions & Placement Assessment	Important Dates	Diversity, Equity & Human Rights	Media Room
Connected to Employers	Apprenticeship Programs	Admission Policies & FAQs	Library (LLC)	Healthy Campus	Request Information
Student Experience	Continuing Education	Academic Upgrading	Academic Centres	History	Social Media Hub
Check Out George Brown	Degree Programs	Entry Advising	Academic Supports	Institutional Research	Staff & Faculty Directory
Parents & Guidance Counsellors	Entry Advising	Financial Aid	Campus Services & Stores	Master Campus Plan	
	Fast-Track and Bridging Programs	Transfer Guide	First Year Experience	Mission Statement	
	Postgraduate Programs	Contact Admissions	Get Involved	News, Events & Media	
	Second Career		Registerers	Procurement	
	Transfer Guide		Related Websites, App & Technical Supports	Public Safety & Security Policies	
			Student Association	Research & innovation	
			Student Services	Seniors' Association	
				Services for the Public	
				Strategy and Vision	
				Sustainability	
Side Menu					Side Menu
CONTINUOUS LEARNING					Program Finder
INTERNATIONAL					How to Apply
PREPARATORY & LIBERAL STUDIES					Financial Aid
ARTS, DESIGN & INFORMATION TECHNOLOGY					Campus Tour
COMMUNITY SERVICES & EARLY CHILDHOOD					Virtual Tour
HEALTH SCIENCES					Info Session
HOSPITALITY & CULINARY ARTS					Request Info
CONSTRUCTION & ENGINEERING TECHNOLOGIES					Program Comparison
BUSINESS					

Figure 6: George Brown College Menu Options

Programs of Study Admission Industry & Community About Contact			
FUTURE STUDENT	CURRENT STUDENT	ALUMNI	FACULTY & STAFF
Why George Brown	Overview	Overview	Overview
Program	Blackboard Login	Connect	Login & Help
Academics	STU-View Login	News & Announcements	Career Services
Admission	Student Email	Alumni Privileges	College Email
	Important Dates	Alumni Career Services	Course Outlines
	Library (LLC)	Get Involved	FacultyConnect
	Academic Centres	Alumni Success	eLTI (eLearning & Teaching Innovation)
	Academic Supports	FAQ	GBC Assist
	Campus Services & Stores	Contact Us	Health, Wellness & Life Learning
	First Year Experience		HelpDesk
	Get Involved		International Opportunities
	Registerers		Partial-Load Registry
	Related Websites, App & Technical Supports		Organizational & Staff Development
	Student Association		Employment at George Brown
	Student Services		Safety
			Policies

Figure 7: George Brown College Refine Menu Options

			Contact us	Getting to SickKids	Newsroom	Directory	Events Calendar	Refer a Patient
Quick Links	Visiting SickKids	Areas of Care	Patient and Family Resources	Careers and Volunteering	Health-care Professionals	About SickKids		
Getting to SickKids	Coming to Emergency	Clinics Directory	AboutKidsHealth	Careers	Clinical practice guidelines	Message from the President and CEO		
Coming for a clinic appointment	Coming for surgery	Specialties	Child and Family-Centred Care	Volunteering	Referring a patient	Who we are		
Coming for surgery	Coming for a clinic appointment	Centres	Child Life		Nursing	Annual Report		
	Staying at SickKids		Creative Arts Therapy		Residents and fellows	Newsroom		
	Getting to SickKids/Parking		Epilepsy Classroom		Paediatric Laboratory Medicine	eNewsletter		
Industry Partnerships and Commercialization	Visitor Resources		Paediatric Advanced Care Team		Paediatric Project ECHO	Perspective		
	Infection Prevention and Control		Health Records inquiries		Training opportunities	Directory		
Office of Patient and Family Experience	Visiting a patient		Resource Navigation Service		Recommended reading	Events calendar		
	Accessibility		Patient safety			History and milestones		
Paediatric Laboratory Medicine	Safety info for families		Values and expectations			Indigenous Health Strategy		
			Privacy			Strategy and performance		
Worldwide activities			International Patient Program			Project Horizon: Our Future Campus		
Quality Improvement Plan			Recommended reading			Accountability		
			MyChart			Donations and Ways to Give		
						Worldwide activities		
						Tours		
						Contact us		

Figure 8: SickKids Hospital Menu Options

Visiting SickKids	Areas of Care	Resources	About SickKids	Careers
Coming to Emergency	Clinics	Patient and Family Resources	Message from the President and CEO	Careers
Coming for Surgery	Directory	AboutKidsHealth	Who we are	Volunteering
Coming for a Clinic appointment	Specialties	Child and Family-Centred Care	Annual Report	
Staying at SickKids	Centres	Child Life	Newsroom	
Getting to SickKids/Parking		Creative Arts Therapy	eNewsletter	
Visitor Resources		Epilepsy Classroom	Perspective	
Infection Prevention and Control		Paediatric Advanced Care Team	Directory	
Visiting a Patient		Health Records inquiries	Events calendar	
Accessibility		Resource Navigation	History and milestones	
Safety info for Families		Health-Care Professionals	Indigenous Health Strategy	
		Clinical practice guidelines	Strategy and performance	
		Referring a patient	Project Horizon: Our Future Campus	
		Nursing		
		Residents and fellows		

Figure 9: SickKids Hospital Refine Menu Options

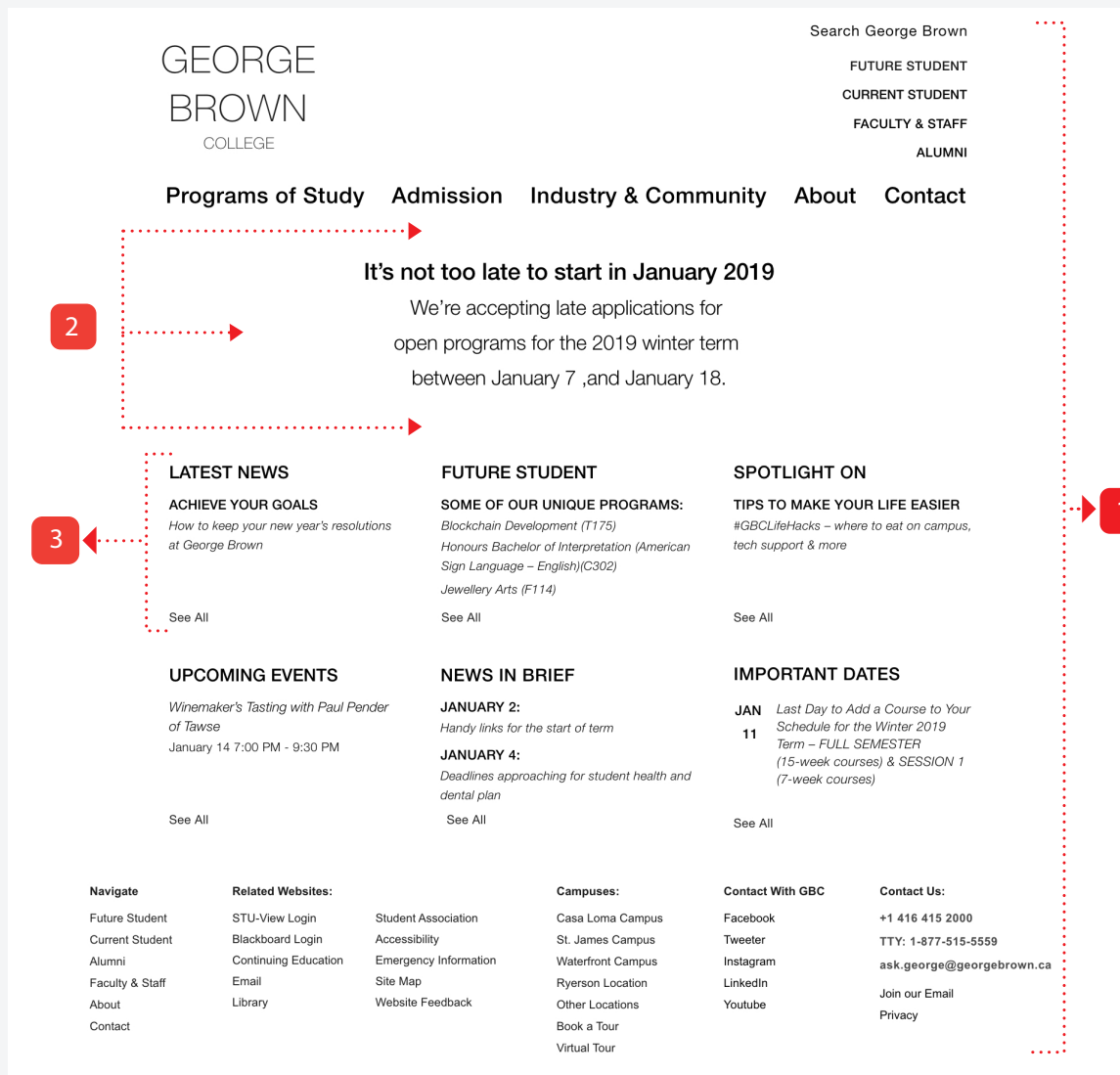


Figure 10: Redesigned George Brown College Website, Type Based

1. Visual Hierarchy: Created by applying different font sizes and weights to each section on page.
 - Main Menu: Size: 38pt., Weight: Medium
 - Secondary Menu: Size: 22pt., Weight: Medium
 - Banner Area: Title Size: 40pt., Weight: Medium. Body: Size 35pt., Weight: Light
 - Body: Three different size and weight is used: Size 30pt., 23pt., 21pt., Weight: Medium and Light
 - Footer: Size: 20pt., Weight: Bold and Regular

2. Spacing: Used enough space to differentiate each section on the page.

3. Proximity and Grouping: Grouped related contents and put them close together.

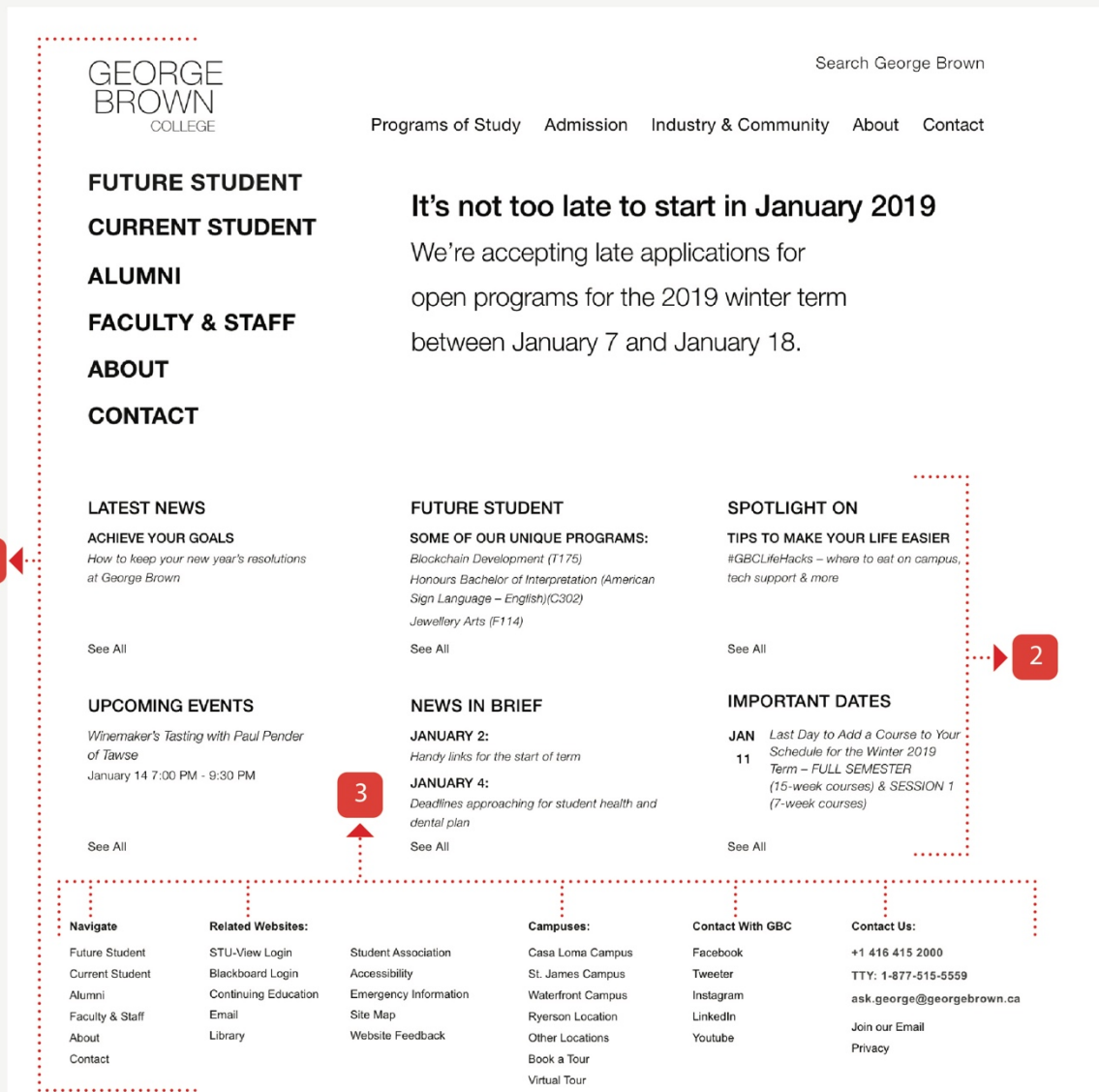


Figure 11: Redesigned George Brown College Website, Type Based

1. Visual Hierarchy: Created by applying different font sizes and weights to each section on page.
 - Main Menu: Size: 40pt., Weight: Bold
 - Secondary Menu: Size: 30pt., Weight: Regular
 - Banner Area: Title Size: 52pt., Weight: Medium. Body: Size 45pt., Weight: Light
 - Body: Three different sizes and weights are used: Size 30pt., 23pt., 21pt., Weight: Medium and Light

2. Similarity: Used for orientation to create logical pattern in the body of web page.

3. Unity: Equal width and space is used to create a sense of orderliness and structure.

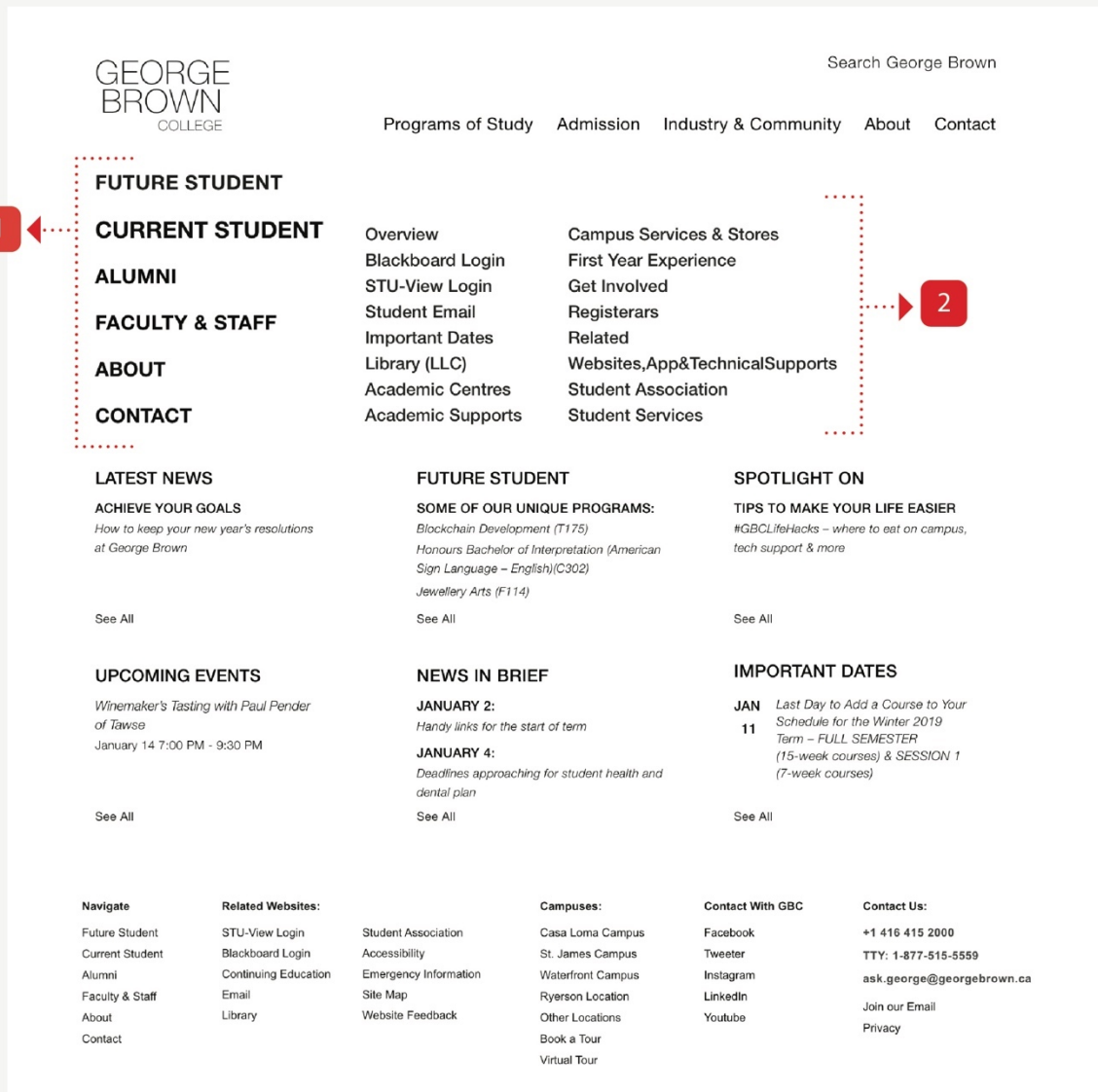


Figure 12: Redesigned George Brown College Website, Type Based

1. Visual Hierarchy: Created contrast by applying different text sizes and weights on active main menu items.
2. Sub menu is moved to top of the banner area for better exposure to users.

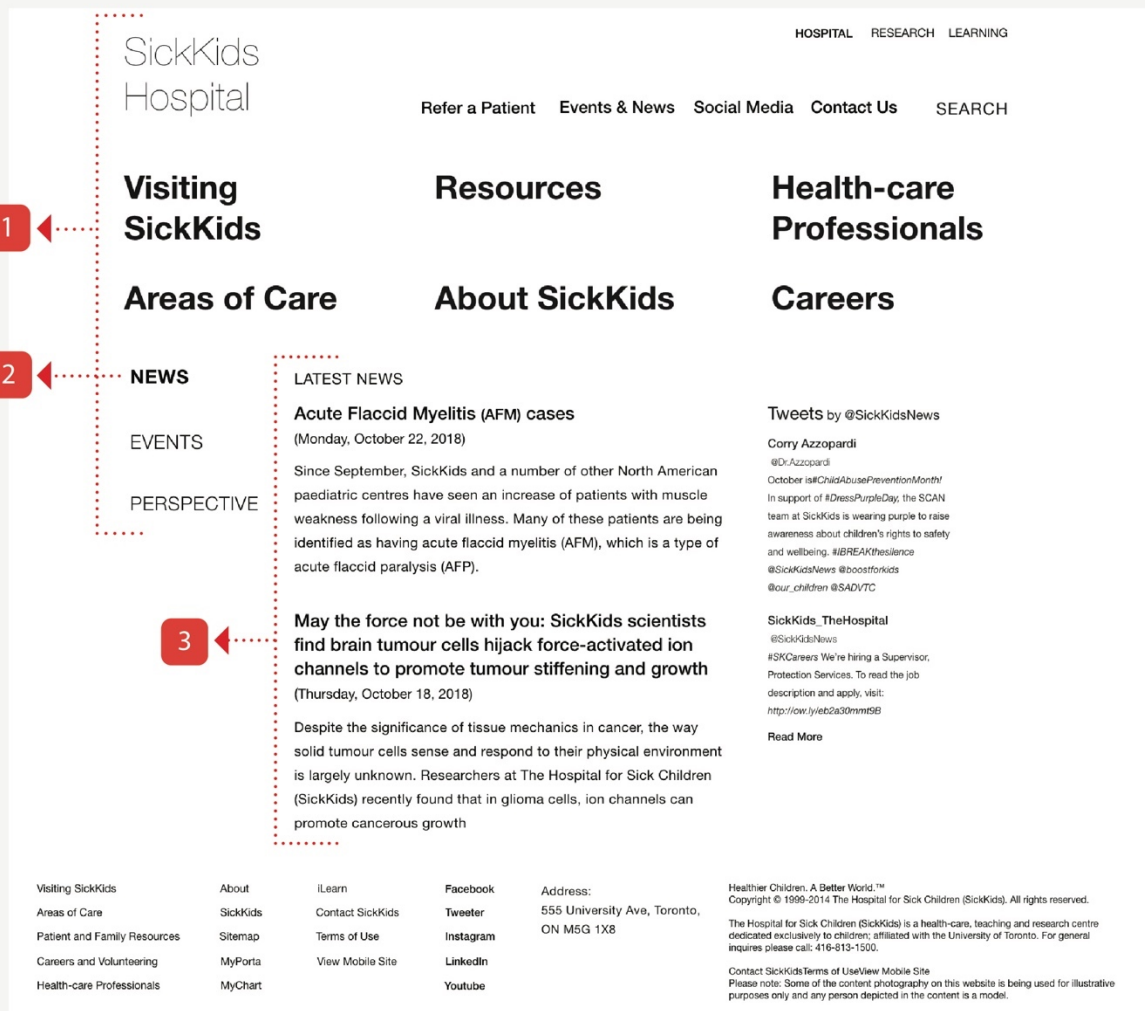


Figure 13: Redesigned SickKids Hospital Website, Type Based

1. Visual Hierarchy: Created by applying different font sizes and weights to each section on page.
 - Main Menu: Size: 55pt., Weight: Bold
 - Secondary Menu: Size: 28pt., Weight: Medium
 - Side Menu: Size: 32pt., Weight: Light and Bold
 - Body: Three different sizes and weights are used: Size 25pt., 23pt., Weight: Medium and Light
2. Bold weight is used for active selected menu option for better distinction.
3. Hierarchy: Applied different font sizes and weights for title and content in body as well as enough spacing between and around every section.

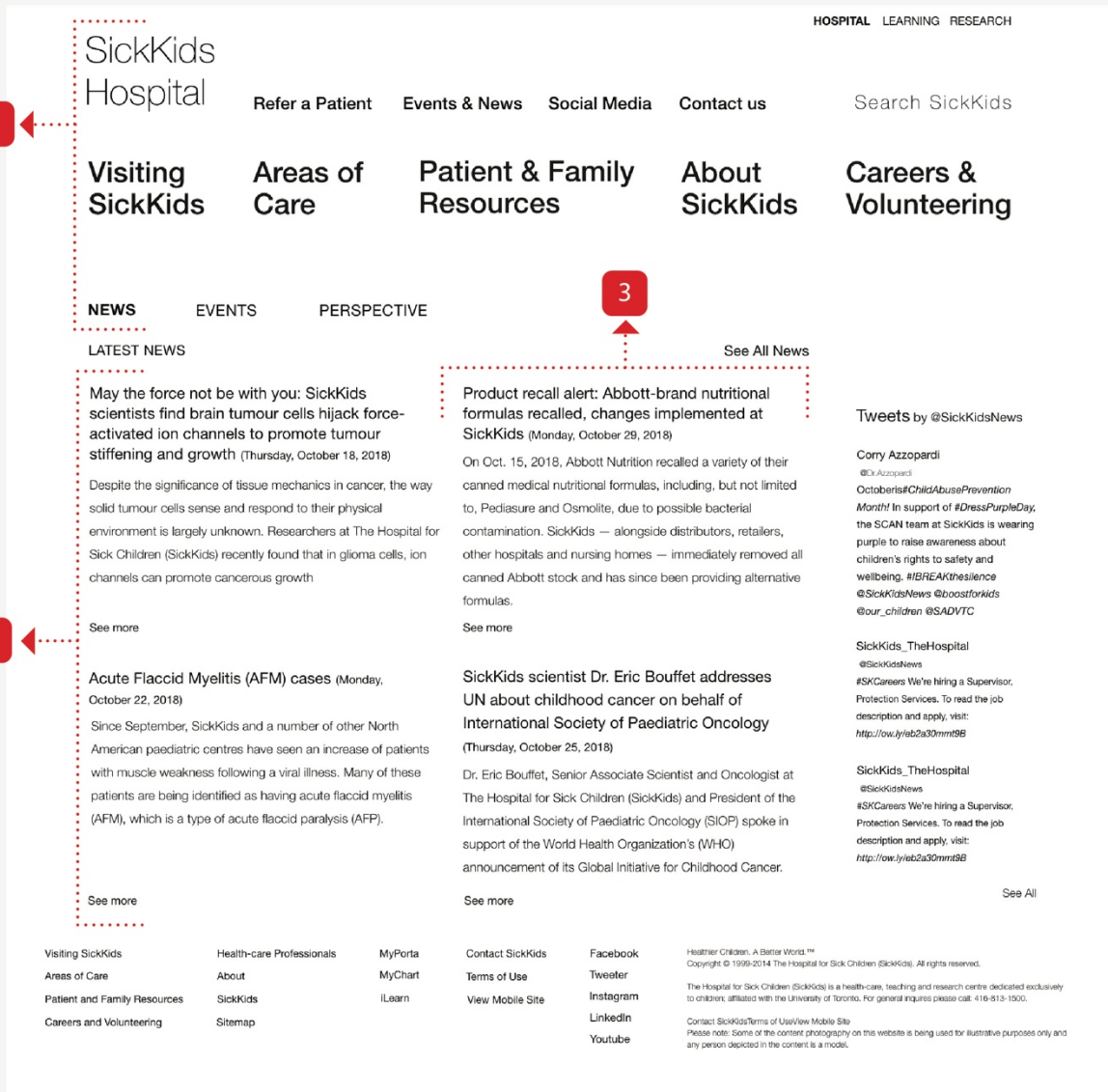


Figure 14: Redesigned SickKids Hospital Website, Type Based

1. Visual Hierarchy: Created by applying different font sizes and weights to each section on page.
 - Main Menu: Size: 50pt., Weight: Medium
 - Secondary Menu: Size: 30pt., Weight: Medium
 - Section Title Menu: Size: 27pt., Weight: Light and Bold
 - Body: Three different sizes and weights are used: Size 27pt., 22pt., Weight: Medium and Light
2. Similarity: is used for orientation to create logical pattern in the body of web page.
3. Unity: Equal width and space is used to create a sense of orderliness and structure.

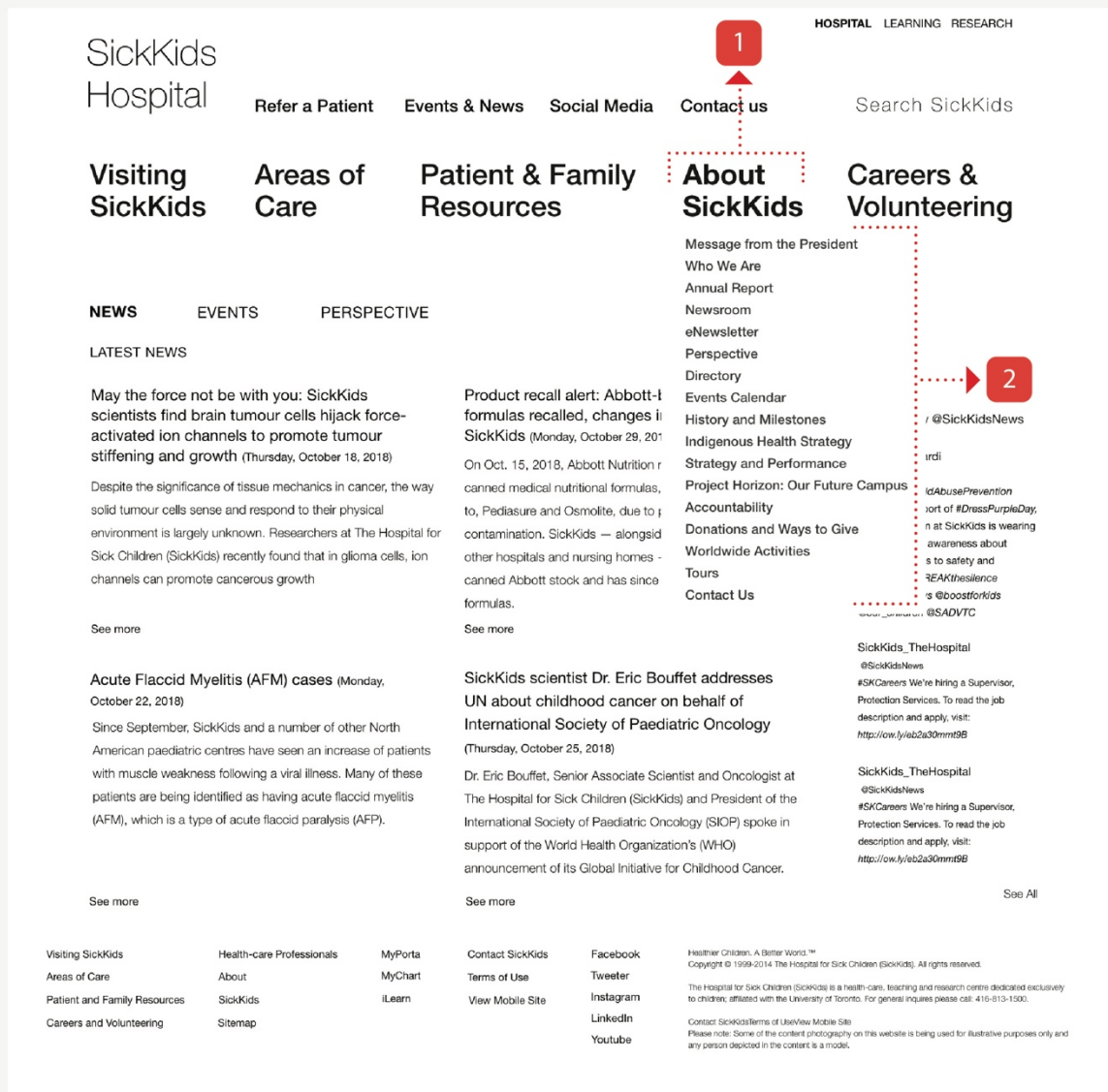


Figure 15: Redesigned SickKids Hospital Website, Type Based

1. Contrast: Use of bold weight when hover over the main menu items.
2. Spacing: Applied white background and proper white space for submenu items.

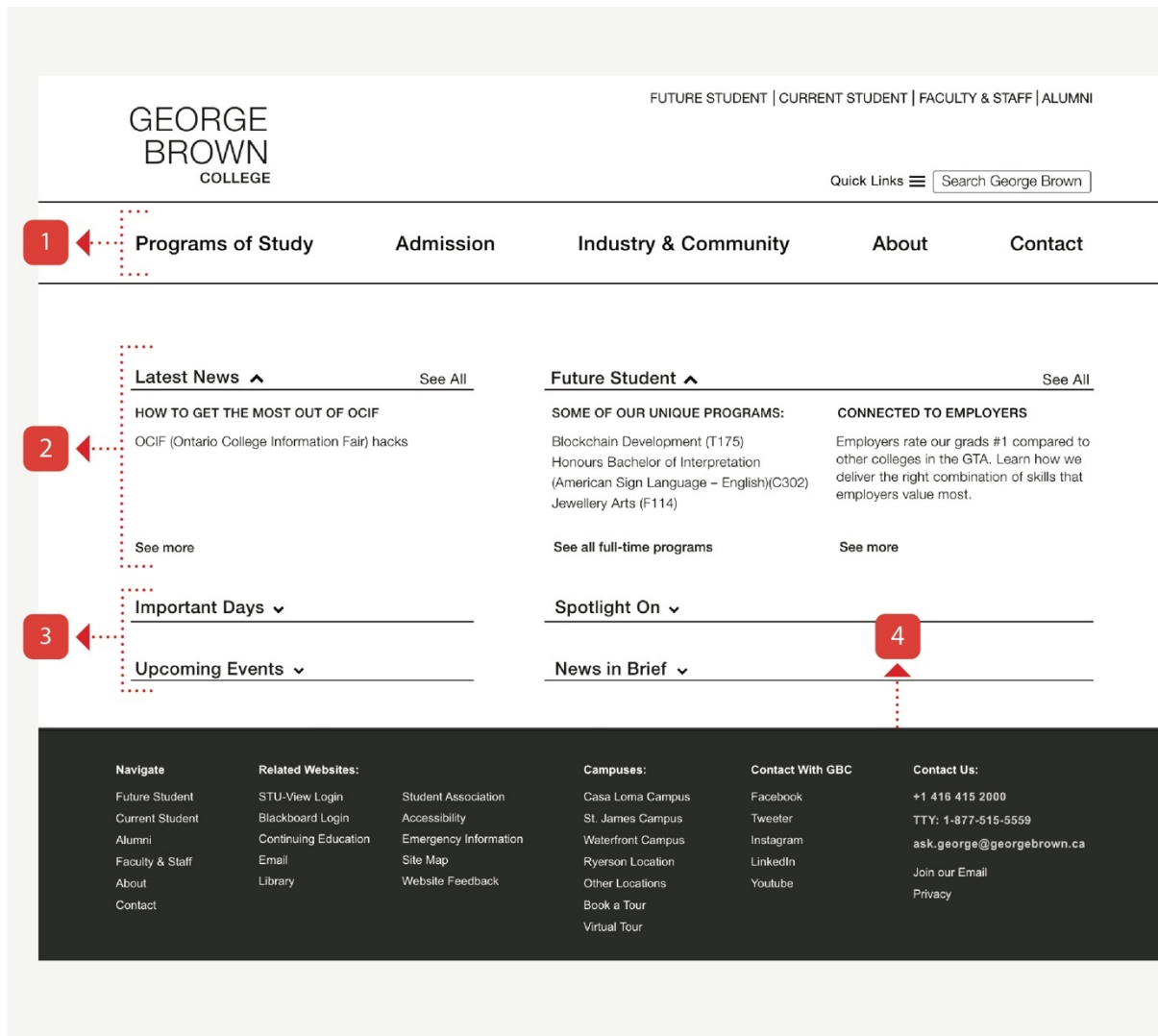


Figure 16: Redesigned George Brown College Website, Shape Based

1. Separated the main menu in header from other sections by placing them between two line.
2. Underlined each title in main body to separate them from their content.
3. Unity: Applied equal width lines to create logical pattern and structure.
4. Shape: Used rectangular shape and filled with colour to separate the footer from the rest of the page.

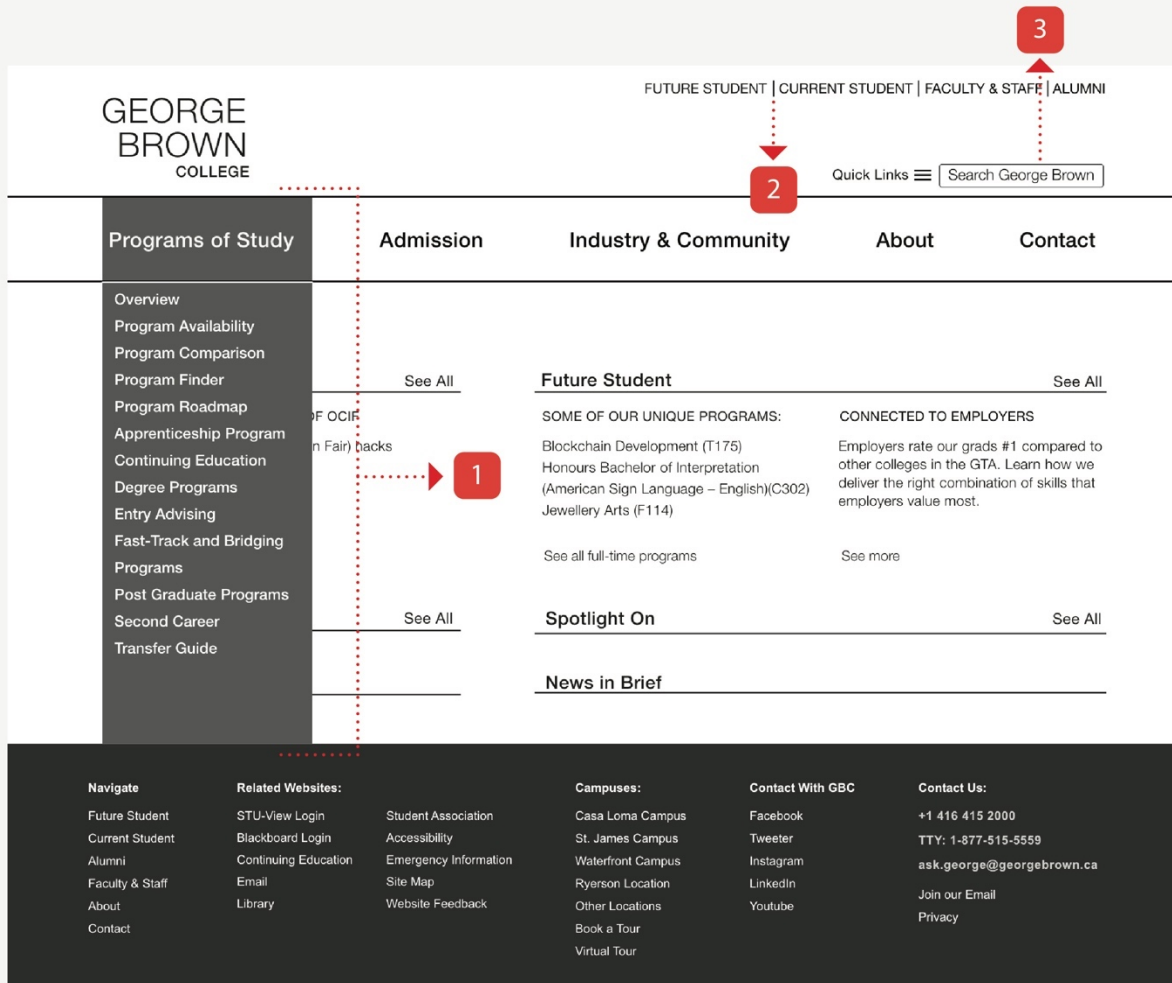


Figure 17: Redesigned George Brown College Website, Shape Based

1. Contrast: Placed sub menu items in shape to specify a designated area and separate them from the rest of the page content.
2. Line: Use of pipe delimited lines in the secondary menu to better distinguish the items from one another.
3. Use of shape to create search area to be perceived better.

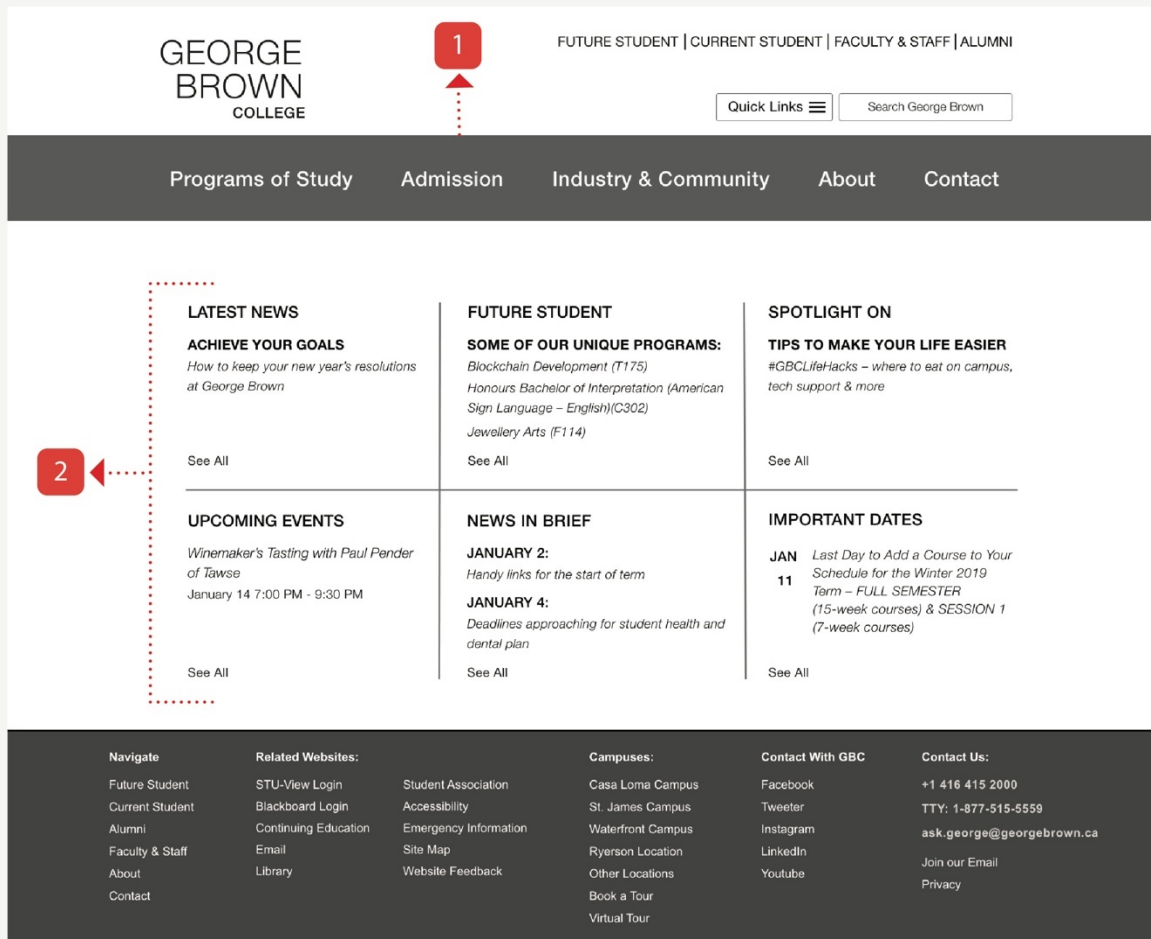


Figure 18: Redesigned George Brown College Website, Shape Based

1. Use of shape to separate main menu from the main body and other sections.
2. Use of line to divide each of main body sections to help with separation of the content while keeping them unified.

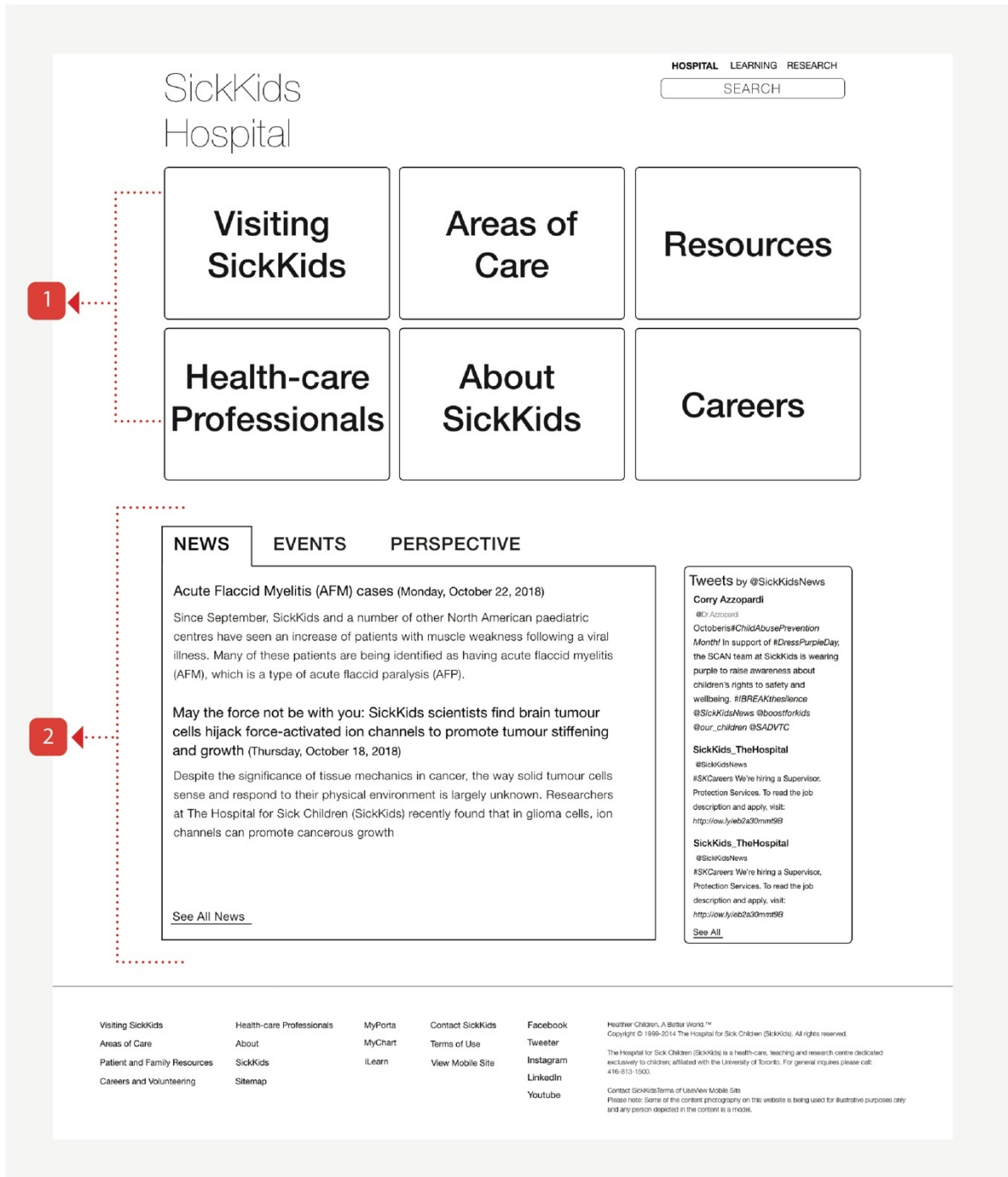


Figure 19: Redesigned SickKids Hospital Website, Shape Based

1. Applied identical shape for main menu options to create pattern and unity.
2. Used unique shapes for each of main body's different contents and sectors.

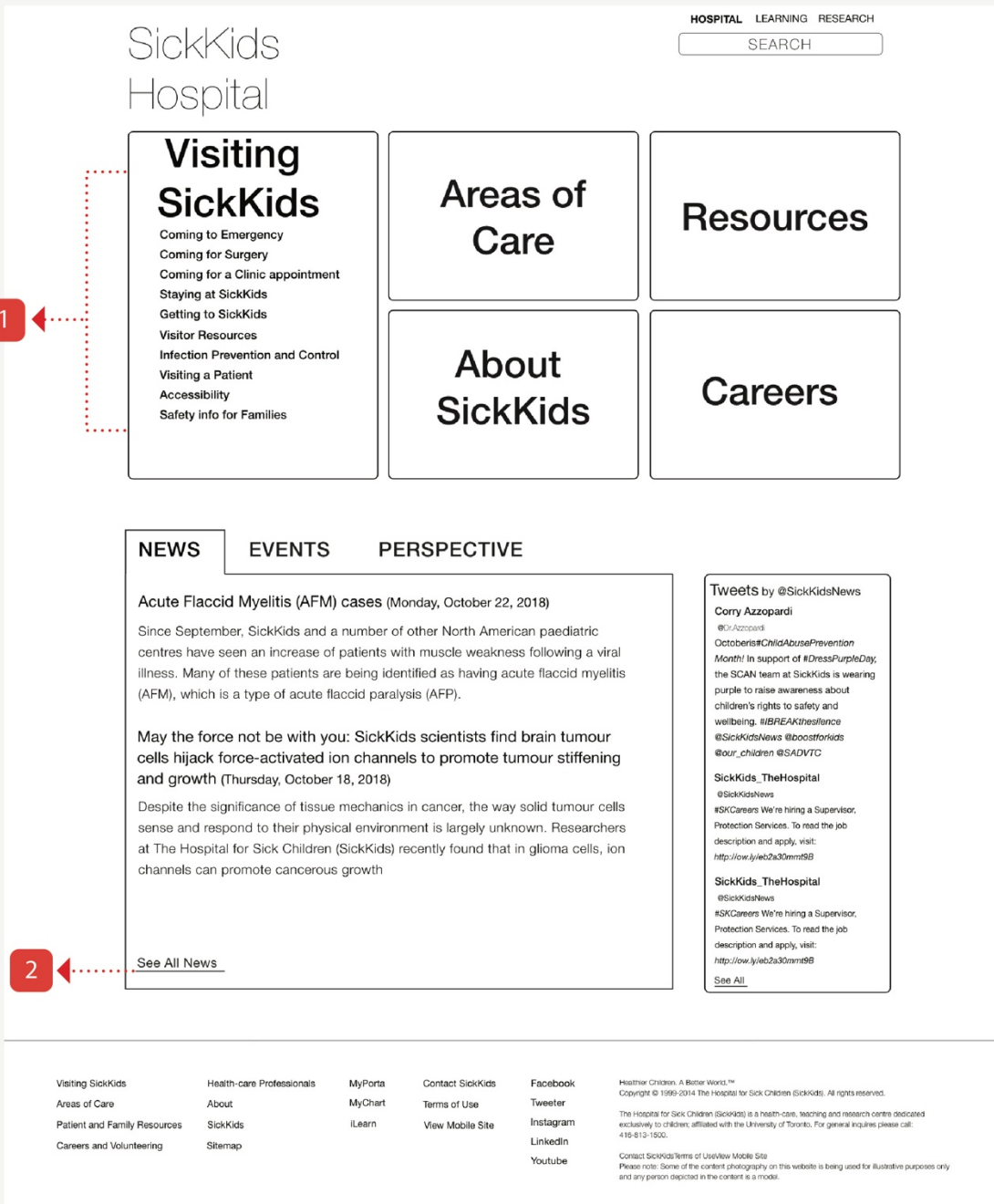


Figure 20: Redesigned SickKids Hospital Website, Shape Based

1. Contrast: Placed sub menu in a different shape from the main menu.
2. Used underlines to represent hyperlinks.

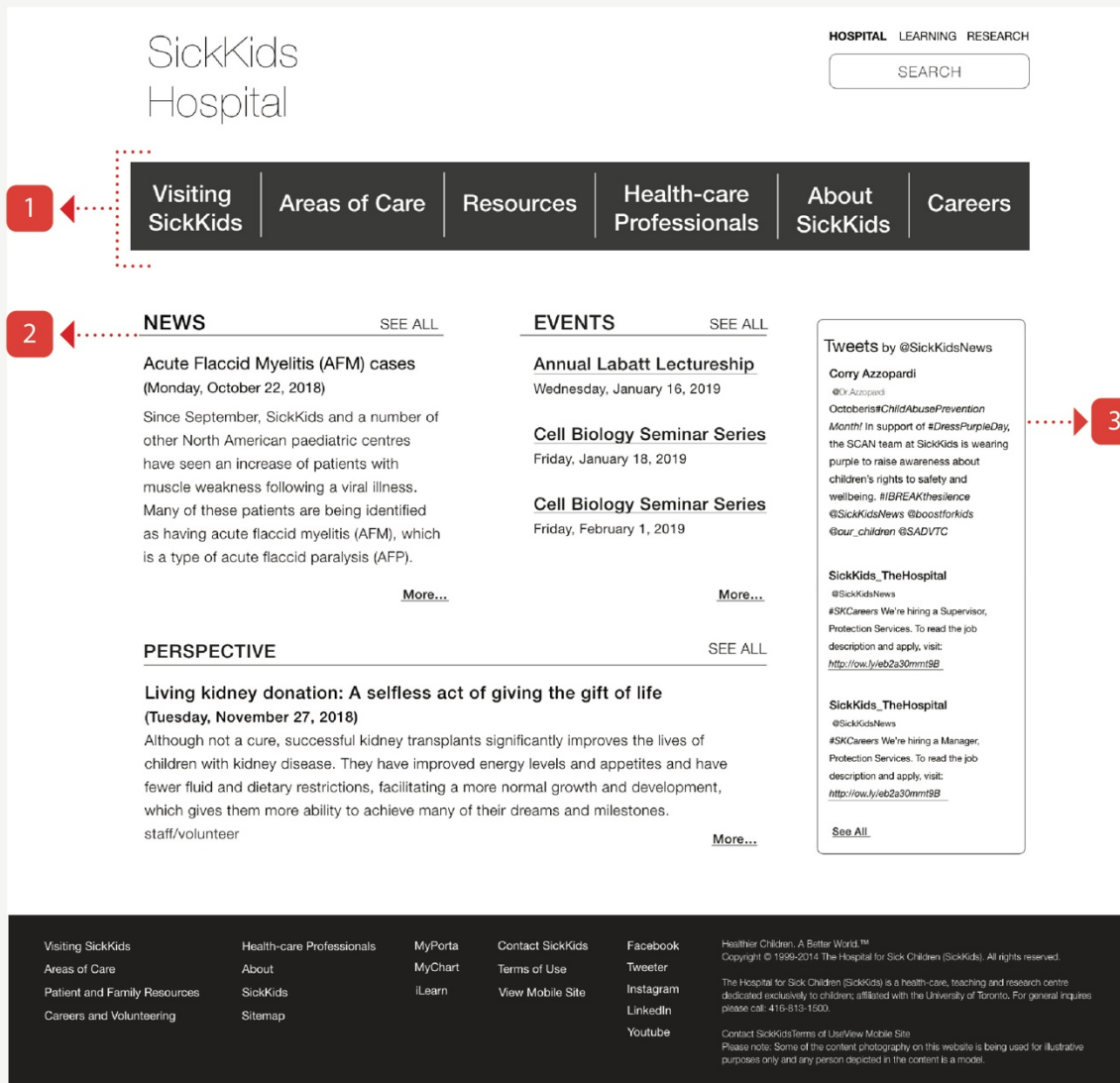


Figure 21: Redesigned SickKids Hospital Website, Shape Based

1. Use of shape to separate main menu from the main body and other sections.
3. Unity: Repeated equal lines under each section's title to create logical pattern and structure.
3. Bounded the Tweet section with shape to separate this section from the rest of body content.



#003266



#005B94



#28527B

Foreground Color: #003266
Background Color: #FFFFFF
Contrast Ratio: 12.74:1
permalink

Normal Text
WCAG AA: Pass
WCAG AAA: Pass
The five boxing wizards jump quickly.

Large Text
WCAG AA: Pass
WCAG AAA: Pass
The five boxing wizards jump quickly.

Graphical Objects and User Interface Components
WCAG AA: Pass
Text Input

Foreground Color: #005B94
Background Color: #FFFFFF
Contrast Ratio: 7.18:1
permalink

Normal Text
WCAG AA: Pass
WCAG AAA: Pass
The five boxing wizards jump quickly.

Large Text
WCAG AA: Pass
WCAG AAA: Pass
The five boxing wizards jump quickly.

Graphical Objects and User Interface Components
WCAG AA: Pass
Text input

Foreground Color: #28527B
Background Color: #FFFFFF
Contrast Ratio: 8.13:1
permalink

Normal Text
WCAG AA: Pass
WCAG AAA: Pass
The five boxing wizards jump quickly.

Large Text
WCAG AA: Pass
WCAG AAA: Pass
The five boxing wizards jump quickly.

Graphical Objects and User Interface Components
WCAG AA: Pass
Text Input

Figure 22: George Brown College Colour Palette

- Every Colour code is checked against WebAim website to validate contrast ratio in order to meet accessibility requirements.
- Selected colour palettes are used and combined to differentiate sections, increase emphasis and help to create visual hierarchy.



#163C80

Foreground Color #163C80
 Lightness

Background Color #FFFFFF
 Lightness

Contrast Ratio 10.54:1
[permalink](#)

Normal Text
 WCAG AA: Pass
 WCAG AAA: Pass
 The five boxing wizards jump quickly.

Large Text
 WCAG AA: Pass
 WCAG AAA: Pass
 The five boxing wizards jump quickly.

Graphical Objects and User Interface Components
 WCAG AA: Pass



#2351A2

Foreground Color #2351A2
 Lightness

Background Color #FFFFFF
 Lightness

Contrast Ratio 7.58:1
[permalink](#)

Normal Text
 WCAG AA: Pass
 WCAG AAA: Pass
 The five boxing wizards jump quickly.

Large Text
 WCAG AA: Pass
 WCAG AAA: Pass
 The five boxing wizards jump quickly.

Graphical Objects and User Interface Components
 WCAG AA: Pass



#002A73

Foreground Color #002A73
 Lightness

Background Color #FFFFFF
 Lightness

Contrast Ratio 13.30:1
[permalink](#)

Normal Text
 WCAG AA: Pass
 WCAG AAA: Pass
 The five boxing wizards jump quickly.

Large Text
 WCAG AA: Pass
 WCAG AAA: Pass
 The five boxing wizards jump quickly.

Graphical Objects and User Interface Components
 WCAG AA: Pass

Figure 23: SickKids Hospital Color Palette



Programs of Study Admission Industry & Community About Contact

Latest News [See All](#)

HOW TO GET THE MOST OUT OF OCIF
OCIF (Ontario College Information Fair) hacks

[See more](#)

Important Days

Upcoming Events

Future Student [See All](#)

SOME OF OUR UNIQUE PROGRAMS:
Blockchain Development (T175)
Honours Bachelor of Interpretation
(American Sign Language – English)(C302)
Jewellery Arts (F114)

[See all full-time programs](#)

CONNECTED TO EMPLOYERS
Employers rate our grads #1 compared to other colleges in the GTA. Learn how we deliver the right combination of skills that employers value most.

[See more](#)

Spotlight On

News in Brief

Social Media Directory Facebook Tweeter Instagram LinkedIn Youtube

Navigate

- Future Student
- Current Student
- Alumni
- Faculty & Staff
- About
- Contact

Related Websites:

- STU-View Login
- Blackboard Login
- Continuing Education
- Email
- Library
- Student Association

- Accessibility
- Emergency Information
- Site Map
- Website Feedback

Campuses:

- Casa Loma Campus
- St. James Campus
- Waterfront Campus
- Ryerson Location
- Other Locations
- Book a Tour
- Virtual Tour

Contact With GBC:

- Visit our Social Media Hub
- Get the GBC App
- Join our Email List
- Privacy

Contact Us:

- +1(416) 415-2000
- TTY: +1(877) 515-5559
- ask.george@georgebrown.ca

Figure 24: Redesigned George Brown College Website, Colour Based

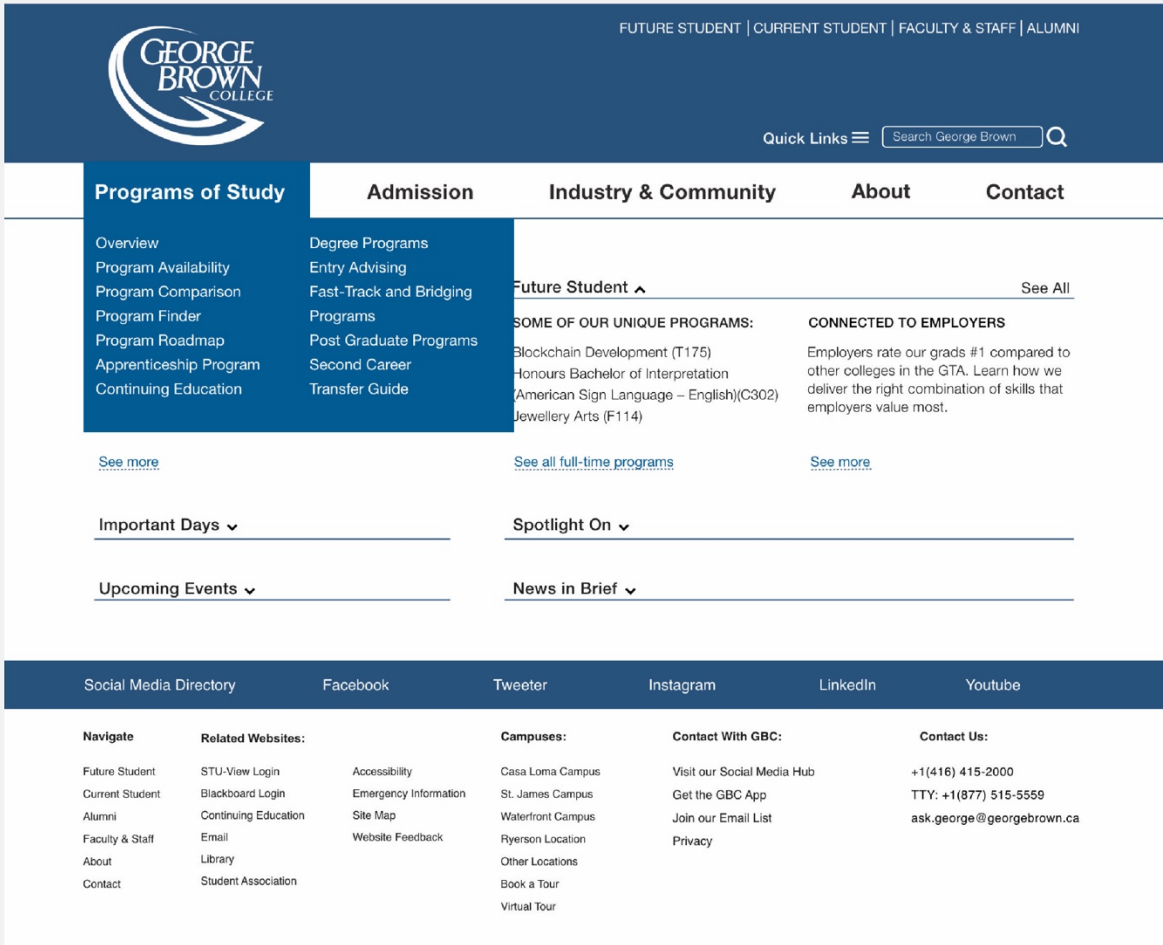


Figure 25: Redesigned George Brown College Website, Colour Based



Figure 26: Redesigned George Brown College Website, Colour Based



Figure 27: Redesigned George Brown College Website, Colour Based



NEWS [SEE ALL](#)

Acute Flaccid Myelitis (AFM) cases
(Monday, October 22, 2018)

Since September, SickKids and a number of other North American paediatric centres have seen an increase of patients with muscle weakness following a viral illness. Many of these patients are being identified as having acute flaccid myelitis (AFM), which is a type of acute flaccid paralysis (AFP).

[More...](#)

EVENTS [SEE ALL](#)

Annual Labatt Lectureship
Wednesday, January 16, 2019

Cell Biology Seminar Series
Friday, January 18, 2019

Cell Biology Seminar Series
Friday, February 1, 2019

[More...](#)

PERSPECTIVE [SEE ALL](#)

Living kidney donation: A selfless act of giving the gift of life
(Tuesday, November 27, 2018)

Although not a cure, successful kidney transplants significantly improves the lives of children with kidney disease. They have improved energy levels and appetites and have fewer fluid and dietary restrictions, facilitating a more normal growth and development, which gives them more ability to achieve many of their dreams and milestones. [staff/volunteer](#)

[More...](#)

Tweets by @SickKidsNews

Corry Azzopardi
@DrAzzopardi
October is #ChildAbusePrevention Month! In support of #DressPurpleDay, the SCAN team at SickKids is wearing purple to raise awareness about children's rights to safety and wellbeing. #BREAKthesilence @SickKidsNews @boostforkids @our_children @SADVTC

SickKids_TheHospital
@SickKidsNews
#SickCareers: We're hiring a Supervisor, Protection Services. To read the job description and apply, visit: <http://ow.ly/b2a30mm19B>

SickKids_TheHospital
@SickKidsNews
With a MyChart account, you can access parts of your electronic health record when you're on the go! Learn more about what MyChart can do for you: <http://ow.ly/4P730mQr3U> Talk to a member of your care team at your next visit to sign up.

[Visiting SickKids](#)

[Areas of Care](#)

[Patient and Family Resources](#)

[Careers and Volunteering](#)

[Health-care Professionals](#)

[About](#)

[SickKids](#)

[Sitemap](#)

[MyPorta](#)

[MyChart](#)

[iLearn](#)

[Contact SickKids](#)

[Terms of Use](#)

[View Mobile Site](#)

[Facebook](#)

[Tweeter](#)

[Instagram](#)

[LinkedIn](#)

[Youtube](#)

Healthier Children. A Better World.™
Copyright © 1999-2014 The Hospital for Sick Children (SickKids). All rights reserved.

The Hospital for Sick Children (SickKids) is a health-care, teaching and research centre dedicated exclusively to children affiliated with the University of Toronto. For general inquiries please call: 416-813-1500.

Contact SickKids/Terms of Use/View Mobile Site
Please note: Some of the content photography on this website is being used for illustrative purposes only and any person depicted in the content is a model.

Figure 28: Redesigned SickKids Hospital Website, Colour Based

<ul style="list-style-type: none"> Coming to Emergency Coming for Surgery Clinic Appointment Staying at SickKids Visitor Resources Infection Prevention Getting to SickKids 	<ul style="list-style-type: none"> Visiting a Patient Accessibility Safety Info Staying at SickKids 	<h2>Areas of Care</h2>	<h2>Resources</h2>
<h2>Health-care Professionals</h2>	<h2>About SickKids</h2>	<h2>Careers</h2>	

NEWS [SEE ALL](#)

[Acute Flaccid Myelitis \(AFM\) cases](#)
(Monday, October 22, 2018)

Since September, SickKids and a number of other North American paediatric centres have seen an increase of patients with muscle weakness following a viral illness. Many of these patients are being identified as having acute flaccid myelitis (AFM), which is a type of acute flaccid paralysis (AFP).

[More...](#)

EVENTS [SEE ALL](#)

[Annual Labatt Lectureship](#)
Wednesday, January 16, 2019

[Cell Biology Seminar Series](#)
Friday, January 18, 2019

[Cell Biology Seminar Series](#)
Friday, February 1, 2019

[More...](#)

PERSPECTIVE [SEE ALL](#)

[Living kidney donation: A selfless act of giving the gift of life](#)
(Tuesday, November 27, 2018)

Although not a cure, successful kidney transplants significantly improves the lives of children with kidney disease. They have improved energy levels and appetites and have fewer fluid and dietary restrictions, facilitating a more normal growth and development, which gives them more ability to achieve many of their dreams and milestones.

[More...](#)

Tweets by @SickKidsNews

Corry Azzopardi
@Dr.Azzopardi
October is #ChildAbusePrevention Month! In support of #DressPurpleDay, the SCAN team at SickKids is wearing purple to raise awareness about children's rights to safety and wellbeing. #IBREAKtheSilence @SickKidsNews @bcostforKids @our_children @SADVTC

SickKids_TheHospital
@SickKidsNews
#SickCareers We're hiring a Supervisor, Protection Services. To read the job description and apply, visit: <http://www.kylebda30careers>

SickKids_TheHospital
@SickKidsNews
With a MyChart account, you can access parts of your electronic health record when you're on the go! Learn more about what MyChart can do for you: <http://www.kylebda30careers> Talk to a member of your care team at your next visit to sign up.

Figure 29: Redesigned SickKids Hospital Website, Colour Based

Celebrating another great year!

Check out our top highlight from 2018

NEWS

EVENTS

PERSPECTIVE

Acute Flaccid Myelitis (AFM) cases (Monday, October 22, 2018)

Since September, SickKids and a number of other North American paediatric centres have seen an increase of patients with muscle weakness following a viral illness. Many of these patients are being identified as having acute flaccid myelitis (AFM), which is a type of acute flaccid paralysis (AFP).

May the force not be with you: SickKids scientists find brain tumour cells hijack force-activated ion channels to promote tumour stiffening and growth (Thursday, October 18, 2018)

Despite the significance of tissue mechanics in cancer, the way solid tumour cells sense and respond to their physical environment is largely unknown. Researchers at The Hospital for Sick Children (SickKids) recently found that in glioma cells, ion channels can promote cancerous growth

[See All News](#)

Tweets by @SickKidsNews

Cory Azzopardi

@C.Azzopardi

Octobers#ChildAbusePrevention Month! In support of #DressPurpleDay, the SCAN team at SickKids is wearing purple to raise awareness about children's rights to safety and wellbeing. #BREAKthesilence @SickKidsNews @boostforkids @our_children @SADVTC

SickKids_TheHospital

@SickKidsNews

#SKCareers We're hiring a Supervisor, Protection Services. To read the job description and apply, visit: <http://cw.ly/eb2a30mm9B>

SickKids_TheHospital

@SickKidsNews

#SKCareers We're hiring a Supervisor, Protection Services. To read the job description and apply, visit: <http://cw.ly/eb2a30mm9B>

[See All](#)

[Areas of Care](#)

[Patient and Family Resources](#)

[Careers and Volunteering](#)

[About](#)

[SickKids](#)

[MyChart](#)

[iLearn](#)

[Sitemap](#)

[Terms of Use](#)

[View Mobile Site](#)

[Twitter](#)

[Instagram](#)

[LinkedIn](#)

[Youtube](#)

Healthier Children. A Better World.™

Copyright © 1999-2014 The Hospital for Sick Children (SickKids). All rights reserved.

The Hospital for Sick Children (SickKids) is a health-care, teaching and research centre dedicated exclusively to children, affiliated with the University of Toronto. For general inquires please call: 416-813-1500.

Contact SickKids [Terms of Use](#) [View Mobile Site](#)

Please note: Some of the content photography on this website is being used for illustrative purposes only and any person depicted in the content is a model.

Figure 30: Redesigned SickKids Hospital Website, Colour Based

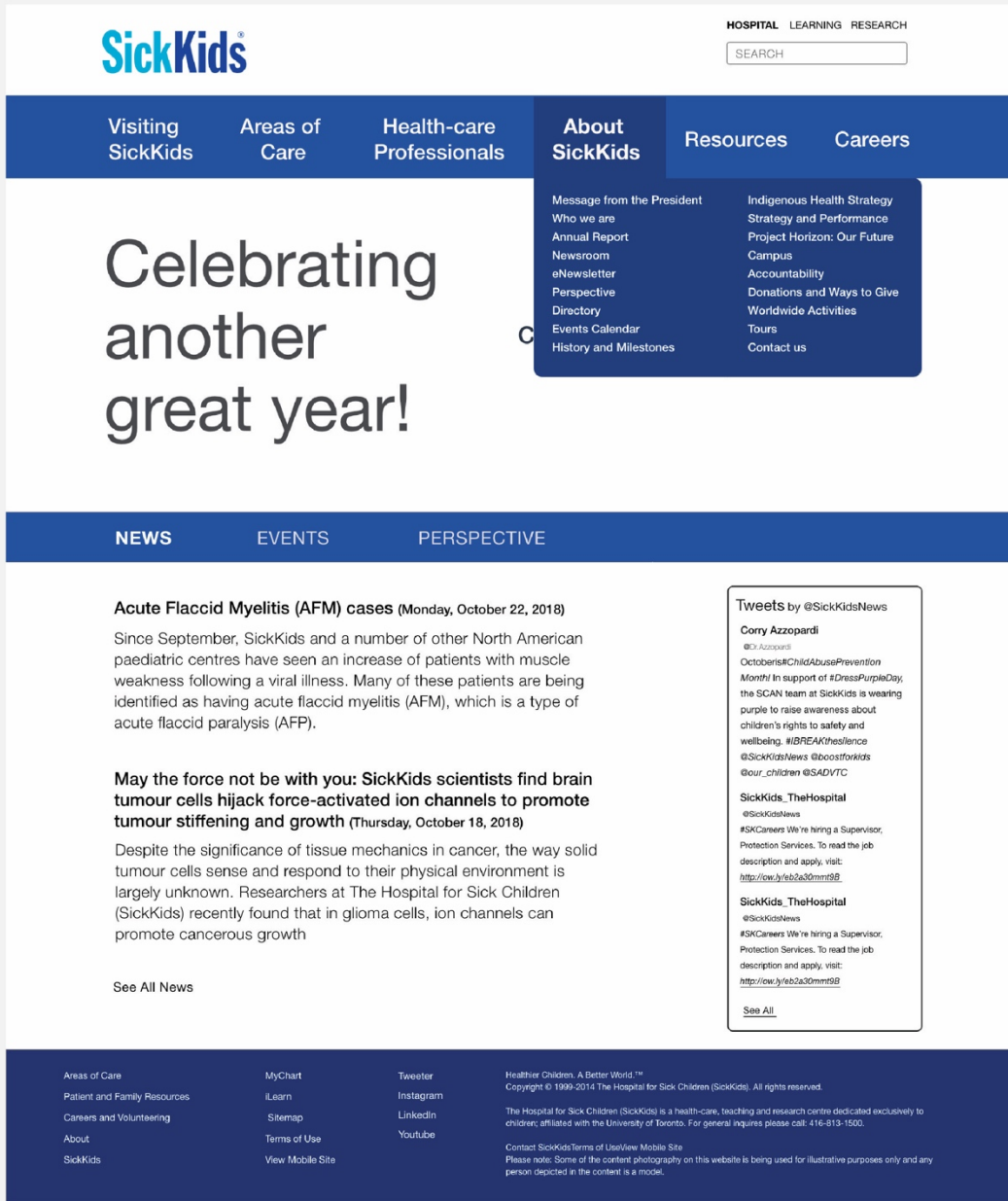


Figure 31: Redesigned SickKids Hospital Website, Colour Based