

MCC Service-Learning

“It is so important to be out in the real world. Theories are just that, theories. Applying them to real life is essential to having a deep understanding of a concept.”

Volume 2-Issue 1

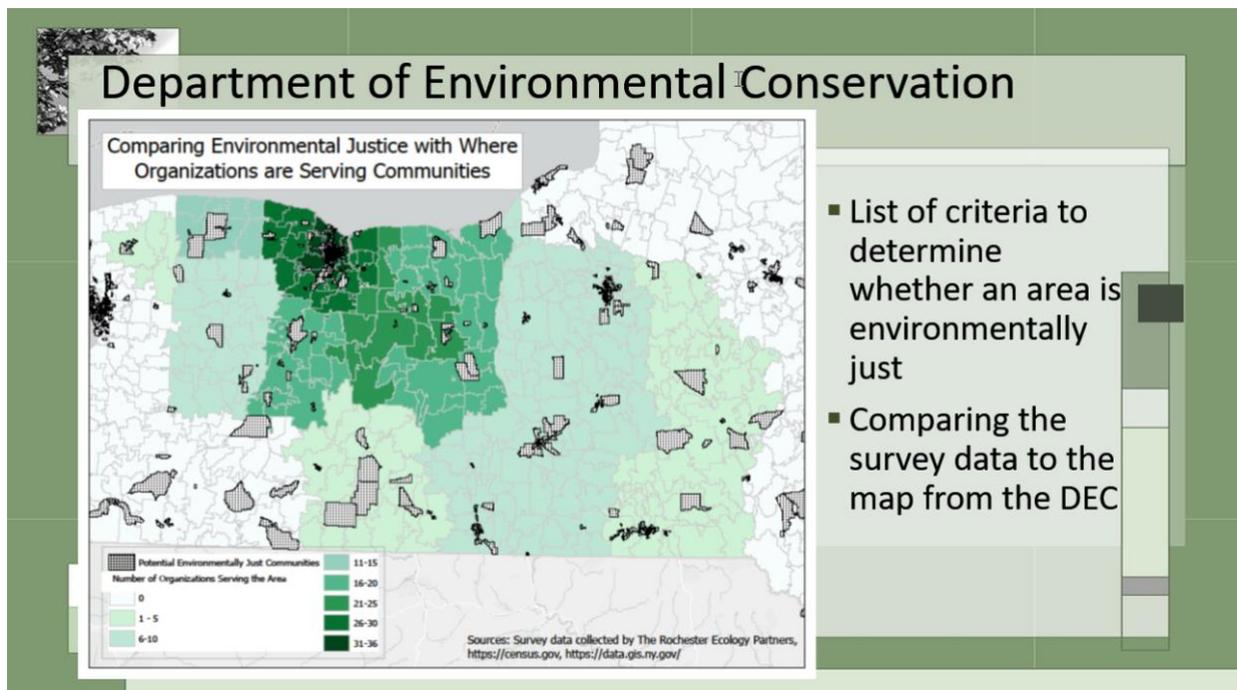
June 23, 2023

GEG 239 – Geospatial Technology Capstone Highlights

In Spring 2023, the **GEG 239 Capstone in GIST** course provided 12 semester-long internships of mapping, analysis & programming hosted at a wide variety of business, government, educational and nonprofit organizations in the Rochester area, Maine, Michigan, Kentucky, Washington, Mexico and Tanzania (all remotely hosted via Zoom meetings). The GIST student interns worked with their hosts to define and create custom geospatial solutions. The final projects created ranged from interactive-map-analysis, to online surveys that map environmental data, to tools automated with Python, to satellite data analysis, to historical story mapping, and more!

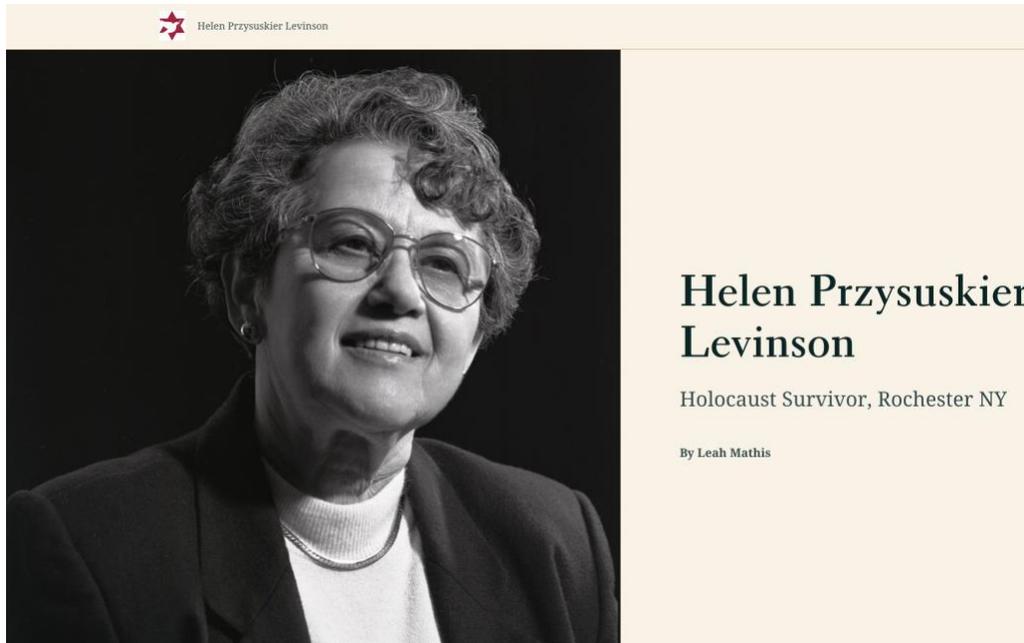
Client Quote

"They brought technical knowledge to our project that we wouldn't have been able to have otherwise. They also had communication and project management skills that made working with them easy. They were tenacious in their pursuit of solutions to a very challenging problem."



Client Quote

"Leah's Survivor StoryMap of Helen Levinson was the first in an ongoing series and will set the standard going forward. Leah has an outstanding Geography and GIS skillset that will serve her well at SUNY Geneseo and beyond."



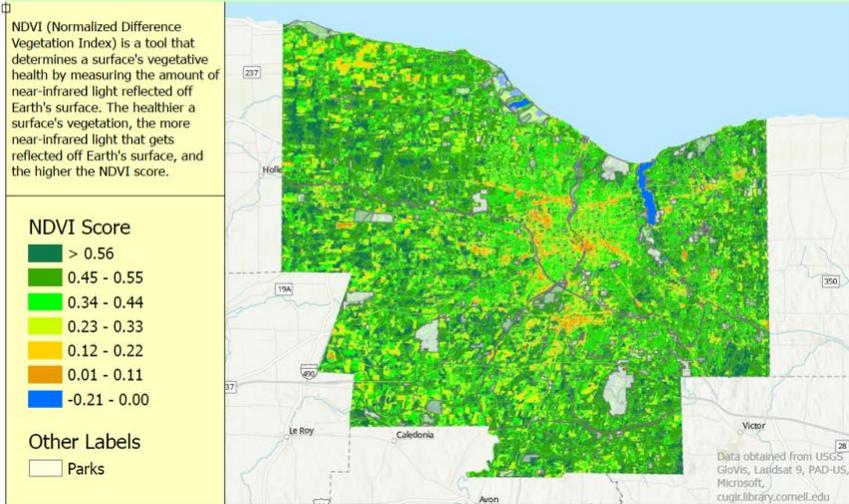
Storymap link: <https://storymaps.arcgis.com/stories/87edf85e27044a27905adf16d1c49f56>

Client Quote

"It was energizing for our organization to collaborate with our student intern from the GIST program at MCC! Our intern created a wonderful interactive map and custom analysis that will enable us to better visualize and communicate about our projects. We all learned a lot from each other!"

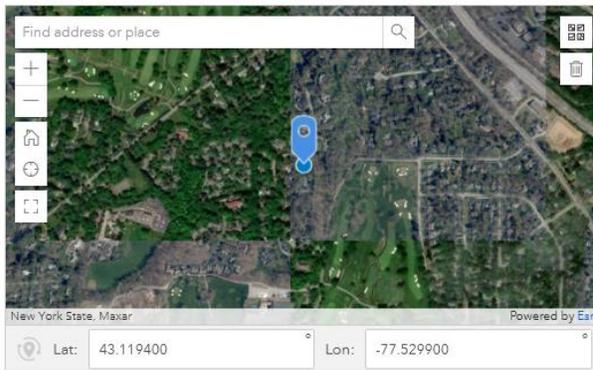
Made by Alex LaBue
5/19/2023

Vegetation Health Map In Monroe County, NY



Pollinator Habitat-Points of Interest (Monroe County NY)

01. Location of pollinator habitat (click map)*



02. Site Title/Name*

03. Site Status*

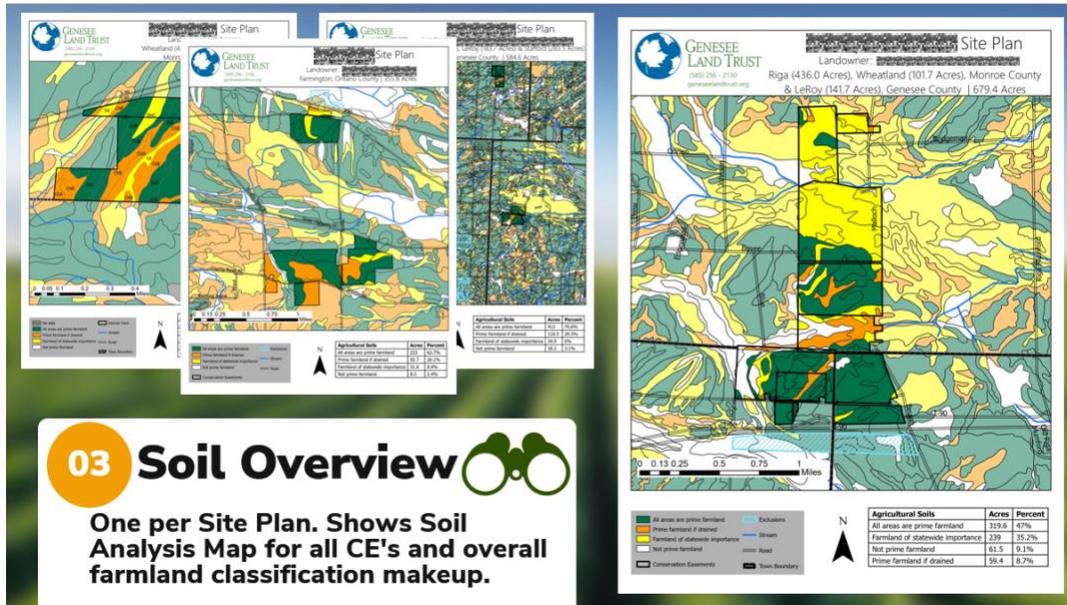
EXISTING Pollinator Habitat

WORK IN PROGRESS to establish Pollinator Habitat

PROPOSED NEW Pollinator Habitat (not yet established)

Client Quote

“Angela was responsive and timely to project needs. She put in the effort to understand the grant program before starting the work. She was able to create site plans that were usable for the grant.”



03 Soil Overview

One per Site Plan. Shows Soil Analysis Map for all CE's and overall farmland classification makeup.

Client Quote

“I’m delighted to see Will’s creativity and tenacity, expanding well beyond what he learned in my Introduction to Geospatial Programming in Python class to the QGIS platform. He helped his host create a unique plugin that will help make this algorithm accessible to many!”

“Clear Sky Boost”: A Python-based QGIS Plugin for Efficient Cloud Removal from Sentinel2 Imagery Using Machine Learning

-William Simone-

Background

Cloud cover in satellite imagery can lead to inaccuracies and errors when producing maps. To mitigate these issues, it is important to remove the cloud cover prior to analysis and processing. Although Frask is a commonly used method for cloud removal and has been available since 2012, it may not be suitable for more detailed work, particularly in forested regions of Maine. Therefore, there is a need for new and improved methods that can accurately remove clouds and facilitate analysis of satellite imagery in diverse geographic contexts. This project began in the summer of 2022 to address this issue. During that time researchers from MCC and UMaine collaborated toward the goal of training a ML algorithm (XGBoost) to detect cloud and shadow pixels in satellite imagery acquired from Sentinel2. Due to the success of the ML training and application, follow-up development was pursued. This is where my work began on the development of a QGIS plugin. The plugin needed to contain all elements of this complex operation in one user friendly package that functions in the QGIS environment.

Methodology

The “Clear Sky Boost” plugin was developed using Python and the QGIS API. To start QGIS Plugin Builder 3 was utilized to create the initial plugin folder and corresponding py modules. Following this a framework was designed to lay out the package folder structure.

Next research into QGIS API classes found a few tools with the functionality needed but ultimately fit and error was to finding the right functionality and GUI.

I combined these tools with segments from the existing Frask Python file that processes Sentinel2 data from the command line. Finally I compiled the required dependencies to ensure the plugin could be distributed and operate independently as intended.

Figure 1. Screenshot of first test plugin. A new console interface and console window functionality is left remaining to be added however, as important first milestone. This was created using the QGIS Plugin Builder Plugin, with the provided window above additional functionality can be added as the developer sees fit.

Research Question

Can a trained Machine Learning Algorithm be applied to Sentinel2 data to provide more efficient high accuracy cloud removal? Can this process be packaged into a standalone open source plugin for QGIS?

ML Training Results

Frask VS. Round 2 ML Output - Clouds (Figure 2)

- Frask cloud coverage is greater, but less detailed (due to buffering of mask)
- Round 2 ML output underestimates cloud coverage

Shadow Output (Figures 3 to 5)

- Frask overestimates areas of shadow in areas of visible clear pixels
- Underestimation of shadow in areas of visible shadow pixels
- Round 2 ML output refines shadow coverage, reduces overestimation from Round 1
- Post processing ML Frask output is less accurate than Round 2 ML output

ML Round Comparison (Figures 6 & 7)

- Cloud matching nearly identical, increased this cloud detection with Round 2
- Shadow refinement reduces errors, fewer clear pixels labeled as shadow
- Post processing ML Frask output VS. Round 2 ML Output (Figure 8)
- PP ML predicts clouds with same high accuracy as Round 2 ML output, but adds a buffer
- Beneficial in areas of wispy, thin clouds
- Round 2 predicts shadow much more accurately than PP ML output.
- PP ML still relies on cloud-shadow matching. Highly selective algorithm needs to be fine tuned to allow for more variation in potential best-match imagery.

Future Work

- Perform accuracy assessment & quantitative comparison on ML output
 - Compare to Frask accuracy (between 92.4 and 95.4%, dependent on version and source of imagery)
- Further refinement of ML
 - Include atmospheric correction
 - More training points for shadow layer
 - Train for cloud/shadow detection on fall/spring imagery
- QGIS Plugin
 - Enhance user interface
 - Allow for multithread processing in the QGIS environment
 - Multi satellite functionality

References & Acknowledgements

University of Maine – Center for Research on Sustainable Forests, School of Forest Resources

Dr. Barry Legend, Assistant Research Professor
Barbara Wheatland Geospatial Lab
Dr. David Stearns, Director
Anthony Gony, Remote Sensing Specialist
David Goodland, Aerial Survey Pilot & Remote Sensing Technician

University of Maine – Center for Advanced Forestry Systems

Dr. Aaron Weisland, Director
Monroe Community College – Department of Chemistry & Geosciences
Jonathan Little, GIS Professor & Principal Investigator
Wayne Howard, Computer Science & GIS Professor & Senior Researcher
Cassie Bessie, GIS Admin and Researcher

• Miller, Michael. “QGIS Plugin Development with Python.” Library, University of Maine, 2020. <https://www.library.umaine.edu/qgis/qgis-ecosystems-4th-edition/>

• Zhu, L., & Woodcock, C. E. (2012). Object-based cloud and cloud shadow detection in sentinel-2 imagery. Remote Sensing of Environment, 118, 83-94. <https://doi.org/10.1016/j.rse.2012.03.002>

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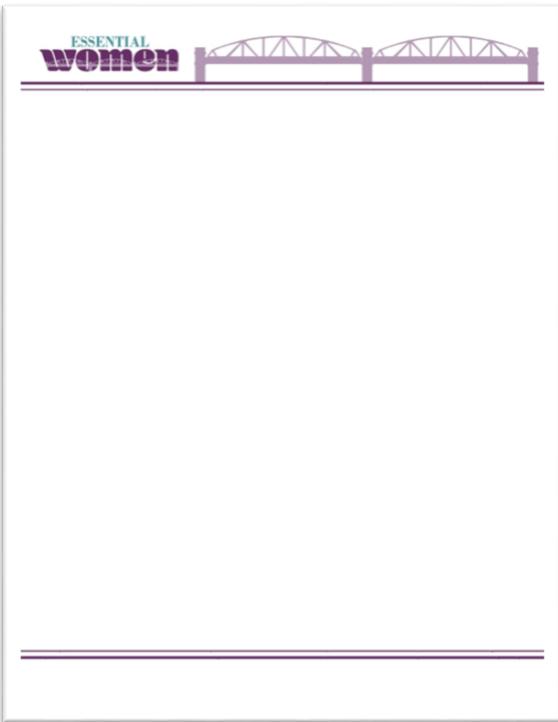
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AAD 205 – Graphic Design II Highlights

In the AAD 205 Graphic Design II class, clients are brought into the classroom for GD II students to work in a real-world design experience. Clients work with the professor to decide on the types of print and/or digital media that are needed for the client’s business. Students listen to the client describe their business needs, what they’ve tried before and the student design new collaterals for their use. This class includes several design reviews by the client and makes changes based on the client feedback. Here you see examples from the NY Guard and Essential Women clients.

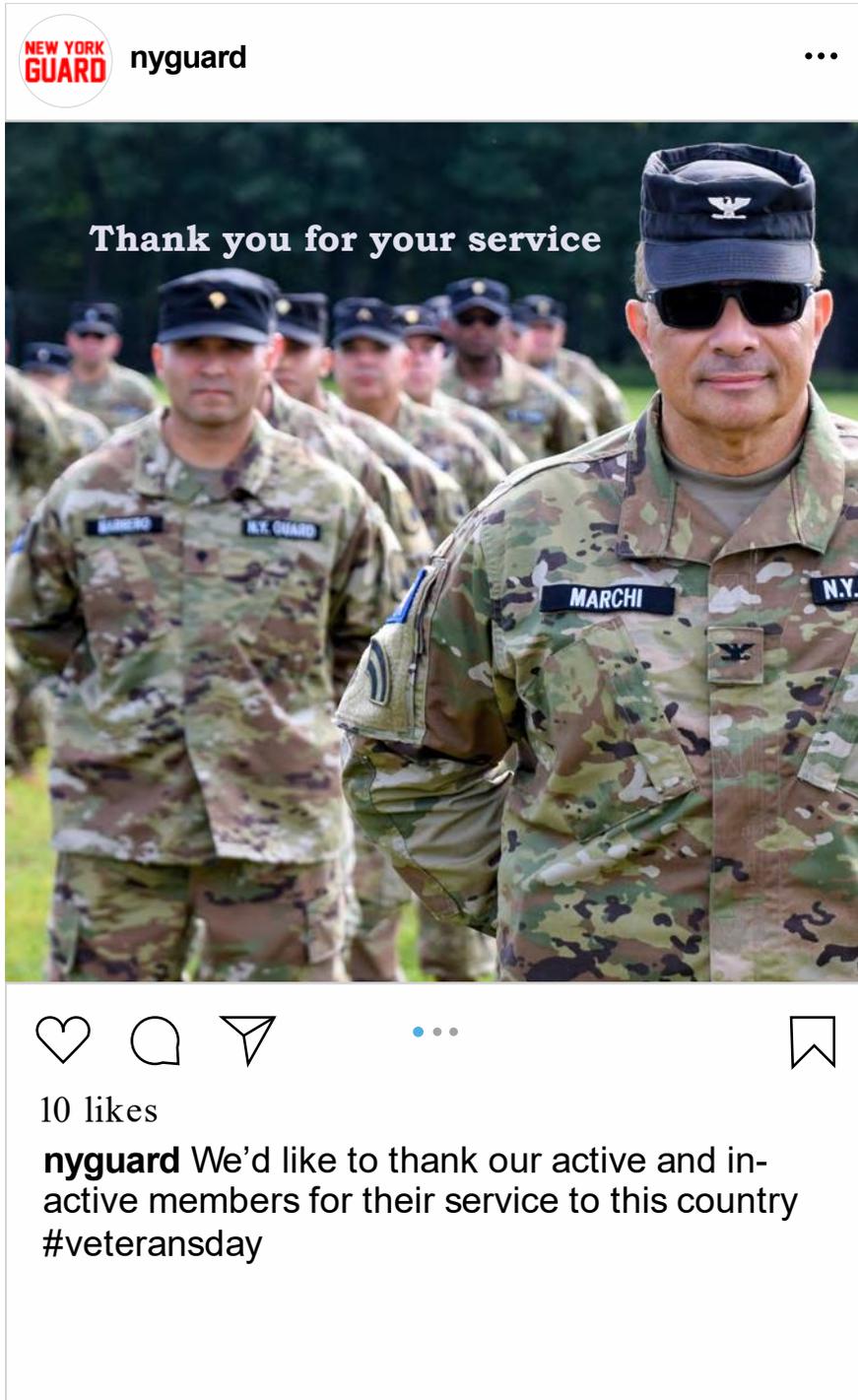
Client Quote

“This entire process has been incredible and has gone a long way to help me solidify my plans for an organization that will be focused on helping women achieve financial solvency. As an MCC alum, I am so grateful for the opportunity to come back and work with these talented students.”



Client Quote

“The students have really helped put images to the mission of the New York Guard. I believe this will go a long way to helping us gain new recruits.”



The image shows an Instagram post from the account 'nyguard'. At the top left is the 'NEW YORK GUARD' logo, and next to it is the username 'nyguard'. A three-dot menu icon is in the top right corner. The main image is a photograph of a line of soldiers in camouflage uniforms. The soldier in the foreground is wearing a dark cap with an eagle emblem, sunglasses, and a name tag that reads 'MARCHI'. Another name tag on his chest reads 'N.Y.'. The text 'Thank you for your service' is overlaid in white on the top left of the photo. Below the photo are icons for a heart, a comment bubble, a share icon, a three-dot menu, and a bookmark icon. Below these icons, it says '10 likes'. The caption reads: 'nyguard We'd like to thank our active and inactive members for their service to this country #veteransday'.

BUS 104 – Introduction to Business Highlights

In the BUS 104 Introduction to Business class, clients are brought into the classroom to present the objective(s) of a problem they are trying to solve. Students have an opportunity to listen, ask questions, and then have access to the client throughout the duration of the project as they work on their solutions in teams. To determine their recommendations, teams apply the Lean 6-Sigma methodology using the 5 phases of the world-class DMAIC approach: (I) Define, (II) Measure, (III) Analyze, (IV) Improve, (V) Control. These projects allow students to apply course content using real-world business processes for a real client issue and gain workforce skills such as teamwork, problem solving, and written and oral communication.

Client Quote

“I have worked with students on these types of projects for some time now. The student feedback is so valuable. These are the best projects I have seen.”

Some of the Student Project Results for the Tutoring and Academic Assistance Center (TAAC):



The slide has a brown background with white text. At the top, the word "Define" is written in a large font. Below it, the question "What is our objective?" is asked. The objective is stated as "Determine a student communication strategy for the TAAC". To the left, under the heading "Our Goal:", there is a bulleted list. To the right, there is a circular logo for the TAAC.

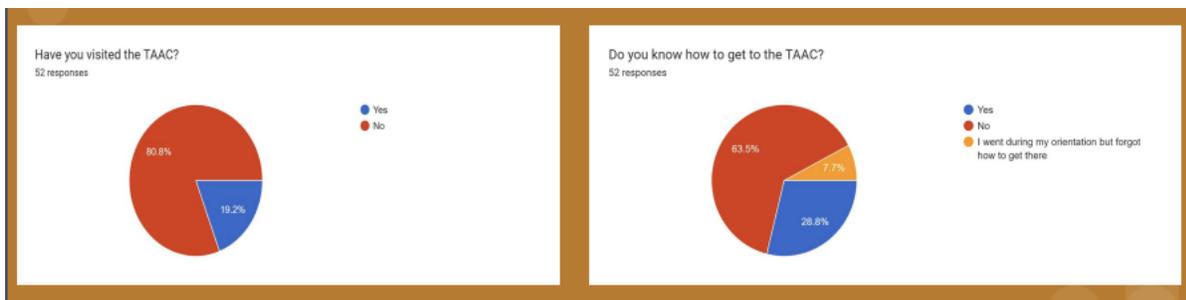
Define
What is our objective?

Determine a student communication strategy for the TAAC

Our Goal:

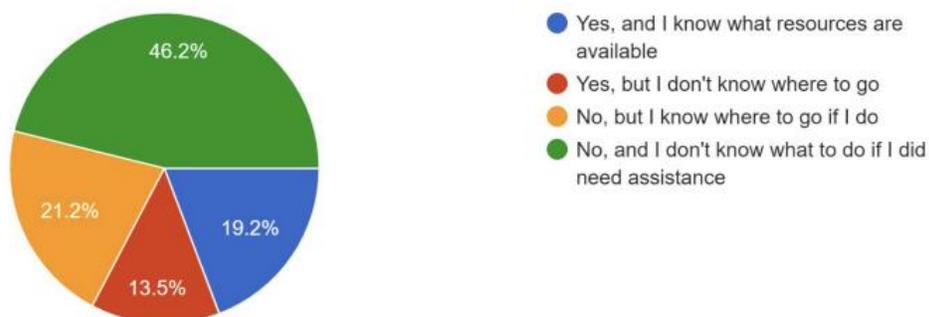
- Increase traffic
- Increase awareness





Do you need tutoring or academic assistance?

52 responses



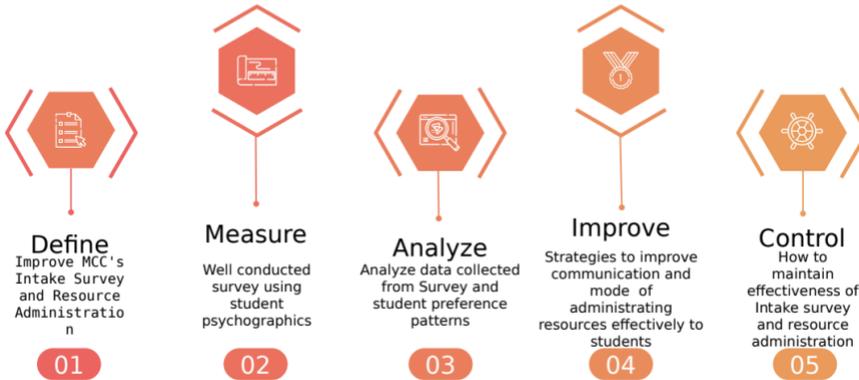
Improve

What do we recommend?

- Add a square to the MCC network on the student homepage
- Require teachers to visit TAAC with students, especially early in the semester
- Point out location on maps around campus
- Move the location
- Update the social media pages and increase advertisement
- Add more visual representations of the hours inside and outside the TAAC
- Add a section to the "Stall Talk"

Some of the Student Project Results for the Student Intake Survey with Enrollment Management and Student Services:

Six Sigma Process



Gantt Chart

ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE	PERIODS													
						1	2	3	4	5	6	7	8	9	10				
Strategies and ideation Survey	11th April	1 Hour	11th April	2 Hours	100%	█													
Questions	11th April	2 Hours	1	1 Hour	100%	█													
Gantt Chart	19th April	30 Mins	19th April	1 Hour	100%	█													
Making Survey Collecting	26th April	1 Hour	26th April	1 Hour	100%	█													
Responses Finishing up	26th Apr	5 Hours	28th April	5 Hour	100%	█													
Report Finishing up	May 9th	3 Hours	May 9th	3 Hours	100%														
Presentation Last Minute touch ups Basic	May 13th	4 Hours	May 13th	4 Hours	100%														
Formatting	May 17th	1 Hour	May 17th	1 Hour	90%														
	5	2	5	6	75%														

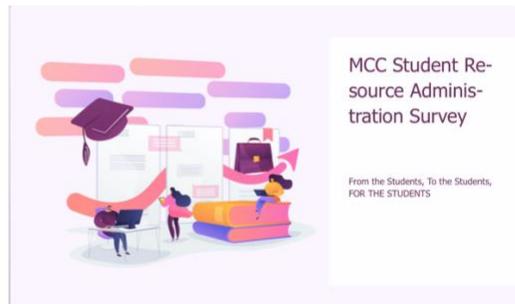
Measure

MCC Student Resource Administration Survey

1. We Created an effective survey to understand the issue at hand

2. We printed several copies of the survey and collected responses from students all around the campus

3. We analyzed the responses and made graphs and charts to show data



Measure

We took some questions directly from the initial In-Take Survey and asked students how they found out about the specific resource

1. Do you have questions about transportation to campus? Like where to park or taking the bus, for example?

Yes/No

3. Do you know about transportation to campus? Like where to park or taking the bus? If so, how did you find out about it?

Enter your answer

2. What concerns do you have about getting the books needed for your classes?

- I am not sure where to get my books
- I am not sure what books I need
- I am not sure that I can afford the books I need
- No concerns, I'm all set

2. Do you know where to get your books from? How did you learn about it?

- No
- In-Take Survey
- Students
- MCC Staff
- Professors
- Other. Please specify:



Step

04

Improve



Improvement for Student In-Take Survey

- Integrating a more responsive and engaging survey
- The In-take survey should be a mandatory part of orientation
- Should be conducted in person or over a phone call
- Survey should mention our alternate improvement - "Tribby"
- Conduct the improved In-take survey every semester to cater to veteran students as well



Step

04

Improve



Improvement for how resources could be better administered:

- Improve Tib411 Chatbot with AI integration and student recognition
- Set students up with peer navigators and give them the option to opt out
- Make a tile for an interactive and live map on student Brightspace where students can search for exact departments (such as Brock University)
- Improve MCC's social media engagement by consistently posting short, to the point, new, and engaging content everyday regarding campus resources and activities.
- Communicate resources in the form of phone calls and video shorts rather than lengthy emails



These are just some of the many wonderful Service-Learning projects that are going on within MCC.

Make real-world issues part of your course:

Service-learning presents students with issues and problems that cannot be neatly defined or solved. Encouraging students to "think outside the box" fosters development of problem-solving skills.

Provide students with opportunities to develop civic engagement skills:

By working with college or community members, students can enhance their group, organizational and interpersonal skills. They also can gain important experience working with diverse members of their class and communities.

Provide students with leadership and communication skills:

The connectiveness afforded in Service-Learning projects helps reduce stereotypes and facilitates cultural & racial understanding while developing a sense of social responsibility and commitment to service.

Consider Service-Learning or ePortfolios for Your Courses:

Service-Learning projects are completely within the control of the professor, can be as short as five hours, and have many benefits.

For information and assistance with embedding Service-Learning or ePortfolios in your courses email Professor Kathleen Borbee (kborbee@monroecc.edu)

