



MacChangers

2020/ 2021

Report

Compilation of MacChangers Student Project Briefs



Letter from the Director

This past year was an exciting one in which we pivoted to deliver our MacChangers program in a virtual setting due to the global pandemic. Over the past eight months we expanded our vision, deepened our relationships, and engaged in work that supported our community during the COVID-19 recovery efforts. For readers learning about our program for the first time, MacChangers is a co-curricular program that pairs multidisciplinary teams of students with community experts in order to propose innovative solutions to some of the local challenges facing the Hamilton community. Our vision is to offer experiential learning opportunities to students and to propose collaborative solutions to the most complex and pressing problems confronting society in the 21st century as identified in the United Nations Sustainable Development Goals (Think Global) and Our Future Hamilton (Act Local) long-term community vision.

This year marked the sixth iteration of the program, as well as the largest and most diverse group of student participants to have ever completed the program. With over 130 students and representation across all faculties, students worked to solve problems in four Challenge Areas, in alignment with the City of Hamilton's 25-year community vision: Our Future Hamilton. The Challenge Areas are Clean and Green, Healthy and Safe Cities, Infrastructure and Built Environment, and Economic Prosperity and Growth.

This report details each of the MacChangers Projects completed in the 2020-2021 year as well as the students who participated in each of these projects. There are a lot of individuals without whom this year would not have been possible. I would like to extend my deepest gratitude to our community experts that volunteered their time to join us virtually and support our students' learning journeys. After reading this report, I am certain you will see the extent of learning obtained through their guidance and mentorship.

MacChangers would not be possible without the support of the Faculty of Engineering. I would like to specifically thank Dean Ishwar Puri, as well as the Director of Outreach & Engagement, Arlene Dosen, who have championed this program since its inception. Starting this year MacChangers has partnered with the Office of Community engagement and I would like to thank them, in particular their Director, Professor Sheila Sammon, for providing us with resources and support to engage with the community in a reciprocal and respectful way. Finally, I would like to thank the members of our teaching team, including Beth Levinson, Kyle Ansilio, Abbie Little, Jay Carter, and Abbey Hudecki as well as our Student Partners, Gavin Boyd, Zizheng Gao, Ali Hamdy, Rachael Rajendram, and Coryn Urquhart. The teaching team and the student partners are a dynamic and engaging group who mentored the participants of MacChangers over eight months, encouraging them and supporting them as they created real-life solutions. Finally, there are the students who have taken the time out of their studies to work with our team and the community to make the future brighter. Thank you.



Cameron Churchill
Director of the MacChangers Program

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Clean and Green



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Engagement

C1 – Gamification: A Fun Way of Sharing and Preserving the Bruce Trail

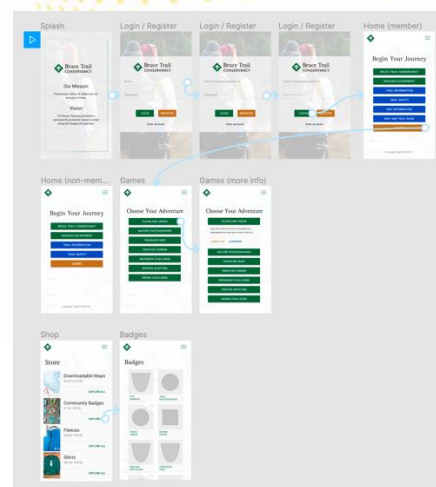
How might we encourage behavioural change to get Bruce Trail users to follow trail etiquette and support ecological conservation through sustainable shared usage?

Student Authors

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Description

The average footfall at the Bruce Trail Conservancy increased drastically with the “outdoor boom” from the onset of COVID-19 as seen through a 50% increase of trail users nationwide (Trans Canada Trail, 2020). As a result, conservation efforts are offset, garbage accumulates, and natural resources are at risk. The problem lies in encouraging all trail users to be active stewards of our land. From our research, we believe that this issue stems from a lack of understanding on sustainable trail usage and lack of seriousness in being a responsible trail user. Relaunching a free-to-download Bruce Trail app will enable users to access important know-before-you-go information about the Bruce trail. The traditional benefits and special accesses remain unchanged for members, but non-members can participate in community games that both educates users about trail conservation and is fun to use. The goal is to gamify the learning process of shared and sustainable usage.



App Prototype

C2 – Book a Date with Mother Nature!

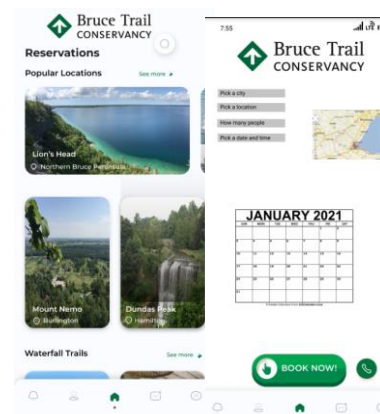
How might we better accommodate the increase in trail traffic in popular locations along the trail?

Student Authors

Luke Schuurman, Engineering
Andy Sefain, Science
Steven Luo, Health Sciences
Sama Al-Salihi, Science

Description

The COVID-19 pandemic has indirectly led to a surge in local tourism, including local trails and parks (Kimber, 2020). In the Northern Bruce Peninsula, trail traffic surged by 124%, (Leitner, 2020) increasing littering and damage to the ecosystem along the trails, as well as unauthorized parking due to lot overflow. Our solution is to create a booking system for highly trafficked trail “hotspots”, which would be integrated with the Bruce Trail Conservancy (BTC)’s website and mobile app, allowing people to reserve slots to visit their desired location. BTC volunteers will be at the trail entrance, ensuring all trail users have reserved in advance. By reserving in advance, trail users are guaranteed access to the trail, and a parking space if arriving by vehicle. A similar system implemented by the Hamilton Conservation Authority was successful in reducing daily visits by more than 70% compared to the year before (Leitner, 2021).



Booking System Prototype

C3 - BTC Information Campaign

How might we encourage the Bruce Trail's users to understand the impact they have on the trail and contribute to its preservation?

Student Authors

Enrico Rescigno, Health Sciences

Anahita Martyn, Engineering

Sarah DeBuono, Arts & Science

Ellie Teeple, Engineering

Description

Preserving biodiversity along the Bruce Trail has recently become a significant problem as websites like BlogTO advertise it as 'the place to get the perfect picture' (Palumbo, 2019). The Bruce Trail Conservancy's (BTC) past efforts to promote biodiversity and responsible trail use have been less successful than they had hoped, and our goal is to address this by proposing a system to reach a wider audience. There are currently 62 endangered species along the Bruce Trail, (Bruce Trail Conservancy, n.d.) which trail users have unknowingly put at increased risk by veering off-trail. Our proposed solution is an information campaign that aims to improve the knowledge of appropriate trail use, as well as to inform others on the types of wildlife that are found along the trail itself. This solution entails updating the signage along the trail and updating the BTC social media pages to provide more engaging ways for trail users to stay informed.

C4 – ECO PAL: A Tiered Solution to Improve Accessibility within the Cootes to Escarpment EcoPark System

How might we assist EcoPark System partners in educating their trail users about local biodiversity using an accessible framework?

Student Authors

Melissa Vu, Engineering

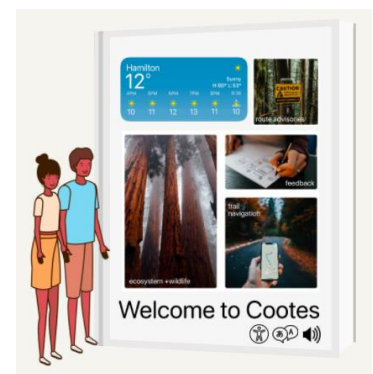
Celine Do, Business

Milena Hadzi-Tosev, Science

Abhinav Pathak, Health Sciences

Description

A significant increase of visitors on Cootes to Escarpment EcoPark System partner owned properties due to COVID-19 has amplified improper trail use and etiquette (Wiercioch, 2021). There exists a need to educate visitors on how to be better stewards and take care of local biodiversity. Our proposed, tiered solution aims to create a more accessible educational framework for trail users. These tiers involve revamping the EcoPark System website as a user-friendly mobile app, implementing a digitized sign at the entrance of major trails, and creating a digitized directory. Each step will focus on educating trail users about environmental advisories, surrounding wildlife, proper navigation, and trail difficulty/elevation. Through strategies such as offering 5+ languages, different accessibility modes, and open feedback channels, this solution is able to reach all trail users.



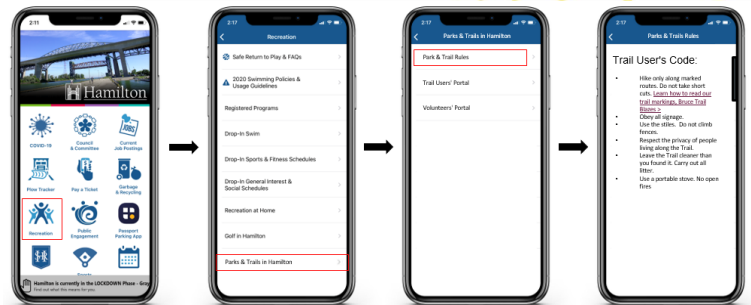
Digitized directory

C5 – City of Hamilton App – Parks Extension: Encouraging Proper Park Etiquette

How might we promote and educate trail users about proper trail etiquette and safety?

Student Authors

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Prototype Image

Description

Increased trail usage has been threatening the natural biodiversity within the Hamilton area due to improper trail etiquette and increased littering. Kara Bunn, a City of Hamilton employee, described the increasing damage being imposed by trail users who are not adhering to trail usage guidelines, an issue that has been accelerated by COVID-19 (Bunn, 2021). Over half of all respondents of a survey by Trans Canada Trail indicated increased trail usage across all age groups during the pandemic, which correlates with an increase in the number of trail injuries and trespassing incidents (Burger, 2020). Our proposed solution will focus on improving trail safety and ecosystem preservation through adding an extension to the City of Hamilton's mobile application. This app will provide trail users with the rules of Hamilton trails before they visit. Also, the law enforcement and volunteer process will be streamlined through this app to increase the ease of participation.

C7 - Reducing Levels of Pollution in Hamilton Harbour Through the Use of Bioremediation

How might we reduce the Cyanobacteria blooms in Hamilton Harbour therefore restoring its environmental health and recreation potential?

Student Authors

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Description

Hamilton Harbour is infected with Cyanobacteria that poses a risk to human health, inhibits most recreational use of the harbour and depletes its ecosystem health (Government of Canada, 2021). The Hamilton Harbour is an essential economic and industrial stakeholder, but this has caused long term contamination. This in turn is damaging Hamilton's reputation and environmental health, therefore impacting all Hamiltonians. With a focus on Sustainable Development Goals 6, 11, and 14 we believe that the innovative and cost-efficient solution of Bioremediation could help Hamilton improve water quality, develop sustainable wastewater management, and rejuvenate aquatic ecosystems. Bioremediation involves the use of microorganisms to break down targeted pollutants (Vidali, 2001). Through research on local nitrogen levels (Saati, 2016), our proposed solution is implementing a nitrogen-reducing biofilter (Shannon et al., 2016) that could control the nutrients feeding the harmful Cyanobacteria. This solution will contribute towards the global initiative for sustainable development while improving local water quality.



Hamilton Harbour's Beach Use Sign
 Credit: John Rennison

C8 – Reducing Conflict on Multi-Use Trails Through Accessible Information

How might we implement educational tools to reduce biker-pedestrian collisions along Cootes Drive in Hamilton?

Student Authors

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Description

Hamilton trail usage has increased by 124% since the beginning of the COVID-19 pandemic (Kimber, 2020). Community members expressed concern regarding new user's unfamiliarity with trail etiquette leading to harmful situations like collisions (Mann, 2020). Violation of trail etiquette is largely due to the ignorance of new users, which is being addressed by educating incentives like the Ambassadors Program on Hamilton's Waterfront Trail. Our solution is focused on Cootes Drive, a multi-use trail that is accessed through Sanders Boulevard. A safety review of the intersection reported a total of 3,712 users in a day (Suggett, 2004). Our proposed solution is a sign with a catchy slogan and scannable QR code that downloads a pdf of trail rules. The sign will include a condensed graphic of the pdf for individuals without phones. This solution is designed to be cost-effective, accessible, and educational for users on Cootes Drive and ultimately reducing ignorance-based trail conflict.

Proposed Solution



Prototype Image

C9 – Promoting Trail Education and Etiquette Through Accessible Advertising

How might we improve accessibility of trail education for all potential users in order to increase safety and user satisfaction?

Student Authors

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Description

The City of Hamilton is home to 25 major trails, which are publicly accessible (City of Hamilton, 2016). For trails to truly be publicly accessible, they must accommodate all of the needs and uses of the Hamilton and surrounding population. The City of Hamilton lists safety and accessibility as their primary objectives with regard to trail planning (City of Hamilton, 2016). Further studies in this area show that education campaigns are highly effective at mitigating conflict and promoting user satisfaction on multi-use trails (Hasenauer, 2020; Koontz, 2005; Moore, 1994). The City of Hamilton has previously used video and image-based advertising to educate and promote proper etiquette in other areas (City of Hamilton, 2020). However, the City of Hamilton has not yet used this method to promote education on trail etiquette. Therefore, this project focuses on creating simple, eye-catching video and picture advertisements to promote safe and ethical conduct on multi-use trails in Hamilton.



Prototype Image

C10 – EcoLight: Achieving Sustainability in Fifty Point

How might we help current users of the Fifty Point Conservation area better understand implemented guidelines and protocols to ensure the sustainability of its natural habitat and surrounding environment?

Student Authors

Kavya Sundaresan, Engineering

Joshua Carl Ngo, Engineering

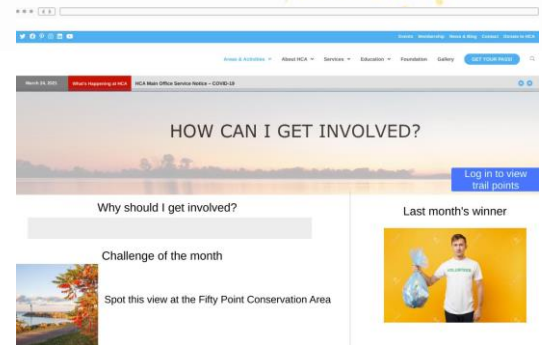
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Description

The Fifty Point Conservation space is a popular park in Hamilton that’s frequently used for recreational purposes. Its crowded atmosphere has caused an uprise in improper waste disposal, exhausting Hamilton’s \$2.3 million budget on waste disposal initiatives (Pecoskie, 2014). Waste accumulation in this area can lead to runoff into Lake Ontario, contaminating the drinking water of 9 million Canadians (Lake Ontario, n.d.). To mitigate this issue, we propose EcoLight, a rewards-based program which allows visitors to engage in cleaning the conservation space for prizes. Participants can share pictures of the litter that they have collected on social media to accumulate points, which can be exchanged for gift cards. By partnering with the Hamilton Conservative Authority, EcoLight can be added to their website, allowing participants to track their contributions. Participants can also check their rankings against others on this webpage and compete to be in the top five to be featured on EcoLight’s social media.

Prototype Website



Economic Prosperity and Growth



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E1 – Connecting Famers to Customers

How might we provide health-conscious Hamilton families with a better transaction medium in order to make locally grown food more accessible?

Student Authors

Emma Ellis, Science

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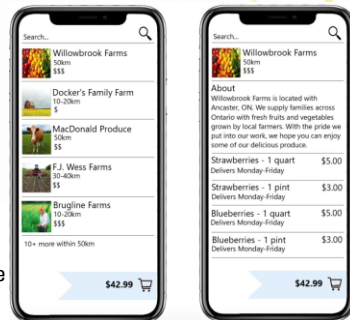
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Description

COVID-19 regulations have negatively impacted the operations of local farmers' markets, a significant source of sales for local farmers that have seen an 80 percent decrease in customers during 2020. Research from the Government of Ontario suggests demand for local produce has increased during the pandemic. Furthermore, 79.5 percent of Canadians surveyed are willing to pay premiums for locally-sourced foods, but only 25 percent actively seek them out. This showcases that accessibility is the key issue - a new transaction medium is needed for farmers to reliably sell their products. Farmarket enables accessibility to local foods by connecting Hamilton farmers directly with consumers through an online platform. By offering delivery and personalization services like that of a farmer's market, it creates an improved purchasing medium with lower transaction costs than current alternatives.



Prototype Image

E2 – Buy-namic: A Digital Solution for COVID-19 Business Burnout

How might we support local small businesses in effectively communicating up-to-date guidelines to customers and create a more comfortable and straightforward shopping experience?

Student Authors

Aniruddh Arora, Engineering

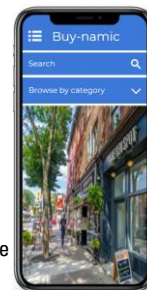
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Description

The COVID-19 pandemic has had an unprecedented impact on small businesses. Forced to navigate unpredictable lockdown restrictions with few resources, business owners have developed a variety of techniques to maintain their customer base by improving their online presence and encouraging online ordering for pickup. Ontario's businesses have reported losing customers simply due to confusion over ever-changing hours of operation, policies, and space capacity limits. Few owners have the resources available to create or regularly update their online business information at pace with these changing guidelines. Buy-namic will offer a simple and straightforward digital platform (website or mobile application) to provide clear and up-to-date information on the latest safety precautions and details for local Hamilton businesses. Buy-namic's goal is to enhance communication between business owners and customers during the pandemic by offering a flexible, efficient, and low-maintenance way for businesses to share their safety protocols and the services they offer.



Prototype Image

E3 – FEED (Farmers Education, Enrichment and (crop) Diversification) Program

How might we help farmers of Hamilton sustain the increased demand for local and fresh food?

Student Authors

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Prototype Logo

Description

In recent years, Hamilton has seen an increased demand for local and fresh food (The Conference Board of Canada, 2013). This shift in consumer preferences was not anticipated, and hence, the supply of local produce is limited compared to the demand (The City of Hamilton, 2016). Our project is focused on addressing the shortage in availability of local produce to maintain the current levels of demand (Adam, 2020). This can be done through diversifying production so that farmers can allocate their resources more mindfully rather than using all their resources in the production of a single entity. We believe that an efficient way to deal with this issue would be through training/support programs to encourage farmers to grow produce with a shorter harvest period, promote the use of high-yield variety seeds, and provide information about crops that can be easily produced in different weather conditions, etc. This would make the production process more efficient and bring supply to an equilibrium with demand.

E4 – Prioritizing the Elderly: Increasing the Convenience of Car Side Pick Up

How might we increase the appeal of supporting locally run restaurants and food services in the Hamilton region to elderly customers during inclement weather during COVID-19

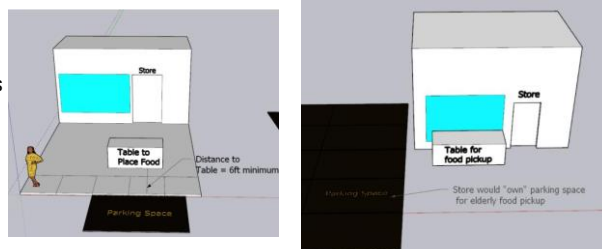
Student Authors

Jordan Horruzey, Science

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David Mason, Arts & Science

Prototype Process



Description

According to Lai, 43% of seniors aged 65+ are profoundly afraid of COVID-19, as they are the most at-risk age group (Toast, 2020). Consequently, seniors decreased their visitations to non-essential food services, as said by Rachel Braithwaite, Executive Director of the Barton Village BIA. Additionally, according to DeSantis, director of the Kamloops Central Business Improvement Association, during COVID-19, customers were more likely to visit downtown areas during summer months, significantly increasing the revenues of downtown shops, particularly restaurants (Lai, 2020). The American National Restaurant Association reported that 90% of stores indicate that inclement weather negatively affects sales. To help local food services on Barton Street retain senior customers during COVID-19 and inclement weather, we propose to Hamilton Municipal Parking System Office that restaurants adhering to COVID-19 guidelines be granted temporary ownership of nearby parking spaces to reserve for seniors, allowing outdoor transactions under a tarp-covered, nearby area, minimizing exposure to inclement weather and the public.

E5 – Hamilton Farmers’ Marketplace: Improving Virtual Accessibility to the Hamilton Farmers’ Market for Consumers of Locally Farmed Goods

How might we optimize consumer access to local and fresh food from the Hamilton Farmers’ Market to address current consumer accessibility needs?

Student Authors

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Description

Prior to COVID-19, there were between 15,000 to 20,000 visits to the Hamilton Farmers' Market per week. During the pandemic, this plummeted to 5,000—a 300% decrease in overall in-person consumer visits (Hristova, 2021). Thus, accessibility to these goods has posed a challenge to the Hamilton Farmers’ Market and the community (Hamilton Farmers’ Market, n.d.). In order to address these accessibility challenges, a solution to increase sales of local food by way of increasing consumer access to the market must be implemented (Goodman, 2019) (Agrba, 2020). Technology is integral to society as it contributes to increasing access to information with ease and convenience (Doneria & Vinodani, 2017) “Hamilton Farmers’ Marketplace” is our proposed solution, which serves as an extension of the pre-existing Hamilton Farmers’ Market website. It is designed to increase user satisfaction and bolster sales through a simplistic design interface, while incorporating analytics of online shopping for the Hamilton Farmers’ Market to accommodate community needs (Pickard-Whitehead, 2019).

E6 – Fresh Food Farmers Market: Implementing Online Sales Platform for Local Farms

How might we effectively use methods of direct-to-direct consumer sales to increase sales of small, local consumers who want to enjoy the benefits of consuming local produce?

Student Authors

Cindy Kim, Social Sciences

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Tim Wang, Engineering

Description

With the COVID-19 pandemic, there has been an increasing demand for local products, including food (Deloitte, 2020). With the heightened public awareness for food safety, 64.9% of people are now preparing meals more often, up to several times a week, due to the high risk of getting an infection. There is a growing importance in finding an effective way to sell the products to sustain this tremendous demand. Although the demand is high, the profit of some farmers isn’t fitting the trend at the same time. Fresh Food Farmers Market is an online platform where create an easier way for customers and farmers to form a better shopping experience. For the farmers side, Fresh Food Farmers Market can allow farmers to manage their online order easily to promote their product in the best condition. For the customers side, Fresh Food Farmers Market creates a platform that is easy to get on hand and get in touch with to fulfill their expectations of shopping local food as shopping on other websites (e.g. Amazon, Ebay).

Prototype Website



E7 – Handcrafted Hamilton: Themed Gift Baskets from Local Hamilton Handicraft Small Businesses Promoting Consumers to Shop Local

How might we provide local handicraft businesses with community-based marketing channels to help them better survive the COVID-19 pandemic?

Student Authors

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Description

According to a McKinsey report, 25~36% of small businesses have closed permanently due to the disruptions of COVID-19; arts and recreational businesses making up the largest percentage of these (Dua, et al., 2020). Unlike restaurants that have access to online platforms such as Skip the Dishes, local handicraft stores have limited options for reaching consumers, and public health guidelines are drastically reducing the amount of leisure shopping that these businesses depend on (Nmpidigital, 2021). To allow small businesses to better adapt to the hardships of COVID-19, we propose a marketing strategy that will see small businesses work together to create themed gift baskets featuring popular products and coupons from each small handicraft business. We further propose to work with our community partners to use existing online channels to distribute the gift baskets to the local community. Not only will this help local businesses better survive the pandemic, but it will encourage consumers to shop locally.

E8 – Designing a Communication System for Centralizing and Delivering Health Protocol Information to Small Business Owners on Barton Street

How might we design a method to improve proper communication between public health officials and business owners facing barriers of language, internet access, and other resources?

Student Authors

Fatima Zahirisaransari, Engineering

Meagan James, Engineering

Anabela Cotovio, Health Sciences

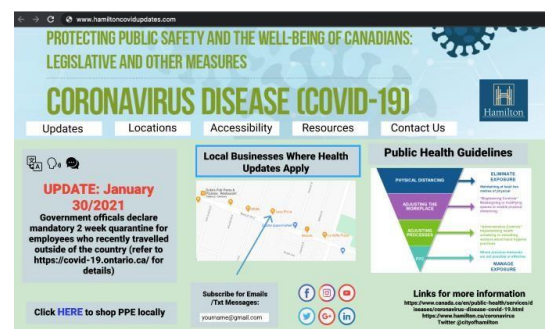
Alexandria Mansfield, Science

Sulaksa Jeevakumar, Engineering

Description

Due to ineffective communication between public health officials and local business owners and the often-changing regulations some local businesses on Barton Street, Hamilton, while doing their best to keep customers and staff safe, have been struggling to always keep up to date with the new requirements. Inconsistent updates on mandated protocols have resulted in reduced consumer demand, increased health risks to their personal family and broader Hamilton community, risking potential closure of these businesses' (Braithwaite, 2021). Current methods of email blasts and door to door visits have not been feasible when businesses are closed or at limited capacity. We plan on implementing weekly phone call updates as a means of centralizing resources in an accessible format that are otherwise contained within our off-line app (Rajput, 2020). Barton Reform, our app, encompasses multiple streams of information into one accessible location, including off-line chat rooms, government subsidies and a database for links to COVID response resource purchases.

Prototype Website



E9 – BIA Takeout Campaign: Restaurant and Hospitals Sponsorship

How might we design a marketing campaign for restaurants that is accessible to hospital staff from the Barton area?

Student Authors

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Hiba Ali, Science

Ana M Rivera, Science



Description

Due to COVID-19 it is estimated that 1.14 million small businesses are lamenting significant profit declines, in particular sit-down restaurants (Deschamps, 2020). Similarly, front-line workers have been affected by the pandemic because of increasingly inconsistent meal-break cycles influencing their work experience. Studies show that inadequate food consumption can decrease the quality of patient care and cause medical errors, hence decreasing patient care overall (Hamidi et al., 2016). Dr.Take-Out is a fundraising meal campaign that targets both restaurants and health-care workers. This campaign will have various local restaurants deliver free meals to local hospitals, for which costs would be covered by fundraising initiatives. The Dr. Take-Out campaign will start via a marketing campaign within hospitals with QR coded poster advertisements. This meal campaign aims to support the local economy as well as supply Hamilton's healthcare workers with convenient free meals that will aid them in their battle against COVID-19.

Healthy and Safe Cities



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H2 – WellHub: The Student Wellness Centre Nexus

How might we increase awareness of and access to McMaster Wellness Centre mental health services to better support students during campus closures?

Student Authors

Clare-Marie de Souza, Humanities

Hunter Ceranic, Engineering

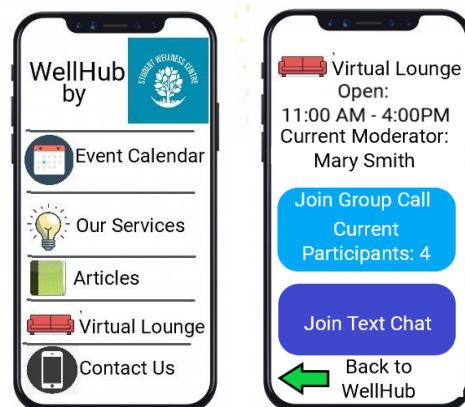
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Bhavika Nayyar, Engineering

Cindy Zhang, Health Sciences

Description

10-20% of Canadians between the ages of 15-24 experience mental health issues, which signifies that mental health is a rising concern amongst university students, the population which represents our future (Tamboly & Gauvin, 2013). In light of COVID-19, we anticipate that the need for mental health services will increase (Panchal et al., 2021). Two barriers of accessing mental health services include a lack of awareness about existing services provided by the university and perceived stigma associated with mental health services (Giamos et al., 2017). Our project aim is to eliminate these barriers by increasing awareness about existing mental health services provided by McMaster Wellness Centre and increasing the ease to which students can access these services. In order to achieve this, we propose a mobile application that acts as a centralized hub for the Wellness Center mental health services, programs, support and community.



Mobile Application prototype

H3 – A Plastic Barrier to Improve Physical Activity/Socializing during COVID-19 in Senior Retirement Homes

How might we create opportunities for physical activity/socialization, in line with COVID-19 restrictions that do not require assistance or physical touch?

Student Authors

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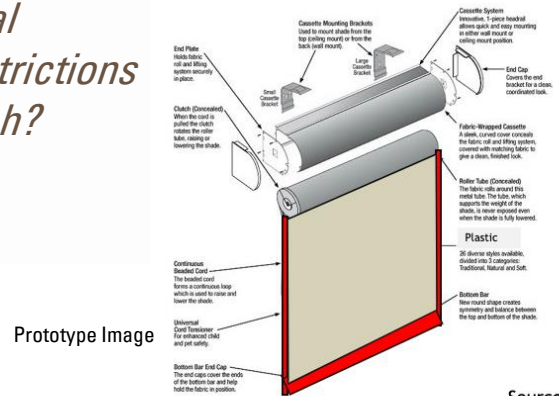
Krista Ariello, Health Sciences

Zach Chapple, Engineering

Zareen Kabir, Engineering

Description

The COVID-19 pandemic has devastating impacts for vulnerable populations like long-term care residents. Residents account for 36% case fatality which represent up to 85% of all COVID-19 deaths in Canada (Hsu et al., 2020). Infection prevention control has resulted in reduction of physical activities for residents; decreasing quality of health. (Sepúlveda-Loyola et al., 2020). Physical activities are still essential - that is why our proposed solution is creating a clear plastic cover for the doors of resident rooms, to prevent direct physical contact with others and reduce any risk of infection. This cover would be secured around the perimeter with magnets and could be rolled up/down using a pulley system. This cover can be installed on both sides of the door, allowing for door opening and closing. This solution would allow seniors to exercise with peers/staff without the risk of physical contact.



Prototype Image

Source:
Greenland
Metal

H4 – Stay Home, Stay Fit Bundle: The COVID-19 at Home Senior Fitness Program

How might we make it safe and feasible for older adults to stay active this winter with COVID-19 restrictions in place?

Student Authors

Irene Ye, Science

Sarah Honaizer, Science

Tracy Huynh, Engineering

Selena Esteves, Science

Srikohilan Manoharan, Science

Description

Nearly 64% of Canadians are inactive during the winter months, which is set to increase due to limitations during the pandemic (Merchant, Dehghan & Akhtar, 2007). With 17% of Hamiltonians being over 65 years old (City of Hamilton, 2019), this large portion of the Hamilton community is at a higher risk for serious COVID-19 complications and age-related disabilities. For many seniors, the safest and only option is staying at home, and in person recreational programs are no longer available to keep those over 65 active. Our solution includes a biweekly exercise subscription package delivered to the doors of older adults who are stuck at home during the COVID-19 pandemic. This includes optional equipment available for delivery, an infographic outlining exercises, and video access with audio description. This will allow seniors to keep active while maintaining their sense of comfort, independence, and safety at home with a solution that is easily customized to fit their income and fitness levels.

Prototype Process



H5 – Automated Public Washrooms: Safer For your Peace of Mind

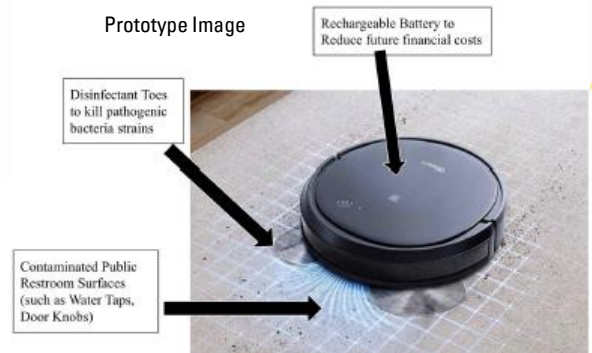
How might we improve current public washrooms for the Hamilton community to ensure they are safe for use amidst the COVID-19 pandemic?

Student Authors

Mann Badami, Science
Syeda Raveen Muzaffar, Science
Betsy Luo, Health Sciences
Maggie Zhu, Engineering

Description

Public washrooms are an essential amenity needed for hygiene, sanitation, and refuge. However, 46% Canadians feel unsafe visiting public restrooms during this pandemic (Canada, 2020). Washroom surfaces that may be contaminated pose the risk of exposing users to pathogenic diseases, causing severe illness. Even before the pandemic, a study revealed that about 89% of 7,482 samples from bathroom surfaces were contaminated with pathogenic bacteria (Matini et al., 2020). Thus, having a clean public restroom is necessary to ensure people feel safe when using them. Our proposed solution is to construct a self-cleaning robot that can disinfect high-contact surfaces such as water taps and doorknobs. These robots would reduce pathogenic bacteria strains, creating more hygienic public restrooms. This solution will provide cleaner washroom facilities that are more accessible to homeless individuals amidst the pandemic. Although a high initial financial investment is required, it would be outweighed by reduced maintenance costs.



H6 – Pop-Up Hamilton Public Toilet: Improving the Accessibility of Public Washrooms in Hamilton

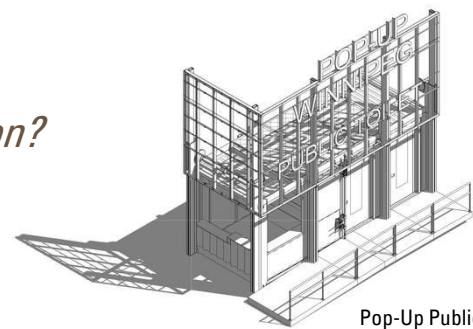
How might we implement standalone public washrooms to increase accessibility for individuals facing precarious housing in Hamilton?

Student Authors

Matthew Ho, Engineering
Adrian Salopek, Health Sciences
Gagan Dhami, Science

Description

The COVID-19 pandemic has made it difficult for individuals facing precarious housing in Hamilton to safely access washroom facilities. The City of Hamilton has seen the largest increase in people experiencing homelessness outside of Toronto (Strobel, 2021). With frequent public announcements instructing citizens to stay at home and sanitize consistently, individuals facing precarious housing are struggling to oblige and are at risk of contracting COVID-19, which could lead to higher infection rates in the general public. This can be attributed to public washrooms decreasing in availability to maintain safety and social distancing standards (Hristova, 2020; Karim, 2020). Pop-Up Hamilton Public Toilets, are standalone washrooms that provide washroom facilities to individuals facing precarious housing. These facilities are strategically located to provide safe, accessible, free to use washrooms.



Pop-Up Public Toilet
Credit: Bridgman Collaborative
Architecture LTD

H7 – MacUVC: Improving the Sanitization and Accessibility of Public Bathrooms for the Hamilton Community

How might we make sanitized public spaces more accessible to the Hamilton community using existing infrastructure?

Student Author

Hiba Minhaj, Health Sciences



Description

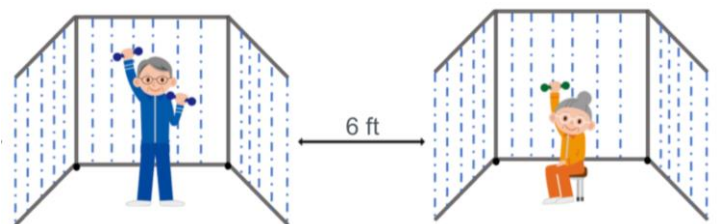
The coronavirus disease 2019 (COVID-19) pandemic has exacerbated the Hamilton community's shortage of clean public bathrooms (Karim, 2020). Many people, including people with children, the aging population, and people experiencing homelessness, require frequent trips to a bathroom. Without access to a clean accessible public bathroom, many people have no choice but to relieve themselves in public spaces. This affects the health of individuals and affects public health and safety overall. Due to the closure of many government facilities, fewer bathrooms are available to the public. Furthermore, many operating establishments have closed their bathrooms to the public to prevent the spread of germs. Our dynamic solution encompasses using Ultraviolet C (UVC) light to inactivate pathogens. The use of this germ-fighting technology will prevent the spread of pathogens and decrease the need and risk of cleaning public bathrooms, thus keeping existing public bathrooms open, safe, and functional.

H8 – Tribubble: Addressing Isolation & Group Physical Activity during COVID-19 in Long-Term Care Homes

How might we design physical activity programs within long-term care homes that are inclusive of the elderly population's exercise requirements while respecting COVID-19 restrictions?

Student Authors

Sophie Krokhine, Science
Emily Murray, Health Sciences
Denise Catacutan, Health Sciences
Rebecca Ladouceur, Science
Sabrina Price, Health Sciences



Tribubble prototype

Description

Within Canada, the long-term care (LTC) sector has been disproportionately affected by the COVID-19 pandemic, accounting for more than 80% of all COVID-19 deaths in the country (CIHI, 2020; WHO, 2020). Unfortunately, physical distancing protocols have made it more difficult for seniors residing in LTC homes to achieve daily physical activity requirements, which is often conducted in a group setting (Vancouver Coastal Health, 2020). The pandemic has eliminated much of the social interaction that comes with frequent family visitors and social activities (i.e. exercise), and this has shown to take a toll on the mental health of LTC residents. According to a recent study, "social connection is good for mental health and well-being and important to quality of life in LTC homes" (Bethell et al., 2021). Additionally, many residents have complex health needs (e.g. cognitive or mobility impairments) so completing exercise in a group setting with supervision and support is crucial (ibid). To promote social interaction while also achieving physical activity, our proposed solution is a three-sided, foldable droplet shield made of thin, sturdy plexiglass fixed within a transportable metal structure (on wheels) that can be collapsed for storage. As LTC homes vary in design, the exact conditions of use will depend on the structure of designated recreational rooms and COVID-19 protocols. Additionally, our solution is sustainable in that it can be applied to other social activities during disease outbreaks post-COVID.

H10 – Mental Health at Mac Day

How might we address stigma surrounding mental health within the Hamilton student community in order to increase awareness and accessibility to mental health services?

Student Authors

Brianna Sookdeo, Humanities

Mary Wiebe, Science

Kavya Patel, Science

Eva Wang, Social Sciences

Description

Students' mental health should be considered as mental health plays a significant role in academic outcomes (Awadalla, Davies, & Glazebrook, 2020). Stigma is described as a barrier as it leads to "'labelling' of individuals and 'creating a separation'" (Public Health Agency of Canada, 2019). In relation with mental health, stigma consists of negative stereotypes around mental illnesses, and resources available. Over 70% of people affected by mental illness receive no treatment as a result of "prejudice against people who have mental illness, and [the] expectation of discrimination" (Henderson, Lacko, & Thornicroft, 2013). Within the Hamilton student community, "often the students who need the services most are the least likely to seek and find the care they need" (Munn, 2019). Hence, we propose to have "Mental Health @ Mac Day"; a one-day virtual or in person fair to exhibit and bring awareness to mental health resources available to students.

Prototype Image



H11 – Sanitracker: Real-Time Updating Map of Publicly Accessible Sanitation Facilities

How might we disseminate evidence-based information about public sanitation facilities to the Hamilton community, particularly individuals experiencing homelessness and limited access to the internet, so they can easily locate available services/facilities?

Student Authors

Yang Hu, Health Sciences

Marzan Hamid, Health Sciences

Justine Gould, Science

Salma Abdelghaffar, Engineering

Description

Hamilton currently lacks publicly available information regarding public facilities. Public washroom facilities are a necessity for all, and particularly important to vulnerable populations such as women, people with disabilities, and houseless populations (Lovgreen & Smyth, 2020; Lowe, 2020). Public washroom access has been severely limited due to COVID-19, leaving undignified alternatives (Nicol, 2020). People without internet access are unable to locate available facilities and may be at increased risk of spreading transmittable diseases due to decreased ability to follow hygiene protocols. We propose a real-time updating map of available washroom facilities. The map will use data reported by municipal maintenance staff and members of the public who can report information such whether the washroom is being cleaned, available for use, and washroom amenities, through an app. As an early-stage prototype, a community bulletin of available washroom facilities will be updated daily by student-volunteers in Jackson Square in Downtown Hamilton to gauge interest and test feasibility.

Prototype Image



Built Infrastructure and Environment



ENGINEERING



Office of
Community
Engagement

12 – Smart Shelter: Protection from Theft and Weather

How might we provide micro mobility vehicles with protection at the final destination?

Student Authors

Dhvni Shah, Engineering

Geety Baburi, Science

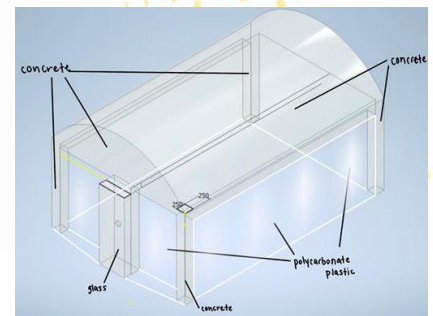
Zeinab Harb, Engineering

Yasmeen Harb, Engineering

Description

Encouraging biking is critical to the success of Hamilton's transport network as it aligns with the MTO's plans for 2041, which outline the desire to expand and enhance on active transportation by building communities that are cycling supportive (METROLINX, 2018). Protection of personal bicycles through public infrastructure is an integral piece in encouraging ridership (Ryan, 2017). In December 2019, Hamilton police found stolen bikes, worth \$40,000 (Hristova, 2019). Additionally, cold temperatures cause a decrease in air pressure leading to flat tires (Sahota, 2020), and constant exposure to rain and snow causes deterioration and rusting of bikes over time (Giddings, 2021). We developed the SMART Storage bike shelter to aid in active transportation during the first and last mile of a trip. A built-in locking mechanism, bikekeep (bikekeep inc., n.d) along with insulation and inexpensive yet durable materials like concrete, polycarbonate plastic, and steel, will be used, costing \$5000. This preserves bikes from theft and inclement weather to ensure their protection.

Prototype Image



13 – Bus Station Heater Innovation and its Response to the Hamilton Community Happiness Index

How might we innovate the current city bus station heater operation to increase the community happiness index and make it more ec—friendly infrastructure?

Student Authors

Helena Song, Science

Ruoxi Yang, Science

Echo Song, Science

Meixi Lin, Science



Bus shelter prototype

Description

Happiness with respect to temperature could be measured and maximized at 13.9°C (Haybron, 2020; Tsutsui, 2013). However, Hamilton's cold season lasts for 3 to 4 months and the average daily high temperature is below 5 °C (Weather Spark, n.d.). Therefore, inclement weather in Hamilton negatively affects the Residence Happiness Index (RHI). At the same time, 400+ bus shelters have been installed in Hamilton, however, few of them have a heating system (Vyas, 2020; The City of Hamilton, n.d.). To address the problem, we proposed a simple closed-circuit system consisting of a solar panel, a radiant heat lamp, and a push-off button which would provide a 5-minute of warmth to passengers. It is designed to enhance the RHI in Hamilton in winter with an ecology-economy-friendly outside heating system and promote the development of public transportation in Hamilton.

14 – Bottlenecked Bikes: Rethinking Cyclist Safety on York Road, Hamilton

How might we improve the safety index for cyclists on York Rd to encourage active transportation?

Student Authors

Sarah Rottenberg, Social Sciences

Amal Malik, Social Sciences

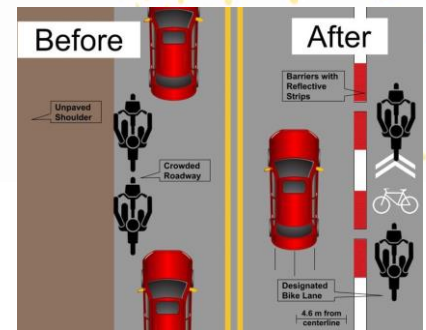
Arya Babaei, Engineering

Farhan Rafiq, Engineering

Description

With a heightened awareness and implementation of social distancing, many have switched to active transportation, further increasing the demand for bike infrastructure (Abu-Rayash & Dincer, 2020). York Road in Hamilton is a highly congested route with connections to Highway 6, the 403, and Hamilton’s major tourist attractions (Moulton, 2017). Cyclists are frequent users of the road despite its narrow shoulders and lack of a designated bike lane. Given the high demand for cyclists and limited infrastructure on York Road, it is crucial to prioritize their safety. As much as 60% of cyclists and 20% of non-cyclists said they would be more inclined to bike if their safety concerns were addressed (IBI Group, 2017). Our proposal is the construction of a bike lane on either side of the road with concrete barriers and reflective strips. Adding a physical barrier with reflective strips will separate vehicular traffic from cyclists, making it safer for both cyclists and drivers.

Prototype Image



15 – Developing an Accessible Real-Time Winter Google Maps

How might we improve transportation methods to destinations places during winter to increase and maintain accessibility?

Student Authors

Divya Thakkar, Engineering

Namit Chopra, Engineering

Janahan Rajagopalan, Engineering

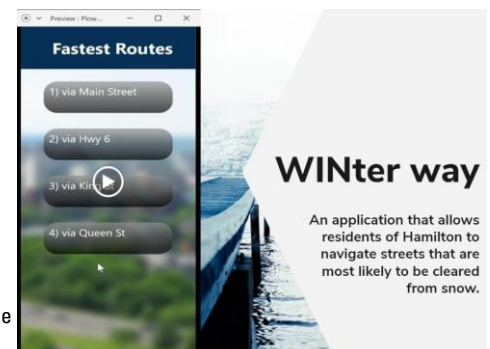
Areeba Imran, Science

Suleman Tariq, Health Sciences

Description

The number of vehicle collisions in Ontario are steadily increasing. The province is the only one to report an overall increase in its collision frequency rate, which is up 4.7% since last year (Cariati Law, 2017). These collisions mostly happened in the month of February, hinting that inclement weather is a big factor. Slippery, icy, and unclear roads make travelling during the winter months dangerous and inconvenient. With small businesses and destination spaces already facing challenges with COVID 19 restrictions, the winter season is anticipated to make people arriving at these locations yet another challenge. Thus, we propose an app that uses Google Maps and the City of Hamilton's road clearing priority chart to create routes that utilize the most cleared roads. This will make transportation more accessible during inclement weather and hopefully reduce the collision frequency rate in Ontario.

Mobile Application prototype



16 – Schedulize: A Software for Safety, Scheduling, and Supporting Small Businesses during COVID-19

How might we increase accessibility, convenience, and safety for consumers visiting in-person Central Hamilton retail and grocery stores during the COVID-19 pandemic?

Student Authors

Aruka Selliah, Engineering
Abeka Selliah, Engineering
Zeja Chen, Health Sciences
Rahul Singh, Health Sciences



Schedulize App Prototype

Description

COVID-19 has limited accessibility in the public use of services by local businesses; with over 2,700 confirmed total cases in Hamilton and 40% of cases coming from close contact, there are significant, but justified, regulations forcing businesses to change their strategies in catering to customers (Rankin, 2020). Hamilton has been strict with enforcing COVID policies, having already laid charges against 15 companies not following COVID-related laws (The City of Hamilton, n.d.). Schedulize is an app that allows consumers to schedule times to shop in Central Hamilton retail businesses and avoid densely populated shops, based on access to real time store GPS traffic data. Customers can make informed decisions about where and when to shop at in person venues, thanks to the hourly traffic averages provided by the app. Businesses can set limits on people attending stores, following public health protocols. They can also use our platform to promote their business and collect analytics data, potentially streamlining profits.

17 – Riding the Wave: A Revolution in Safer Micro-Mobility and Active Transit Infrastructure

How might we encourage the use of micro-mobility through designing infrastructure that creates a sense of safety and attracts a diverse range of users?

Student Authors

Petra Ialleggio, Engineering
Jaskiran Bains, Science
Cici Sun, Humanities
Subaita Refaaf, Science



Illuminated wave delineator Prototype

Description

In designing equitable and complete infrastructure, active transportation must be prioritized. In 2019 alone, over 128 cyclist collisions involved the lack of physical barrier separation at intersections along a number of bike lane paths in Hamilton (The City of Hamilton, 2020). Additionally, an active transport study shows that most vehicle-micromobile mode collisions occur during the hours of 18:00pm-23:59pm, suggesting that low visibility is a major cause (Papouts, 2014). For example, the Cannon Street bike path is the most used in Hamilton due to its physical barriers (Peterson, 2017), however, it still faces collisions because the existing barriers aren't robust enough. To address this broad issue, our group proposes the illuminated wave delineator. The illuminated wave delineator is a steel wave-shaped barrier with an integrated light component, used to physically separate and illuminate bike paths. It is designed to increase cyclist safety, attract a diverse range of users, and ultimately, shift Hamilton towards a cycling-friendly culture.

I10 – Battered to Beautiful: Providing Arts Students Opportunities to Beautify Local Construction Zones

How might we incentivize the community to improve the aesthetic and atmosphere of long-term local construction spaces in order to revive local businesses and improve the quality of living for Hamilton residents?

Student Authors

Thuvarakaa Sathiyamether, Engineering

Forrest Herman, Engineering

Tina Ismail, Engineering

Ivan Wu, Engineering

Description

Construction zones are often unappealing and avoided by visitors, which in turn negatively impacts business owners in the area. Through our research, we found that construction near small businesses can negatively affect the livelihoods of the shops and may even force them to shut down completely, as seen near a recent long-term construction zone in Quebec. After discussing with Hamilton community members, we discovered that Hamilton's Gore Park suffers from unattractive construction hoarding and fences. Our proposition is to kickstart a program offering McMaster students and local high schools the opportunity to apply and display their skills in downtown Hamilton to beautify and improve the aesthetic of construction spaces, as part of an extracurricular program or integrated into the curriculum. Through this initiative, students will be able to hone their artistic skills while also making a meaningful contribution to the community, fostering a deeper connection and pride for their city.

Project Concept
Source: Flow Clark



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E5 - Prioritizing the Elderly: Increasing the Convenience of Car Side Pick Up

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