

Introduction

Learning 2Gether is a novel solution which addresses the needs of the postsecondary **student-caregiver** population. It follows a 2-generation approach, helping meet needs of caregiver and dependent simultaneously.



Problem & Objective

Student-caregivers have been identified as an underserved demographic in the Canadian postsecondary environment (van Rhijn, 2014). They are unique in their struggle to balance academics with the pressing demands of raising the next generation (van Rhijn, 2014). In a preliminary survey, >80% of student-caregiver respondents reported moderate-significant impact on their 'Quality of Study Time' with these dual demands.

Institutional support that recognizes their needs across policies and services is largely lacking from current college systems (Sallee & Cox, 2019), such as child-friendly spaces and activities while parents study (Keyes, 2017). Quickly changing industry demands in a post-COVID world may require "rapid reskilling" (Policy Horizons Canada, 2022), bringing more adults, including parents, back to school. All while "taking care of children or family" remains a barrier to further education (Employment and Social Development Canada, 2023). To help bring down such barriers, the program aims to establish a sustainable model that can be applied across Canada, ensuring institutions can provide equitable access to educational supports for this vulnerable subset of students.

The program leverages existing resources with community partnerships, providing a framework with the aim of supporting caregiver's success in their chosen field. The core **question** we are answering is whether community-based, tandem, educational programming is an effective solution for addressing student-caregivers needs.

Community Partners



Methodology

To answer that question we are giving student-caregivers 2 hours of **dedicated learning time**, 2 times per week, at 2 different locations (Mohawk College Fennell Campus and the Terryberry Library), while their children take part in engaging educational programming led by RECEs.



A quiet study space for focused schoolwork, literacy and math support from Mohawk College's Learning Support Centre tutors, and conversational café is provided for registered caregivers on Wednesdays and Thursdays from 4:30 - 6:30 PM.

While busy studying, their children/dependents have access to a **play-based learning** space to grow and develop. Children aged 2-12 can participate in engaging activities programmed in partnership with the HPL. Additionally, youth aged 13-17 can get homework help from a dedicated N2N volunteer. Children are looked after by RECEs and Mohawk College ECE students.



Collage with RECE Marney, RECE Sam, ECE student Amrit, ECE student Bindu, and youth participants in play-based learning.

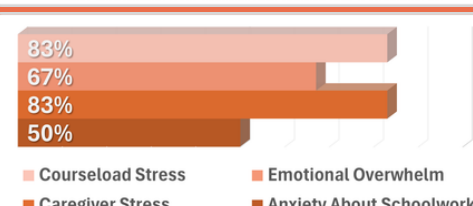
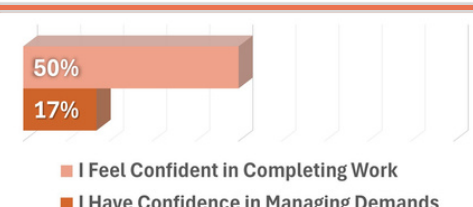
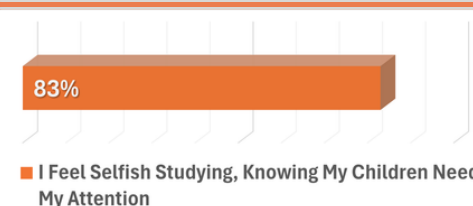
For data collection, we're using mixed methods. Quantitatively, we are collecting optional & anonymized pre-program and sessional surveys measuring student-caregivers' perceptions of stress levels, balance, coping, support systems, purpose, optimism, academic confidence, and more. Qualitatively, we will be conducting semi-structured interviews for more subjective and nuanced feedback on the effectiveness of the program.

Socioeconomic Impact

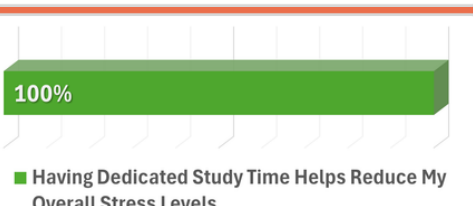
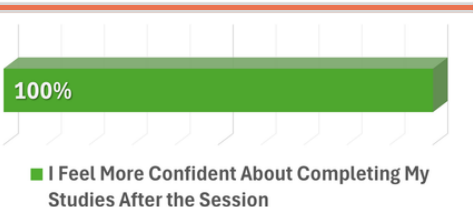
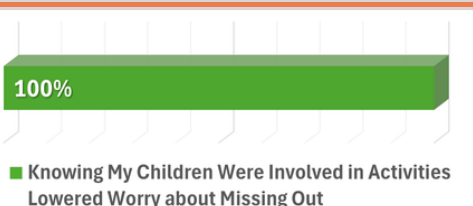
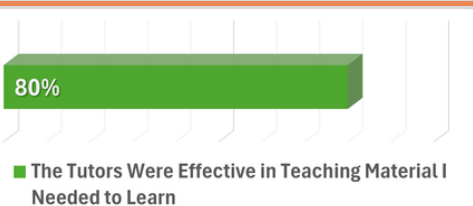
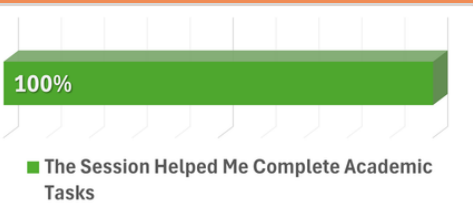
Effects could be as diverse and far-reaching as the fields of study in which participants are enrolled. It gives a strong foundation to ECE students who get practical experience in the program. It is offered free of charge, reducing economic barriers. It encourages awareness of existing infrastructure.

Findings & Analysis

Pre-program Surveys



Post-session Surveys



Data notes: One survey removed from both pre-program and session surveys with 0 responses recorded. Data up to and including the March 5, 2026 session. Figures rounded to nearest whole %. 6 total valid pre-program surveys & 44 total valid post-session surveys included in above data.

Conclusion

Strong positive contrast between pre-program & post-session surveys shows that Learning 2Gether is a **promising model** for allowing postsecondary student-caregivers nationwide to: balance responsibilities and complete their schoolwork, get support from their institution, overcome guilt and worry as a caregiver, develop academic confidence, and reduce overall stress levels. All while their dependents receive constructive educational programming. Let's make it happen!

References

Employment and Social Development Canada. (2023, July 5). *Research summary - Characteristics and barriers of adult learners*. <https://www.canada.ca/en/employment-social-development/corporate/reports/research/characteristics-barriers-adult-learners.html>

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Automated Train Identification from Railway Videos Using Computer Vision

Yashkaran Yashkaran, Gul Afroz Akbari, Pushpinder Badoni, Long Gia Truong
Amin Azmoodeh, Stephen Adams

1 Problem Statement:

- Motion blur, lighting reduce OCR accuracy
- Text visible only few frames



2 Develop automated pipeline detecting train cars and extracting readable markings.

3 Methodology:

- Detection, tracking, OCR pipeline
- Frame selection improves text clarity

4 Example Output:

Detected train car and extracted reporting marks from selected clear frame



8 Conclusion:

Computer vision enables automated extraction of train markings from video.

6 Innovation:

- Integrated detection, tracking, OCR system,
- Automatic best frame selection

5 Evaluation:

Precision and recall measured
OCR character accuracy evaluated

7 Industry and Community Impact:

- Supports railway research and documentation
- Enables automated transportation data analysis



Fight the Mites, Save the Bees: Tandem Application of Formic Acid & Amitraz to Combat Resistance in Varroa Mites

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¹Mohawk College, ²Backed By Bees

Varroa destructor mites are the most significant pest of honeybees worldwide, preying on both the adult and larva stages, as well as carrying diseases such as Deformed Wing Virus which cause strain on the colony. If left untreated, mites are capable of causing total colony collapse within 2 years. Miticides are drugs that are specifically designed to target and kill mites while leaving the honeybees and their products relatively unaffected.

Varroa Mites Kill Adult and Larval Honeybees



Common Miticides: Amitraz & Formic Acid

Amitraz: Interferes with the nervous system of mites, specifically the G protein-coupled receptor β -adrenergic-like octopamine receptor (Oct β 2R). Unfortunately, resistance to arises through a series of DNA point mutations which causes amino acid substitutions in the Oct β 2R protein.

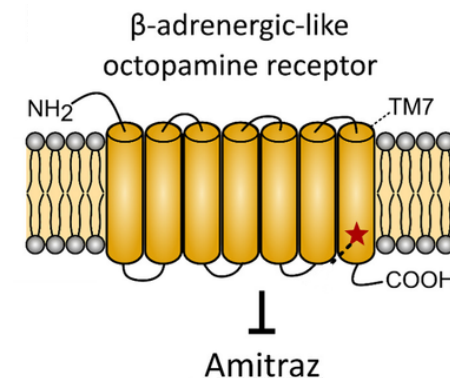
Formic acid: A naturally occurring volatile acid, which works by causing respiratory interference leading to death of the mites, while leaving the honeybees relatively unaffected. However, this method presents unique challenges which if not ideal can impact efficacy and bee/queen safety.

Hypothesis: Tandem sequential treatment of Formic Acid followed by Amitraz will result in less resistance detected, as mites developing resistance to two distinct treatment mechanisms of action is unlikely.

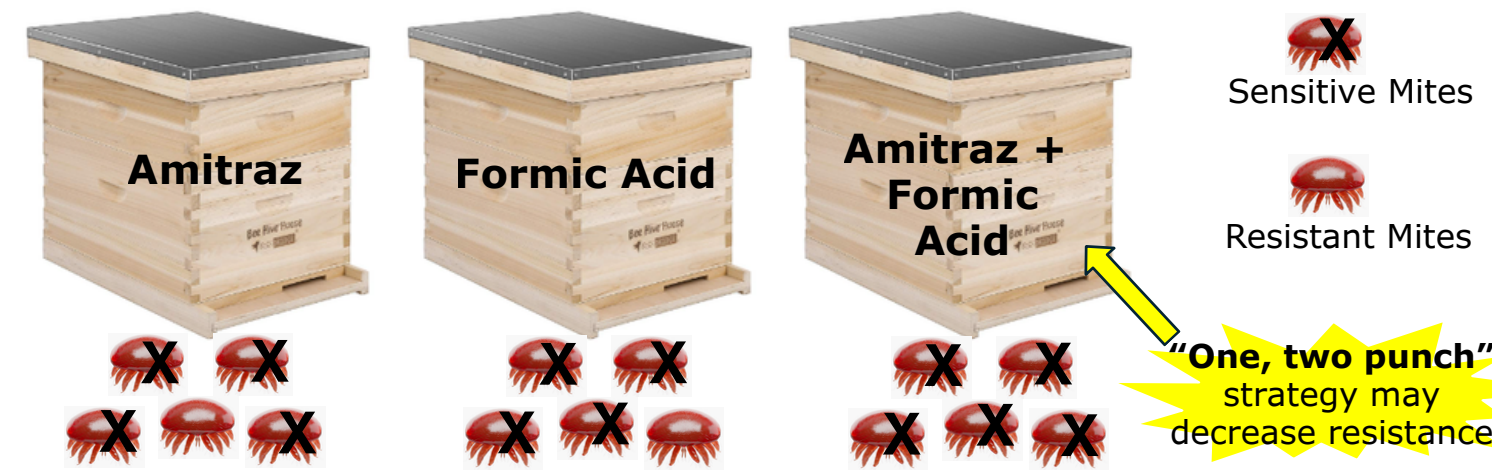


Mutations that confer Amitraz resistance¹⁻³

- N87S
- Y215H
- F290L
- Y337F



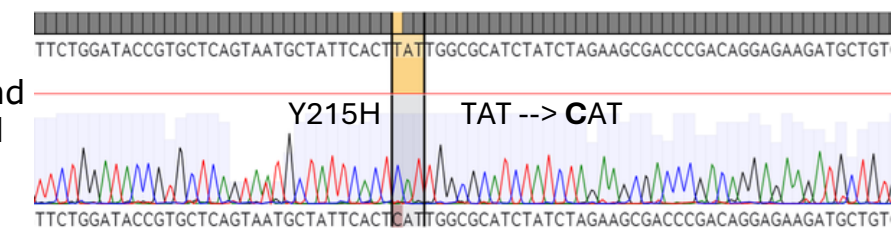
Experimental Design - April 2026



Honeybee Monitoring & Resistance

Monitoring: Colony health, mite loads, as well as sensitivity or resistance to Amitraz.

Resistance: DNA from sensitive/resistant mites will be extracted and the Oct β 2R gene will be sequenced to look for commonly associated amino acid substitutions.



Impact

- Survey of Amitraz resistance in an Ontario Apiary
- Identify resistance patterns to help inform pest control strategies of beekeepers
- Use of combination treatment to decrease resistance mutation burden
- Support long-term health & viability of honeybee colonies in Ontario & worldwide

Bee Happy!



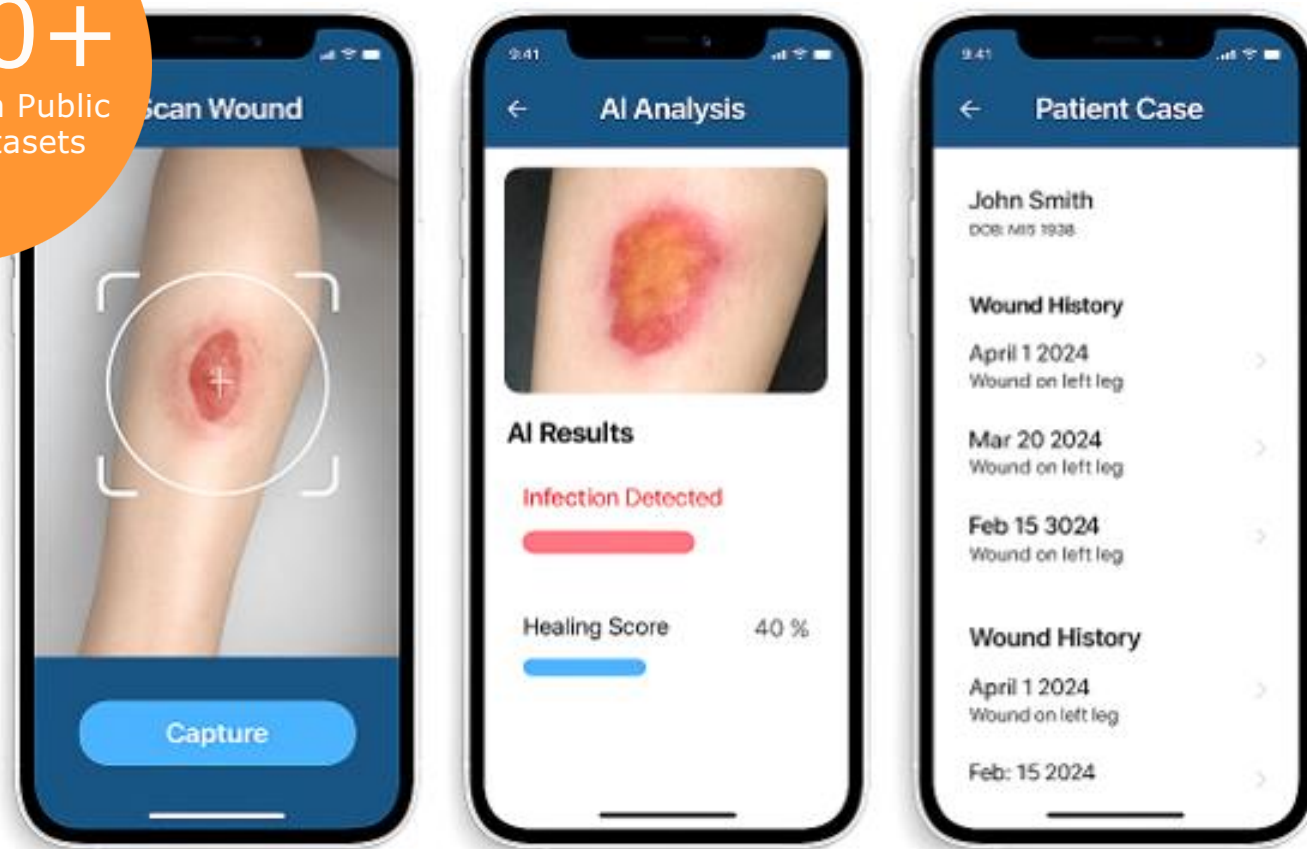
References

¹Hernández-Rodríguez CS, Moreno-Martí S, Almecija G, Christmon K, Johnson JD, Ventelon M *et al.*, Resistance to amitraz in the parasitic honeybee mite *Varroa destructor* is associated with mutations in the β -adrenergic-like octopamine receptor. 2022 J Pest Sci 95:1179-1195
²Hernández-Rodríguez CS, Moreno-Martí S, Emilova-Kirilova K, González-Cabrera J. A new mutation in the octopamine receptor associated with amitraz resistance in *Varroa destructor*. Pest Manag Sci. 2025 Jan;81(1):308-315.
³Inak E, De Rouck S, Koç-İnak N, Erdem E, Rüstemoğlu M, Dermauw W, Van Leeuwen T. Identification and CRISPR-Cas9 validation of a novel β -adrenergic-like octopamine receptor mutation associated with amitraz resistance in *Varroa destructor*. Pestic Biochem Physiol. 2024 Sep;204:106080.
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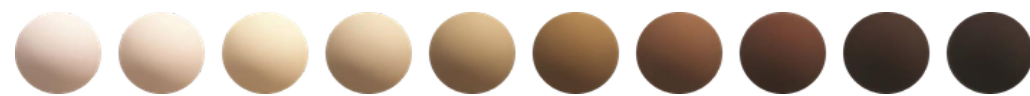
In partnership with DExaMedic Inc., we aim to enhance the accuracy of infection detection via RGB data collected through cameras on smartphone devices



2500+
Images from Public Wound Datasets



Images Courtesy of DExaMedic Inc.



Monk Skin Tone Scale: Created by Dr. Ellis Monk and Google

Findings

- Challenges in this area of research include:
 - Finding Appropriate Datasets
 - Skin Tone Bias
 - Model Architecture Selection
- UNet and LinkNet are the most optimal models according to our research.
- Currently Using Supervisely, a No-code Program to test out different models.

8
Papers on RGB Wound Image Segmentation

Next Steps

- We will validate and fine tune the optimal model in OpenCV
- The model will be evaluated for accuracy using the Dice Coefficient and IoU

Anticipated Societal Impact

- Allows wounds to be assessed more accurately
- Allows for wounds to be better compared over time
- Help reduce skin tone bias in wound assessment
- Help with further research for novel wound treatments

4
Best Practice Statements on Skin Tone Bias in Wound Assessment

1
Paper on Skin Tone Bias in Wound Assessment



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