# JIPE

## Journal *of* Innovation *in* Polytechnic Education

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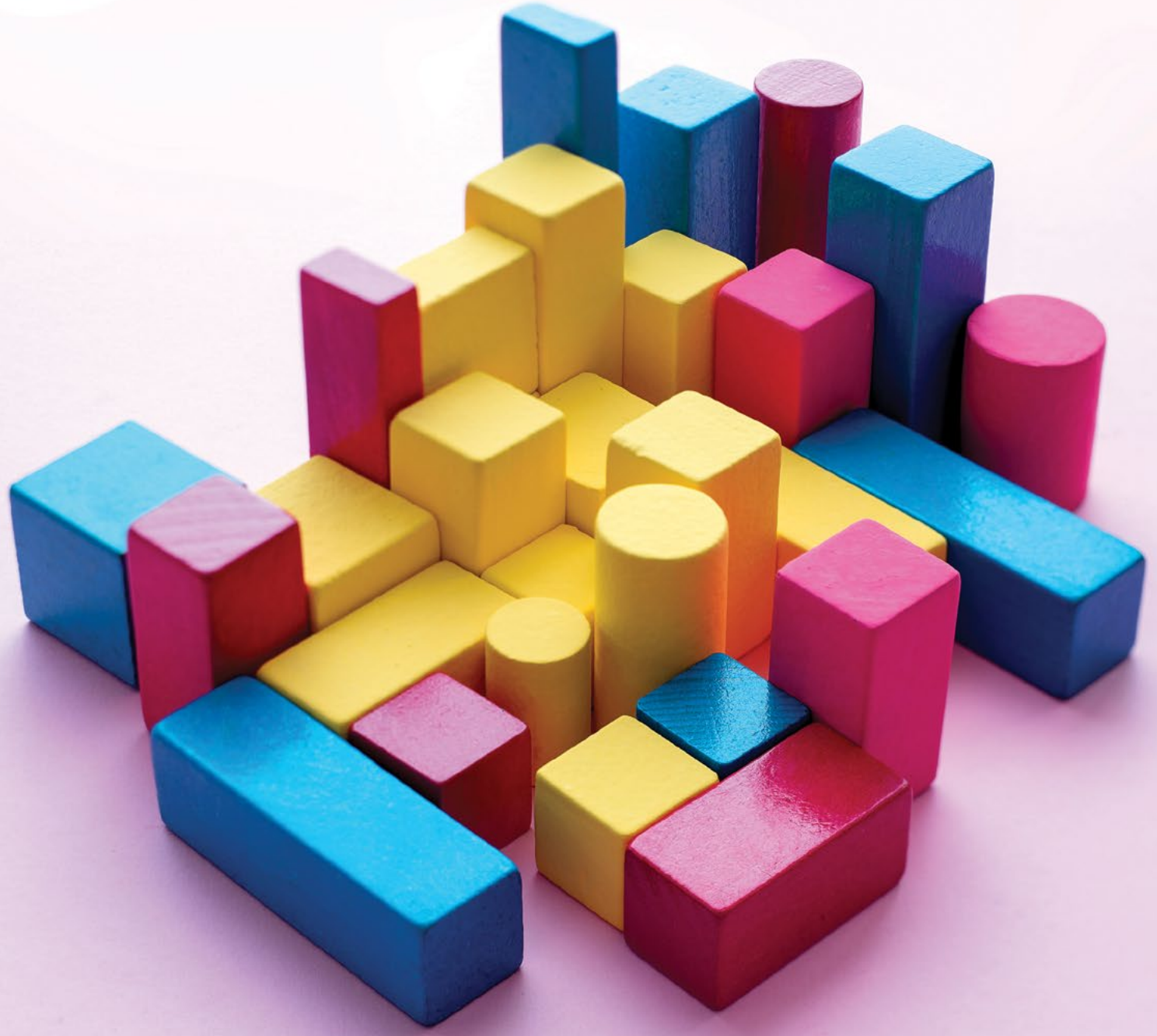

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## Land Acknowledgement

Humber College is located within the traditional and treaty lands of the Mississaugas of the Credit. Known as Adoobiigok [A-doe-bee-goke], the “Place of the Alders” in Michi Saagiig [Mi-Chee Saw-Geeg] language, the region is uniquely situated along Humber River watershed, which historically provided an integral connection for Anishinaabe [Ah-nish-nah-bay], Haudenosaunee [Hoeden-no-shownee], and Wendat [Wine-Dot] peoples between the Ontario Lakeshore and the Lake Simcoe/ Georgian Bay regions. Now home to people of numerous nations, Adoobiigok continues to provide a vital source of interconnection for all.


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# Research, Growth, and Community: We Are All Researchers

**Emma Smith, PhD**
*Humber College Institute of Technology & Advanced Learning*

**The sharing of knowledge and professional practice is a communal value in the Office of Research & Innovation (ORI).** Moments of curiosity are carved out across meeting tables, conference calls and passing conversations. It is through these interactions that creativity is encouraged, and perspectives are expanded. A burst of innovation or point of reflection is often a celebrated takeaway.

These 'knowledge exchanges' have become central to my growth as a researcher. Moments of encouragement are mutually communed across the global experiences and diverse expertise of colleagues. We create, strategize, challenge and commend one another—capturing the very essence of academia.

These conversations also serve to elucidate uncertainties or unknowns about a particular topic. Described as a 'point of awakening,' we are often reminded of how research happens in daily life. We all identify problems, develop innovative solutions and find belonging as part of a community. The search through local grocery flyers for the right flavour of spaghetti sauce, the navigation of an optimal transportation route to arrive at a friend's house, or the perusal of several movie reviews for that desired moment of escapism. These are daily examples of inquiry and result.

Research exists around and within us—and we have a responsibility to share.

The Journal of Innovation in Polytechnic Education (JIPE) is an extension of ORI's culture. It is a space for knowledge exchanges to flourish and for questions to be pondered. A space for dynamic topics and multi-method projects to be showcased. This collection of articles embodies themes of growth, resilience and innovation that spread within the Humber community and beyond. I invite you to explore them as part of your own daily research.

## Author Note

**Emma Smith, PhD**, is the Associate Dean of Research and Development in the Office of Research & Innovation at Humber College Institute of Technology & Advanced Learning. She is currently working with the Toronto Police Service on an external evaluation of their Neighbourhood Community Officer Program.

# Importance of Research Knowledge Dissemination

**Melanie Spence-Ariemma, PhD**
*University of Guelph-Humber*

**An integral component of any research project is the dissemination of the findings.**

Sharing the results of a study helps to ensure the benefits of the study are passed on to others. This could mean positive economic, political, and social impact, advancing innovation, increasing visibility on an issue, and/or solving a complex problem. It is important that the benefits of a study are passed on to others.

Finally, results can also cultivate research partnerships, promote future multi-disciplinary research and be a conduit to promote new learning.

## Author Note

**Melanie Spence-Ariemma, PhD,** is currently serving as the Vice-Provost and Chief Academic Officer at the University of Guelph-Humber. She holds a PhD in Leadership and Policy from New York's Niagara University; an MA in community college education from Central Michigan University; a B.Ed. in adult education from Brock University; an M.R.T., radiation therapy, from the Hamilton Regional Cancer Centre; and a B.Sc. from McMaster University.

# Collaboration and Dissemination—The Cornerstones of Advancement

**Richard Emes, PhD**
*Nottingham Trent University*

**As quoted by Sir Isaac Newton in a letter to Robert Hooke, "If I have seen further than others, it is by standing on the shoulders of giants."** This has been claimed to be either a reference to the many scientists whose work Newton built upon or a sarcastic poke at Hooke's shorter stature. I hope it was the former. To advance research at the pace needed by society and our more immediate communities, we need to work together. Collaboration is the cornerstone of scientific advancement. This is both in the need to bring different disciplines, technologies and solutions to a problem but also to hear the most diverse voices pose their challenging questions for research. At Nottingham Trent University UK, like our international partner universities, we are anchored in our communities and region and pride ourselves on the inclusive engagement with diverse voices of our community to ask the research questions which are important and will make an impact on those seeking the answers. This approach to "hyper-local" research is exemplified by our PhD programme Co(l)laboratory (https://ufncollaboratory.ac.uk/). Now in its second cohort, Co(l)laboratory is bringing together university researchers with community organisations and citizens of our region to deliver insight and change. This eight-year project is funded by the Research England Development (RED) Fund and will train 50 PhD students and many citizen scientists through paid internships including local government staff, community leaders and health and medical practitioners.

Whilst asking the right questions is important, dissemination of the findings is essential for the reproducibility and integrity of research. Research observations—whether the scale of the study is big or small, or the findings support or challenge current dogma—need to be published and found by others. In my discipline of computational biology, data is only considered of true value when it is "FAIR" data. That is when it is Findable, Accessible, Interoperable and Reusable. This mantra is equally relevant in all research areas and all of our practices.

As the first quote notes, collaborators standing on the shoulders of your observations and data is what moves a research discipline forward. Research articles like those published here may be the first point in that movement to change our collective understanding, and they are essential to be read and shared.

## Author Note

**Richard Emes, PhD,** is the Pro Vice-Chancellor of Research and Innovation at Nottingham Trent University UK. He is a computational biologist by training but currently focuses on research strategy and innovation development.

# The Transformative Potential of Applied Research

**Sharon M. McIntyre, M.Ed., DSocSci**
*President, New Cottage Industries & Co.*

**As a member of the Journal of Innovation in Polytechnic Education (JIPE) editorial board, I am delighted to play a small part in bringing this edition into the world.** I would like to recognize the invaluable work of the entire JIPE team, all the volunteer article reviewers, and my fellow editorial board members; together we aim to ensure the quality of the research shared in each edition of JIPE.

JIPE is dedicated to the essence of applied research within polytechnic institutions: sharing research that addresses real-world challenges with innovative insights and solutions. The heart of applied research lies in its transformative potential; it thrives on the premise that knowledge, when applied effectively, becomes a catalyst for progress. Individual lives and entire communities can be transformed as a result. I extend my heartfelt appreciation to the contributing researchers for their commitment and dedication to this endeavour.

Applied research within polytechnic institutions is a collaborative effort that bridges the gap between theory and practice. It is about turning ideas into action, making meaningful changes that resonate beyond academic realms. I invite you to read the articles presented in this issue. Each study represents a step forward in our journey towards innovative and impactful research. It is my hope that the research insights spark conversations and inspire further explorations.

Thank you for joining me in celebrating research that aims to create a positive difference in our world.

## Author Note

**Dr. Sharon M. McIntyre** is the president of New Cottage Industries & Co.

ORIGINAL RESEARCH PAPER*

# Examination of Manual Removal Strategies for Dog Strangling Vine

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*Humber College Institute of Technology & Advanced Learning*

**Keywords**
Dog Strangling Vine, DSV, Cynanchum rossicum, invasive species, manual removal strategies

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***Original Research Articles** are papers that report on original empirical research with a focus on teaching and learning. Papers may be qualitative or quantitative and include an Abstract, Introduction, Method, Results, Discussion, and Reference section, as well as any tables and/or figures.

**Abstract**
In the summer of 2019, the Junior Naturalists posed a question regarding the control of Dog Strangling Vine (DSV), an invasive plant that is present in the Humber Arboretum. This group conducts stewardship activities in the Arboretum to help balance the environment by using non-chemical methods to control some of the invasive plant species there. They had been cutting off the flowers of the DSV to prevent seed production, but this did not affect the survival of the plants. This research project was created in response to the group's question. Four strategies were studied for their efficacy in controlling the growth of DSV. These strategies were digging out the plant, pulling out the stalk, cutting the crown beneath the soil surface, and cutting the stalk above the soil surface. While each approach has its benefits and drawbacks, digging the entire plant out of the ground was found to be the most effective in preventing the regrowth of the individual plant. The research is intended to guide student gardeners working in ornamental gardens at the Arboretum and stewardship volunteers working in public parks in non-chemical strategies to be used for controlling DSV. The most effective control efforts should be repeated from year to year, which can result in long-term control of DSV in cultivated gardens and natural areas.

This study has limitations since it was enacted on natural areas that had already been overtaken by DSV, which means that the numbers of plants, seeds, and other species in each plot were not consistently uniform. In a subsequent investigation, standardized, cultivated plots of DSV could be created and different competitive native species could be added to determine the effects of treatments on these combinations.

## Introduction

***Cynanchum rossicum*, commonly referred to as Dog Strangling Vine (DSV)** is a perennial plant originally from a small area in eastern Europe that is a member of the Apocynaceae or milkweed family. This introduced species has infested a large portion of North America and is considered one of the main problem invasives in Ontario. It overtakes large areas and eradicates the native plants that were once

present (Sandilands, 2013, pp. 104). It was most likely introduced as an ornamental plant in the 19th century. The earliest specimen was collected in Victoria, BC in 1885. It has not proliferated in that area, but was able to do so in southern Ontario, where it was cultivated as a source of rubber in a failed experiment during World War II. There are many theories as to why it has been so successful in specific regions, but these remain inconclusive (Miller and Kricsfalusy, 2008, pp.7).

The leaves of a DSV are oval with pointed tips, seven to twelve centimetres long, growing in an opposite leaf arrangement. They are initially green and turn yellow later in the summer. As a vine, it grows up to two metres and can wrap itself around trees, shrubs, and other herbaceous plants. Its small, star-shaped flowers are pink to dark purple with five petals. Eventually, these flowers develop into seed pods that form in July, turning from green to light brown as they grow. They produce and release large numbers of seeds in late summer that are easily carried by the wind, with each square metre of DSV being capable of producing up to 28,000 seeds.

In addition, DSV is an especially aggressive exotic as it is highly adaptable and easy to grow. It can grow in a variety of soil conditions, tolerating drought, shallow soils in addition to disturbed and undisturbed soils, as well as in shady and sunny areas, even though it does prefer the sun (DiTommaso, 2013, pp. 382). Notably, it forms symbiotic relationships with other plants' mycorrhizal networks that help Dog Strangling Vine to strengthen itself, eventually choking out surrounding plants (Sandilands, 2013, pp.104). It has also been suggested that DSV has allelopathic qualities, wherein it can alter the chemical composition of the soil to better suit its needs, thereby no longer suiting other species' needs (Sandilands, 2013, pp. 104). In addition to this, it reproduces quickly and aggressively by making huge numbers of seeds attached to feathery tufts of hair, called coma, that allow them to be carried over long distances by the wind, insects, and animals once they have been released from the plant's seed pods in the late summer and early fall.

As a lover of hydro corridors, DSV seeds have been dispersed through the Rouge, Don, and Duffins watersheds from the east, and it has most recently been estimated that DSV is now present in approximately 20% of the Toronto area (Sandilands, 2013, pp. 104). In the Greater Toronto Area, it has been present for at least a century but only began to cause alarm in the 1970s and 1980s, becoming a mainstream concern in the 2000s (Miller and Kricsfalusy, 2008, pp.8). This suggests that the plant's invasiveness began slowly and sped up after a certain threshold had been reached, as the plant's fitness is related to its population size and density. This phenomenon is otherwise known as the "allee effect," wherein it reaches a certain tipping point where it is able to thrive and colonize a large area. In other words, once any other vegetation has been suppressed and the soil chemistry has been sufficiently altered, the plant's population size begins to grow exponentially (Sandilands, 2013, pp.105). The more it can multiply, the stronger it gets, and the more it spreads.

DSV's effects on its surrounding area are extensive and severe, affecting the entire ecosystem around it. It has the capability of creating monocultures that outcompete any surrounding species, as well as modifying soil community composition, making the soil inhospitable to other plants. As it grows, the plant itself wraps itself around any adjacent plants, physically outcompeting them for necessary resources such as light, water, and nutrients. When allowed to grow profusely, they form a dense, tangled mat of vegetation that covers large areas and eliminates native and endangered plants, reducing wildlife habitats for birds and insects. In addition, monarch butterflies, an at-risk species, often mistake it for native milkweeds and lay eggs on DSV plants, whose roots are toxic for the caterpillars, subsequently killing them. Deer and other browsing animals avoid DSV, as its roots are toxic to mammals, which can increase grazing pressure on native plants and reduce existing native plant species' population size.

As a result of these numerous survival adaptations, DSV is notoriously difficult to eradicate. The use of herbicides is permitted for the control treatment of DSV; however, these chemicals are non-specific, killing all plants that are in the treated areas. If there are valuable plant species in the same area, chemical treatment is not recommended. In the past, when the DSV infestation was sparse, individual plants were treated by 'hand wicking' (using a chemically infused glove to apply the herbicide on an individual plant). This strategy is not an approved use of the chemical and it can no longer be used in this way (Pest Management Regulatory Agency, 2017).

It is easiest to manage before its population becomes established, focusing on smaller areas outside of a large infestation to control its spread (Anderson, 2012, pp. 12).

The only method that has been successfully proven to rid an area of DSV completely is by digging it out with its roots, although this is only feasible for small populations (Anderson, 2012, pp. 14). This method can be applied selectively to individual DSV plants, allowing other valuable plant species to thrive.

Once established, the main control methods focus on prevention of spread by reducing seed production, either by mowing, clipping, pulling, tarping, or physically removing seed pods (Anderson, 2012, pp. 18-19). However, none of these methods can be considered foolproof methods of complete eradication. They need to be repeated often, and sites need to be revisited for years after these control methods have been implemented, since seedlings can grow in the remaining disturbed soil (Anderson, 2012, pp. 19). It is even capable of remaining dormant in shaded forests, biding its time until a gap forms in the canopy for light to come through, and it is able to begin its growth process again (Milbrath, 2008, pp. 1287). Therefore, even if it appears to have been eradicated on a surface level, roots or seeds may still be present, waiting for an opportunity to thrive in any given environment. There has been some research indicating that interplanting competitive native species such as goldenrod or raspberry could help to reduce DSV's reproductive capacity by limiting resource availability (Maguire, Sforza and Smith, 2011, pp. 1238).

## Method

### DSV Controls Investigation

1. An area was located where there was a dominant culture of DSV in the Arboretum meadow (full sun); however, the area was not entirely uniform as regards the number of DSV stalks per square metre or the other species present.
2. An information sign was posted at the research site to inform passers-by regarding the work being done.
3. Using stakes and rope, twelve sections, measuring 2m x 3m, were created.
4. Within each section, there were two test plots marked using wooden stakes and string to define each plot measuring 1m x 1m each with a 0.5m buffer zone around the outside. The purpose of this perimeter zone was to allow researchers to walk around the test plots but not to interfere with growth within the test plot. Each entire section was treated according to the schedule, but data was only recorded from within the inner 1m x 1m sections.
5. The test plots were defined as follows:
   **1A:** DSV cut beneath the surface using knife once at the beginning of July.
   **1B:** DSV cut beneath the surface using knife once at the beginning of June and once at the end of August.
   **1C:** DSV cut beneath the surface using knife once at the beginning of June, once in the middle of July and once at the end of August.
   **2A:** DSV cut 5 cm above the surface using pruners once at the beginning of July.
   **2B:** DSV cut 5 cm above the surface using pruners once in the middle of June and once at the end of August.
   **2C:** DSV cut 5 cm above the surface using pruners once in the middle of May, once in the middle of June, once in the middle of July and once at the end of August.
   **3A:** DSV pulled out by the main stalk once in the middle of July.
   **3B:** DSV pulled out by the main stalk once at the beginning of June and once at the end of August.
   **3C:** DSV pulled out by the main stalk once at the beginning of June, once in the middle of July and once in the middle of August.
   **4A:** DSV stalks dug out using a spade to remove roots and new shoots once in the middle of June.
   **4B:** DSV stalks dug out using a spade to remove roots and new shoots once at the beginning of July and once at the end of August.
   **5A:** DSV Control—no removal during the growing season.
6. Measurement data (number of stalks, height of stalks, presence of flowers, presence of seeds and other plants present) was recorded once per week for each test plot, prior to scheduled removals—if any.
7. All plant material from DSV removals was placed into sealed garbage bags, placed in the direct sun for a week to allow the plant material to become non-viable and then disposed into the landfill to prevent further spread of the plant species.

### Soil Samples

1. Soil samples were taken from two areas adjacent to the research site—one taken from an area where the DSV plants dominated and one taken from an area where there were only grasses evident.
2. The two samples were tested using soil sedimentation in a jar. The same weighed quantity of each dried soil sample (500g) was placed into each of two preserving jars.

3. Water was added to fill the jars and the soil/water mixture was shaken to completely mix the soil and water.
4. The soil was placed in a cool place for two days and allowed to settle completely.
5. The soil layers were examined, and the jars photographed.
6. The two soil samples were also sent to Agrifoods, University of Guelph Laboratory Services, for analysis of Total Salts (Electrical Conductivity), Organic Matter Content, Phosphorous, Magnesium, Potassium, pH, Sodium, and Calcium.

## Auxiliary Experiment for DSV Plant Parts

This investigation originated from questions that arose from the main research.

The purpose was to test the growth potential of four different DSV plant parts. The plant parts were prepared as follows and five replicates of each were planted in separate pots:

**Stem End**—The DSV stalk was pulled out of the ground. The main stem was cut off, making sure not to cut the small buds at the base. There were a few short roots attached. A stem end was planted in each pot with soil.

**Crown (roots trimmed)**—The DSV crown was removed using a knife to cut around the base of the stalk below the soil surface. Long roots were trimmed with scissors. The DSV stalk was cut just above the crown. A trimmed root crown was planted in each pot with soil.

**Root Mass**—A spade was used to dig out the DSV making sure to include the roots. The stem was removed by pulling it off. The soil was removed to expose the roots. A Root Mass was planted in each pot with soil.

**Roots Only**—A spade was used to dig out an individual DSV plant, making sure to include roots. The stem was removed by pulling it off. The soil was removed to expose the roots. The roots were cut away from the crown. A bunch of root fragments was planted in each pot with soil.

1. All pots were watered once a week while observations were being done.
2. Pots were placed in a sheltered location and the soil was kept moist. They were observed for signs of growth each week.
3. Growth and changes were recorded.

# Results

## Summary Data for Humber DSV research

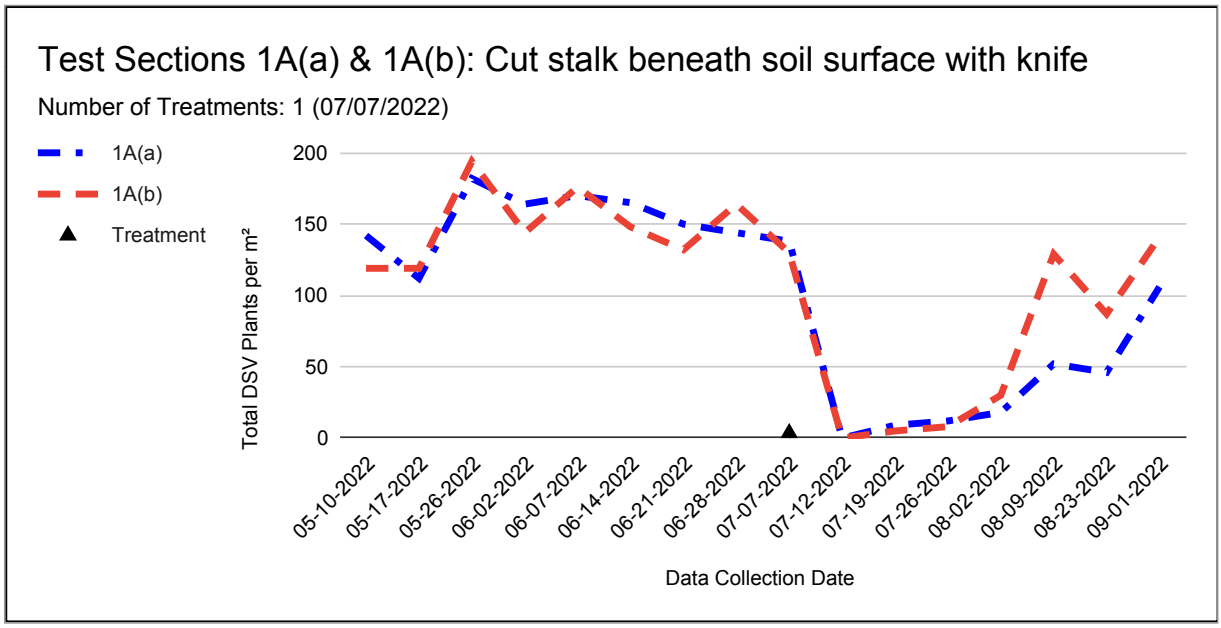
### *Number/m2 section*

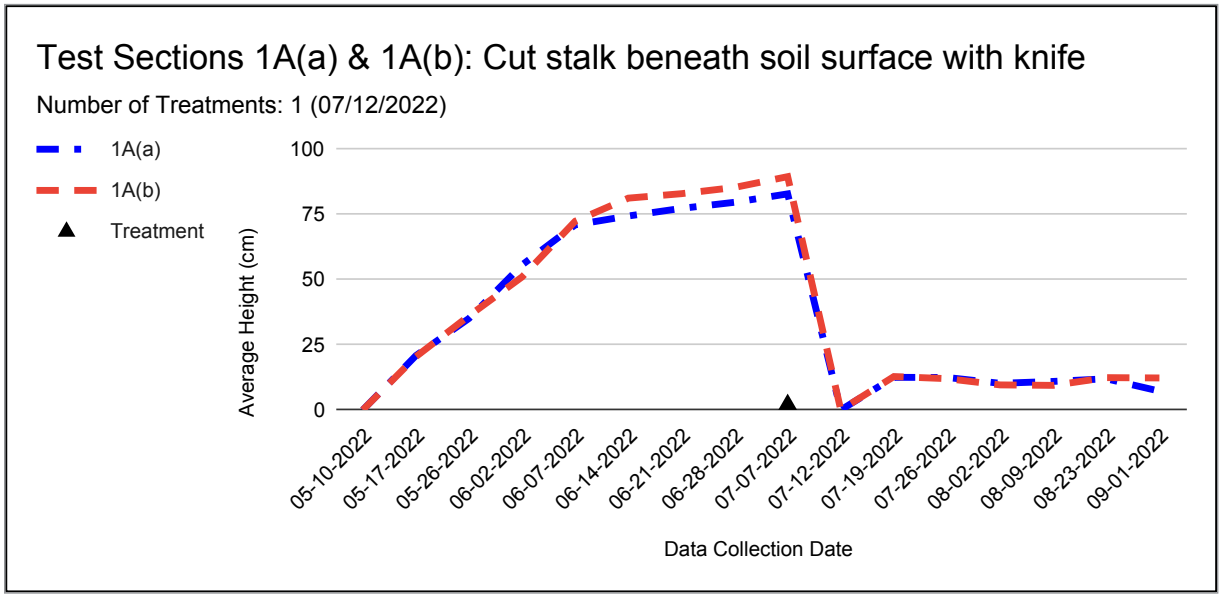
| Date/ Section | May 10 | May 17 | May 26 | May 31 | Jun 07 | Jun 14 | Jun 21 | Jun 28 | Jul 07 | Jul 12 | Jul 19 | Jul 26 | Aug 02 | Aug 09 | Aug 23 | Sep 01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1A (a)** | 142 | 112 | 182 | 164 | 170 | 165 | 150 | 144 | 138 | 0 | 9 | 12 | 18 | 52 | 46 | 106 |
| **1A (b)** | 119 | 119 | 194 | 144 | 206 | 148 | 132 | 164 | 130 | 0 | 5 | 8 | 30 | 129 | 87 | 141 |
| **1B (a)** | 150 | 186 | 265 | 185 | 37 | 28 | 117 | 153 | 142 | 138 | 142 | 129 | 176 | 228 | 226 | 32 |
| **1B (b)** | 65 | 119 | 178 | 130 | 11 | 18 | 61 | 108 | 91 | 91 | 84 | 86 | 97 | 137 | 201 | 39 |
| **1C (a)** | 106 | 126 | 190 | 165 | 30 | 34 | 74 | 121 | 95 | 108 | 122 | 8 | 13 | 24 | 20 | 14 |
| **1C (b)** | 112 | 132 | 203 | 174 | 10 | 14 | 83 | 105 | 108 | 108 | 111 | 7 | 15 | 28 | 32 | 24 |
| **2A (a)** | 33 | 129 | 195 | 153 | 171 | 166 | 155 | 155 | 171 | 39 | 15 | 51 | 132 | 199 | 292 | 241 |
| **2A (b)** | 35 | 132 | 234 | 169 | 200 | 165 | 159 | 179 | 196 | 26 | 19 | 38 | 121 | 216 | 268 | 229 |
| **2B (a)** | 92 | 131 | 202 | 168 | 165 | 152 | 41 | 61 | 81 | 98 | 106 | 129 | 125 | 177 | 191 | 21 |
| **2B (b)** | 81 | 121 | 184 | 164 | 157 | 167 | 16 | 43 | 40 | 76 | 85 | 106 | 99 | 210 | 154 | 35 |
| **2C (a)** | 88 | 131 | 91 | 128 | 135 | 154 | 22 | 87 | 123 | 50 | 98 | 2 | 16 | 123 | 163 | 63 |
| **2C (b)** | 99 | 119 | 100 | 151 | 164 | 175 | 36 | 192 | 227 | 100 | 154 | 0 | 20 | 200 | 223 | 61 |
| **3A (a)** | 59 | 114 | 177 | 145 | 128 | 92 | 126 | 129 | 117 | 126 | 126 | 19 | 44 | 64 | 83 | 138 |
| **3A (b)** | 80 | 115 | 174 | 139 | 102 | 103 | 91 | 105 | 105 | 109 | 110 | 21 | 37 | 123 | 124 | 133 |

| Date/ Section | May 10 | May 17 | May 26 | May 31 | Jun 07 | Jun 14 | Jun 21 | Jun 28 | Jul 07 | Jul 12 | Jul 19 | Jul 26 | Aug 02 | Aug 09 | Aug 23 | Sep 01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3B (a)** | 83 | 106 | 259 | 230 | 24 | 87 | 147 | 166 | 176 | 162 | 142 | 170 | 179 | 264 | 309 | 11 |
| **3B (b)** | 48 | 115 | 237 | 213 | 18 | 67 | 140 | 146 | 170 | 153 | 149 | 163 | 168 | 253 | 262 | 14 |
| **3C (a)** | 69 | 125 | 174 | 176 | 22 | 39 | 69 | 84 | 93 | 91 | 100 | 7 | 11 | 26 | 2 | 6 |
| **3C (b)** | 101 | 176 | 222 | 192 | 30 | 42 | 111 | 104 | 113 | 113 | 127 | 10 | 24 | 50 | 8 | 27 |
| **4A (a)** | 56 | 116 | 228 | 193 | 182 | 186 | 0 | 0 | 1 | 2 | 2 | 4 | 5 | 6 | 8 | 11 |
| **4A (b)** | 64 | 131 | 235 | 162 | 167 | 197 | 0 | 0 | 0 | 0 | 2 | 9 | 9 | 16 | 14 | 24 |
| **4B (a)** | 74 | 129 | 188 | 191 | 146 | 172 | 188 | 139 | 136 | 0 | 0 | 0 | 0 | 0 | 2 | 13 |
| **4B (b)** | 70 | 137 | 182 | 187 | 153 | 162 | 158 | 134 | 125 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| **Control (a)** | 58 | 69 | 175 | 113 | 95 | 134 | 113 | 92 | 107 | 74 | 93 | 75 | 79 | 111 | 114 | 122 |
| **Control (b)** | 94 | 125 | 210 | 154 | 150 | 176 | 129 | 110 | 128 | 115 | 111 | 96 | 105 | 159 | 185 | 134 |

### *Average Heights/m2 section*

| Date/ Section | May 17 | May 26 | May 31 | Jun 07 | Jun 14 | Jun 21 | Jun 28 | Jul 07 | Jul 12 | Jul 19 | Jul 26 | Aug 02 | Aug 09 | Aug 23 | Sep 01 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1A (a)** | 20.8 | 35.1 | 55.7 | 71 | 74.4 | 77.3 | 79.6 | 81 | 0 | 12.5 | 12.5 | 10.2 | 10.9 | 12 | 12.4 |
| **1A (b)** | 20.4 | 36.1 | 51 | 72.4 | 81.2 | 82.9 | 85.3 | 87.5 | 0 | 12.8 | 12 | 9.6 | 9.4 | 12.4 | 12.3 |
| **1B (a)** | 25.8 | 40.3 | 60.4 | 21.2 | 20.1 | 19.2 | 22.9 | 23.7 | 25.8 | 28.4 | 27.2 | 26.8 | 24.8 | 26.5 | 11.4 |
| **1B (b)** | 22.4 | 34.7 | 50.2 | 13.5 | 14.1 | 18.3 | 20.4 | 22.7 | 23.2 | 23.4 | 25.2 | 23.7 | 21.9 | 24.5 | 8.1 |
| **1C (a)** | 19.2 | 31 | 55.9 | 15 | 15.5 | 16.2 | 25.5 | 22.3 | 21.4 | 22.4 | 10.4 | 9.4 | 10.2 | 10.3 | 6.3 |
| **1C (b)** | 21.8 | 37.1 | 56.3 | 15 | 17.3 | 17.4 | 19.7 | 22.1 | 22 | 22.8 | 10.9 | 9.3 | 9.5 | 8.9 | 6.8 |
| **2A (a)** | 21 | 31.9 | 47.9 | 49.7 | 53 | 55.4 | 54.4 | 53.4 | 12.4 | 13.5 | 13.9 | 14.6 | 17.6 | 15.7 | 14.9 |
| **2A (b)** | 20.1 | 28 | 38.4 | 41.2 | 47 | 45.1 | 45.8 | 44.9 | 18.6 | 19.5 | 18.3 | 16.1 | 11.3 | 16.3 | 16.4 |
| **2B (a)** | 22.9 | 37.2 | 54.6 | 67.7 | 80.8 | 16.9 | 13.8 | 16 | 16.7 | 15.9 | 16.3 | 15 | 18.7 | 18.3 | 6.9 |
| **2B (b)** | 25.2 | 38.9 | 50.3 | 71.7 | 79 | 14.3 | 13.7 | 14.8 | 14.7 | 14.5 | 14.3 | 12.2 | 15.3 | 16.2 | 7.6 |
| **2C (a)** | 23.1 | 18.2 | 31.9 | 45.1 | 54.3 | 16.3 | 21.2 | 24.5 | 27.5 | 28.2 | 10.9 | 9.8 | 13.2 | 12.5 | 7.7 |
| **2C (b)** | 22.6 | 16.5 | 31.2 | 44.3 | 52.8 | 16.7 | 16.7 | 20.7 | 20.8 | 24.3 | 10.6 | 10.3 | 11.2 | 12.5 | 8 |
| **3A (a)** | 21.6 | 28.9 | 42.6 | 59.2 | 61.9 | 66.2 | 71.4 | 65.4 | 68.9 | 61.3 | 10.9 | 9.9 | 11.6 | 11.5 | 8.7 |
| **3A (b)** | 26 | 36.4 | 54.7 | 62 | 65.8 | 66.2 | 70.8 | 84.6 | 77.5 | 76.4 | 12.8 | 14.8 | 11.3 | 11.5 | 10.6 |
| **3B (a)** | 20.8 | 34.6 | 53.8 | 11.3 | 19.6 | 24.2 | 29.2 | 32.1 | 32.9 | 35.6 | 34.2 | 33.2 | 30.2 | 31.5 | 7.9 |
| **3B (b)** | 20.4 | 39 | 52.5 | 7.1 | 20.3 | 24.6 | 28.9 | 32.9 | 34.3 | 42.8 | 34.6 | 33.9 | 28.4 | 32.1 | 8.4 |
| **3C (a)** | 24.4 | 36.2 | 55 | 13.5 | 18.7 | 22.6 | 27.1 | 29.3 | 32.2 | 27.4 | 9.1 | 8.8 | 9.2 | 8 | 7.1 |
| **3C (b)** | 25.4 | 37.8 | 53.6 | 9.5 | 20.4 | 27 | 30.4 | 37.6 | 36 | 37.1 | 9.8 | 11.1 | 10.3 | 9.4 | 7 |
| **4A (a)** | 21.8 | 36.2 | 50.3 | 61.5 | 65.6 | 0 | 0 | 4 | 4 | 4 | 4 | 5 | 6.5 | 8.5 | 5.5 |
| **4A (b)** | 23 | 34.8 | 47.1 | 62 | 67.4 | 0 | 0 | 0 | 0 | 4 | 4 | 4 | 6.4 | 7.6 | 5.6 |
| **4B (a)** | 25.4 | 41.7 | 53.5 | 72.2 | 80.2 | 79.7 | 89.5 | 91.2 | 0 | 0 | 0 | 0 | 0 | 5 | 2.3 |
| **4B (b)** | 24.9 | 34.4 | 52.3 | 75.9 | 82.4 | 84.6 | 83.6 | 94.3 | 0 | 0 | 0 | 0 | 0 | 0 | 1.7 |


Test Sections 1A(a) & 1A(b): Cut stalk beneath soil surface with knife
Number of Treatments: 1 (07/07/2022)
1A(a)
1A(b)
Treatment
Total DSV Plants per m²
200
150
100
50
0
05-10-2022
05-17-2022
05-26-2022
06-02-2022
06-07-2022
06-14-2022
06-21-2022
06-28-2022
07-07-2022
07-12-2022
07-19-2022
07-26-2022
08-02-2022
08-09-2022
08-23-2022
09-01-2022
Data Collection Date


Test Sections 1A(a) & 1A(b): Cut stalk beneath soil surface with knife
Number of Treatments: 1 (07/12/2022)
1A(a)
1A(b)
Treatment
Average Height (cm)
100
75
50
25
0
05-10-2022
05-17-2022
05-26-2022
06-02-2022
06-07-2022
06-14-2022
06-21-2022
06-28-2022
07-07-2022
07-12-2022
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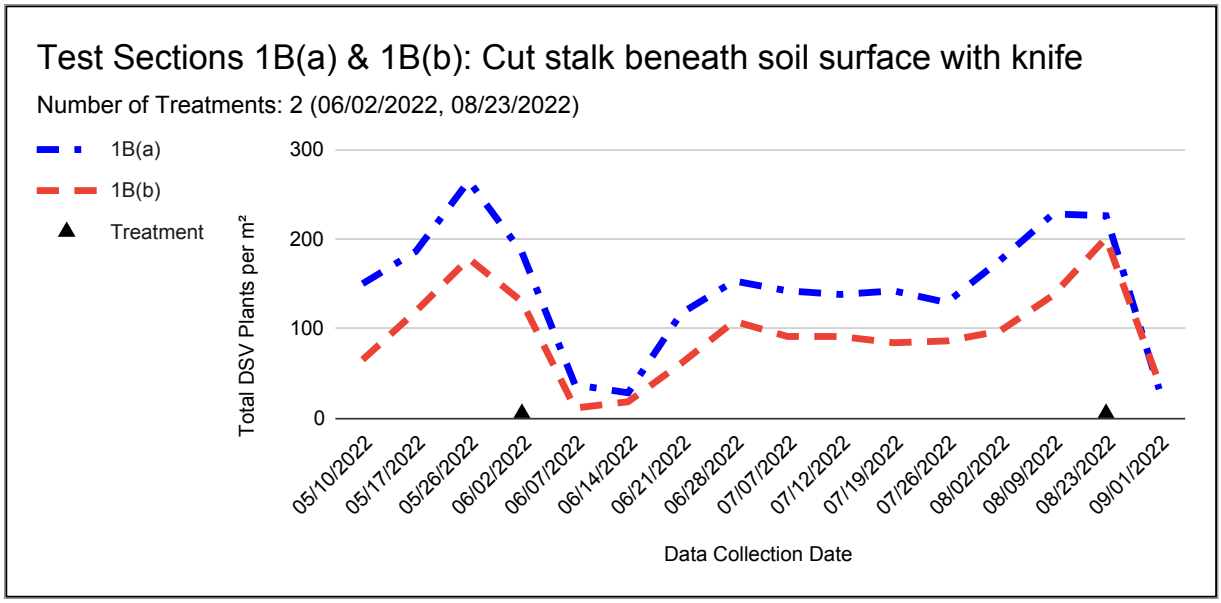
08-09-2022
08-23-2022
09-01-2022
Data Collection Date


Test Sections 1B(a) & 1B(b): Cut stalk beneath soil surface with knife
Number of Treatments: 2 (06/02/2022, 08/23/2022)
1B(a)
1B(b)
Treatment
Total DSV Plants per m²
300
200
100
0
05/10/2022
05/17/2022
05/26/2022
06/02/2022
06/07/2022
06/14/2022
06/21/2022
06/28/2022
07/07/2022
07/12/2022
07/19/2022
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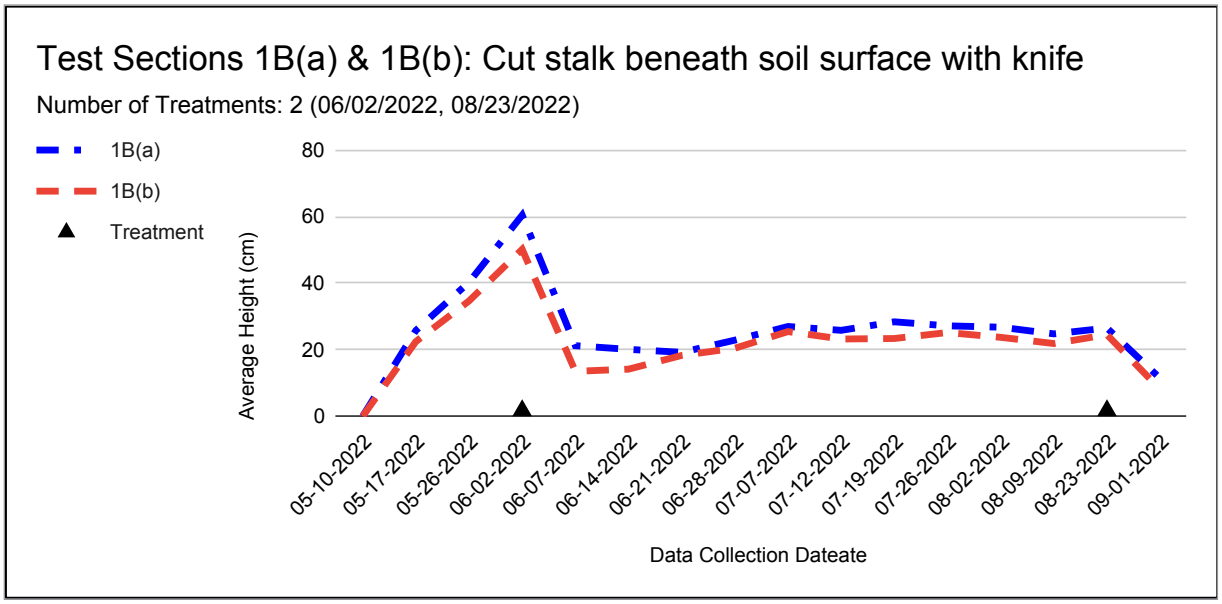
08/09/2022
08/23/2022
09/01/2022
Data Collection Date


Test Sections 1B(a) & 1B(b): Cut stalk beneath soil surface with knife
Number of Treatments: 2 (06/02/2022, 08/23/2022)
1B(a)
1B(b)
Treatment
Average Height (cm)
80
60
40
20
0
05-10-2022
05-17-2022
05-26-2022
06-02-2022
06-07-2022
06-14-2022
06-21-2022
06-28-2022
07-07-2022
07-12-2022
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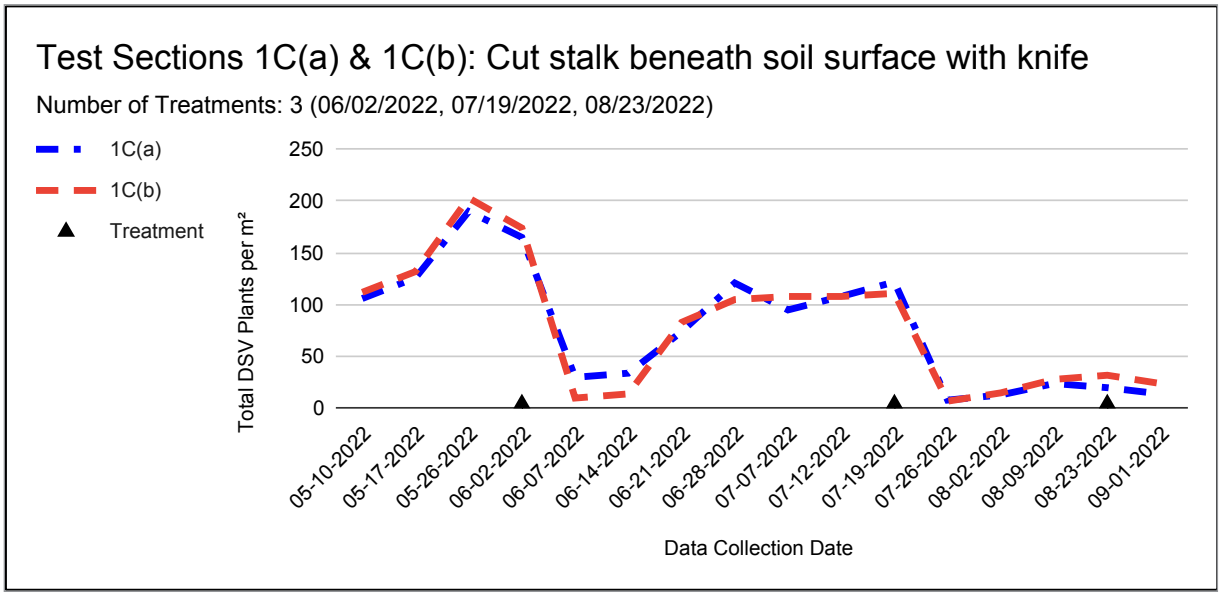
08-23-2022
09-01-2022
Data Collection Dateate


Test Sections 1C(a) & 1C(b): Cut stalk beneath soil surface with knife
Number of Treatments: 3 (06/02/2022, 07/19/2022, 08/23/2022)
1C(a)
1C(b)
Treatment
Total DSV Plants per m²
250
200
150
100
50
0
05-10-2022
05-17-2022
05-26-2022
06-02-2022
06-07-2022
06-14-2022
06-21-2022
06-28-2022
07-07-2022
07-12-2022
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07-26-2022
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08-09-2022
08-23-2022
09-01-2022
Data Collection Date

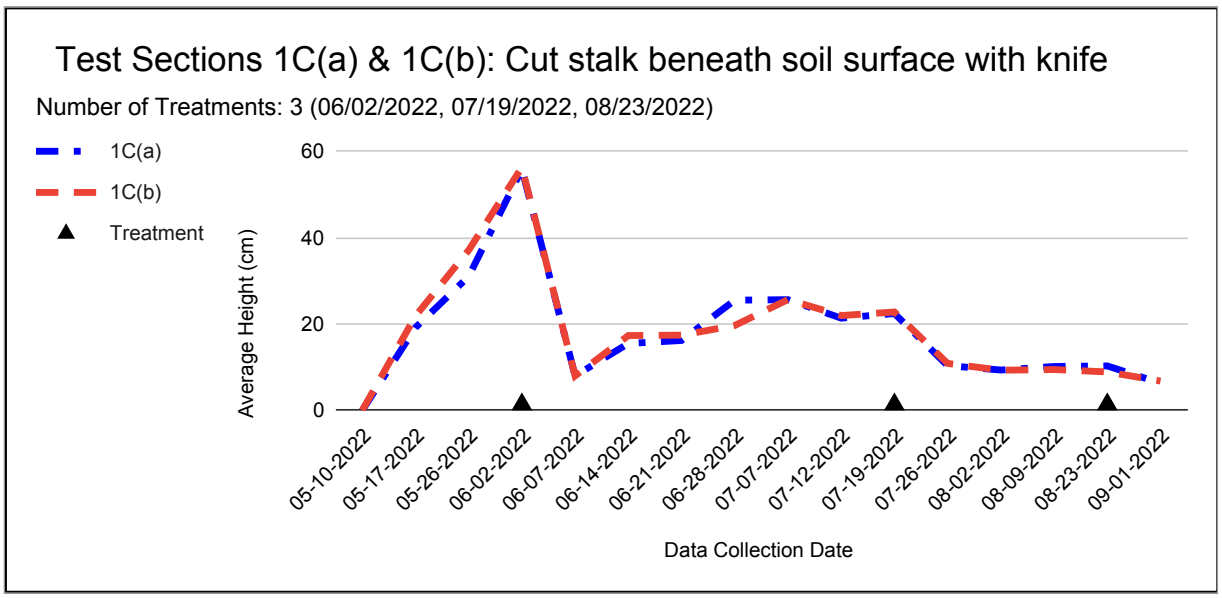

Test Sections 1C(a) & 1C(b): Cut stalk beneath soil surface with knife
Number of Treatments: 3 (06/02/2022, 07/19/2022, 08/23/2022)
1C(a)
1C(b)
Treatment
Average Height (cm)
60
40
20
0
05-10-2022
05-17-2022
05-26-2022
06-02-2022
06-07-2022
06-14-2022
06-21-2022
06-28-2022
07-07-2022
07-12-2022
07-19-2022
07-26-2022
08-02-2022
08-09-2022
08-23-2022
09-01-2022
Data Collection Date

***Table 1. Observations for Plots 1A, 1B, 1C—Cut stalk beneath soil surface with knife***

| Date | **1A Observations**<br>**Non-DSV plants present:** Grasses, Goldenrod | **1B Observations**<br>**Non-DSV plants present:** Grasses, 3 Raspberry, Thistle, Wintercress, Vetch, 1 Hackberry sapling | **1C Observations**<br>**Non-DSV plants present:** Grasses, Goldenrod |
|---|---|---|---|
| **05/10/2022** | DSV just emerging from soil | DSV just emerging from soil | DSV just emerging from soil |
| **05/17/2022** | Some DSV flower buds starting to appear | Some DSV flower buds starting to appear | Some DSV flower buds starting to appear |
| **05/26/2022** | More DSV flower buds | More DSV flower buds | More DSV flower buds |
| **06/02/2022** | DSV flowers opening, stem tips beginning to curl | DSV flowers opening, stem tips beginning to curl<br>**Treatment done in 1B** | DSV flowers opening, stem tips beginning to curl<br>**Treatment done in 1C** |
| **06/07/2022** | DSV in full bloom and stem tips curled and twisting together | DSV seedlings present | DSV seedlings present |
| **06/14/2022** | Some grasses but mostly DSV | No observations recorded | No observations recorded |
| **06/21/2022** | DSV seed pods visible | No observations recorded | No observations recorded |
| **06/28/2022** | More DSV seed pods, all still green | Only two DSV in flower | No observations recorded |
| **07/07/2022** | Soil very dry, difficult to cut stem beneath soil, more DSV seed pods, and stems are curled and tangled<br>**Treatment done in 1A** | More DSV in flower | No observations recorded |
| **07/12/2022** | No observations recorded | Some DSV in flower, some seed pods | No observations recorded |
| **07/19/2022** | Grasses leaning over. DSV thin and yellow | No observations recorded | **Treatment done in 1C** |
| **07/26/2022** | Trampling in buffer zone suppressing grass and DVS, Grasses browning—evidence of drought and soil disturbance | Trampling in buffer zone suppressing grass and DVS, Grasses browning—evidence of drought and soil disturbance | Trampling in buffer zone suppressing grass and DVS, Grasses browning—evidence of drought and soil disturbance |
| **08/02/2022** | Ground very dry, grasses dry and yellow, DSV wilted with brown spots on leaves | Ground very dry, grasses dry and yellow, DSV wilted with brown spots on leaves | Ground very dry, grasses dry and yellow, DSV wilted with brown spots on leaves<br>Lots of tiny DSV seedlings under the other plants |
| **08/09/2022** | Some DSV seedlings less than 10cm | DSV growth stunted but still producing flowers and seed pods | Carpet of DSV seedlings covering 15% of plot |
| **08/23/2022** | No observations recorded | Some DSV seed pods<br>**Treatment done in 1B** | **Treatment done in 1C** |
| **09/01/2022** | DSV seedlings show minimal growth over past several weeks<br>DSV thin stemmed, no seeds or flower | DSV seedlings show minimal growth over past several weeks, Some seedlings | DSV seedlings show minimal growth over past several weeks |

For Plots 1A, 1B, and 1C, the stalk was cut beneath the soil surface with a special knife.

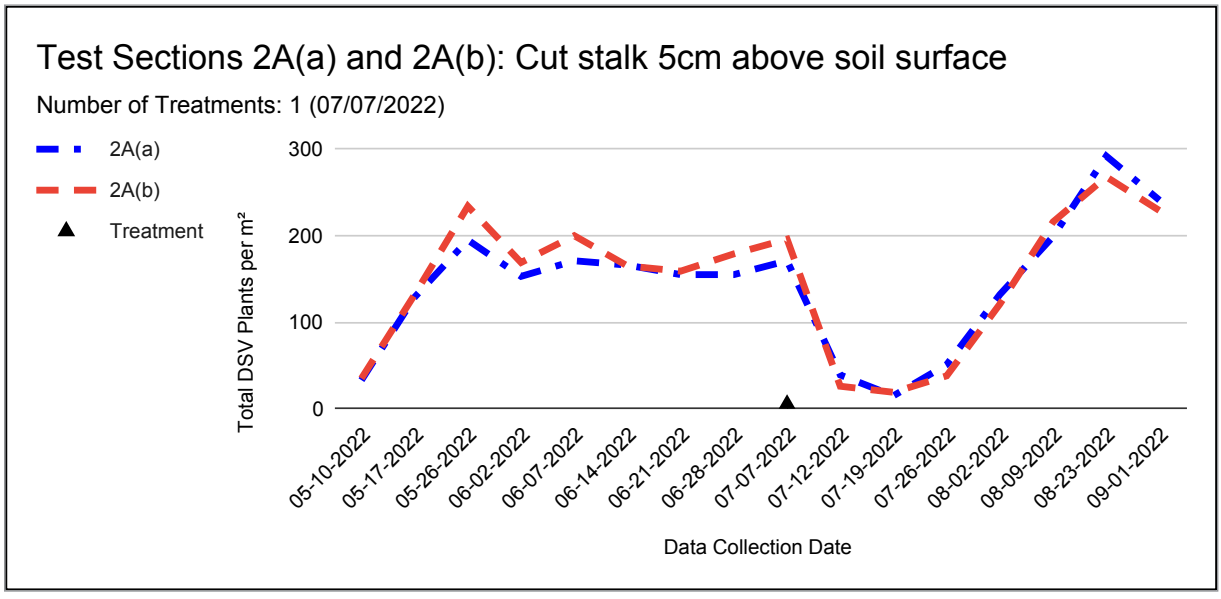
Attempts were made to include the growth crown at the end of the stalk but not all the roots. In 1A and 1C plots, grasses became dominant. 1B had some diversity present.

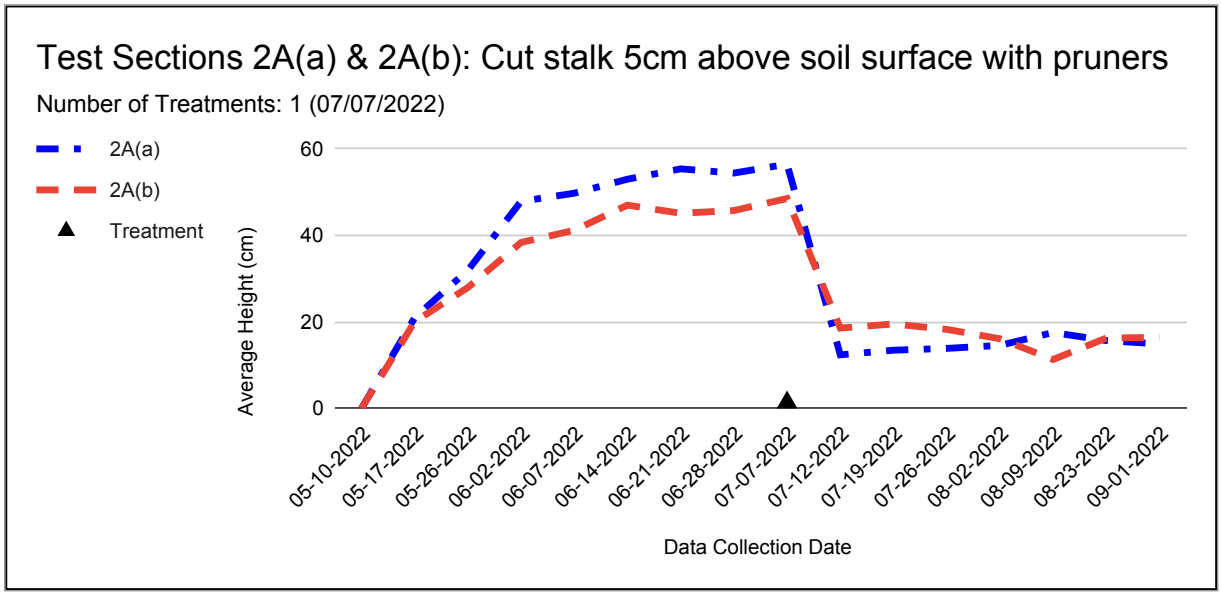
*Photo 1:* This shows the special knife and the cut-out root crown.

1A was cut only once which resulted in the numbers of stalks recovering but remaining small. There was no flower or seed production following.

1B was cut twice which resulted in the numbers of stalks recovering after both cuts but the plants remained small. There was some flower and seed production after the first cut but that was removed by the second treatment.

1C was cut three times. The numbers of stalks began to recover after the first cut, but the numbers remained low after subsequent cuts. The plants remained small.




Test Sections 2A(a) & 2A(b): Cut stalk 5cm above soil surface with pruners
Number of Treatments: 1 (07/07/2022)
2A(a)
2A(b)
Treatment
Average Height (cm)
60
40
20
0
05-10-2022
05-17-2022
05-26-2022
06-02-2022
06-07-2022
06-14-2022
06-21-2022
06-28-2022
07-07-2022
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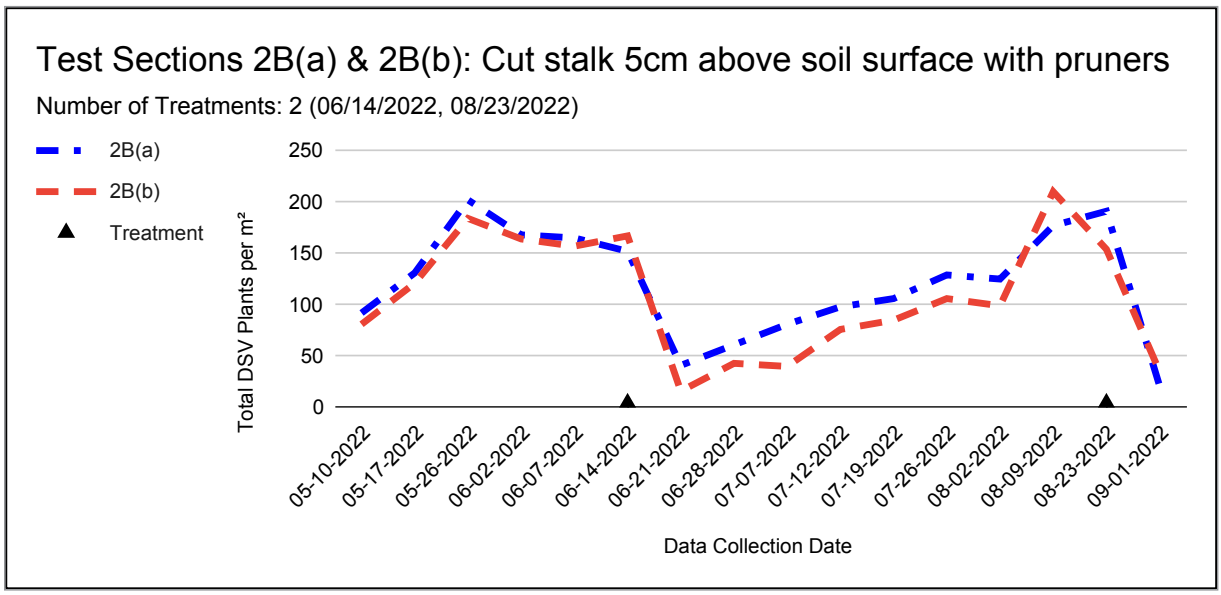
08-23-2022
09-01-2022
Data Collection Date


Test Sections 2B(a) & 2B(b): Cut stalk 5cm above soil surface with pruners
Number of Treatments: 2 (06/14/2022, 08/23/2022)
2B(a)
2B(b)
Treatment
Total DSV Plants per m²
250
200
150
100
50
0
05-10-2022
05-17-2022
05-26-2022
06-02-2022
06-07-2022
06-14-2022
06-21-2022
06-28-2022
07-07-2022
07-12-2022
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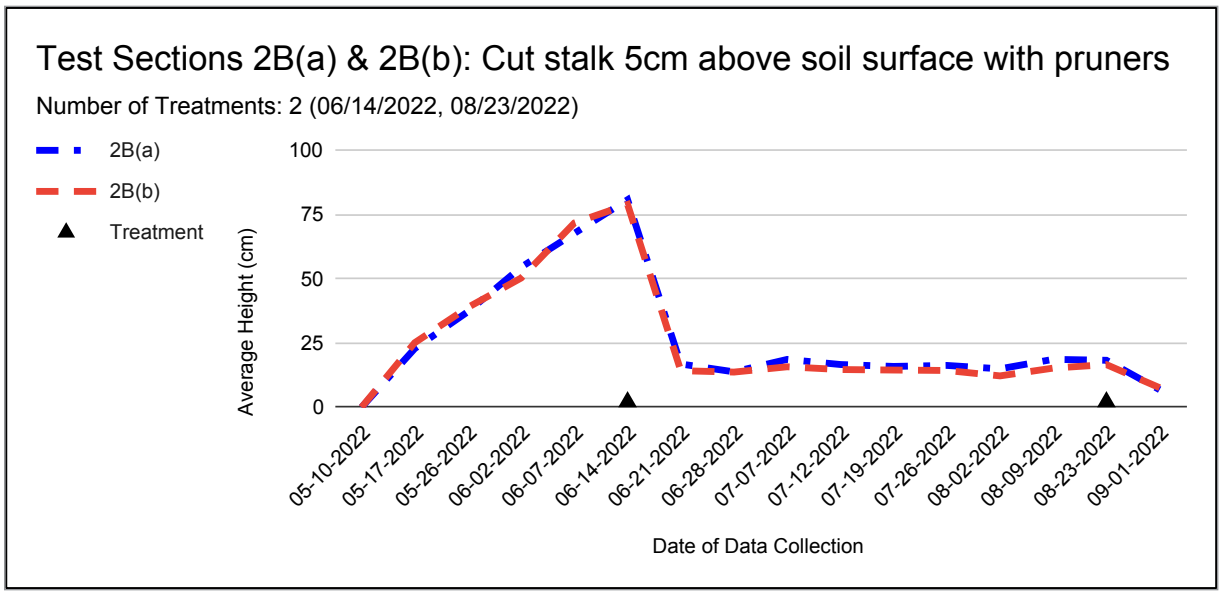
08-09-2022
08-23-2022
09-01-2022
Data Collection Date


Test Sections 2B(a) & 2B(b): Cut stalk 5cm above soil surface with pruners
Number of Treatments: 2 (06/14/2022, 08/23/2022)
2B(a)
2B(b)
Treatment
Average Height (cm)
100
75
50
25
0
05-10-2022
05-17-2022
05-26-2022
06-02-2022
06-07-2022
06-14-2022
06-21-2022
06-28-2022
07-07-2022
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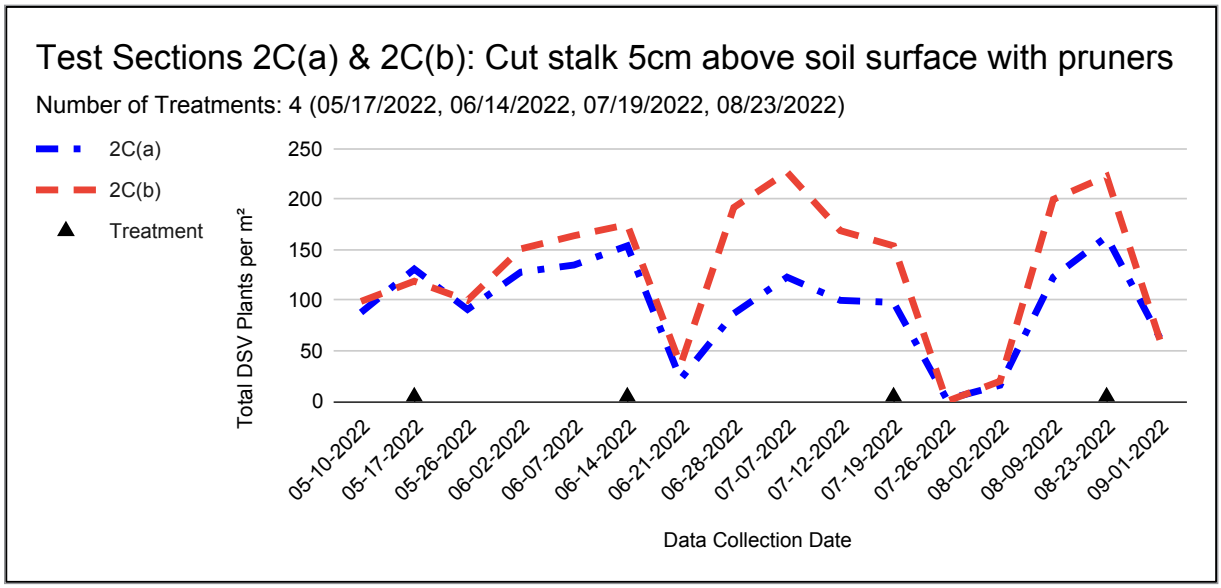
08-09-2022
08-23-2022
09-01-2022
Date of Data Collection



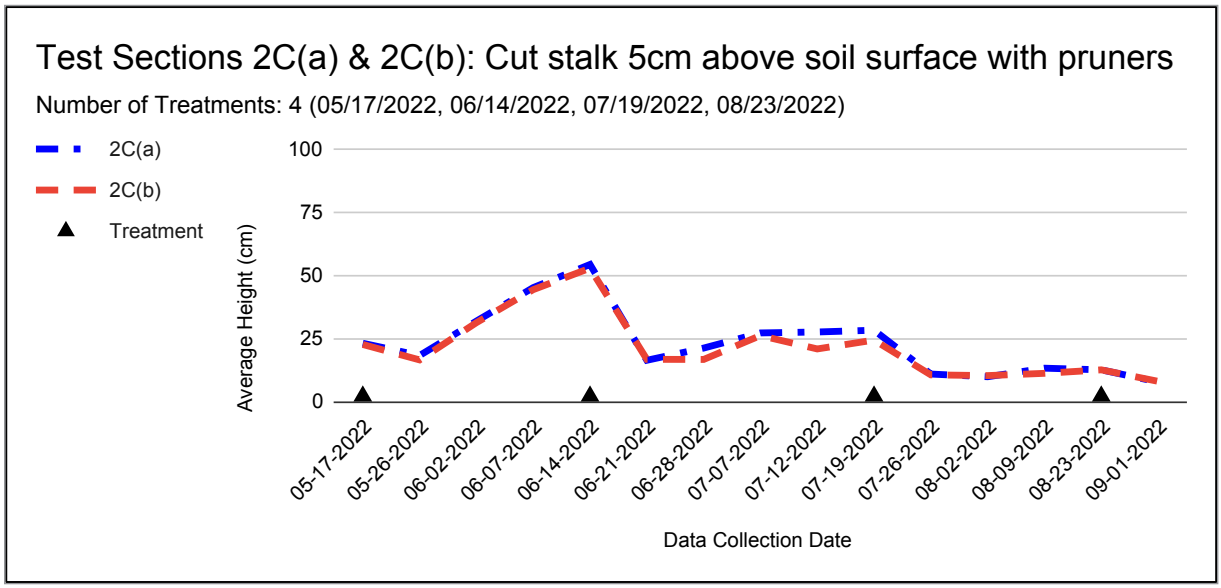




***Table 2. Observations for Plots 2A, 2B, 2C—Cut stalk 5 cm above soil surface with pruners***

| Date | 2A Observations<br>**Non-DSV plants present:** Grasses, 1 Raspberry, Thistle, Wintercress, Vetch, St John's Wort | 2B Observations<br>**Non-DSV plants present:** Grasses | 2C Observations<br>**Non-DSV plants presesnt:** Grasses, 25 Raspberry, Thistle, Moss |
|---|---|---|---|
| **05/10/2022** | DSV just emerging from soil | DSV just emerging from soil | DSV just emerging from soil |
| **05/17/2022** | Some DSV flower buds starting to appear | Some DSV flower buds starting to appear | Some DSV flower buds starting to appear<br>Treatment 2C |
| **05/26/2022** | More DSV flowers | More DSV flowers | No flowers after treatment |
| **06/02/2022** | DSV flowers opening, stem tips beginning to curl | DSV flowers opening, stem tips beginning to curl | No observations recorded |

| Date | 2A Observations<br>**Non-DSV plants present:** Grasses, 1 Raspberry, Thistle, Wintercress, Vetch, St John's Wort | 2B Observations<br>**Non-DSV plants present:** Grasses | 2C Observations<br>**Non-DSV plants presesnt:** Grasses, 25 Raspberry, Thistle, Moss |
|---|---|---|---|
| **06/07/2022** | DSV in full bloom and stem tips curled and twisting together | DSV in full bloom and stem tips curled and twisting together | No observations recorded |
| **06/14/2022** | No observations recorded | **Treatment done in 2B** | **Treatment done in 2C** |
| **06/21/2022** | DSV seed pods visible | Patches of soil appear to have been disturbed by an animal | No observations recorded |
| **06/28/2022** | More DSV seed pods, all still green | No observations recorded | Raspberry has grown very tall and covers most of the plot 2C(a) less in plot 2C(b) |
| **07/07/2022** | More DSV seed pods, stems are curled and tangled<br>**Treatment done in 2A** | No observations recorded | No DSV in flower, all very small |
| **07/12/2022** | 30% of plot covered in DSV seedlings | Lots of grasses, DSV is all thin stemmed and yellowish | Some DSV beginning to flower |
| **07/19/2022** | No observations recorded | No observations recorded | Treatment done in 2C |
| **07/26/2022** | 60% of ground is covered in DSV seedlings less than 5 cm, goldenrod in buffer about to flower | 1 DSV in flower | Raspberry plants have thrived with removal of DSV, DSV seedlings |
| **08/02/2022** | Trampling in buffer zone suppressing raspberries, grasses and DSV | Grasses dry and yellow, DSV wilted and yellowish, 2 DSV in flower<br>Trampling in buffer zone suppressing raspberries, grasses and DSV | Carpet of DSV seedings less than 5 cm covering %70 of plot<br>Trampling in buffer zone suppressing raspberries, grasses and DSV |
| **08/09/2022** | Many cut DSV stems have regrown with 2 or 3 new stems | No observations recorded | No observations recorded |
| **08/23/2022** | No observations recorded | DSV has chlorotic patches on leaves<br>**Treatment done in 2B** | DSV has chlorotic patches on leaves<br>**Treatment done in 2C** |
| **09/01/2022** | 1 DSV with seed pod, regrowth is thin and stunted, 2 have produced seed pods, lots of DSV seedlings and regrowth shoots | All DSV has yellowish discoloured leaves, very little regrowth no seeds or flowers, lots of seedlings that show very little growth over past several weeks | All DSV has yellowish discoloured leaves, very little regrowth no seeds or flowers, lots of seedlings that show very little growth over past several weeks |

For Plots 2A, 2B and 2C, the stalk was cut 5 cm above the soil surface with hand pruners. Some cut stalks grew back with multiple stems. Other plant species in the test plots were left uncut. Small DSV seedlings have appeared.

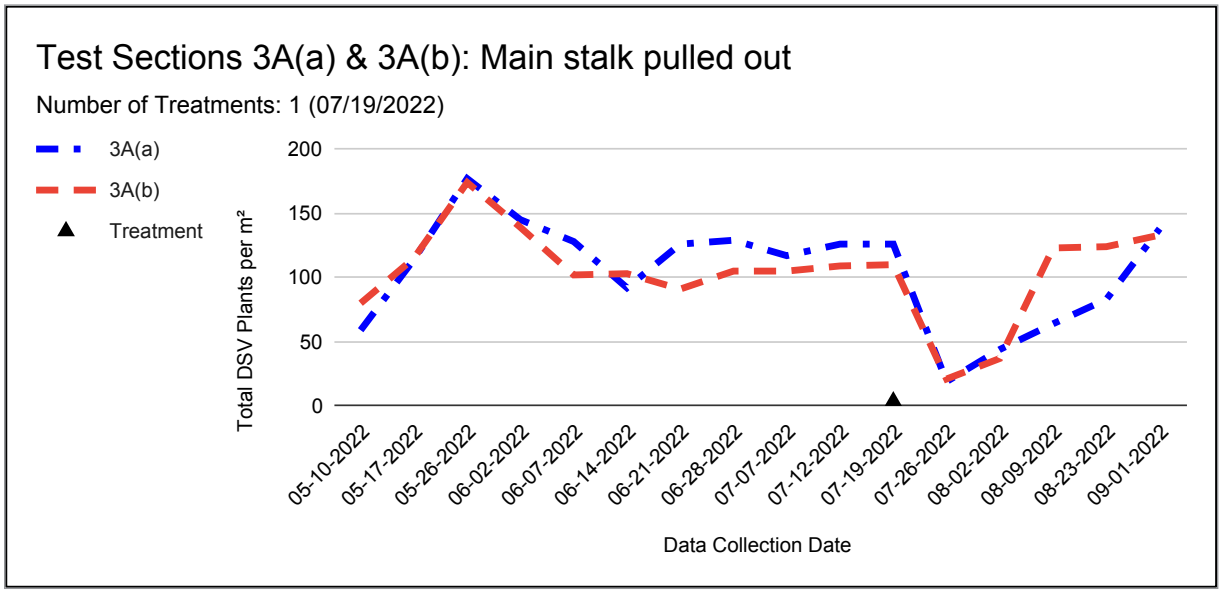
*Photo 2:* A cut stalk grew two branches. Small DSV seedlings are present.

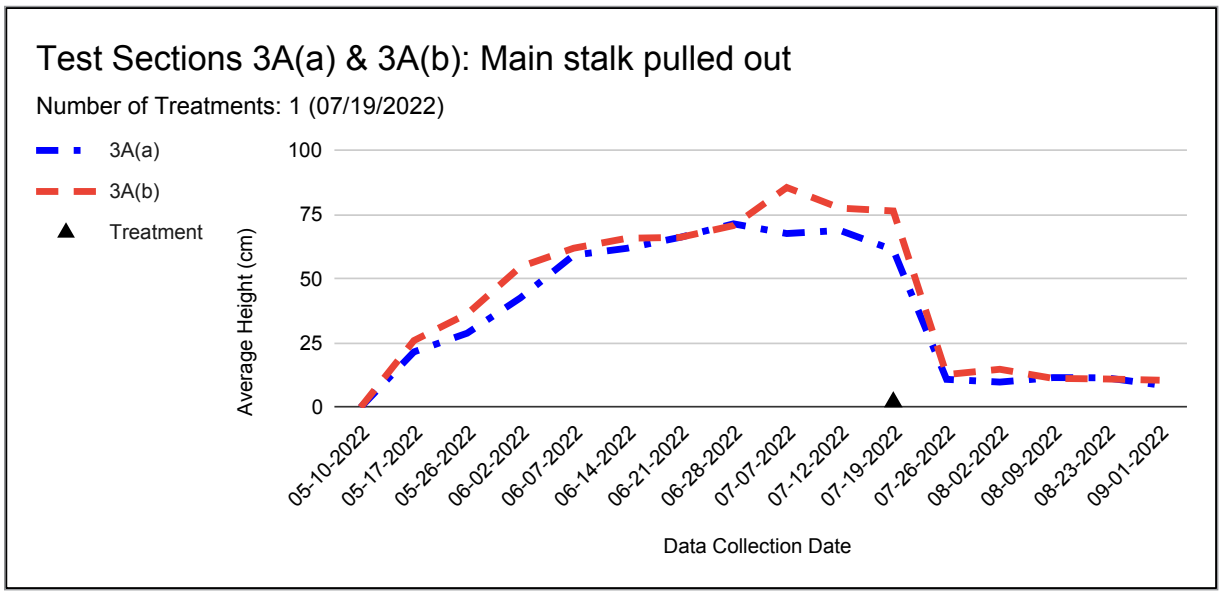
Plot 2A was cut once. The numbers of stalks recovered well but remained small. Many seedlings were observed under the grasses. Very few plants flowered.

Plot 2B was cut twice. The numbers recover well by August, but the plants remain small and appear yellow and thin. Some DSV flowering was observed. Grasses dominate.

Plot 2C was cut four times. The numbers recover but the plants get smaller with each cut. There are many tiny seedlings throughout the plot. No seeds are produced. The raspberry plants that were originally present have thrived.

*Photo 3:* Raspberry plants dominate Test Plot 2C




Test Sections 3A(a) & 3A(b): Main stalk pulled out
Number of Treatments: 1 (07/19/2022)
3A(a)
3A(b)
Treatment
Average Height (cm)
100
75
50
25
0
05-10-2022
05-17-2022
05-26-2022
06-02-2022
06-07-2022
06-14-2022
06-21-2022
06-28-2022
07-07-2022
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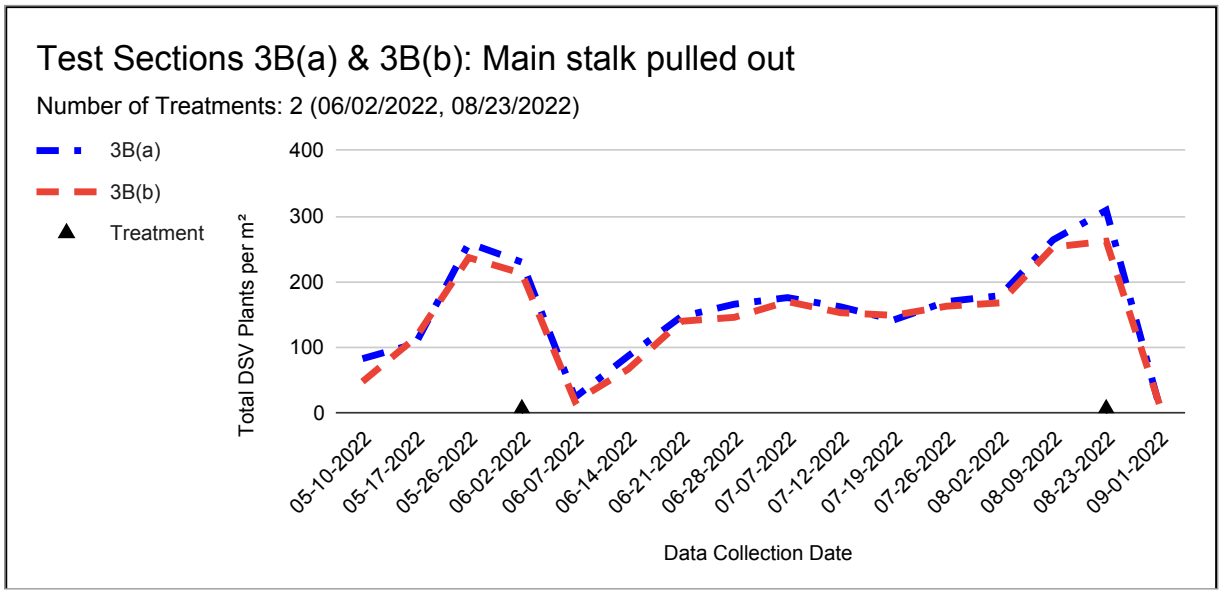
Data Collection Date


Test Sections 3B(a) & 3B(b): Main stalk pulled out
Number of Treatments: 2 (06/02/2022, 08/23/2022)
3B(a)
3B(b)
Treatment
Total DSV Plants per m²
400
300
200
100
0
05-10-2022
05-17-2022
05-26-2022
06-02-2022
06-07-2022
06-14-2022
06-21-2022
06-28-2022
07-07-2022
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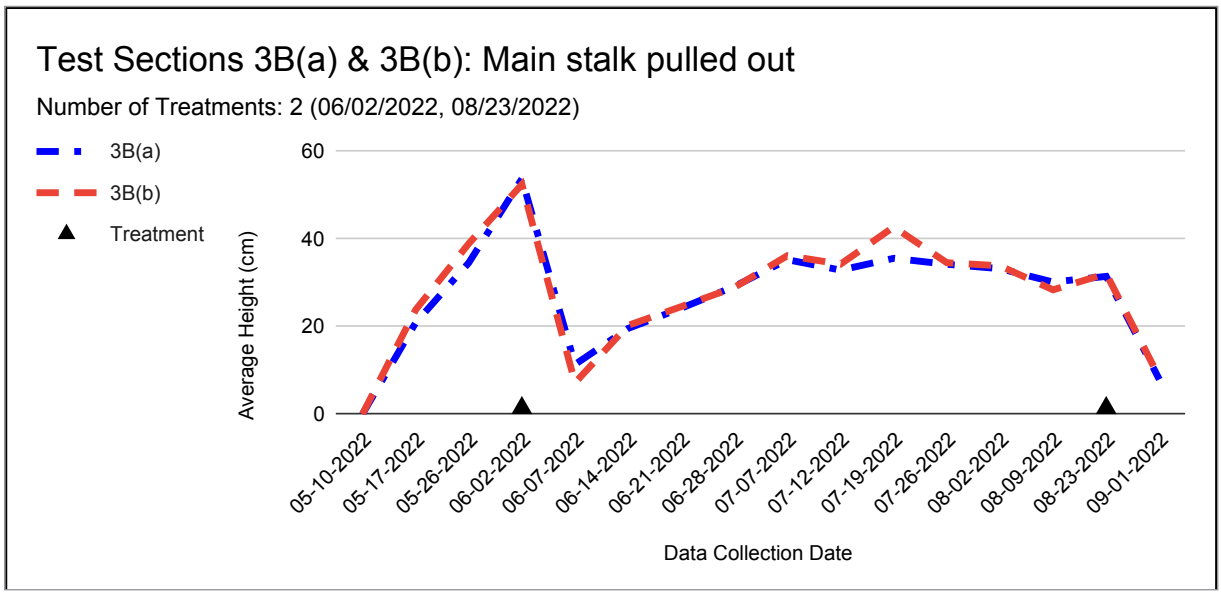
08-09-2022
08-23-2022
09-01-2022
Data Collection Date


Test Sections 3B(a) & 3B(b): Main stalk pulled out
Number of Treatments: 2 (06/02/2022, 08/23/2022)
3B(a)
3B(b)
Treatment
Average Height (cm)
60
40
20
0
05-10-2022
05-17-2022
05-26-2022
06-02-2022
06-07-2022
06-14-2022
06-21-2022
06-28-2022
07-07-2022
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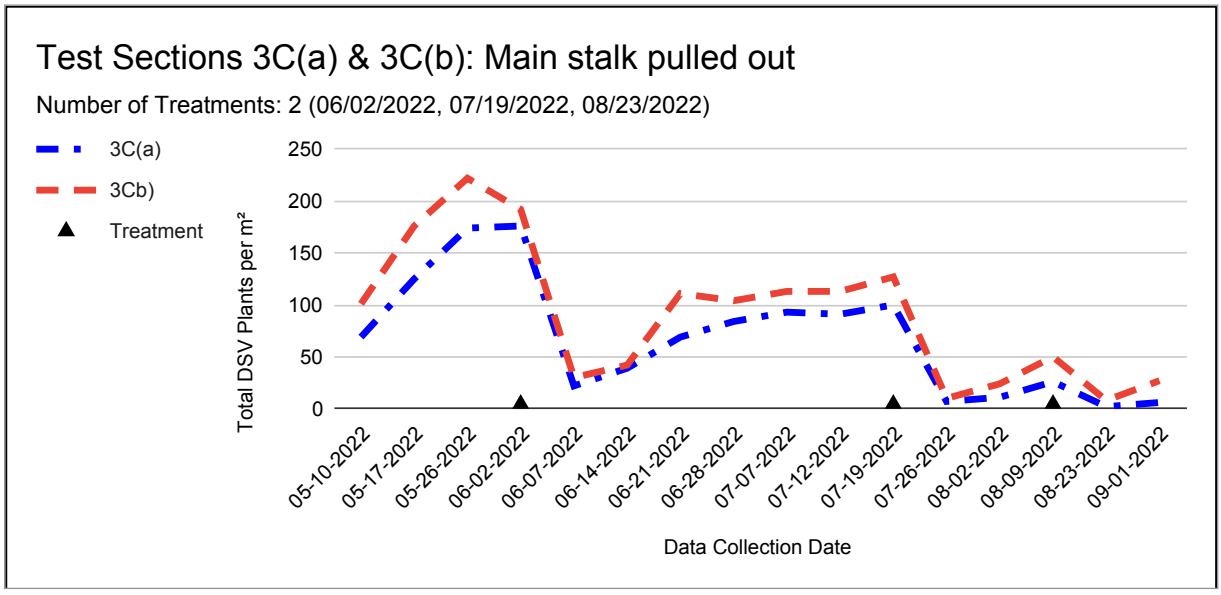
08-09-2022
08-23-2022
09-01-2022
Data Collection Date



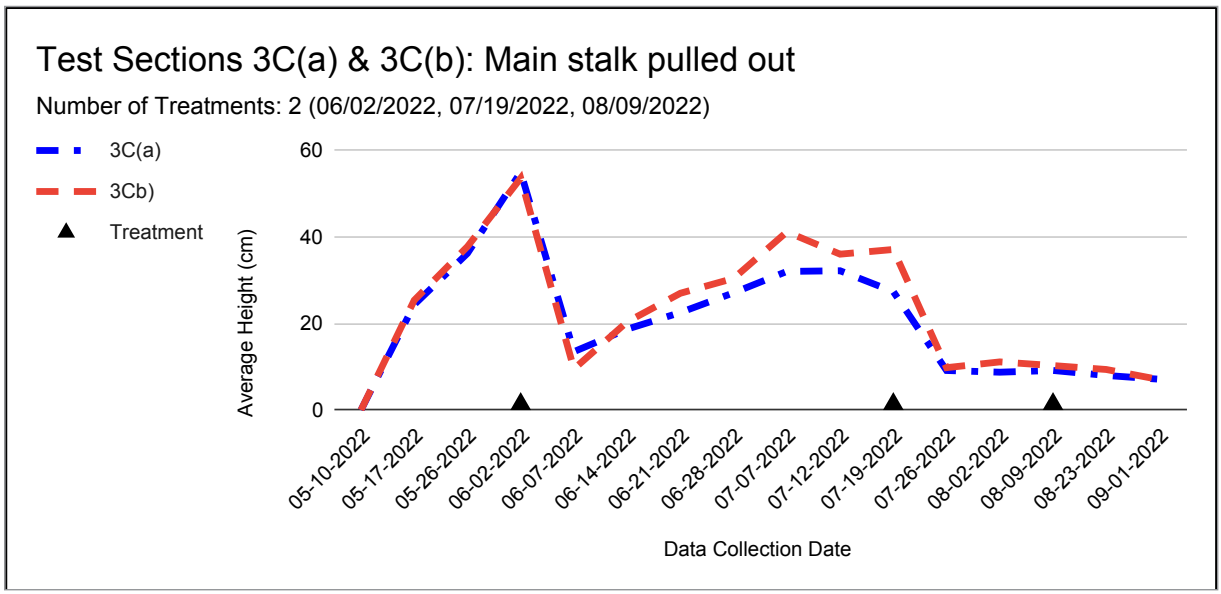




***Table 3. Observations for Plots 3A, 3B, 3C—Main stalk pulled out***

| **Date** | **3A Observation**<br><br>**Non-DSV plants present:** Grasses, Thistle | **3B Observations**<br><br>**Non-DSV plants present:** Grasses, Thistle, Raspberry, Moss | **3C Observations**<br><br>**Non-DSV plants present:** Grasses (Reed Canary Grass), Thistle, Vetch |
|---|---|---|---|
| **05/10/2022** | DSV just emerging from soil | DSV just emerging from soil | DSV just emerging from soil |
| **05/17/2022** | Some DSV flower buds starting to appear | Some DSV flower buds starting to appear | Some DSV flower buds starting to appear |
| **05/26/2022** | More DSV flowers throughout research site | More DSV flowers throughout research site | More DSV flowers throughout research site |

| Date | 3A Observation<br><br>**Non-DSV plants present:** Grasses, Thistle | 3B Observations<br><br>**Non-DSV plants present:** Grasses, Thistle, Raspberry, Moss | 3C Observations<br><br>**Non-DSV plants present:** Grasses (Reed Canary Grass), Thistle, Vetch |
|---|---|---|---|
| **06/02/2022** | DSV flowers opening, stem tips beginning to curl | DSV flowers opening, stem tips beginning to curl<br><br>**Treatment done in 3B** | DSV flowers opening, stem tips beginning to curl<br><br>**Treatment done in 3B** |
| **06/07/2022** | DSV in full bloom, stem tips curled and twisting together | DSV seedlings present | DSV seedlings present |
| **06/14/2022** | No observations recorded | No observations recorded | No observations recorded |
| **06/21/2022** | DSV seed pods visible | No observations recorded | No observations recorded |
| **06/28/2022** | More DSV seed pods, all still green | No observations recorded | No observations recorded |
| **07/07/2022** | More DSV seed pods, stems are curled and tangled | No observations recorded | No observations recorded |
| **07/12/2022** | Large DSV seed pods, stems leaning over and twisted, leaves curled and folded. | No observations recorded | Some DSV in flower, some small seed pods, stems leaning and twisted, leaves curled and folded |
| **07/19/2022** | **Treatment done in 3A** | No observations recorded | **Treatment done in 3C** |
| **07/26/2022** | 20% of ground covered with DSV seedlings, grasses (species unknown) predominate, grasses suppressed in buffer by trampling | Some DSV has flowers and seeds, reduced DSV growth in buffer due to trampling | Some DSV seedlings, reduced DSV growth in buffer due to trampling |
| **08/02/2022** | Grasses still green, DSV wilted | No observations recorded | Reed canary grass tall and gone to seed, DSV small and yellowish |
| **08/09/2022** | No observations recorded | Most DSV has seed pods | DSV remains small |
| **08/23/2022** | Densely covered with grasses | **Treatment done in 3B** | Mostly reed canary grass<br><br>**Treatment done in 3C** |
| **09/01/2022** | DSV is discolored, thin stemmed and has no flowers or seeds. Lots of seedlings less than 5cm that haven't grown noticeably over the past several weeks. Plot is predominantly filled with grasses. | A carpet of DSV seedings less than 5 cm tall covering 45% of plot, haven't grown noticeably over the past several weeks. DSV regrowth is small, thin and has no seed or flowers | DSV is small and thin and has no seeds or flowers. Lots of DSV seedlings haven't grown noticeably over the past several weeks. Lots of reed canary grass present |

Plots 3A, 3B and 3C have had the main stalk pulled out. This removes the end of the stalk including the new growth buds.

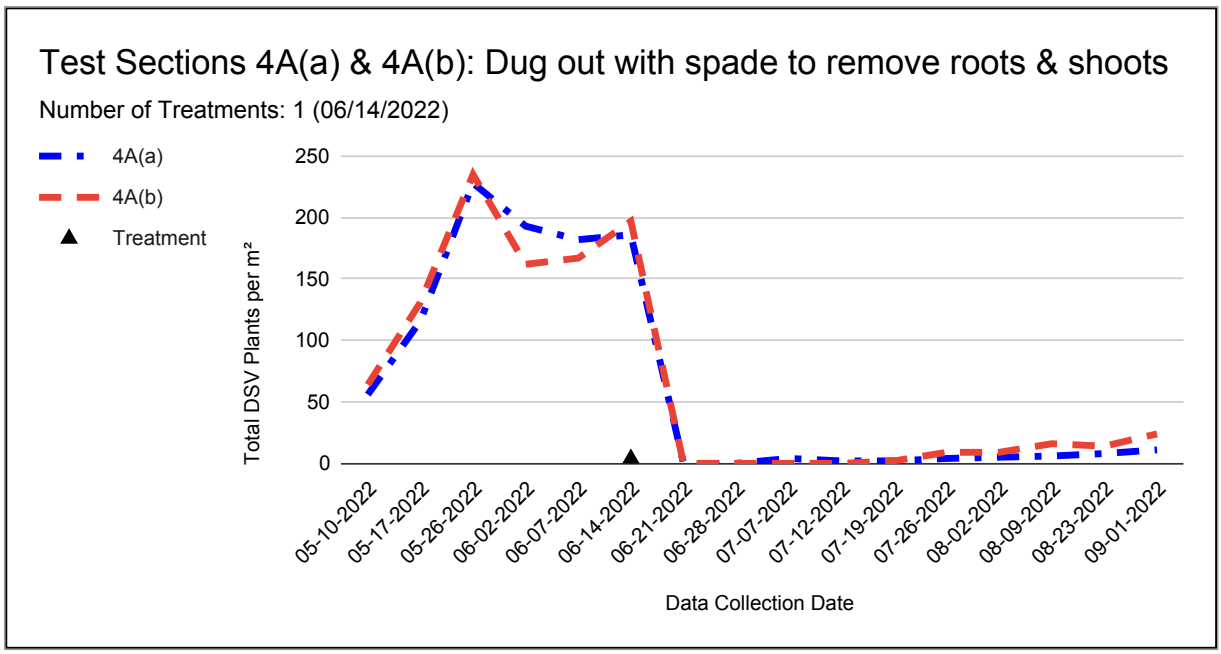
*Photo 4:* Stalk ends including growth buds.

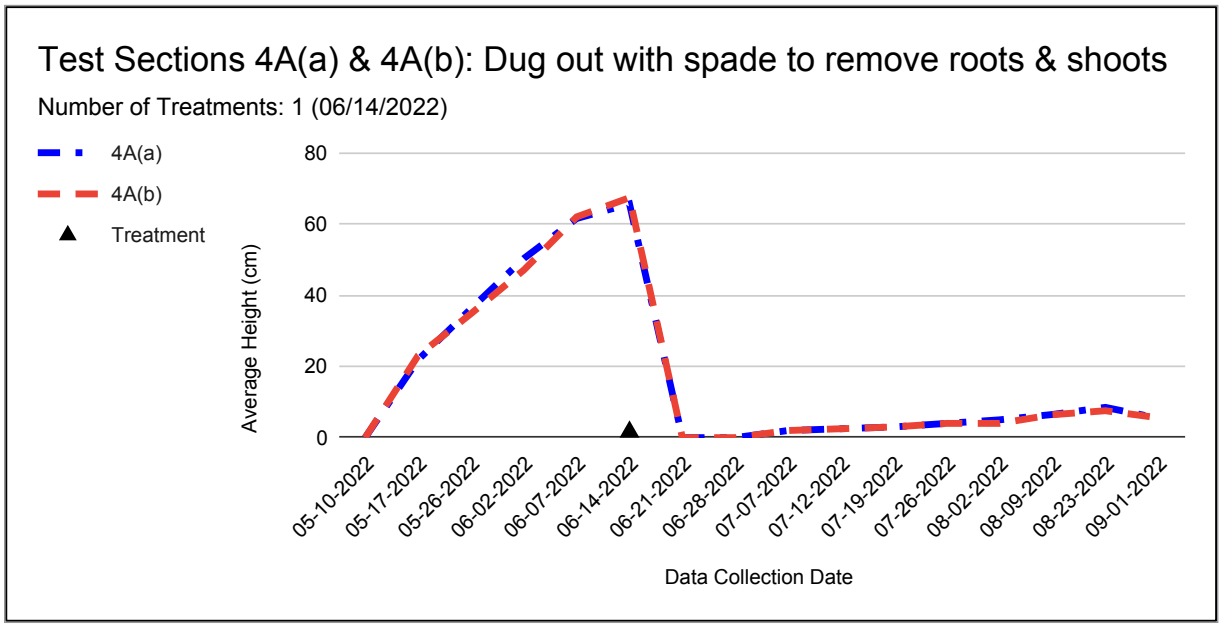
Plot 3A had stalks pulled out once. Although the numbers of stalks recover, the heights of the stalks do not. Pulling them out once seems to have stunted the growth and prevented seed production. There are tiny seedlings present.

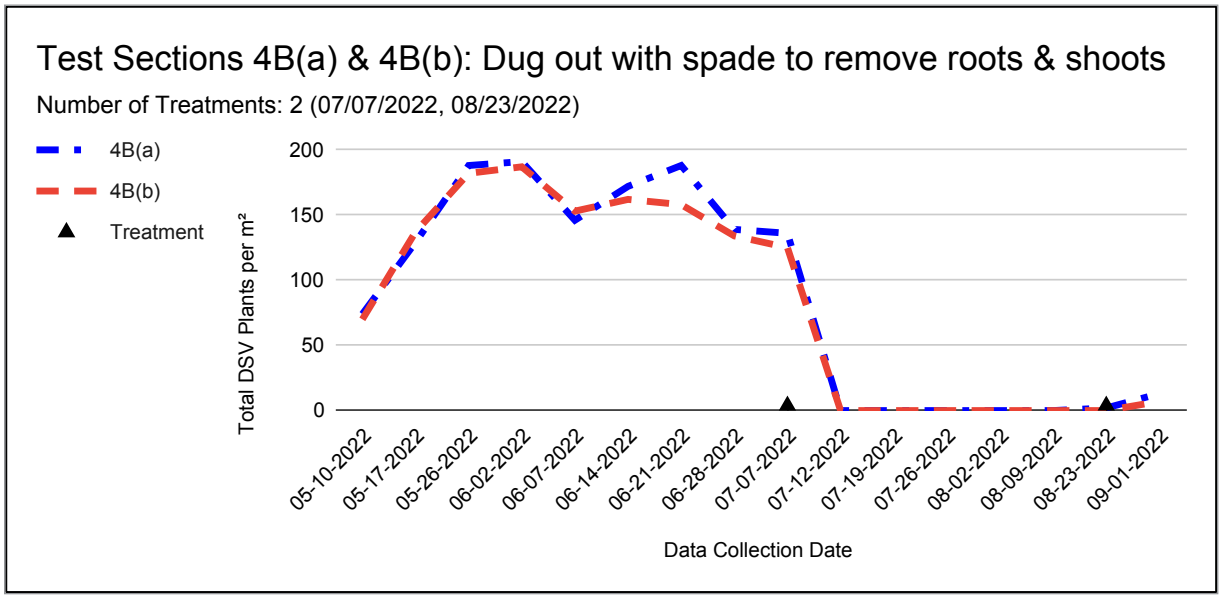
Plot 3B had stalks pulled out twice. In this case, the numbers of stalks and heights recovered after the first treatment. Seed pods developed but were removed at the second treatment. The other plant species continued to grow undisturbed.

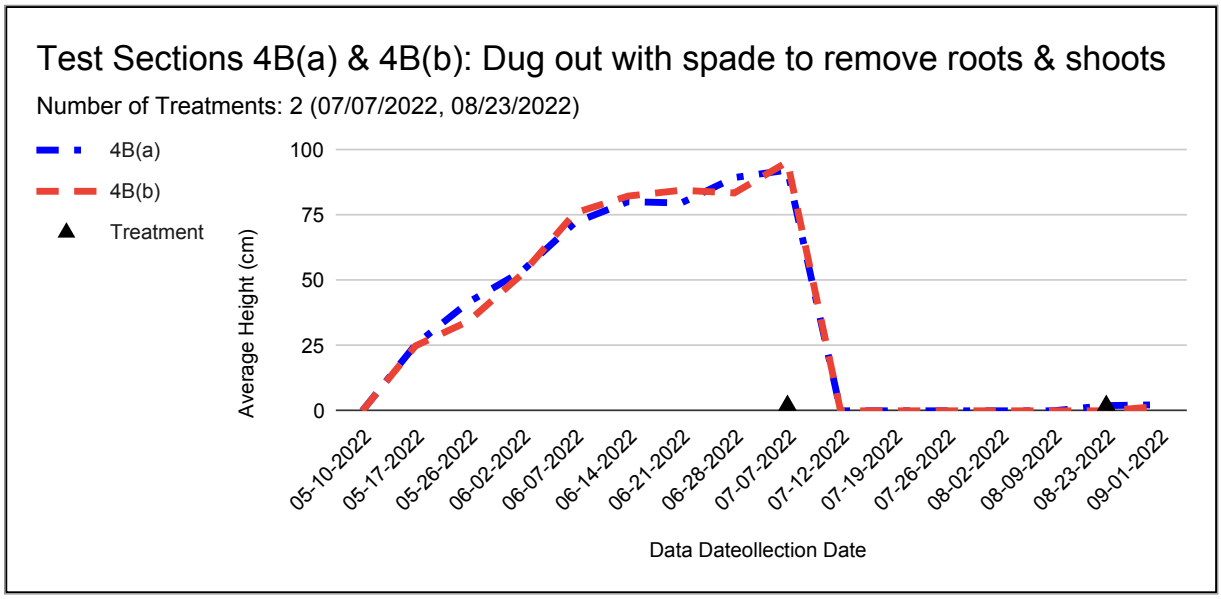
Plot 3C had stalks pulled out three times. After the first treatment, the numbers of stalks and the heights recover but, after the second treatment, they do not. This plot became dominated by Reed Canary Grass after the first treatment and remained that way throughout the season.

*Photo 5:* Plot 3C showing Reed Canary Grass dominating.




Test Sections 4A(a) & 4A(b): Dug out with spade to remove roots & shoots
Number of Treatments: 1 (06/14/2022)
4A(a)
4A(b)
Treatment
Average Height (cm)
80
60
40
20
0
05-10-2022
05-17-2022
05-26-2022
06-02-2022
06-07-2022
06-14-2022
06-21-2022
06-28-2022
07-07-2022
07-12-2022
07-19-2022
07-26-2022
08-02-2022
08-09-2022
08-23-2022
09-01-2022
Data Collection Date


Test Sections 4B(a) & 4B(b): Dug out with spade to remove roots & shoots
Number of Treatments: 2 (07/07/2022, 08/23/2022)
4B(a)
4B(b)
Treatment
Total DSV Plants per m²
200
150
100
50
0
05-10-2022
05-17-2022
05-26-2022
06-02-2022
06-07-2022
06-14-2022
06-21-2022
06-28-2022
07-07-2022
07-12-2022
07-19-2022
07-26-2022
08-02-2022
08-09-2022
08-23-2022
09-01-2022
Data Collection Date


Test Sections 4B(a) & 4B(b): Dug out with spade to remove roots & shoots
Number of Treatments: 2 (07/07/2022, 08/23/2022)
4B(a)
4B(b)
Treatment
Average Height (cm)
100
75
50
25
0
05-10-2022
05-17-2022
05-26-2022
06-02-2022
06-07-2022
06-14-2022
06-21-2022
06-28-2022
07-07-2022
07-12-2022
07-19-2022
07-26-2022
08-02-2022
08-09-2022
08-23-2022
09-01-2022
Data Dateollection Date

### *Table 4. Observations for Plots 4A, 4B—Dug out with spade to remove roots & shoots*

| Date | 4A Observations<br>**Non-DSV plants present:** Grasses, Goldenrod | 4B Observations<br>**Non-DSV plants present:** Grasses, Thistle |
|---|---|---|
| **05/10/2022** | DSV just emerging from soil | DSV just emerging from soil |
| **05/17/2022** | Some DSV flower buds starting to appear | Some DSV flower buds starting to appear |
| **05/26/2022** | More DSV flowers | More DSV flowers |
| **06/02/2022** | DSV flowers opening, stem tips beginning to curl | DSV flowers opening, stem tips beginning to curl |
| **06/07/2022** | DSV in full bloom and stem tips curled and twisting together | DSV in full bloom and stem tips curled and twisting together |
| **06/14/2022** | **Treatment done in 4A** | DSV beginning to develop seed pods |
| **06/21/2022** | No DSV or any vegetation | DSV seed pods visible |
| **06/28/2022** | No growth | More DSV seed pods, all still green |
| **07/07/2022** | No growth | More DSV seed pods, stems are curled and tangled<br>**Treatment done in 4B** (very difficult to dig, soil dry and clay-like, roots dense and tangled) |
| **07/12/2022** | No growth | No DSV or any vegetation |
| **07/19/2022** | No growth | No growth |
| **07/26/2022** | Some thistle and bindweed growing back | No DSV, appearance of a few small thistles |
| **08/02/2022** | DSV growth in buffer zone of plot, some thistle and bindweed | 4-thistles |
| **08/09/2022** | Bindweed slowly spreading | Thistles still tiny |
| **08/23/2022** | Clover and many Wintercress seedlings growing | **Treatment done in 4B** |
| **09/01/2022** | 30% of ground covered in wintercress seedling, some thistle, mostly bare soil, some patches of DSV regrowth, some very small seedlings. Two DSV shoots have produced seed pods. | 8 thistles, 3 wintercress seedlings, mostly bare soil, some very small DSV seedlings |

For Test Plots 4A and 4B, the DSV plants were completely dug out with a spade to remove all roots & shoots. This treatment also removed the other plant species present because the roots were tangled together.

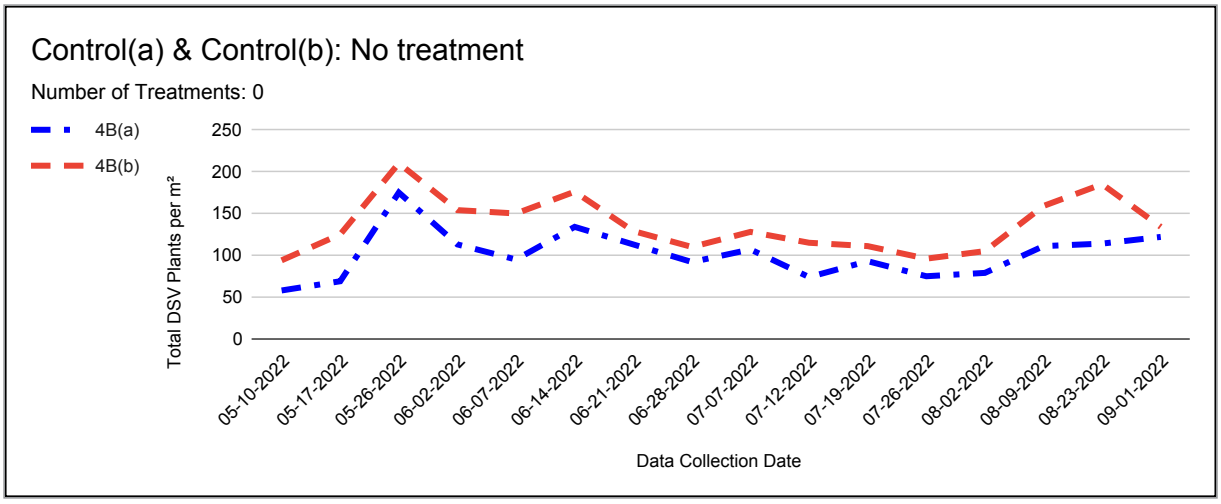
*Photo 6:* Plant roots from dug-up plants are tangled together.

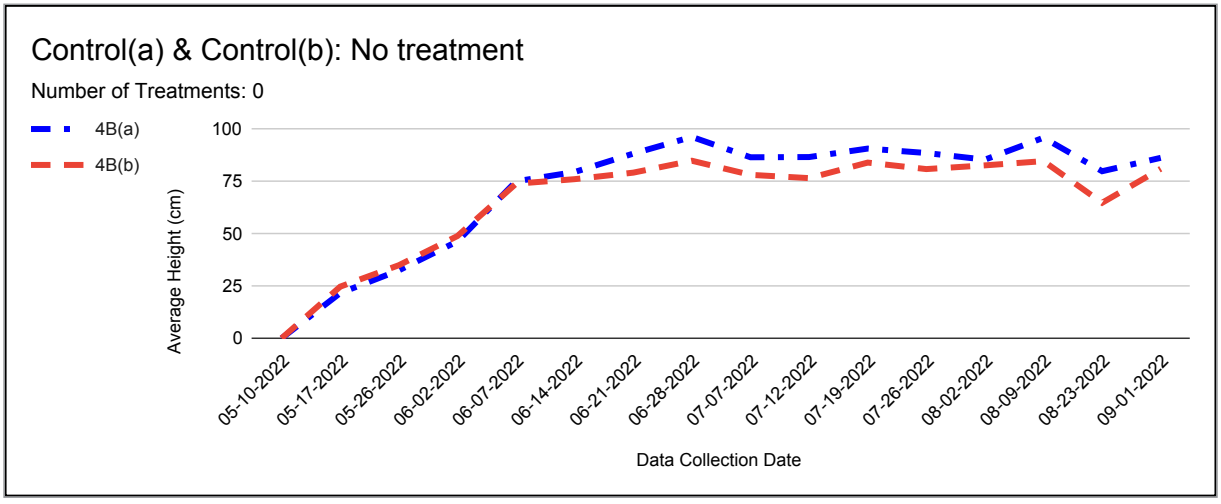
*Photo 7:* Plant roots from dug-up plants are tangled together.

After removal, the DSV stalks did not recover in numbers of stalks or heights. A few other species returned in both Test Plots.

Test Plot 4A: Many Wintercress seedlings appeared in late August after rain.

Test Plot 4B was treated twice in July and August resulting in complete removal of DSV stalks. There was a slight recovery of a few DSV seedlings.



### *Table 5. Observations for Control Plot—No treatment*

**Non-DSV plants:** Grasses, Thistle, Vetch, Bindweed, Milkweed

| Date | Control |
|---|---|
| **05/10/2022** | DSV just emerging from soil |
| **05/17/2022** | Some DSV flower buds starting to appear |
| **05/26/2022** | More DSV flowers |
| **06/02/2022** | DSV flowers opening, stem tips beginning to curl |
| **06/07/2022** | DSV in full bloom and stem tips curled and twisting together |
| **06/14/2022** | DSV seed pods beginning to form |
| **06/21/2022** | DSV seed pods visible |
| **06/28/2022** | DSV stems curled and tangled, more DSV seed pods, all still green |
| **07/07/2022** | Plot appears to have been trampled by animal, difficult to measure DSV, more DSV seed pods, and stems are curled and tangled |
| **07/12/2022** | Vetch gone to seed |
| **07/19/2022** | DSV very tangled and difficult to measure and count |
| **07/26/2022** | DSV dominates, tangled and difficult to count and measure, some DSV seedlings appearing |
| **08/02/2022** | DSV seed pods maturing, DSV wilted and very tangled |
| **08/09/2022** | Mature seed pods split and beginning to disperse seeds |
| **08/23/2022** | Appears to be some newer shoots that are smaller, still all green and have not produced seeds or flowers among the mature plants |
| **09/01/2022** | DSV is beginning to dry out turning yellow and brown, stems lying down and tangled, seed pods exploding lots of fluffy seeds everywhere! DSV seeds dispersing |

The Control Plot acted as a reference to determine the growth cycle of DSV at this location. The DSV plants were allowed to grow undisturbed. Collecting data became increasingly difficult as the summer progressed because the vines became tangled. There were a few different plant species within the plot, but those individual plants did not thrive in this environment.

The DSV plants began to grow in early May. By late May/early June, flowers appeared.

The flowers developed into green seed pods by late June and by early July the stalks were twisting upon each other. The plants reached their maximum heights in late June/early July. The seed pods turned brown, became dry and split to reveal the fluffy seeds by August. By early September, the plants' leaves yellowed, and the seeds dispersed in the wind.

## Soil Sample Analyses

### *Table 6. Soil Analysis Summary (Agrifoods)*

| Soil Sample | pH | Organic Matter % dry soil | Phosphorus mg/L P | Potassium mg/L K | Magnesium g/L Mg | Sodium mg/L Na | Calcium mg/L Ca |
|---|---|---|---|---|---|---|---|
| **DSV present** | 6.8 | 6.9 | 9.8 | 97 | 240 | 15 | 3400 |
| **No DSV present** | 6.6 | 6.8 | 9.9 | 72 | 260 | 21 | 3300 |

## Soil Sedimentation Jars (July 2022)


The soil analysis data and sedimentation layers in the jars appear to be very similar between the soils collected from areas where there was an abundance of DSV and areas where there were only grasses.

*Photo 8:* Soil Sedimentation tests in mason jars

### *Table 7. Auxiliary Experiment for DSV Roots and Crowns Observations*

| Date | Stem Ends | Root Crown | Root Mass | Root Fragments |
|---|---|---|---|---|
| **Aug 2** | Set up planting | Set up planting | Set up planting | Set up planting |
| **Aug 9** | Growth evident in all pots (A,B,C,D,E) | Growth evident in pots A,B,C.D | Growth evident in D & E | No growth evident in any pots |
| **Aug 17** | Growth evident in all pots (A,B,C,D,E) | Growth evident in all pots (A,B,C,D,E) | Growth evident in all pots (A,B,C,D,E) | No growth evident in any pots |
| **Sept 6** | Growth evident in all pots (A,B,C,D,E) but the shoots are not gaining any height | Growth evident in all pots (A,B,C,D,E) but the shoots are not gaining any height | Growth evident in all pots (A,B,C,D,E) but the shoots are not gaining any height | No growth evident in any pots |

*Photo 9:* Left to right: stem end, root crown, root mass, root fragments

*Photo* 10: Root fragments

## Discussion

### Plots 1A, 1B, 1C—Cutting Beneath the Soil Surface

Cutting the DSV stalks below the surface using a special knife was very challenging when done for large numbers of stalks for prolonged periods of time in dry clay soil that was very hard. The researchers often acquired sore points or blisters on the hands. In the two Test Plots where this treatment was used in July, the plants remained small and did not produce flowers. For the Test Plot that was treated in June, the recovering plants did produce flowers. This indicates that, if this technique is used, it should be done in July or later. It could be used in a garden setting where the soil is more easily worked and the plants surrounding the DSV stalk are valuable and cannot be disturbed by extensive digging.

It does not seem to be practical as a method to be used in a park/meadow setting by Stewardship Volunteers.

### Plots 2A, 2B, 2C—Cutting Above the Soil Surface

Repeatedly cutting the DSV stalks above the soil surface suppressed their growth. In the research setting, where the stalks were selectively cut, this allowed the other plant species that were already present to thrive. Grasses were able to dominate in some Test Plots and, in one plot, Raspberry Canes became the dominant plant present. Because the area had been mown prior to setting up the test site, all raspberry canes from the previous season were cut down. Fruit is produced only on second-year canes. It will be interesting to see whether the Raspberry Canes produce any fruit next summer or whether their growth is suppressed by the DSV.

Cutting above the surface is not very practical to carry out by hand for large areas. However, if there are very few valuable other species present, this would be useful if mechanized, i.e., using a mowing device. It must be noted that when an area is mowed, the DSV is suppressed, but no other plant species can attain heights greater than the mowing height (Biazzo and Milbrath, pp. 174). This would be most useful to create a grass path through a meadow but not to enhance the growth of a wildflower meadow. Repeated mowing would be required.

### Plots 3A, 3B, 3C—Pulling out the Stalk

An easy and quick method for controlling DSV is to pull the stalk out without disturbing the soil. Care must be taken to hold the stalk close to the soil surface when pulling to ensure the stalk does not break above the surface. It seemed that this was most effective when the soil was moist, allowing the lower part of the stem along with the new growth buds to be removed. When the stalks were pulled in June, the plants recovered quickly. It appears that it is better to pull plants in July or later to stunt the growth. Once the plants were removed, the grasses that were already present became dominant. In particular, the Test Plot with the Reed Canary Grass seemed to have a dramatic effect on the growth of the DSV. After removal, there seemed to be only a few small DSV plants and tiny seedlings.

Upon observation of patches of Reed Canary Grass in the surrounding fields adjacent to the Research Site, a similar phenomenon was observed. The DSV does not grow where the Reed Canary Grass is dominant. The area does not experience any disturbance, i.e., no mowing and no foot traffic.

Non-Native Reed Canary Grass is known for being very aggressive, as well as for remaining dormant as part of a region's seed bank until a gap forms and it is able to germinate (Lavergne and Molofsky, 2004, pp. 422). Disturbed areas can enhance Reed Canary Grass' ability to proliferate, so the pulling out of DSV could have created the perfect opportunity for the grass to thrive. In addition, Reed Canary Grass shares DSV's strong ability to compete for nutrients, its symbiotic relationship with mycorrhizal fungi in the soil, and its tolerance of a wide range of growing conditions (Lavergne and Molofsky, 2004, pp. 423). Both species can limit their underground or above-ground growth to conserve resources. DSV generally focuses on above-ground growth, while reed canary grass has stronger roots and forms rhizomes, which likely makes it a strong competitor for DSV (Lavergne and Molofsky, 2004, pp. 417).

### Plots 4A & 4B—Digging out the Plant

Of the four strategies used to control the growth of Dog Strangling Vine (DSV), the most effective approach was to dig the entire plant out of the ground. This approach was also the most difficult to accomplish due to the effort required to remove the tangled roots in dry clay soil. In a garden setting, where the plants are not growing so densely, this would be the recommended method of choice since the soil is likely to be more easily worked and the plants can

be isolated for removal. The DSV plants could be selectively dug out. Care should be taken to dig the root mass out to a depth of 8 to 10 cm to ensure removal of the growth crown and most of the roots. Sometimes, there appears to be a series of growth crowns at different depths so deep digging is recommended if feasible to ensure complete removal of the individual plant.

*Photo 11:* Note the multiple growth crowns below the main stalk.

In a park meadow setting, digging the plant out may not be as practical. If there were isolated plants in particular areas of concern, they could be dug out without disturbing their surroundings, particularly if there are valuable plants present.

After all the plants were dug out in the research setting, thistle and bindweed returned in small numbers. Their rhizomes must have been below the area that was dug. In Test Plot 4A, there must also have been a large seed bank of the biennial, Wintercress, present in the soil. After the rain, the seeds germinated. These small plants will overwinter and bloom the following spring. It will be interesting to see if it dominates in that location or if the DSV returns.

*Photo 12:* Wintercress seedlings sprouting after a rain.

## Soil Analyses

The soil analyses conducted did not show any remarkable differences between soil taken from an area that had a dense cover of mature DSV plants and soil that was taken from an area that had only grasses growing in it. It appears as that there must be other factors that we were not able to analyse using the methods available to us at this time. This is an area that could benefit from further investigation.

## DSV Roots and Crowns

From our findings examining the plant parts that could potentially propagate new DSV plants, it appears that many parts of the DSV plant are able to propagate new plants. There is also some research to indicate that the plant can grow from root fragments, although this was not our observation (Miller and Kricsvalusy, 2008, pp. 34). However, to err on the side of caution, after any removal strategy, it seems important that care must be taken to ensure that no parts of the plant are left behind. They should be sealed in a plastic bag, solarized for 1 to 2 weeks (left in the sun until the plant material is not viable) and then discarded into landfill to prevent spread of the plant.

## Limitations of the Study

There were limitations in conducting this experiment. To begin, this experiment was conducted in natural areas that had already been overtaken by DSV. The numbers of plants, seeds, and other species in each plot were not consistently uniform. Therefore, some plots may have had more or fewer DSV plants and seeds than others, and/or more competitive plant species present. Therefore, each plot was a unique experiment.

Trends within each plot were analysed independently from others. Perhaps in a subsequent investigation, standardized, cultivated plots of DSV could be created and different competitive native species could be added to determine the effects of treatments on such combinations. This would require multiple seasons because time would be required to establish the standardised plots prior to treatments.

As previously mentioned, DSV is known for engaging in a "sit and wait" strategy, wherein it can lay dormant for extended periods of time until it has the advantage over any surrounding species. This experiment lasted only from May until September, so we cannot be sure whether or not the DSV that did not reappear after removal was simply dormant beneath the surface of the soil and would regrow in time. Similarly, considering the numerous seeds that each DSV plant produces, it is possible that there are seeds from the surrounding areas now be part of the soil's seed bank that could grow at the first opportunity. Small seedlings that remained small throughout the summer were observed to be present in many of the test plots. They may be the plants that will prevail and grow next season. Again, to answer these questions, further study in subsequent years would be required. It would be interesting to observe the recovery of the DSV at this test site in the following spring/summer season to determine the long-term effectiveness of the different treatments.

Research indicates that repeated mowing or defoliation attempts are necessary to have long-term, significant effects on the growth habit of DSV (Milbrath, 2008, pp. 1287). To assess the eradication of DSV in the plots that appeared to be under control by the end of the experiment, the sites would need to be revisited regularly over the course of several years, with the potential for repeating the appropriate control method for each individual plot.

## Conclusion

This study is intended to guide student gardeners working in ornamental gardens at the Arboretum and stewardship volunteers working in public parks in non-chemical strategies to be used for controlling DSV. The indications are that the most effective control method is digging out the plant including the roots. Because this is not always practical, an alternative recommended approach would be to pull out the plants as often as possible, starting in late July before the seed pods mature. These control efforts should be repeated from year to year, to affect long-term control of DSV in the cultivated gardens and natural areas.

## Conflict of Interest

The authors declare that no conflict of interest or monetary interest exists.

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ORIGINAL RESEARCH PAPER*

# Extending Classroom Learning Borders: Caregiver Training Workshop for Chronic Disease Family Caregivers

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***Original Research Articles** are papers that report on original empirical research with a focus on teaching and learning. Papers may be qualitative or quantitative and include an Abstract, Introduction, Method, Results, Discussion, and Reference section, as well as any tables and/or figures.

**Abstract**
Through the provision of education and training, the Caregiver Training Workshop (CTW) pilot study aimed to advance knowledge about in-person educational interventions for primary family caregivers aiding ill adults (18 years of age and over) at home. The target population was community-dwelling chronic disease caregivers, 14 of whom participated in the workshop/pilot study in September and October 2019. The sessions were offered once a week, over five weeks—each session lasting two hours. The goal of the CTW pilot study was to measure any relationship between caregiver burden levels and the study's multi-component curriculum and course design, and to obtain participant feedback about the content and structure. Curricular topics were chosen based on a review of the literature. The methodology selected was mixed-methods and convergent pretest–posttest design. Data was collected at three points in time. The pre-workshop data collection instruments consisted of the Burden Scale for Family Caregivers (BSFC) in long form and a mixed demographics form. Post-workshop instruments consisted of the BSFC (second time) and open-ended questions evaluating the program. Three-months post workshop conclusion, the instruments consisted of the BSFC (final time) and a mixed questionnaire regarding the program's impact. The reduction in caregiver burden was not statistically significant; however, burden scores from three of the 14 caregivers improved over the study period. Analyzing the qualitative data, as well as viewing caregiver burden through self-efficacy theory, offer insights as to why. Many caregivers expressed interest in maintaining contact with each other post workshop completion. This supports research indicating that some caregivers are interested in maintaining social connections throughout their care recipients' illness trajectories.

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## Introduction

**A long-standing explanation for why family caregivers have assumed and/or** are expected to assume the bulk of care for their care recipients (recipients) is that efficiencies in the health care system have resulted in earlier discharges from hospital (Houts et al., 1996). This has placed heightened pressure on caregivers to coordinate care for family and obtain the knowledge needed to provide care on a long-term basis—responsibilities previously handled by health care workers (Houts et al., 1996). The health care system has become reliant on caregivers (The Change Foundation, 2016). The need for caregivers is expected to rise in the coming years as persons aged 65 years and older will become a larger proportion of the population; they are projected to live longer and with more complex illnesses (Battams, 2016; Plöthner et al., 2019).

The Caregiver Training Workshop (CTW) pilot study endeavoured to build on the findings of previous research-based, in-person educational interventions targeting primary family caregivers (caregivers) of adult recipients (18+) living at home with long-term, chronic illnesses. The CTW pilot study was constructed as five, weekly, two-hour sessions delivered by a multidisciplinary team of faculty members at a large polytechnic institute in an urban centre in Ontario, Canada. The goal was to determine whether there was a relationship between caregiver burden levels and the multi-component curriculum and course design. The study also obtained feedback from participating caregivers about the course design (content and workshop structure) to explore teaching and learning with a community-based population that extends the borders of established classroom learning.

## Literature Review

The evidence suggests that there is often little advance preparation time to become a caregiver; they are frequently thrust into their new roles with insufficient supports (The Change Foundation & Ontario Caregiver Organization, 2019; MacDonald et al., 2010; MacIsaac et al., 2010). Caregivers can more effectively manage their burden and build task mastery through formalized training and also through supportive interventions, e.g., receiving a socially supportive phone call from a health care practitioner (MacDonald et al., 2010; Reinhard et al., 2008). Caregiver training needs should be assessed by health care providers and classified within the three domains of adult learning: cognitive, affective, and psychomotor (Given et al., 2008).

Training should be provided by health care professionals to enhance caregiver competencies and confidence (Given et al., 2008; Houts et al., 1996; Reinhard et al., 2008). Given et al. (2008) propose that "program planners, providers, and policymakers" (p. 33) collaborate to construct evidence-based educational interventions that consider the multifaceted needs of caregivers. Involving other family members and/or offering on-site respite/concurrent activities for recipients is an accommodation that facilitates caregiver participation (Ostwald et al., 1999).

Research-driven educational interventions for caregivers have typically focused on recipients with a single affliction (Reinhard et al., 2008). Chronic disease caregivers may take on greater care responsibilities, particularly in advanced stages of illness, as they often try to manage more than one condition. Mardanian Dehkordi et al. (2016) refer to this as walking an "unpredictable path" (p. 128). Depending on the chronic condition(s), as the recipients' health needs change and care demands increase, caregivers must continually learn new skills and/or perform increasingly complex tasks, without adequate training—which can result in higher stress levels and the institutionalization of recipients before their actual need (MacDonald et al., 2010; Reinhard et al., 2008). As it is, more than half of caregivers worry that they might make a mistake when administering care (White et al., 2022). Ultimately, caregivers shoulder "significant demand and burden to their own endurance and coping mechanisms" (Burleson Sullivan & Miller, 2015, p. 7).

Caregivers with high self-efficacy appear to be better able to manage complex care, while those with low self-efficacy appear to experience higher levels of burden; self-efficacy is described as having the belief in one's self to confidently execute certain tasks (White et al., 2022). Seemingly, self-efficacy is not intrinsic to some caregivers and extrinsic to others; it can be learned. To illustrate, it has been suggested that for dementia caregiving, levels of caregiver self-efficacy are modifiable through psychoeducational interventions (De Maria et al., 2021; White et al., 2022); and, in a hospital-based, nurse-led educational intervention designed for cancer caregivers, levels of self-efficacy increased for caregivers with respect to both recipient care and caregiver stress (Hendrix et al., 2015).

Regarding their own health needs, caregivers often neglect booking routine health care visits for themselves. One reason cited is that in taking recipients to so many appointments, caregivers experience "medical visit fatigue"

(Burleson Sullivan & Miller, 2015, p. 8). They also face higher risks of acquiring or exacerbating their own "age-related diseases" (Barrett & Blackburn, 2010, p. 203) based on the demands of care, e.g., providing care for Alzheimer's disease may lead to a more rapid deterioration of a caregiver's immune system (Barrett & Blackburn, 2010).

### Research Purpose Statement and Guiding Questions

There appears to be a significant gap in family caregiver training programming, i.e., multi-component educational interventions have not been made widely available to caregivers, specifically those aiding chronically ill adult recipients at home. There was, and remains, a lack of longitudinal studies examining whether the interventions that have been offered are meeting the ongoing needs of chronic disease caregivers.

The purpose of this research study then was to determine whether and to what extent offering a multi-component curriculum and course design to primary family caregivers improved their burden levels, using a pretest–posttest design. The following questions about caregivers guided the research:

- Are burden levels impacted by participating in this educational intervention?
- Could burden be reduced for only some caregivers and not all? If so, why not all?
- Is there a relationship between caregiver burden levels and the topics/curriculum covered?
- Is there a relationship between caregiver burden levels and the workshop structure?
- What knowledge/learning will caregivers demonstrate immediately post-workshop vs. three months post?

The researchers hypothesized that using a multi-component curriculum and course design would improve caregiver burden levels in both the short- and longer-term.

### Recruitment Approach, Sample, Site, and Session Topics

Participants were recruited through flyers posted in public areas throughout the community of a large urban area in Ontario, Canada. Flyers were also distributed electronically to interested health care practitioners and adult day program administrators.

To enroll in the workshop, an interested caregiver contacted the principal investigator (PI) by email or telephone. Herein, they discussed eligibility (i.e., a primary family caregiver of an adult recipient living at home with a chronic disease; caregiver and recipient did not have to live in the same dwelling). To confirm eligibility, chronic disease was based on the list of conditions outlined by the Public Health Agency of Canada (current as of 2019). The PI and caregiver also discussed the at-home care situation, workshop logistics, and the availability of on-site respite and/or concurrent activities for recipients. These activities, e.g., group conversation and indoor walking, were conducted with students from a Practical Nursing (PN) diploma program with faculty oversight.

After caregivers were confirmed as meeting the eligibility criteria, they were asked whether they wanted to learn more about the research study (eligible caregivers could take the workshop whether or not they elected to participate in the research). Interested caregivers were contacted by a research assistant and apprised of study details, i.e., informed consent document, timeline for completion of the evaluations, and incentive for participation.

At the conclusion of the recruitment process, 17 primary caregivers were both eligible and expressed interest in taking the workshop. Prior to the start of session one, three caregivers elected to step away from workshop participation. Of the remaining 14 caregivers enrolled in the workshop, all agreed to voluntarily participate in the study. Two of the caregivers and their recipients accepted the offer of on-site respite.

The workshop/study took place over five Saturdays in September and October 2019, from 10:00 AM to 12:00 PM. Curricular topics included: Staying at Home Versus Long-Term Care; Symptom Management; Medication Management; Maximizing Nutrition; Funeral Planning; Safety at Home; Emergency Preparedness; and, Coping with Caregiving. Time was also devoted to survey completion in sessions one and five.

## Method

The researchers opted for mixed methods research, specifically a convergent design, which involves concurrent collection of quantitative and qualitative data to compare and identify any inconsistencies in the results (Creswell & Guetterman, 2019).

### Data Collection Instruments

The researchers used the Burden Scale for Family Caregivers

(BSFC) as the quantitative measure for burden levels. It is designed for chronic disease caregivers who are providing at-home care. The BSFC in long form (28 questions, four-point Likert scale), offers a subjective measure of a caregiver's emotional and physical health. The lower the score on the scale, the lower the caregiver's perceived burden, with a range of scores from 0–84 (Burden Scale for Family Caregivers, n.d.; Gräsel et al., 2003).

A mixed demographics form was created by the researchers and administered prior to the start of session one. In addition to general demographic information, this document asked caregivers to identify who they provide care for, care tasks they perform, how many hours a week they devote to caregiving, length of time caregiving, their employment status (pre and during caregiving), their own health concerns, which features they would like to see in an in-person caregiver training workshop, and whether they had previously used any services to help with burden management.

In addition to administering the scale for burden measurement, the researchers collected feedback on the curriculum and course design, specifically, an open-ended program evaluation questionnaire at the end of the workshop (after completion of session five), and a mixed questionnaire assessing program impact at three-months post workshop completion.

## Data Collection Process

Prior to the start of session one, the following documents were administered and collected in person by a project research assistant; the project investigators and logistics team exited the classroom during collection of the following:

- informed consent
- BSFC (first time)
- mixed demographics form

At the conclusion of session five, the following documents were administered and collected in person by a project research assistant; the project investigators and logistics team exited the classroom during collection of the following:

- BSFC (second time)
- open-ended questions regarding program evaluation

At three-months post workshop, the following documents were administered and collected by mail by a senior representative of the institution's research office.

- BSFC (third and final time)
- mixed questionnaire regarding program impact

Any participant who completed all forms over the study period received an incentive of a $25 CAD gift card.

## Data Analysis

In addition to scoring the BSFC per specifications, measures of central tendency were performed. The mean burden score declined from the pre-workshop stage to post-workshop, and increased again at three-months post. Pre-workshop, mean burden was found to be 48.57 which fell to 46.09 post-workshop and then rose to 48.88 after three months. Due to the small sample size, parametric tests, e.g., a paired t-test, could not be performed to better understand the findings. This mean pattern persisted when isolating the participants who completed evaluations at all points across three time periods, which entailed six participants. Next, a non-parametric test was chosen, specifically the Wilcoxon signed-rank test, to search for differences among the three sets using the Statistical Package for the Social Sciences (SPSS software). According to Scheff (2016), the Wilcoxon signed-rank test is more powerful than the Sign test as it uses the magnitude of the difference and is highly sensitive. The results of this test were not statistically significant (see Table 1). The Friedman test was also run to interpret the means and confirmed the Wilcoxon test results. As a result, the hypothesis could not be supported.

It is possible that the decline in mean burden from pre- to post-workshop is related to workshop participation and the offer of respite as having been a crucial support to the caregivers. It is further possible that the rise in mean burden from post-workshop to three-months subsequent is related to the absence of that support and the empowerment caregivers had derived from the group setting. It is therefore feasible that support should be offered to caregivers on an ongoing basis, meeting their needs based on where they reside on the caregiving trajectory and what they are enduring at a specific point in time. Subsequently, the researchers isolated the burden scores of three individuals who experienced the largest changes in perceived burden over the three data collection periods for further analysis. Finally, to inform proposed changes to the curricular topics and workshop structure (within the course design), thematic analysis of all participant feedback was conducted.

***Table 1 Burden Scale for Family Caregivers: Wilcoxon signed-rank test***

| | Pre- and Post-Workshop | Post-Workshop and after three months | Pre-Workshop and after three months |
|---|---|---|---|
| Number of Matching Pairs | 11 | 6 | 8 |
| p: | 0.238 | 0.553 | 0.465 |

**Note:** For each of the three pairs, the Null Hypothesis–that the difference in the median is 0–was accepted. Therefore, it could not be concluded that the difference among the three sets of measures was statistically significant.

# Results

## Workshop Participants / Demographics

Of the 14 primary caregivers enrolled in both the workshop and the research study at the outset, 11 identified as female, and three as male. Sixty-four percent were between the ages of 35–54. The remaining 36% were between 55–75 years old. These age ranges align with the national average; nearly two-thirds of Canadians who identify as caregivers—which is 1 in 4 Canadians—are 45 years or older (Statistics Canada, 2018). Of the 14 participants, 57% had been caregiving between one to five years, and 36% for more than five years. Only seven percent said they had been caregiving for less than six months (see Figure 1).

Caregivers were asked in the mixed demographics form about the duties they perform. Responses included: providing personal care, administering medications, preparing meals, maintaining the household, managing finances, coordinating the recipient's health care schedule, and driving them to appointments. These responses are largely echoed in the research (Committee on Family Caregiving for Older Adults et al., 2016). While there was no attrition in workshop attendance throughout the five weeks, research study participation, which began at 14, fell to 11 at the end of session five and reduced further still to eight at three-months post.

A ninth survey was received three months after the allotted submission time frame. The researchers decided not to include the submission in the analysis and findings.

## Burden Scale for Family Caregivers

The sum score of the long-form BSFC is calculated based on providing either of two types of care at home: a) dementia; and, b) other chronic diseases. The BSFC correlates subjective burden to risk of psychosomatic conditions in three categories: none to mild, moderate, and severe to very severe (Burden Scale for Family Caregivers, n.d.; Gräsel et al., 2003). In their manual describing the development, validation, and instructions for administering the BSFC, Gräsel et al. (2003) do not explicitly indicate why they differentiated scoring for dementia versus non-dementia caregivers. However, dementia caregivers have reported experiencing higher levels of physical and psychological burden compared to other types of caregivers (Kasper et al., 2015; Liu et al., 2022; Schulz & Sherwood, 2008; Sörensen et al., 2002).

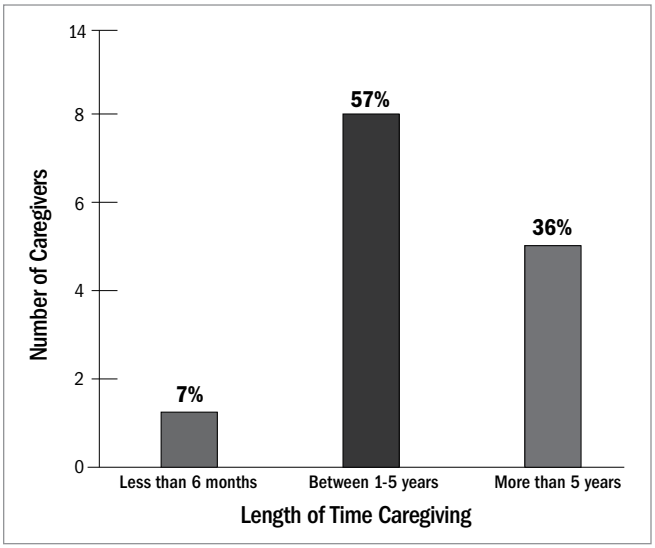


*Figure 1.* Length of Time Primary Family Caregivers Have Been Providing Care at Home

The BSFC was completed by all 14 participants prior to the first session, 11 participants at workshop end (session five), and eight participants at three-months post. Due to the small sample size and fewer evaluations submitted over the study period, it could not be concluded whether the workshop had an impact on overall burden levels (see Table 2). That being said, participants CTWCDM005 and CTWCDM013, who had been caregiving for five or more years, and participant CTWCDM006, who had been caregiving in the one-to-five-year range, had declines in their burden levels (see Figure 2).

In those three cases, the recipients were listed as a parent and each recipient was living with one or more chronic diseases. Participant CTWCDM005 identified as a "dementia caregiver" and classified as FT/lived with recipient. CTWCDM013 identified as an "other chronic disease caregiver" and classified as FT/lived with recipient. CTWCDM006 identified as an "other chronic disease caregiver," did not live with the recipient, and provided care for 10–20 hours a week; however, CTWCDM006 specifically indicated feeling preoccupied with providing care.

***Table 2 Burden Scale for Family Caregivers: BSFC–Combined (Both Diagnoses) Subjective Burden Category***

| Subjective Burden Category | Session One Sample Fraction | Post-Session Five Sample Fraction | Three-Months Post Sample Fraction |
|---|---|---|---|
| None to Mild | 4/14 | 5/11 | 2/8 |
| Moderate | 3/14 | 0/11 | 2/8 |
| Severe to Very Severe | 7/14 | 6/11 | 4/8 |

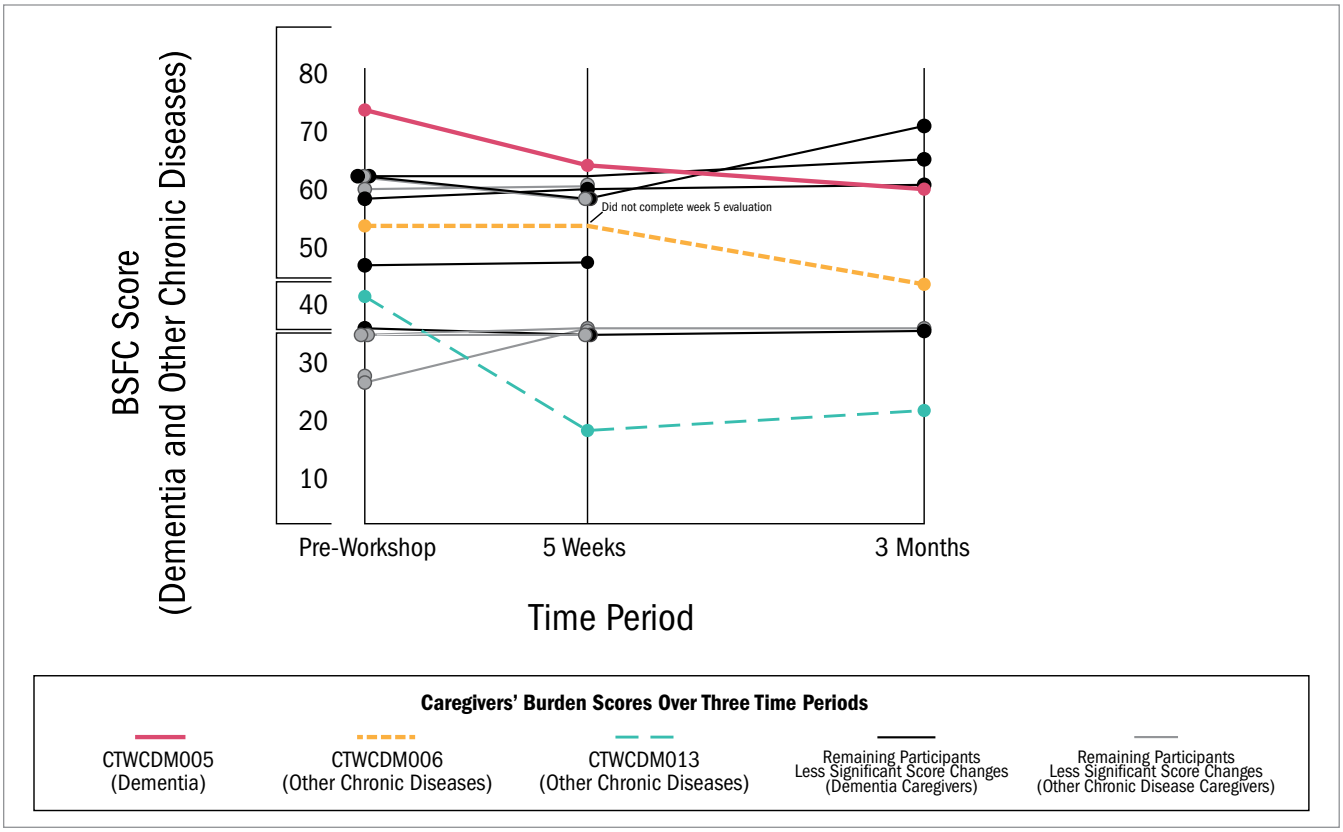


*Figure 2.* BSFC Throughout *the Study: Three Caregiver Participant Scores Isolated*

## Qualitative Instruments

Improvement in BSFC scores largely reflected subtle changes among the three participants over the study period, i.e., feeling they could "switch off" away from the caregiving situation, and experiencing heightened life satisfaction. Given these subtleties within the quantitative measures, the researchers turned to the qualitative data to learn more about why their burden may have decreased. Sorrell (2014) supports using qualitative instruments to better understand what family caregivers endure on a case-by-case basis. Specifically, responses to the three-months post mixed questionnaire were used to identify how these three cases differed from the other workshop participants. The three cases stated that the curriculum and workshop structure better enabled them to increase their acceptance of the care situation (CTWCDM013) and/or not feel as guilty about taking time for themselves when required (CTWCDM005 and CTWCDM006). Responses to the open-ended questions

from all the caregivers participating in the workshop provided greater context for the types of curricular and structural changes that should be considered to better meet their needs in the future.

### *Linking the Decline in the Three Burden Scores to Self-Efficacy Theory*

In addition to analyzing the qualitative data, another possible explanation for the decreased burden scores among the three caregivers surfaces when viewed through self-efficacy theory. Social Cognitive Theory (SCT), a theory developed by psychologist Albert Bandura in the 1960s, emphasizes the social context of learning (LaMorte, 2022). SCT specifies that an individual can misconstrue their level of self-efficacy when performance under normal conditions changes to performance "under taxing conditions" (Bandura, 2012, p. 10). Self-efficacy theory, a subset of SCT, branches into two outcome behaviours: recognizing self-efficacy and the expectations associated with performance (Sutton, 2010). In applying self-efficacy theory to the dementia caregiving context, Stefen et al. (2018) concur with Bandura that "self-efficacy beliefs have been demonstrated to influence the initiation of coping, expenditure of effort, and the degree that behaviors are sustained in challenging situations" (p. 2). Additionally, higher levels of self-efficacy, reframing, and feeling in control during stressful situations have been associated with improved psychological fitness (Teahan et al., 2018). At three-months post, the three cases stated that their confidence improved when asking for help and accessing health-related services.

## Course Feedback: Structure

The five sessions were scheduled from 10:00 AM to 12:00 PM on Saturday mornings. Two topics were scheduled per session, e.g., *Symptom Management and Medication Management*. Each of the sessions ran longer than the prescribed two-hour time frame due to often lengthy content discussions, as well as logistics, e.g., survey completion designated during session time. When asked about this at the end of session five (open-ended questionnaire), of 11 responses logged, 82% said the sessions needed to be extended; others suggested increasing the number of sessions in the workshop. Examples of feedback included: "Make it 3 hours… will ensure the topics don't run overtime and will allow Q&As," and "It could have been longer. Maybe 8 weeks." When asked about the timing of the workshop, of 10 caregivers who responded to the question, 80% affirmed a Saturday morning preference; 20% suggested an early weekday morning, e.g., 7:00 AM on Mondays.

### *On-Site Respite*

Two caregivers brought their recipients for on-site respite/ concurrent activities. When asked about this at the end of session five, 11 caregivers responded and 100% said they were pleased that respite had been made available. Not all caregivers elaborated on this question, but for those who did, their reasoning for not using the respite included having planned for recipient care while they pursued the training.

## Course Feedback: Evaluation

When asked at the end of session five what they liked most about the workshop, course content was dominant among 11 respondents, with 73% identifying the following topics: *Coping with Caregiving, Safety at Home*, and *Maximizing Nutrition for Chronic Disease*; 28% stated they wanted more hands-on skills per session. When asked for other topic suggestions, 55% proposed wellness and wellbeing, family dynamics, patient lifting techniques, taxes and estate planning, and the role of provincial government supports, e.g., Home and Community Support Services (formerly called the Local Health Integrated Networks - LHINs) in Ontario, and their clinic systems (see Table 3).

When probed about what they liked least about the workshop, 28% of respondents specified that due to time constraints in each session, they felt they lacked opportunities to share their own care stories, or listen to others', either in larger or smaller group settings. This comment was also reiterated when respondents were asked for their advice about what researchers should include if/ when offering subsequent intakes of the workshop: "I wish there was more time to share my personal stories," and, "Maybe incorporate a group chat for those that need an avenue to express themselves."

## Course Feedback: Impact

When asked in the three-months post mixed questionnaire what they learned at the workshop, of eight respondents, 100% referred to course content and discussion topics, which included: Coping with Caregiving, Emergency Planning, Maximizing Nutrition for Chronic Disease, and referenced using the resources provided to increase communication and advocacy for their recipients. Thirty-eight percent felt the workshop validated that others shared their caregiving experiences: "Learnt that I am not alone

***Table 3 Feedback to Improve Delivery of the Caregiver Training Workshop: Course Evaluation***

| Description of Feedback | Percentage of Caregivers | Number of Caregivers |
|---|---|---|
| Coping with Caregiving, Safety at Home, Maximizing Nutrition for Chronic Disease | 73% | 8/11 |
| Wellness and Well-being, Family Dynamics, Patient Lifting Techniques, Taxes and Estate Planning, Role of Home and Community Support Services (formerly called the LHINs) | 55% | 6/11 |
| Want more hands-on skills | 28% | 3/11 |

**Note:** Respondents to this evaluation were encouraged to provide multiple responses.

in the caregiving situation and many of us facing similar situations."

When asked if they would recommend the workshop to other caregivers, 50% said they would do so, believing the workshop was an important asset. Twenty-five percent stated 'maybe' to recommending the workshop. One 'maybe' response said they would do so if structural changes were applied (e.g., session length). Regarding the other 'maybe', the respondent said: "Seemed as if most people there were searching for support or help. Most seemed exhausted." The other 25% did not respond to the question.

To learn more about caregivers' motivation to attend the workshop—outside of the initial telephone assessment—the researchers revisited the mixed demographics form (administered pre-workshop). Caregivers had been asked if they used any services to manage the stress or burden of caregiving. Only four of the 14 caregivers said that they had done so.

According to Knowles et al. (2016), caregivers may be hindered from accessing support due to their reluctance to identify as caregivers. In their study, caregivers indicated feeling reticent about having their other labels minimized, e.g., partner or child. As well, caregivers offered that the identity of 'caregiver' could be upsetting to their recipients, as it implies that they are in need of care. Caregivers might also not be aware of various services offered or have time to use (access) them. Further, they may simply prefer to call on family and friends first when in need. To exemplify, 12 of the 14 participants replied that they rely on either family members or friends for informal support. This finding aligns with research stating that caregivers receive the bulk of their social support from a spouse or partner, children, and extended family (Hango, 2020). Caregivers might also have attended the workshop appreciating that the subject matter taught could optimize their care provision at home, but what they might actually have been seeking was support from peers who shared their lived experiences. Informal social support has been deemed important to some chronic disease caregivers along the entire caregiving trajectory, i.e., caregivers want support from peers from the early stages of a recipient's illness, and continue to want it should their caregiving role continue longer-term (Cameron et al, 2013; Walshe et al., 2017).

## Discussion

The researchers endeavoured to answer five separate research questions.

Q.1. Are burden levels impacted by participating in this educational intervention?

The research indicates that multi-component interventions, which include respite, education, and support from peers (Sörensen, 2002), have the most significant effect on burden when compared to singular interventions, e.g., support groups alone (Reinhard, 2008; Sörensen, 2002). However, according to Sorrell (2014), researchers should focus less on measuring burden (i.e., with a goal to decrease it), and focus more on constructing interventions that can address the types of burden caregivers experience, i.e., psychological, social, and financial.

Q.2. Could burden be reduced for only some caregivers and not all? If so, why not all?

The small sample size and lower responses over time

prohibit the researchers from determining whether and to what degree participating in the workshop helped all caregivers. That being said, burden levels remained largely consistent for all caregiver participants (excluding the three isolated cases) over the study time period. Nonetheless, the qualitative feedback points to the caregiver cohort improving their care management at home based on the content and/or workshop structure. This reinforces Sorrell's (2014) recommendation to use qualitative instruments for long-term follow up with caregivers to learn more about their context and caregiving experiences.

Three caregivers in the workshop demonstrated decreases to their burden scores. Each of the three caregivers shared some common characteristics with all caregiver participants, e.g., providing care to a parent and the recipient having acquired one or more chronic illnesses. But the three-months post mixed questionnaire revealed specific themes among these three cases that may explain the reduction in their burden levels over time and/ or increased self-efficacy: greater acceptance of the situation, feeling less guilt in taking time for themselves, and experiencing increased confidence asking for help or accessing needed services.

Q.3. & Q.4. Is there a relationship between caregiver burden levels and the topics/curriculum covered? Is there a relationship between caregiver burden levels and the workshop structure?

When probed at the end of the study, caregivers identified the following topics as most memorable: *Coping with Caregiving, Safety at Home, Emergency Planning*, and *Maximizing Nutrition for Chronic Disease*. While a statistically significant decrease in burden levels was not substantiated in this study, these topics appear to be in line with literature that suggests the following subjects as potentially effective in reducing caregiver burden right from the acute phase of a recipient's illness: *meeting informational needs*, i.e., ensuring the caregiver understands the illness and its course; *health education*, i.e., personal care skills, transferring/ assistance with activities of daily living (ADLs), first-aid and cardiopulmonary resuscitation (CPR), behaviour management, medication management, and recognizing signs of relapse or worsening condition; and, *providing emotional support*, i.e., cultivating an environment that encourages caregivers to discuss their fears and frustrations, and minimizes their loneliness (Stavrou et al., 2017).

Q.5. What knowledge/learning will caregivers demonstrate immediately post-workshop vs. three months post?

The responses from the caregivers at three-months post generally indicated that their confidence levels increased to carry out the caregiving role, but as previously stated, they did not experience a reduction in burden. Noel et al. (2022), having offered a virtual program for dementia, found similar results related to confidence and burden at three-months post. Ducharme et al.'s (2011) psychoeducational in-person program targeting caregivers of recipients with Alzheimer's disease, similarly found that after three months, caregivers had more confidence and, "perceived themselves to be better prepared to provide care" (p. 484); however, the participants also exhibited no discernible change to their stress-management, i.e., burden. Overall, based on participant feedback, it is plausible that program adjustments could result in heightened levels of self-efficacy among a greater number of caregivers, but it is unclear whether this would be impactful to burden levels.

An unexpected finding emerged at the workshop's conclusion: many of the caregivers expressed interest in maintaining contact with one another. As a result of this, two questions received research ethics board (REB) approval for addition to the three-months post mixed questionnaire, to ascertain if the caregivers did in fact remain in touch and whether this facet should be considered in the future: "Did you stay in touch with any of the caregiver participants once the workshop concluded? Yes or No?" and "If you responded yes, do you feel you benefitted from maintaining contact with the caregiver(s), and if so, how?" Of the eight caregivers who responded, 50% said they stayed in touch. They indicated that peer support, exchanging stories, and learning from others' experiences helped with stress reduction. Comments included: "The peer group was the most important thing to come out of the workshop," and "I believe sharing stories and experiences of others who are in similar circumstances lightened my load." While generally indicating that they wished they had done so, 37.5% did not maintain contact. There was one reply missing (no response).

## Limitations

The main limitation of this study was the small sample size. Fourteen participants were insufficient to establish statistical significance of burden levels through the use

of additional quantitative testing techniques. Rather the researchers had to interpret trends and patterns. Regarding the three-month post-workshop evaluations, a ninth participant had submitted surveys. However, this submission arrived three months past the submission deadline. This positioned receipt of the ninth submission during the first global wave of the COVID-19 pandemic. The researchers did not include this submission in the data analysis due to the time discrepancy and uncertainties about the possible confounding relationship between responses provided and the pandemic.

As well, during initial conversations with primary family caregivers, the PI identified the importance of secondary caregivers attending the workshop. A secondary caregiver could have included a spouse, a sibling, or another adult, related or unrelated, to the recipient. The secondary caregivers who attended wanted to assist as much as possible and/or they wanted to learn more about the recipients' conditions. While secondary caregivers were invited to the workshop sessions (two attended), they were not included in the research study, and therefore their feedback was not collected. It is possible that their burden scores as well as feedback regarding the course design could have differed from the primary caregivers and may have provided further insights.

### Future Directions

An important lesson to emerge from the study is that caregivers want increased opportunities to share their stories and learn from the care situations of their peers. This need for social support should be prioritized in the future. While there are disease-specific support groups offered by various established organizations, the cohort in this study included an amalgamation of chronic disease caregivers. The researchers combined this group to enhance understanding about their common experiences, regardless of the recipient's specific condition. Few research reviews have focused on educational interventions for chronic disease caregivers (Farquhar et al., 2016). In conjunction with the identified needs of the small cohort of caregivers in this workshop/pilot study, additional research projects could deliver similar educational interventions to caregivers who are managing chronic care situations at home. This could be advanced in other post-secondary college environments, and the results shared. Findings from these interventions could better inform policymakers and other stakeholders about the educational and holistic needs of a wider range of chronic disease caregivers, ways to make the learning accessible, and how to optimize delivery modes (e.g., in-person and/or online).

## Conclusion

As the current study and literature suggest, design of effective educational interventions for chronic disease family caregivers would benefit from and require addressing the known types of burden they experience. Some greater context for why burden decreased for three caregivers over the study duration was obtained through qualitative data collection and applying self-efficacy theory. The three caregivers indicated how the workshop enabled them to reframe their specific care situations at home. Further, all the study participants provided feedback to inform curricular and course design changes. Importantly, caregivers revealed that they wanted additional dedicated time to discuss their caregiving stories; they also stressed the need to stay in touch with other attendees once the workshop concluded.

## Conflict of Interest

The authors have no competing or financial interests to disclose.


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# Indsights: A Window into the Indigenous Economy

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**Abstract**
In 2020, *Indsights: A Window into the Indigenous Economy* began as a collaboration between the Canadian Council for Aboriginal Business (CCAB) and Humber College. The purpose is to highlight the contributions of Indigenous peoples to the economy through open educational resources in the form of case studies. Indigenous business owners are invited to participate in a qualitative interview to discuss their entrepreneurial journeys, which are then developed into multimedia case studies. Each entrepreneur plays an active role in the creation of their respective study and has the opportunity to provide feedback and input. *Indsights* aims to publish 15 case studies online, each including an interview video, written component, and teaching notes. In doing so, this initiative offers learners a wealth of accessible online resources filling a gap in available content on Indigenous entrepreneurs.

***Indsights* is a direct response to the Truth and Reconciliation** Report's 94 Calls to Action, specifically Calls 63 and 64 advocating for Indigenous voices to become part of the mainstream education curriculum in Canada.

Indigenous voices have long been suppressed in business curriculums from the prioritization of Western worldviews (Woods, Dell, & Carroll, 2022). Consequently, few educational resources are devoted to exploring Indigenous Peoples' entrepreneurial journeys in depth, despite their valuable contributions to Canada's development (Woods, Dell, & Caroll, 2022; Pidgeon, 2016). Indigenizing education plays a large role in moving forward in reconciliation (Pidgeon, 2016). By studying the challenges, successes, and social impact of Indigenous business owners through case studies, more equitable learning environments can be achieved while also promoting the unique perspectives that are helping to drive economic growth (Woods, Dell, & Carroll, 2022).

Indsights is using positive storytelling to challenge and decolonize perceptions of Indigenous economic prosperity through the co-creation of academic content with the Canadian Council for Aboriginal Business and its members. The content produced through this collaboration provides both students and educators


***Presentation Summaries** are brief reports that are summaries of the presentations. This presentation was given at Centre for Social Innovation Workshop Series on April 3, 2023.

with tools to gain a deeper understanding of economic reconciliation and entrepreneurship, with the opportunity to inspire future generations to embrace similar roles in driving social change.

## Method

In 2020, Humber College and the Canadian Council for Aboriginal Business (CCAB) partnered in the development of the Indsights project. CCAB is a non-profit organization that is dedicated to promoting Indigenous business development opportunities through various networking, programming, and research efforts (Canadian Council for Aboriginal Business, n.d.). Indigenous business owners with majority control (51% or more) of their business apply to become a member of CCAB's network (Canadian Council for Aboriginal Business, n.d.).

As part of the research process, the Humber College and CCAB teams work together to identify potential participants among CCAB's members through purposive sampling strategies. Once identified, CCAB members interested in participating partake in an in-depth qualitative interview to discuss their entrepreneurial experiences in their respective industries. Through these interviews, the Indsights team has captured valuable information about each Indigenous entrepreneur, which works as the foundation for building the case studies. Participants actively contribute throughout this process by providing their feedback and input. The Humber research team maintains ongoing communication with the CCAB team, ensuring all activities are appropriate, respectful, and aligned with ethical considerations. Upon completion, these case studies are published online as open resources for learners. By May 2024, Indsights will have a comprehensive collection of case studies published, showcasing a diverse range of Indigenous businesses operating across Canada.

## Results

### Birch Bark Coffee

Mark Marsolais-Nahwegahbow, an Ojibwe entrepreneur, founded Birch Bark Coffee Company in 2018. Birch Bark Coffee operates as a social enterprise aiming to address the water crisis in Indigenous communities across Canada. For every bag of coffee purchased, $1.00 goes towards buying a Belkraft water purification unit; for every 50 bags purchased, one home can access clean drinking water.

Mark started the business without a formal business plan or marketing strategy but focused on building a solid online presence using the well-known e-commerce platform, Shopify. Birch Bark Coffee Company offers organic and fair-trade coffee produced by Indigenous farmers, carrying the Small Producers Symbol (SPP) label. The company's logo and branding emphasize Indigenous culture and issues.

While initially a one-person operation, Birch Bark has expanded to include a social media team and a sales manager. Mark's goal is to leave footprints for other Indigenous entrepreneurs and be a mentor to them.

Birch Bark has experienced growth and secured partnerships with large grocery chains and can be found in stores across Canada. Birch Bark recently partnered with Chapmans Ice Cream to offer a Birch Bark coffee-flavoured ice cream product. Mark's focus is on maintaining the brand's integrity, preserving product quality, and addressing capacity challenges.

Overall, Birch Bark Coffee Company combines entrepreneurship, social impact, and Indigenous values to make a difference in Indigenous communities and the coffee industry in Canada.

> "Entrepreneurs are risk-takers by nature. We want to challenge the way that things have always been done and make them better."
>
> —Mark Marsolais-Nahwegahbow

### Shades of Gray Indigenous Pet Treats

Shades of Gray Indigenous Pet Treats was founded in 2019 by certified raw nutritionist Kari Gray. Shades of Gray provides natural pet treats from rabbits raised on Gray's farm, with a 5,500-square-foot facility where all rabbits used in its products are born and bred. All products Shades of Gray sells are certified and inspected provincially and federally. She is committed to transparency and sustainability.

Kari is proud of Shades of Gray's products, and the company prioritizes minimizing food waste. These efforts stem from the Algonquin Philosophy that is deeply rooted in every aspect of her business:

> "Only take what you need; give in order to receive; recognize that you are an equal part of all that is; be thankful for everything you get. It is encouraged that each person develops their own special relationship

with the Creator. It is this difference, this uniqueness with the Creator that creates meaning for the Algonquin Peoples."

—Kari Gray

Kari also holds a strong connection to her community and sees Shades of Gray as an opportunity to provide well-paying jobs for members of her community, particularly women.

As Shades of Gray continues to grow and surpass its sales targets, there are hopes to expand into the United States (U.S.) market soon.

Kari incorporates Indigenous values and culture into everything related to her business. The Algonquins of Pikwàkanagàn First Nation, where Shades of Gray is located, has a deep connection to their traditions and values and subscribe to the Anishinaabe Way to Live:

- Treat the earth, and all that dwell upon it, with respect
- Remain close to the Creator
- Show great respect for your fellow beings
- Work together for the benefit of all mankind
- Give assistance and kindness whenever needed
- Do what you know is right
- Look after the well-being of mind and body
- Dedicate a share of your efforts to the greater good
- Be truthful and honest at all times
- Take full responsibility for your actions

*Indigenous Heritage - Shades of Gray - Canadian Pet Treats, n.d.).*

## Pawgwasheeng Economic Development Corporation (PEDC)

The Pawgwasheeng Economic Development Corporation (PEDC) in Pays Plat First Nation was founded by Ginny Michano. Its goal is to empower the community and create employment opportunities. The PEDC has successfully secured contracts with government entities and formed partnerships, leading to job creation and specialized training for community members.

The creation of the PEDC initially faced obstacles, including skepticism from the community and the cost of creating an economic development corporation. However, Ginny was able to combat this through education, community engagement, and persistence in securing funding. To date, the PEDC has gained credibility and support from community members and has won large government contracts, including a bid from the Ministry of Transportation (MTO) worth $500,000. The success of this contract has led to future opportunities to work with the MTO.

Additionally, the PEDC has received grants from the Indigenous Economic Development Fund and the Rural Economic Development Program. They plan to apply for further funding to support their growth and community engagement strategy.

The vision of the PEDC is to promote economic development and business opportunities that benefit the Pays Plat community while respecting their traditional territory and ways of life.

"One of our indicators of success will be when we can be completely self-funded."

—Ginny Machino

Aboriginal Economic Development Corporations (AEDC) play a significant role in their communities. AEDCs serve as the economic and business development arm of First Nations, Métis, or Inuit governments, and they own and manage subsidiary businesses to support their communities. Their main goal is to create self-sufficiency and financial independence for future generations.

Currently, over 400 AEDCs are operating across Canada, with their numbers continuing to grow. AEDCs have a Board of Directors appointed by the Chief and Council on behalf of the shareholders, who are local community members. They operate independently like any other private business in Canada.

## Bentwood Skateboards

Bentwood Skateboards is an Indigenous-owned skateboard apparel company founded by Brenda Knights and Jason Bothe, based in Fort Langley, British Columbia. Bentwood sells skateboard decks and incorporates Indigenous design elements into its products—they have partnered with local Indigenous artists to create the designs used on their skateboards.

Brenda is a member of the Kwantlen First Nation and brings her business management experience and community development background to Bentwood Skateboards. At the same time, Jason contributes his expertise in skateboarding and marketing after spending nearly 30 years in the industry as a skateboarder and MC.

Brenda incorporates her First Nations teachings into the business and emphasizes servant leadership.

> "In my nation, we're taught to live by seven laws, and it's health, happiness, humbleness, generations, generosity, forgiveness, and understanding, and we try to bring those principles to the business."
>
> —Brenda Knights

Brenda and Jason aim to provide opportunities for Indigenous youth and break the cycle of intergenerational trauma. They believe skateboarding promotes a healthy lifestyle and social value, particularly in communities facing challenges with limited access to organized sports. They currently sponsor a young Indigenous skateboarder and hope to see an Indigenous skateboarder in the summer Olympics.

Overall, Bentwood Skateboards is a unique and inspiring Indigenous-owned business that combines traditional teachings with modern entrepreneurship to create opportunities and promote cultural representation in the skateboarding industry.

## Gulf Islands Seaplanes

Gulf Island Seaplanes operates out of Nanaimo, on Vancouver Island in British Columbia, and is owned by Alison Evans. Gulf Island Seaplanes offers local flights, scenic tours, and charter services throughout British Columbia and stands out from the competition by being able to land in remote locations with water access. Alison's vision involves expanding their tours to include Indigenous cultural experiences, and she sees this as a way to contribute to the broader reconciliation efforts in Canada.

> "I do believe that offering the cultural, scenic flights that we're going to offer is reconciliation in action, sharing positive stories of resilience. And the people that were on this land, I think it's uplifting and something that everyone in BC, Canada, and the world even needs to hear about and be part of. And hopefully, learn how incredible Indigenous people really are. Yes, there are a lot of negative stories out there, especially in the last couple of years. But I think that being part of the positive narrative that's coming out is a huge part of why we're doing it."
>
> —Alison Evans

Alison's Indigenous values and heritage shape the company's operations. She strives to make decisions that will benefit the next seven generations, considering sustainability and environmental impacts. Gulf Island Seaplanes is committed to becoming carbon neutral, reflecting the importance Indigenous peoples place on the environment and setting an example in the aviation industry.

Alison emphasizes the importance of communication and reaching out to other businesses for collaboration. Gulf Island Seaplanes operates with collaborative and inclusive company culture, treating all employees equally and fostering a sense of family.

Alison successfully built Gulf Island Seaplanes by combining her passion for Indigenous heritage with her business acumen. As a result, the company offers unique services, embraces a positive company culture, and prioritizes sustainability, contributing to reconciliation efforts and promoting Indigenous businesses.

## Nuez Acres

Anthony Wingham founded Nuez Acres, a clean beauty product company specializing in seed-to-skin products made from pecans. Nuez Acres controls the entire manufacturing process, from selecting pecans to packaging the final products. Anthony operates the business from the unceded lands of the Katzie, Kwantlen, Matsqui, and Semiahmoo First Nations in British Columbia and has a background in Métis Business Management.

Anthony recognized the health benefits of pecans in beauty products and saw an opportunity to create sustainable and environmentally friendly alternatives to artificial ingredient-based beauty products. Anthony imports pecans from his wife's family farm in Chihuahua, Mexico and has seen a 150% growth in sales over the past year. Their product range includes skin serums, body balms, hair oils, and serums, all certified clean, vegan, and free from toxic chemicals. In addition, the Nuez Acres branding reflects its Indigenous ownership, inclusivity, and family-oriented approach.

Sustainability is a core value for Anthony, and his team prioritizes responsible farming and resource management techniques. They aim to reduce waste, limit water consumption, and use recyclable materials in their packaging. Anthony draws inspiration from his Métis/Indigenous heritage to maximize the use of pecans and create a holistic approach to product development.

Nuez Acres has achieved several successes, including

becoming CertClean certified and winning international awards for its beard oil and mascara. The company plans to expand into the United States and South Korea, tapping into the waterless beauty market. Anthony and Nuez Acres continue to grow and positively impact the clean beauty industry.

> "It was really neat to join a program two years ago that we really cared about, and then to be not only nominated but to win two awards, it really kind of put that little bit of pat on the back for all the work that we've been doing."
>
> —Anthony Wingham

## Discussion

After speaking with several Indigenous entrepreneurs, a few key themes have emerged from the Indsights research project. First, Indigenous entrepreneurs are not averse to taking risks. Many participants had no formal education or training in running a business. They challenged themselves to start their entrepreneurial journeys while learning as they went. Often faced with uncertainty and unpredictable challenges (i.e., COVID-19), these business leaders were forced to pivot their businesses while learning and developing their skills to ensure their businesses thrive.

Secondly, these business leaders understand and recognize the importance of community and that their businesses represent more than just turning a profit. Profits are important, and businesses need to turn a profit to be successful, but it is not the only thing that drives the business leaders interviewed for this project. The sense of community, ability to provide well-paying jobs, and offer training skills were often critical factors in these businesses measuring their success. This tenacity demonstrates that businesses can thrive in Western capitalist society while staying true to their communities and the people they serve and represent. Social causes and business development can go hand in hand.

Lastly, traditional Indigenous values and culture can co-exist with modern/Western economic ideals. Each entrepreneur brought their unique culture and teachings into their business, which shaped how their businesses run. These teachings often contrast with what is viewed as traditional capitalistic values. Although the sample size may be small, these businesses demonstrate that Indigenous ways and teachings can co-exist and that there is much to learn from these change-makers.

## Conclusion

Each entrepreneur who has participated in the Indsights project plays their own unique role in creating social change that is meaningful and valuable to them, their culture, and their community. Together, they are leading the way toward societal growth that will impact generations to come. As the Indigenous economy continues to thrive, it is critical to prioritize inclusivity, respect for Indigenous rights, and sustainability. By forming partnerships, empowering Indigenous entrepreneurs, and upholding the values of reconciliation, Canada can forge a more inclusive and prosperous future that recognizes and honors the vital contributions and goals of its Indigenous peoples.


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ESSAY*

# Learning In The New Digital Era: Are Polytechnic Education Institutions Up For The Challenge? Are There Lessons To Be Learnt From Sun Tze's Ancient Text "The Art of War"

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**Abstract**
Rapid and necessary changes to the delivery of education in the post-secondary setting during COVID challenged our traditional ways of thinking, being, and doing within higher education. Preserving and promoting academic integrity during these uncertain times were challenging and required a focused, thoughtful, and deliberate shared approach. One faculty within a large urban Canadian post-secondary setting set out to strategically plan efforts that would support and promote integrity within their Faculty of Health Sciences & Wellness. A framework co-created by one of the authors served to anchor the discussions and planning, ensuring initiatives that effectively reach out to students, faculty, staff, and leadership are being realized through deliberate actions that engage the different groups within our community. Examples include an extended membership with the International Centre for Academic Integrity for our leaders, a newly established Community of Practice for interested faculty and staff, and focused campaigns like the Boost and Bolster fall campaign for students, faculty, staff, and leadership. Lessons from this work could offer other higher educational organizations suggestions for similar work.



***Essays** advance a new idea, summarize a development, or initiate or engage in discussion. They may be narrower in scope than the above categories, but the subject matter should be of general scholarly interest.

## Introduction

**If you're in the business of trying to describe Canadian** higher education, one of the hardest things to do is to try to explain Canada's community college sector since the institutions that comprise it vary substantially from one province to another (Usher 2023). In most of Canada, the term polytechnic does not have a legal meaning outside the province of Alberta. But as that term has come to be defined, it refers to that group of large, professionally-oriented and technologically sophisticated institutions which are heavily involved in both applied research and in providing bachelor's level education. They are big organizations that in many ways resemble universities as much as colleges and not solely because of the degree-level programming they offer. There are 13 polytechnic institutions that are members of Polytechnics Canada.

Established with the purpose of providing students with the technical training to enter the labor market, the primary objective of these institutions in Canada is to equip students with the necessary targeted skill development and education for their chosen career paths. When grappling with ideas of what a college education and in particular a polytechnic education will look like in the future, it is important to understand how the recent trends have changed education today, and how they will continue to change education going forwards. The evolving structure of education has seen progressive technology trends in teaching and learning, an increase in soft skills training, highly engaging material to tackle decreasing student attention spans, a prioritization of learning versus teaching, and a recent move away from standardized testing practices (Debétaz, 2023). These recent trends and tools, exacerbated by the effects of the COVID-19 pandemic on the delivery of education, have brought about substantial changes revolutionizing the way education is approached and delivered in our present day and will continue to morph in upcoming decades. Rest assured the revolutionary changes will be with us for many years. The rate of change will accelerate and the ability to embrace change and anticipate the future will be necessary.

## "In the Midst of Chaos There is Opportunity" (Giles 2013, Tze 2018).

One of the most notable changes that has been witnessed is the involvement and development of technological tools, and the recent increase in remote and distance learning as a form of delivering education. As a result of this newfound dependency on remote education, the boundaries of teaching and learning have expanded and have allowed for innovative methods in an attempt to enhance student engagement and comprehension. The annual growth rate of revenue from online learning between the years of 2023 and 2027 is estimated to be 12.52% (Bush, 2023). Massive open online courses (MOOCs) and other forms of online education and programs have tremendously expanded access to education and collaboration for an abundance of learners, regardless of where they reside. Another result of this observed increase of technological dependency has been a parallel increase of attention towards soft skill development in order to fill the gap remote learning has created (Debétaz, 2023). While there has always been a strong focus on soft skills in a college education, this focus has increased due to recognition of their importance in the dynamic and collaborative nature of the modern workforce. Soft skills training and teaching continues to be acknowledged as an imperative step in the preparation of students for future employment. Balancing these two conflicting trends in education is becoming one of the main areas of focus for polytechnic institutions as they grapple with the future of education.

To address decreasing student attention spans, educators have turned to highly engaging multimedia content, employing visual aids, gamification, and interactive platforms to foster active learning experiences (Debétaz, 2023). This increase in the use of educational tools has been facilitated with the rise of technological advancements and coincidentally created in response to the detrimental effects on attention spans created by the reliance of student populations on technology and online environments. According to PEW Research Centre, teachers say that the internet and digital search tools have had a 'mostly positive' impact on their students' research habits, but 87% say these technologies are creating an easily distracted generation with short attention spans (Purcell, 2012). The reality of the inability of the average student to focus for long periods of time has led to the decreased control on students prioritizing independent learning, recent increase of multi-modal and blended learning approaches to teaching, as well as an increase of awareness for student needs and educational desires (Kingsley, 2023).

Additionally, decreased control from a teacher or professor has contributed to an increased emphasis on personalized learning, empowering students to take an active role in their education. This shift is also reflected in the move away from widely distributed standardized testing practices, with a growing recognition of the limitations of such assessments in capturing the holistic development and diverse talents of students (Debétaz, 2023). Not to mention, there has been an increased focus on accommodation for differences in learning styles and students with learning disabilities. As education continues to evolve to meet the needs of a diverse student population and keep pace with the developments of the 21st century, these emerging trends have played a pivotal role in shaping the future of education and paving the way for future modifications in the education system and the institutions which represent it.

The observed transformative change in the past decade or two through emerging trends and technologies serve as an indication for the tremendous potential in visions

regarding the future of a college education. In reference to technological advancements, utilizing dominant and advanced AI-powered software such as CHAT GPT and OpenAI, in addition to online platforms like Coursera and edX, can be expected to gain focus in the future. Understanding how these technological tools work can revolutionize the learning experience and allow learners to capitalize on the educational prospect of such tools (World Government Summit, 2023).

Achieved through comprehensive educational resources and courses targeted at equipping students with the necessary skill set for advanced technological tools, it is equally important to engage in teachings of risk awareness and preventative measures in order to avoid harmful consequences. This aforementioned focus on technological advancements is a representation of the recent push for decentralized learning and individualized forms of education. Moving away from a standardized way of learning has been regarded as an effective way to maximize student potential, in order to hone individual talents and learning skills of each and every learner (World Government Summit, 2023). Decentralization is already gaining traction as a movement in institutions and can continue to be an influential factor in the way that colleges deliver education.

The future of education also entails a shift in prioritization towards track-to-employment teaching in higher education, and there will be an increased emphasis for all educational institutions to focus on developing future-oriented initiatives and cultivating soft intrapersonal skills (World Government Summit, 2023). It is important for colleges to continue to work on providing personalized track-to-employment teaching, specifically focusing on the development of future initiatives and 'soft-skills'. In the event that emotional intelligence and 'people skills' become prioritized in an effort to bridge the gap between present learning and technological learning, educational institutions and facilities will be regarded as collaborative spaces encouraging the interaction of ideas. Tackling the issue of balance between face-to-face and online forms of learning, collaboration and inclusivity in an interconnected learning community and online decentralized learning will be vital in the reinforcement of the dynamic structure of education in the future. Continuing present progress in the educational system, becoming a learner will no longer be limited to a specific age, degree requirement or specification, nor time frame. In an attempt to promote life-long dedications to educational development, higher-education institutions will continue to distance themselves from the idea of 'teaching' and focus on the 'learning' of the population. It will not be the role of the institution to provide the information to the patron; the future in which we are talking will ensure that it is accessible and publicized, yet it will teach individuals the necessary skills to navigate said information and critically engage with it. Colleges will continue to encourage focus on skills of emotional intelligence and employment-based proficiency, all the while providing help in the development of advanced cognitive abilities and to develop skills of adaptability and learning agility.

Conceptualizing the future of a college education is impossible without understanding the various influential factors contributing to the development of the reality in twenty or thirty years. The goal is not to simply create a vision for the future, but to understand how we are to achieve that vision and understand what steps we need to take in the next two decades to get there.

Technological advancements will continue to transform our perception of education, and with that it is important to aim to develop an understanding of the possibility of tools available to us.

Educating the population in having an adaptive and flexible intelligence will allow for learning to become a more active role for those involved, providing individuals with the skills in order to look to the needs and gaps in the future based on present information. In order to cater to the growing need for emotional intelligence and 'people skills', the adaptation of learning methods and frameworks is essential to accommodate for the instruction of such skills – not to mention, restructuring college education to encourage the prioritization of emotional intelligence skills, as well as critical thinking, creativity, complex problem-solving and cross-cultural competency skills.

## "Opportunities multiply as they are seized" (Giles 2013, Tze 2018)

Important to ideas of collaborative learning environments, consideration of the physical design of educational spaces can be an influential part in ensuring the seamless collusion of the online and face-to-face dynamic. Blended learning models and the continuous adaptation of such models are vital in ensuring that the rise of technological advancements in education does not eradicate the importance of personalized and present learning. With the

emerging presence of Open Educational Resources (OERs) and Massive Open Online Courses (MOOCs), restrictive boundaries of formal learning will have to be dismantled in response to the diversification, decentralization and increasing accessibility of higher education. It is important that a college education continues to adapt and respond to the social and cultural shifts which have already taken place and will continue to occur in the next decades.

## Conclusion

### "Quickness is the essence of war" (Giles 2013, Tze 2018).

Education must encourage adaptability and develop resiliency in order to survive. The welcoming of integrating global perspectives and societal understandings into curriculum in order to reinforce the connectivity of a polytechnic educational institution is key to their success. In an attempt to understand the future of a college education, it is important to recognize that in the ever-changing context we find ourselves today, it remains elusive. With that said, recent trends and emerging tools have provided a strong framework with which we can attempt to develop a vision of what a polytechnic education will look like in the upcoming decades. There will be a lot of experimentation and few bumps along the way. Polytechnic institutions are up for the challenge and have already begun their transformative journey. There is no doubt polytechnics will undergo recombination in order to embrace the new paradigm of education.  As the Chinese proverb clearly states, "We are living in most interesting times." The future looks very bright for polytechnic education.

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# Advancing Post-Admission Academic Language Support at a Canadian Polytechnic Institute

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***Innovation Spotlights** extremely brief contributions that highlight an innovative teaching practice, approach, or tool, and provide accompanying evidence that speaks to the effectiveness of the innovation.

**Abstract**
This paper presents innovative post-admission language support initiatives at a polytechnic college. These initiatives address the challenges faced by higher education institutions in English-speaking countries regarding the linguistic preparedness of students for academic study in English. The rising number of English as an Additional Language (EAL) students in post-secondary institutes in Canada has prompted some institutions to prioritize the development of academic language abilities. This paper presents how one Canadian polytechnic institute has taken an innovative approach to support EAL students through flexible, faculty-led academic language support services that aim to improve students' grades, increase their language confidence, and prepare them for the Canadian workforce.

## Introduction

Higher education institutions in English-speaking countries around the world are finding that many current English as an Additional Language (EAL) students are not linguistically prepared for the rigour of post-secondary studies in English (Fox et al., 2016; Read, 2015, 2016). These at-risk students, which include both domestic and international (Edwards et al., 2021), are defined by Read (2016) as "those who have significant academic language needs (to the extent that they are at risk of failure or not achieving their academic potential)" (p. 4). Regarding internationals, these students face unique challenges related to their social adjustment and academic studies, including the challenge of language difficulties that often require specialized support services. Moreover, lack of language proficiency can significantly increase academic stress as well as significantly decrease academic success (Lin et al., 2019; Martirosyan et al., 2019). For example, according to Chen (2021), first-year international students at the University of Queensland showed lower final grades (4.89 on a 7-point scale) compared to their domestic counterparts (5.47). Fass-Holmes and Vaughn (2014) showed that up to 62.7% of international students at an American university were required to take community college English classes before commencing undergraduate studies. The authors concluded that as the number of international

students rises, so will the number of those who struggle academically.

Therefore, to address the increasing numbers of EAL students who are struggling to meet learning outcomes, post-secondary institutions are prioritizing the development of these students' academic language ability to equip them for successful workforce participation (Arkoudis et al., 2012; Read, 2015). There is evidence for the effectiveness of language support interventions. A study conducted by Urmston et al. (2016) at the Hong Kong Polytechnic University showed significant improvements over one year for students who made effective use of available supports. In another example, an Australian university analyzed outcomes from 2017 to 2019 for students who attended academic language support sessions compared to those who did not attend. Across five courses from five different disciplines, it was found that the former group performed better in terms of retention, pass rate, and GPA. Over the three years, passing rates for attendees were on average 11.8% higher than for non-attendees (Ashton-Hay & Doncaster, 2021).

## Background

Beynen (2020) states that in Canada, "post-secondary classrooms have become culturally and linguistically diverse due to internationalization efforts and decades of immigration" (p. 23). The number of international students in Canadian colleges more than doubled from 60,318 in 2015 to 153,360 in 2020, and international students made up 19.3% of Canadian college enrolments in 2019/2020 (Statistics Canada, 2021). These colleges include STEM-focused polytechnic institutes, and cultural and linguistic diversity is especially true in STEM programs (Beynen, 2020).

The context for this paper is a Canadian polytechnic institute, where data for 2021 showed that 21% of full-time students did not speak English as their primary language (British Columbia Institute of Technology, 2021). The paper specifically focuses on the institute's most common type of program: short-cycle tertiary education (SCTE) programs, which usually feature hands-on one- to two-year certificates or diplomas (Skolnik, 2021). And significantly, as is typical in higher education, SCTE programs require all students to learn the epistemology, vocabulary, texts, sociocultural context, and communication conventions of a discipline, collectively known as academic literacy (Wingate, 2015). This can create substantial demands for EAL learners, who need to become literate not only in academic content but also in a new language, and all of this within a short timeframe of one to two years. And despite having been accepted into their programs and being deemed language-ready according to entrance criteria, some EAL learners may indeed not reach their academic potential due to deficits in their academic language development, according to Read's previously mentioned definition. In fact, Daller et al. (2021) argue that standardized entrance tests such as IELTS and TOEFL "provide a good cut-off point below which students are at risk of failing their studies, but that they are not meant to predict actual study success (the marks the students get)" (p. 1503). Thus, for many students, post-admission academic language support is required for academic success. This paper will examine how one Canadian polytechnic institution has endeavoured to assist its EAL students by developing post-admission academic English language support, defined as "extra support with their English comprehension and/or expression following their admission" (Knoch & Elder, 2016, p. 211). Before examining the current supports that are in place (Innovation Section), it will be helpful to place them in their historical context.

In 1996, the English and Communication Learning Centre at the institute was closed, leaving students with a lack of language support services. The need for these services was reflected in investigations by the Communication Department in 2001 and 2005, which suggested that approximately 22% of diploma program students were not linguistically prepared for post-secondary studies in English. To address this challenge, in 2009, the department began to offer Language Support classes (LS classes) to assist EAL students who were failing their program-specific Communication classes, which themselves focus on technical and business communication, including email writing, short technical report writing, professional presentations, and teamwork. This LS class intervention was in line with the department's role as the English-language gatekeeper for the programs into which it taught. This intervention had some success, as internal reports from 2011, 2013, and 2014 showed that failure rates in Communication classes were reduced by 25% because of students' attendance in LS classes. In 2021, moreover, a comprehensive analysis of 1,200 students' grades showed that students who were recommended for these classes and attended them had Communication grades that were

6% higher than students who received a recommendation but did not attend (see Devos, Nizonkiza, & Lynch, in press).

For LS classes to be effective, there needed to be a consistent and reliable assessment for determining which students required these classes. However, since such an assessment was not in place at the institute when LS classes began in 2009, instructors offered self-made writing diagnostic assessments to identify potentially at-risk students. Then in 2018, a research project published by Devos (2019) led to the development of the English Screening Test for Polytechnics-Online (ESTP-O) (see also Innovation Section), a more centralized and standardized online post-admission assessment that used measures of vocabulary, grammar, and writing. By 2022, more than 20 programs had used the ESTP-O to help them identify and refer students to the LS classes.

In 2021, the Language Success Team (LST) was founded with external research and curriculum development funds. The funding allowed for the development, maintenance, and administration of the ESTP-O, and also for the development of additional, more flexible faculty-led language learning services to complement and augment the LS classes, which were not available to all students. At present, language support at the institute is offered through collaboration between the LST and the Communication department. The current supports will be described in Innovation Section.

Wingate (2018) strongly recommends that post-admission support program researchers share pertinent details, including the contributions of language specialists and discipline instructors. She notes that without such information, it is "difficult for institutions and individual practitioners to learn from these examples and develop similar approaches" (Wingate, 2018, p. 6). Thus, in the following sections we provide details of our approach to supporting EAL students in SCTE programs. Our key question was: *How could we provide effective research-based language support (including skills of reading, writing, listening, and speaking) that fits within the local context and that improves EAL students' grades, increases their language confidence, and prepares them for success in the Canadian workplace?*

## Innovation

This section examines the following six language supports at the authors' institute: (1) English Screening Test for Polytechnics—Online (ESTP-O), (2) Language Support (LS), (3) 1-on-1 English Help, (4) English Conversation Group, (5) Online Language Learning Resources, (6) Job Application and Interview Online Course.

### English Screening Test for Polytechnics-Online (ESTP-O)

Given that some students are arriving in their programs without the academic literacy and language skills needed for academic success, many post-secondary institutes' post-admission language support efforts are beginning with a post-entry language assessment (PELA) (for a review of PELAs internationally, see Devos, Nizonkiza, & Lynch, in press, or Read, 2015). PELAs are low-stakes language tests (Read, 2015) whose goal is to determine the language readiness of new students for post-secondary programs in English (Fox, von Randow, & Volkov, 2016). They often serve as the first step in an institution's academic support efforts and are typically followed by language support based on a student's needs (Read, 2015).

The English Screening Test for Polytechnics—Online (ESTP-O) is a PELA with a two-step screening and diagnostic procedure—similar to that found in the Diagnostic English Language Needs Assessment (DELNA) at the University of Auckland (Erlam & Botelho de Magalhães, 2021; Elder & Erlam, 2001). The ESTP-O is delivered before the term begins. All students in 14 programs[1] are asked to complete the ESTP-O regardless of language background and enrolment status, i.e., domestic or international. The purpose of the test is to identify and recommend students for non-credit LS classes that augment their Communication courses.

The ESTP-O is delivered online via the institution's learning management system (LMS) and contains two main parts: firstly, an auto-graded screening, consisting of a short vocabulary and grammar test, and secondly, a diagnostic, which involves two short reading tasks as well as a writing task (i.e., a brief email response). The development and validation of the ESTP-O are explained in detail by Devos, Nizonkiza, & Lynch (in press) and Devos (in press). The writing diagnostic portion is read and marked by

1 In 2022 and 2023, 14 programs, ranging from Accounting to Food Technology, participated in the ESTP-O and follow-up Language Support classes. Although this is a fraction of the institution's programs, due to current language support resources, it is currently a reasonable and manageable amount.

Communication instructors, who then recommend possibly at-risk students to attend LS classes.

Since its regular use in 2021, about 20% of all ESTP-O test takers have been recommended to these classes for additional academic support. The role of the LST is to develop, administer, research, and report on the ESTP-O so that it remains a standardized, objective, and fair test for the test-takers (i.e., students) and test users (i.e., instructors).

## Language Support (LS) Classes

Students who are identified via the ESTP-O are recommended for LS classes. These are free, non-credit, discipline-specific classes that are offered weekly for one to two hours and taught by Communication faculty members with training and/or experience in teaching EAL. Classes function as an early intervention for EAL students to help them experience academic success early in their studies. Students are offered 12 to 15 hours of LS classes each term. Having these classes taught by faculty members as opposed to language specialists offers a closer integration with specific disciplines as the LS classes primarily offer support for students' program-specific Communication courses. Moreover, for the most part, the LS class instructors also teach the specific Communication classes for which the LS classes offer support. These small group classes offer students individual feedback on writing and speaking skills. Also, instructors have an opportunity in these classes to "triage" when a student's language skills fall far below expectations.

About 250 students from the 14 programs are recommended to LS classes each term, with about the same number attending. Not all attendees arrive at LS classes via ESTP-O, but rather some attend because of an instructor's recommendation or because they self-select to attend. Student feedback indicates that the classes are effective. In student feedback received from November 2021 to January 2023, 90% of the respondents felt the classes had a positive impact on their academic performance in their Communication courses and 70% felt the LS classes had a positive impact on their academic performance in classes other than Communication. In a post-term survey for the same period, 63 students responded to questions about their experience in LS classes. Some comments included:

> *This class helped me a lot in COMM classes.*
>
> *I was more confident writing texts and doing midterms.*
>
> *It [LS class] has helped me with my presentation, my resume, and my cover letter, the instructor is very helpful.*
>
> *By reviewing my work and giving recommendations to improve as well as breaking down some of the assignments to make them more clear.*

As previously mentioned, research by the LST shows that of those who were recommended for these classes, students who attended had better grades in their Communication courses than those who did not attend (Devos, Nizonkiza, & Lynch, in press). Thus, the role of the LST is to not only research the efficacy of these classes but also to collect and report on the utilization data of LS classes.

## 1-on-1 English Help

The LST also coordinates and promotes 1-on-1 English Help at the institution. 1-on-1 English Help involves individual consultations with language advisors who are also Communication faculty members. These language advisors diagnose and advise learners, which may include offering additional feedback on assignments, providing additional learning resources, brainstorming topics or ideas for assignments, or working with students to revise grammar and writing in assignments. These 15-minute sessions are bookable through an online portal, and students can then meet with an advisor online or in person. Since LS classes are not available in all programs, and since students have very full and demanding schedules, 1-on-1 English Help offers them an opportunity to receive individual language skills feedback and advice.

In sum, these sessions provide an opportunity for students to discuss a language development plan, which can be motivating for them (Knoch et al., 2016). 1-on-1 English Help was piloted in the 2022/2023 terms and had 65 visits between September and May.

## English Conversation Group

The LST also coordinates, promotes, and reports on an informal peer conversation group. The English Conversation Group (formerly English Lounge) is available to all full- and part-time students. These weekly one-hour sessions allow participants to practise their speaking and listening skills on school and work-related topics. The faculty instructor often chooses a topic with the participants the week before and prepares questions and activities related to the topic. Reports from students suggest they appreciate the speaking

opportunities this group offers. One regular participant (a first-year civil engineering EAL student) stressed that his participation in the group led to getting a job offer:

> *I got several job interviews in this term. Of course, my English is not perfect, but all interviewers – we had real communication. That's why I got a job offer. That's the best thing I got from English Lounge, is confidence speaking in English.*

Important for this peer conversation group is that participants get to have multiple turns to speak, as they often find themselves unable to take speaking turns in larger, fast-paced classroom situations. About five to ten students attend the English Conversation Group each week.

## Online English Exercises

The LST also developed a free, online language learning resource for all students. The Online English Exercises course is in the institution's LMS and offers support that includes self-access and self-paced learning materials. This resource was created by an EAL curriculum development specialist with input from Communication faculty instructors. It focuses on workplace communication skills, such as body language for professional presentations, writing for short reports, and vocabulary and grammar in technical and business contexts. The resources are interactive, and students learn from videos, audio clips, infographics, and learning activities.

Students self-register for the course through a simple, two-step process and earn shareable, digital awards and a non-credit certificate for completing self-selected modules. This individual and flexible e-learning affords learners more direction and agency over their learning (Boettcher & Conrad, 2016), and also allows students to interact with content in unique ways that are not provided in the classroom (Bell & Federman, 2013). Finally, the content applies principles of Universal Design for Learning (UDL) to make the materials relevant and accessible for all learners (Fovet, 2021; Novak, 2016).

The LST monitors and maintains this resource, as well as reports on its utilization to the institute through the number of students who self-register, receive digital awards, and complete module quizzes. Since August 2023, 573 students have self-registered for the resource, 45 digital badges have been awarded, and 162 quizzes completed.

## Job Application and Interview Online Course

From 2021 to 2023, the LST established partnerships with two local companies to help international students and students who were newcomers to Canada with their subject-specific job preparation and interview skills. These partnerships aimed to promote more hiring diversity and inclusion in companies while increasing EAL students' confidence for their first job interview experience. This service was made available to students in several different programs that had entry-level skills related to the companies involved. Students voluntarily participated in weekly, one-hour online mentoring sessions with one of the LST members to hone their personal brand, resumes, and cover letters. After eight weeks, students then had mock interviews with real hiring managers at one of the two companies.

Students shared their experiences via blog posts on the LST website. One student shared that they:

> *learnt many things from these mock interviews, such as being ready for the unexpected, and trying to structure my answers before I talk. I think this is a very precious opportunity for a new graduate because the more he/she practises, the more confident he/she is.*

Another student shared some important personal development ideas after participating in the mock interview:

> *After the interview, I noticed that giving personal examples to illustrate answers is really important in an interview. Thus, I came up with an idea to create a folder in my note-taking system to consistently note my experiences. I will name this folder "Who am I?" to list all my personalities, strengths, and weaknesses, and then frequently update my real-life situation to show each trait.*

In total, ten students have participated in the job application preparation and mock interview initiative.

# Discussion

Across Canada over the past 20 years, higher education institutions, which include polytechnics, have been turning to different forms of language support to help rising numbers of international and domestic EAL students meet the demands of post-secondary study in English and prepare them with workplace-ready communication skills. In this paper, we have outlined some innovative approaches to supporting EAL students at a polytechnic institute. Although

international or national variations of these supports exist, it is the direct faculty involvement and the establishment of the LST within the Communication Department that make the outlined approaches unique. Additionally, to the best of our knowledge, the development, administration, and research of a PELA at a college or institute in Canada is also novel.

The forms of support presented here are from one polytechnic's perspective, and although they are currently operational, the supports at this institution are also in development. Although short-term funding can spur language support initiatives, long-term institutional funding is required for research, personnel, curriculum development, and other resources to maintain and develop these forms of support on an ongoing basis. Without long-term funding, there is a risk that important language support services will not be sustainable. For example, the Job Application and Interview Online course (see Innovation Section) could not be maintained long-term and thus, students are currently missing an opportunity to prepare for job searches and have mock interviews with real hiring managers.

The newness and small size of the LST, and the wide diversity of program needs have led to the current support model being what Goldsmith and Hunter (2021) describe as "practice by practice" (p. 6), as opposed to an institution-wide model. The LST also works under the motto of what Kift (2015) considers "just in time, just-for-me tailored support" (p. 54). That is, it aims to offer flexible, multidimensional, and multimodal services that accommodate students' busy schedules and are available right at the moment when students need them.

## Impact

By presenting examples of post-entry language support as applied to a local polytechnic context, we hope to assist other institutes in examining which forms of academic language support can be developed within their own contexts. We recognize that every institution is unique and there is no set prescription for what type of forms will work best in any given context. However, it is valuable for institutes to share their experiences and update their language support as post-secondary realities evolve. Therefore, along with Wingate (2018), we put out a call for other academics to continue to report on their local experiences in developing language supports for their students.

## Conclusion

This paper has presented different forms of post-admission language supports and their unique application at one Canadian polytechnic institute. Our key question was: *How could we provide effective research-based language support (including skills of reading, writing, listening, and speaking) that fits within the local context and that improves EAL students' grades, increases their language confidence, and prepares them for success in the Canadian workplace?* Although the answer to this question will be ongoing, several unique language support features emerged that provide a foundation for future support work in our particular context. Key among these features is the direct involvement of faculty, program by program support, and flexibility that allows for just in time tailored student support. Through reporting on our context-specific experiences, institutions can assist one another with the important goal of helping EAL students thrive in both their post-secondary programs and in their future workplaces.

## Conflict of Interest

The authors declare that no conflict of interest or monetary interest exists.


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Nathan has researched and published about post-admission support since 2018. In 2021, he founded the Language Success Team to develop and support post-admission supports for English as an Additional Langauge (EAL) students in diploma programs. He has also taught second language acquisition and content and integrated learning in Germany as well as business and technical communication in Canada.

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ESSAY*

# Breaking Binaries
# The Brookfield Sustainability Institute: Positioning Polytechnics as a Thought Leadership Strategic Bureau

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**Abstract**
Throughout the years there has always been a tension between the classification of Colleges with respect to Universities. In the Ontario College system there is an added complexity with a number of Colleges being named Polytechnic Institutions. At George Brown College we have created a thought leadership agency that is called the Brookfield Sustainability Institute. It is a place where global thinking and research is being applied to help solve climate change and build sustainable communities for the future.



***Essays** The primary purpose of an essay is to advance a new idea, summarize a development, or initiate or engage in discussion. The subject matter is of general scholarly interest.

**Polytechnic institutions and the offerings of this nature of education** have been continuously developing, evolving and increasing in popularity amongst post-secondary options over the last decade. This increase in recognition of polytechnic institutions can be attributed to its distinctive approach to education, which complements the needs and demands of Canada in the twenty-first century. “As the postsecondary world evolves, the gray zone between universities and colleges grows. The advent of transfer programs has created bridges and symbiotic relationships between the two...the classic typology of universities and colleges no longer captures the complexity of higher education” (Doern, 2008). With the presence of transformative factors such as increased technological progress, the restructuring of the employment sector and its requirements, and an aging population unequipped to work within the parameters of the labour market, there is ample demand for a workforce trained with a polytechnic education (Polytechnics Canada, 2023). As employers’ criteria for employees and the demands of the workforce change, educators must reconsider how credentials are issued, validated, and recognized (Polytechnics Canada, 2023).

As a result of considerable uncertainty regarding the official meaning and purpose of a polytechnic institution, one must familiarize themselves with existing definitions in order to grasp the emergence and importance of this type of educational institution. Polytechnics Canada defines a polytechnic institution as “an institution of higher education providing technical, applied, hands-on learning; offering applied degrees, diplomas, certificates and apprenticeship training; fueling business innovation with applied research expertise” (Polytechnics Canada, 2023). Polytechnic institutions

are neither a college nor a university. As distinct entities, polytechnics provide their students with unique learning opportunities through their industry-aligned teaching and learning, as well as their integration of real-world work experiences and opportunities throughout the learning process (Polytechnics Canada, 2023). Not only does this approach to education allow students to find relevance in their studies, it provides students with an opportunity to work alongside and foster connections with employers in their respective fields and reinforces problem-solving skills relevant to present-day issues. In other words, polytechnics foster highly employable graduates readily prepared to contribute to the workforce and utilize developed skills that are in demand.

A comprehensive understanding of the development of polytechnic institutions in Canada requires a look into its historical context. In popular discourse, Canada's higher education system is generally regarded as a binary structure distinguishing educational institutions as either universities or colleges (Doern, 2008).

In order to continue to evolve and address industry needs, polytechnic institutions are in critical need of recognition and distinction from the preconceived notions of the Canadian population surrounding higher education. Dismantling the university-college dichotomy and highlighting the importance of diversity between the offerings of different institutions is essential in demonstrating the growing need for the education offered by polytechnics. Not to mention, obtaining domestic and international recognition and designation helps to attract new opportunities for collaboration amongst institutions and provide new possibilities for students.

Polytechnic institutions are positioned to lead change in the education, labour, and economic sectors of our society. With industry-focused programming, hands-on and work-integrated learning, applied research programs and opportunities, and flexibility in delivery and learning styles, polytechnics have the ability to successfully cater to the needs of an ever-changing workforce.

A very distinctive differentiator for polytechnic educational institutions is the creation of thought leadership entities. Thought leadership can be defined as a strategy that positions a person or organization as an authority in their field by providing unique insights, original research, and expert opinions on industry trends and issues (Digital Marketing Institute, 2019). With the creation of the Brookfield Sustainability Institute at George Brown College, we have successfully created an agency for thought leadership that transcends the local market and allows the college to interact globally.

The Brookfield Sustainability Institute (BSI) was launched at George Brown College to address the growing need to identify, understand and address problems that are arising from accelerating climate change. The Institute develops practical applied solutions that can minimize and reverse the impact of climate change on our planet by focusing on sustainable and smart communities. The Institute will ultimately be located on the top floor of George Brown's new, net-zero carbon, tall wood building.

The BSI will be focused on developing applied research projects for sustainable and smart communities that are environmentally, socially, culturally and financially viable. The Institute will foster interdisciplinary collaboration through ideating, prototyping and sharing applied solutions with communities, industry and governments.

The BSI will focus on the intersection of two key trends that are shaping the future of our communities and wider communities worldwide. One trend involves combating climate change by creating net-zero carbon cities and the other trend involves understanding the ethical use of digital technology in our society.

In order to achieve the goals of the Institute, twenty-five scholars/affiliates locally and internationally will act as research fellows and project co-sponsors. They will bring their own organizations' staff, time and in-kind resources to the projects. Their involvement in the Institute would position them as thought leaders in applied sustainable solutions. They would contribute to and benefit from the Institute's work in showcasing and circulating those ideas, lifting their reputation in the community and enabling them to work with students as another dimension of the work-integrated learning promise. The Institute will employ and activate a number of varied types of knowledge dissemination formats with corresponding expertise in related publishing and symposium activity. Key research observatories will be created, and access by the global group of students, faculty, industry and government will be made available.

Climate change is not a problem that governments can solve alone. It is going to take thought leadership agencies like the BSI to foster collaboration across disciplines and sectors in order to find innovative and sustainable solutions. The Brookfield Sustainability Institute brings together knowledge and expertise from diverse experts to share best practices

and promising practices from a global perspective. BSI, under the umbrella of polytechnic education, is leading the way and will serve as a beacon of knowledge for all post-secondary institutions. Solutions will be realized that will ultimately be prototyped and tested with municipal and private sector partners. With BSI, polytechnic educational institutions have just entered a new era of thought leadership on a global scale.

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ORIGINAL RESEARCH PAPER*

# Perspectives of Bhutanese TVET practitioners on online teaching and learning during the COVID-19 pandemic

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***Original Research Papers** are papers that report on original empirical research with a focus on teaching and learning. Papers may be qualitative or quantitative and include an Abstract, Introduction, Method, Results, Discussion, and Reference section, as well as any tables and/or figures.

**Abstract**

Due to the shutdown of schools, universities, and Technical and Vocational Education and Training (TVET) programs during the pandemic, practically all students experienced educational challenges for an entire year. The education system was conducted remotely via the internet, TV, and mobile phones; however, TVET education, which is learned outside of the typical classroom, suffered due to internet problems, lack of electricity supply, lack of availability of technology, unprepared teachers, and challenges in balancing studies and household responsibilities for female students. It is tough and challenging to adapt and implement this educational system under such pandemic conditions, particularly for low-income and vulnerable youths. Since TVET strongly emphasizes practical skills and workplace readiness, remote learning is complex. TVET is a practical-based education that can be successfully learned through performing in classrooms, workshops, or laboratories, along with the practical experience of training or attachment at the workplace. In another setting, practical instruction for some professions could be realistically simulated, for example, through augmented reality experiences. Still, again, the cost of purchasing sophisticated and complex software that can run such simulations can be a barrier for most students. The biggest challenge is adjusting to distance learning, which mainly relies on learning by experience.

This study aimed to learn more about how Bhutanese teachers and students in a technical training institute perceived and experienced online classrooms during the pandemic. In response to the present pandemic, the entire educational system changed and modified itself to include the delivery of online classes. This survey describes Technical Training Institute teachers' and students' perceptions and concerns about the emergency pivot online instruction.

The sample consisted of 10 trainers and 119 trainees from Technical Training Institute Samthang in Wangdue Phodrang. An online survey method (Google Forms) was used for data collection. While most participants (69%) thought online education saved time, the study also uncovered significant challenges

related to the validity of the assessment system. The findings show that only 27% believed online teaching is effective. It is also reported that this negative impression of online education can be attributed to the low level of knowledge transfer, lack of structure in lessons, challenges to clarify doubts during the class, and poorly designed learning materials. Significantly, most participants believed that technical issues majorly disrupt the flow and pace of online teaching.

## Introduction

**Contrary to the general education system, TVET is more comprehensive,** more diversified, and more complicated; as a result, it is essential to comprehend it to guide TVET reform initiatives. According to the TVET system typology, Bhutan's TVET system may be divided into three primary sub-systems: formal, informal, and non-formal. There are three ways to give training: through institutions, at the workplace, and by combining several TVET delivery methods.

Through 112 institutions, the official TVET is delivered, with more than 80% being privately owned and concentrated in the major towns of Thimphu, Phuentsholing, and Paro (urban bias). Six Technical Training Institutes (TTIs), two Institutes of Zorig Chusum (IZCs), and four other public training providers comprise the public TVET sector. While commercial training providers mainly provide courses in driving, ICT, media, business, and management, public TVET institutions offer instruction in technical fields that need significant investment. The commercial sector is more prevalent in quantity, while the public sector assumes more responsibility regarding basic technical capabilities. From 2008 to 2019, institutions under the MoLHR enrolled around 12000 trainees, with 71.73% men and 28.27% women. Technical Training Institute, Samthang in Wangdue Phodrang Dzongkhag, is one of the six TTIs that provide automobile courses and the focus of the study. Until the outbreak of the pandemic, traditional apprenticeship learning was the primary mode for informal TVET in carpentry, masonry, arts and crafts, and traditional culinary. Though the number of conventional apprentices and artisans is still being determined, they cater in prominence to the needs of rural communities. Learning usually takes place together with daily activities. However, the outbreak of COVID-19 has brought a tremendous paradigm shift in the teaching and learning process.

The Ministry of Education has been carefully monitoring the situation and taking precautions to stop the potential spread of COVID-19 in school settings. The disease was declared a Public Health Emergency of International Concern and classified as a pandemic by the WHO on March 11, 2020. On March 5, 2020, the nation experienced its first COVID-19 case. Schools, colleges and universities near Paro, Thimphu, and Punakha were shut down starting March 6, 2020. On March 7, 2020, schools in Wangdue Dzongkhag, Phuntsholing Thromde, and one school (Chumithang MSS) under Chukha Dzongkhag also closed. This was done to stop the spread of COVID-19 and its imminent danger to children's lives.

The Royal Government of Bhutan then announced the closure of all schools and educational institutions nationwide on March 18, 2020, by an executive decree. Bhutan had reported seven positive cases as of April 28, 2020, all of which were imported. Five have fully recovered, and the remaining patients are doing the same. Bhutan has remained in the pandemic's Orange Zone since March 5, 2020, as there have been no cases of community transmission in the nation. This left both teachers and trainees anxious about the coverage of the syllabus. Teaching through WeChat, Google Classroom, Radio and TV in general education was suddenly adopted to roll out Education in Emergency (EIE). However, Technical Training institutions took a while to embrace online learning since, unlike general education institutions, TVET institutions do not offer Education in Emergency (EIE). Thus, with the directives from the Department of Technical Education, the planning of online teaching started to engage trainers and trainees meaningfully during the lockdown. That was the era of a new beginning in the TVET system. The launch of a digital learning management system (LMS) for the construction sector on December 15, 2021, was a massive milestone in the history of the TVET sector in Bhutan. It was expected to create flexibility in the learning system (Kuensel, December 16, 2021). To access the LMS, trainers and trainees have to register to log in to access teaching and learning materials. The LMS server was installed in one of the TVET institutes in central Bhutan, TTI Chumey. LMS provided trainers and trainees access to video tutorials in all the trades, assessment memos and their performance results. This system was a great boon to TVET faculties and students, especially during the lockdown that engaged everybody in academic areas without breaking COVID-19 protocols. LMS was one part of online teaching. We also

used other online forums like Zoom, Google Meet and WhatsApp.

Although the COVID-19 pandemic has provided us with an opportunity to pave the way for introducing digital learning, there were certain deficiencies, such as the weakness of online teaching infrastructure, the limited exposure of teachers to online teaching, the information gap, the non-conducive environment for learning, weak internet and software access and so on. This article evaluates the impact of the COVID-19 pandemic on the teaching and learning process in one of the TVET institutions in Bhutan. The challenges and opportunities of online and continuing education during the COVID-19 pandemic are summarized, and the way forward is suggested.

## Research Questions

This research study is set within a Bhutanese TVET context during the COVID-19 pandemic. The researchers set out to investigate the impact of the pivot to online learning to understand how online instruction might supplement face-to-face instruction. As part of this research, we sought answers to the following research questions:

1. How does online teaching impact TVET practitioners' teaching identities?
2. What barriers do trainers and trainees encounter when taking online courses?
3. How do trainers and trainees perceive the effectiveness of online teaching and learning?
4. What could be the pros and cons of online teaching and learning?

# Literature Review

## The Impact of COVID-19 on the Education System

The way educators deliver high-quality education is changing drastically due to many Internet platforms (Tadesse & Muluve, 2020). Due to the limitations placed on actual meetings owing to the unprecedented COVID-19 outbreak, the usage of these platforms has been essential during the last few years. Because of lockdown and social segregation measures implemented in response to the COVID-19 pandemic, most nations have had to close schools, training institutions, and higher education institutions (Preeti, 2020). Tadesse and Muluve (2020) claim that "Education in Emergency" has been adopted by instructional machines and instructors through unique online platforms. However, the difficulties that teachers and newcomers face, such as online learning, distance training, and continuing with exercise, have evolved into a remedy for this massive global pandemic (Adams et al., 2018). For trainees and instructors, transferring from traditional face-to-face to online training is exceptional, given the lack of options. They are under pressure to transform into a machine they are unprepared for. Thus, two (2) sub-sections—the influence on the educational and training environment and the impact on teachers and students—will illuminate this part.

### *The Impact on the Education Environment*

Schools, institutions and universities have been closed because of the COVID-19 pandemic, which has had an unintended ripple effect on students, parents, and educators worldwide. In these trying times, educational institutions seek to preserve a high level of education for everyone as governments, frontline staff, and health authorities battle to prevent the spread (Krishnan et al., 2020). They continued by saying that many pupils had gone through psychological and emotional turmoil and could not communicate effectively at home or in a communal setting. Many families and concerned authorities chose various approaches to provide their children with a better experience during this challenging period. Due to school closings and rigorous confinement measures, more families have turned to technology and digital solutions to keep kids interested in learning, entertained, and connected to the outside world. However, not all children can access the information, abilities, and tools needed to be secure online (Siti Nurshahidah et al., 2020).

However, using technology for education became the new standard, which prompted various changes in how education was delivered. Several systemic changes have been brought about by the shutdown of educational institutions, most notably in teaching and learning. According to Preeti (2020), it impacted teaching and evaluation methods and learning and education frameworks. She also mentioned how institution closures have impacted learners' learning. To sustain continuity in institutions and universities, one urgent step was required. One such measure was adopting several educational institutions' digital learning tools and platforms. Colleges, especially TVET training institutions, started embracing open-source as a digital learning solution to run online classes while continuing to deliver instruction

through learning management systems (LMS). The pandemic significantly influenced the sector, and higher education is crucial in defining the nation's economic future (Mohamed et al., 2022).

### *The Impact on Educators and Learners*

Movement constraints affected both how students learned and how their learning was measured. The method of delivering lessons, as well as assessment and evaluation, changed due to the lockdown. Due to educational institution closures, several tests and assessments have been postponed or cancelled (Mohammad Izzamil et al., 2021). By adopting online assessment technologies, many colleges and institutions have shifted from traditional classrooms to online classes and from offline to online examinations (Chung et al., 2020). Online assessment tools may have downsides. Online assessment technologies include several things that could be improved compared to traditional measurements (Bibi et al., 2020). However, evaluation and assessment are crucial since they are critical components of education that gauge the success of learning. Additionally, it provides reliable data that employees can use to compare prospects when hiring graduates. Burgess and Sievert-sen (2020) demonstrated how employers evaluate candidates using educational credentials like grade point averages and degree categories. Thus, the lockdown had an impact on how recent graduates were hired.

As candidate outcome disturbances rise, the effectiveness of new graduates' matching (matching recent graduates with the target market of job specifications) is deteriorating, leading to higher employment separation rates and slower wage development. Preeti (2020) says this is costly for the individual and the community. Furthermore, it is challenging to monitor students' online course behaviour and ensure that they are not engaging in academic dishonesty (Basilaia & Kvavadze, 2020). Online performance testing, practical tests, and laboratory exams are impractical to emphasize the issue further. Tests and evaluations may be challenging for students without internet access (Sahu, 2020).

## E-Learning

Shahzad et al. (2021) claim that artificial intelligence and other technological advancements have turned traditional education into current learning. Therefore, "e-learning" refers to a broader range of technology-based learning methods, including websites, learning portals, video conferencing, YouTube, mobile applications, and numerous other free blended learning websites. However, any information system's users determine its effectiveness (Almaiah et al., 2020). E-learning improves students' knowledge, academic staff's understanding, and professional and industry people's abilities via the Internet (Adams et al., 2018). As a result, in an e-learning system, student acceptance of e-learning is considered a critical success component. Through two (2) sub-sections—e-learning in higher education and the benefits and drawbacks of e-learning for teachers and students—this part will be broadened to encompass a broader perspective.

### *E-Learning in Higher Education*

Students on and off campus can take online courses at most higher education institutions. The government of Malaysia, which makes significant investments in higher education, is an excellent example of this. Massive Open Online Courses (MOOCs) are reportedly being used by Malaysian universities, colleges, and polytechnics to support online teaching and learning. According to Radha et al. (2020), the online education market is expected to grow at an annual rate of 16.4 per cent between 2016 and 2023. They predicted that in the next ten to fifteen years, university teaching and learning paradigms would change as a result of the internet's exponential growth. Although virtual education is frequently discussed, every educational institution—established or yet in the early stages of development—in every nation faces difficulties getting users to use and embrace it. Since the necessary progressive stages have already been reached, as Almaiah et al. (2020) stated, developed nations are likely to be less concerned about their learners' motivation to adopt and employ e-learning systems. Due to the digital gap in developing countries, the challenges associated with establishing e-learning systems continue to exist (Almaiah et al., 2020).

### *The Benefits and Challenges of E-Learning to Educators and Learners*

With the aid of e-learning, educators can reach a wider audience and effectively communicate their message to their intended audience (Ab et al., 2022). This ensures that all students receive the same instruction when employing this kind of instruction. However, due to difficulties in its practical application, e-learning has yet to attain parity in stature across geographical boundaries. Despite the prevalence of online learning, specific demographic segments purposefully shun it, mainly due to a false

perception (Doucet et al., 2020). Despite the rising popularity of online courses, most students still opt for traditional classroom education, claim Krishnan et al. (2020). Physical classroom instruction is more natural than online learning, and students can debate, reflect, and discuss with their professors and classmates. As a result of their findings, they concluded that in-person education is essential for practical learning because e-learning may, at any time, run into unforeseen technology issues. Additionally, a reliable internet connection with a high bandwidth connection is required for all forms of online learning. Due to a significant lack of connections and energy, it is only sometimes successful. Due to a lack of the necessary infrastructure for online courses, e-learning is less developed in rural areas than urban ones. As a result, students cannot attend virtual classrooms (Mohammad Izzamil et al., 2021). Due to the pandemic, however, e-learning is more prevalent today, and many nations are attempting to adopt it to guarantee learning continuity.

When universities and schools were shut down due to the pandemic, e-learning systems allowed schools and colleges to continue to provide instruction to students (Subedi et al., 2020). It is essential to evaluate and support staff and student readiness as they adjust to new developments. Learners with a fixed perspective find it challenging to adapt and adjust, whereas those with a growth mindset are more open to changing their learning environment. Due to the diversity of academic fields and their demands on learners, there is no one-size-fits-all model for online learning. Different approaches to online education are required for many disciplines and age groups (Doucet et al., 2020). Additionally, online learning allows students with physical disabilities to study more independently in a virtual environment requiring less mobility (Basilaia & Kvavadze, 2020).

## Challenges in E-Learning

### *Lack of ICT Infrastructure and Support*

The current literature review identified several obstacles to implementing an e-learning system. The challenges can be divided into four groups, according to Almaiah et al. (2020): a) technology challenges, b) individual challenges, c) culture challenges, and d) course challenges. It is found that these issues differ significantly among nations due to various cultures, settings, and levels of preparedness. For instance, inadequate network infrastructure, lack of ICT expertise, and lack of content production were the main obstacles to adopting e-learning systems in developing countries (Aung & Khaing, 2015). According to another study, the main barriers to the effective adoption of e-learning systems in Pakistan include system characteristics, internet experience, and computer self-efficacy (Kanwal & Rehman, 2017). Similar research was conducted in Kenya, where it was found that there were three significant obstacles to e-learning: lack of ICT infrastructure, lack of technical expertise, and financial constraints (Tadesse & Muluye, 2020). According to a study by Rahim and Chandran (2021), inadequate interface design, lack of IT skills, and insufficient technical support are the main obstacles preventing the effective implementation of existing e-learning programs.

According to a study by Aboagye et al. (2020) cited by Heng and Sol (2021), the main obstacles to implementing e-learning are technological infrastructure, digital competence, socioeconomic factors, assessment and supervision, heavy workloads, and compatibility. As a result, technical proficiency, technological infrastructure, lack of content production, and individual and cultural variations are the most frequent issues encountered when using e-learning. Heng and Sol (2021) also noted that Southeast Asian learners faced a significant barrier due to a lack of internet access. However, the region's problems are more comprehensive than those involving the Internet. The learning environment at home was shown to be the biggest obstacle in a study done in the Philippines (Barrot et al., 2021). Similar to this, Malaysian research by Bibi Noraini and Jihan (2020) revealed six major obstacles that universities, teachers, and students must overcome when implementing e-learning methodologies: ICT infrastructure, necessary online skills, platform security, lecturers' and students' motivation when using the online method, and context-specificity.

### *Lack of Budget and Funding in Some Higher Institutions*

The challenges frequently addressed in e-learning are accessibility, cost, flexibility, pedagogy, lifelong learning, and educational policy (Alkhezzi & Ahmed, 2020). The availability of digital devices and internet access are significant problems in many countries. Online education exposes the learner to increased screen time, even if economically disadvantaged pupils in many poor countries cannot afford it (Hove & Dube, 2021). Offline activities and self-exploratory learning have consequently become

crucial for students. They continued by saying that parental guidance is another problem, especially for young students and when both parents work. Physical workplaces conducive to different learning modalities raise practical issues since they could find it challenging to include online learning resources (Bibi et al., 2020). Compared to more traditional modalities of instruction, institutions will need to budget for both per-learner and overall costs related to online learning. Prices may become more tolerable if courses can be spread out over a broader learner population (Ab et al., 2022). By pressuring students and parents to buy any necessary multimedia equipment for online education, such as PCs, laptops, printers, or scanners, a school may shift some costs to them (Bozkurt et al., 2020). However, specific locations have restrictions on internet access, adding to the difficulties.

### *Challenges among Educators*

Due to a dearth of computers, internet access, mobile network access, and ICT-trained teachers in developing nations, educators and students may face some difficulties, including familiarity with online tools, the ability to maximize the benefits of the medium, teachers' availability during times of need, and the ability to provide feedback and prompt responses from students (Morgan, 2022). As teachers, they encounter many difficulties with e-learning, such as limited experience with platform setup (for example, Zoom Meetings, Google Hangout Meet, Telegram, and Google Classroom), worries about student participation, lack of assessment techniques for determining course learning outcomes, and lack of experience creating e-content (Zhu et al., 2018; Bozkurt et al., 2020). Teachers are also worried about students' devices and internet access when they take online classes. The technical issues that students face while taking part in activities—such as the need for an email to register for a new account, the inability to explore the platform's tools, and the inability to search for uploaded assessments—send educators into a panic (Bozkurt et al., 2020).

Additionally, Abdul Rahman et al. (2021) observed in their study during the Malaysian Movement Control Orders that teachers' failure to increase and maintain student participation is a challenge specific to online learning. They also emphasized that the most challenging part of online learning was engaging and recruiting pupils. This was also noted earlier by Ab Wahab and Mohamad (2022), who talked about the lack of participation from the teacher's perspective. They argued that when teachers cannot see their students' faces, they cannot recognize signs of attentiveness or inattention and cannot act quickly to assist.

Researchers Bibi Noraini and Jihan (2020) found that instructors confront six (6) significant obstacles to online learning, including the following: In residential colleges, students abandoned learning tools like books and laptops because they were less focused on online learning, the platform or medium of instruction was unsatisfactory, and students' internet access was so poor that lectures had to be prolonged past their scheduled times. There were four (4) methods for getting beyond these challenges. 1) Institutions should offer more thorough e-learning platforms for students who wish to learn online; 2) students and teachers should have appropriate internet access to guarantee a seamless and continuous online learning experience; 3) teachers should attend workshops or training sessions on managing online courses and 4) the number of students per group in practical classes should be low enough to accommodate ten.

### *Challenges among Learners*

Numerous earlier studies have looked at various challenges learners and instructors face. Students faced administrative issues, social interaction, academic and technical aptitudes, motivation, time restraints, limited resource access, and technology challenges (Barrot et al., 2021). The lack of online student discipline, faculty reluctance, and the high costs associated with online production and distribution were among the challenges students faced when pursuing online education (Shahzad et al., 2021). These challenges are similar to those found in earlier studies, such as unclear roles and responsibilities, delay in obtaining feedback from teachers, lack of technical support, reliance on technology that is too great, and low student performance and satisfaction (Chung et al., 2020). As students regard themselves as an online component, challenges may arise from a lack of motivation, alienation, and isolation (Sahu, 2020). Through social media platforms, including Facebook, WhatsApp, WeChat, and email, learners believed it less engaging than other kinds of instruction, unwelcoming to learners, and insufficiently interactive to develop a sense of connection with teachers and peers (Haleem et al., 2020). Students' attitudes, human resources, time constraints, lecturer self-efficacy, and technology challenges have all been noted as problems (Zhu et al., 2018).

The coronavirus lockdown may cause people to feel tense, dreadful, and anxious, including fear of passing away or the passing of their loved ones (Sahu, 2020). This stress could harm the students' emotional and physical health. The pandemic may have negatively impacted learners' careers or prevented undergraduate students in higher education from graduating this year (Niranjan, 2020). According to Haleem et al. (2020), not all learners will interact favourably with online learning platforms and apps because some users may be more active than others and take longer to become used to the technology. Some challenges they now encounter include losing their sense of social connection and finding it challenging to form the study groups they once loved. While distance education can be helpful during a pandemic, some forms of it lack interaction between students and educators, which has been a significant issue, claims Tümen (2020), who conducted a study titled "College Students' Views on Pandemic Distance Education: A Focus Group Discussion". According to the statistics, most points of view indicated worry about the adverse impacts of virtual education on students' learning, including a loss of connection, issues with communicating with teachers, tests, assignments, time management, and traditional educational traditions. Most study participants lamented not having enough opportunities to question teachers. Parallel to this finding, the researchers found that students had to wait until they had another interaction with the lecturers to ask questions as they came to mind (Ab Wahab & Mohamad, 2022).

## Methodology

### Research Design and Instrument

Because no previous comparative study on this topic had been undertaken in TTIs in Bhutan, this study aimed to determine the contributing factors that affect the outcome of online classes and get fresh insights. Because the information available was limited, an explanatory investigation research design was chosen. The study was conducted using a descriptive survey questionnaire, as this method provides a breadth of coverage.

For this study, the authors formed two short surveys: one for the trainers and the other for the trainees. The five-point Likert scale questionnaires were developed from the literature review, and their reliability was tested with Cronbach's alpha. The trainees' questionnaire had a Cronbach alpha score of 0.744. The first part of the questionnaire required respondents to fill in demographic data—and the second part intended to collect data on online class perspectives. The trainees' survey questionnaire contained 29 closed-ended Likert scale questions on various aspects of online teaching and two open-ended questions. Similarly, the trainers' survey questionnaire contained 64 closed-ended Likert scale questions on numerous elements like course, personal, trainees, and perceived satisfaction and barriers.

### Population and sample

Survey respondents were limited to trainees and trainers who had the experience of attending and taking online classes introduced recently as per the institute's contingency plan during the COVID-19 lockdown. Therefore, 119 trainees and ten trainers were the targeted populations selected through a non-random sampling strategy to acquire the lived experience of online classes introduced at Technical Training Institute Samthang from 2019 to 2020.

### Data Collection and Analysis

The researchers collected the data using Google Forms amidst ongoing online classes and the nationwide lockdown in Bhutan. The data collection was administered through the use of Google Forms. Researchers designed survey questionnaires using Google Forms and shared them with trainers and trainees through Google Classroom, WhatsApp, Telegram groups, and email.

Collected data were analysed using the STATA-13 software package with descriptive statistics like frequency and percentage. The study was then displayed and interpreted according to trainers' and trainees' perceptions of recent online classes.

## Results

The survey was done to understand the experience and perception of trainers and trainees about the recently introduced online teaching mode due to the pandemic. The survey results were divided into the trainers' and trainees' perceptions of online classes. The results for both were discussed separately.

### Participants' demographic

A total of 20 teachers and 119 students participated in the survey. For the teachers' survey, 13 teachers completed the entire survey, i.e. 65% of the total sample, whereas, for the students, 80 completed the whole survey, i.e., 67.22% of

the total sample. Hence, only 13 teachers and 80 students' data were considered for the analysis. Of the 13 teachers considered for the study, 69% were male, and 31% were female. Regarding trainees, 74.07% were male, 24.69% female and 1.23% of the population preferred not to disclose their gender.

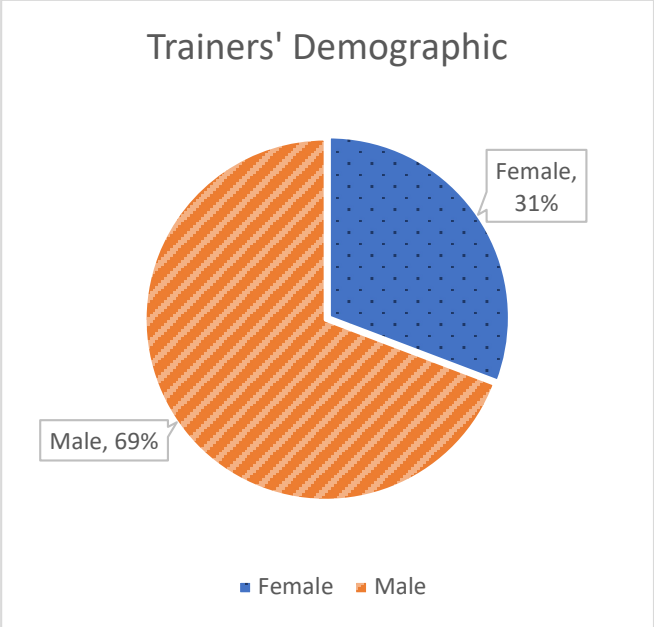


*Figure1.a: Total* Participants:20, Males 69% and females 31%.

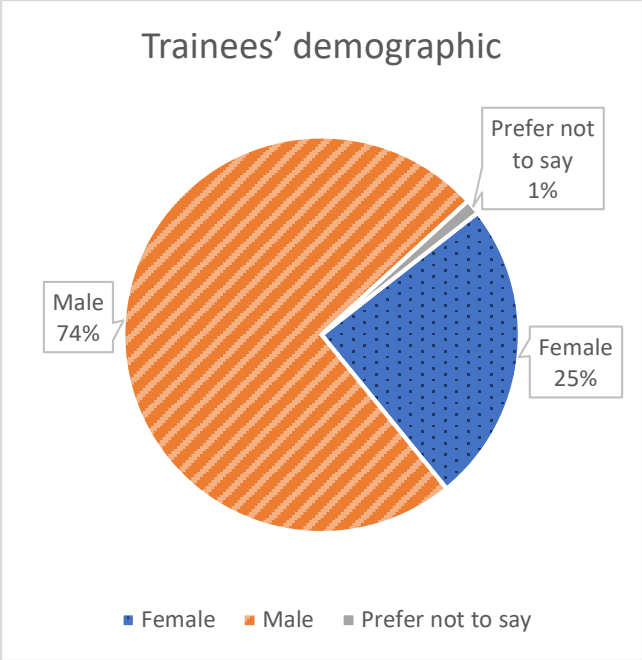


*Figure1.b: Total* Participants:119, Male 74% and Female, 25% and 1% Preferred not to say their sex.

## The most preferred online platforms

The most common online platform the trainers found convenient is Google Meet (23.91%), followed by those listed in Figure 2. Figure 2 indicates that Google Classroom and Zoom were the most commonly used for online classes after Google Meet. WhatsApp and Telegram were primarily used to send assignments and carry out class tasks, as they can be referred to after the course.

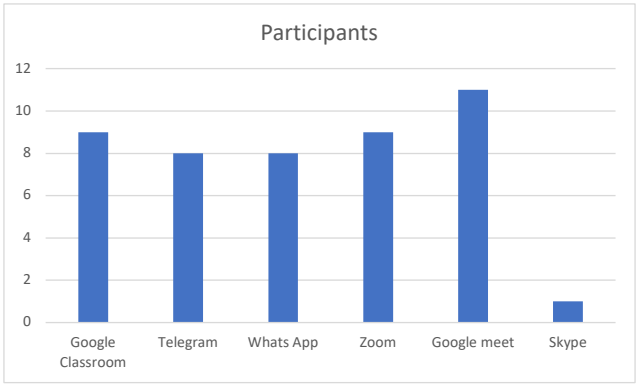


*Figure 2:* Trainers were asked to select the online platform they are most comfortable with and it was found that Google Meet is the most favorable for online teaching (~24%). On the other hand, skype (~2%) is less popular amongst the trainers.

## Trainees' perception of the quality of online teaching

The student survey had items assessing three dimensions: the quality aspects of online teaching, perceived satisfaction, and personal factors that affect online teaching. In the quality aspect of online teaching, 33% of the trainees involved in the study remarked that online classes are more effective than traditional classroom teaching, and 27% believed that online classes are ineffective. Around 68% of the respondents felt online courses needed more interaction. Similarly, 29% of the sample disagreed that online classes were more convenient than the classroom teaching method, while 25% agreed it was more convenient. Regarding the quality of discussion, 58% said that the quality of debate in online teaching was low, whereas 20% agreed that the quality of discussion in online teaching was higher. Significantly, 76% of the participants believed that the technical issue majorly disrupts online teaching flow and pace. The other factors attributed to the low quality of online teaching were the low level of knowledge transfer (38%), less structured than classroom teaching (53%), challenging to clarify doubts (53%), and teacher designing teaching learning materials

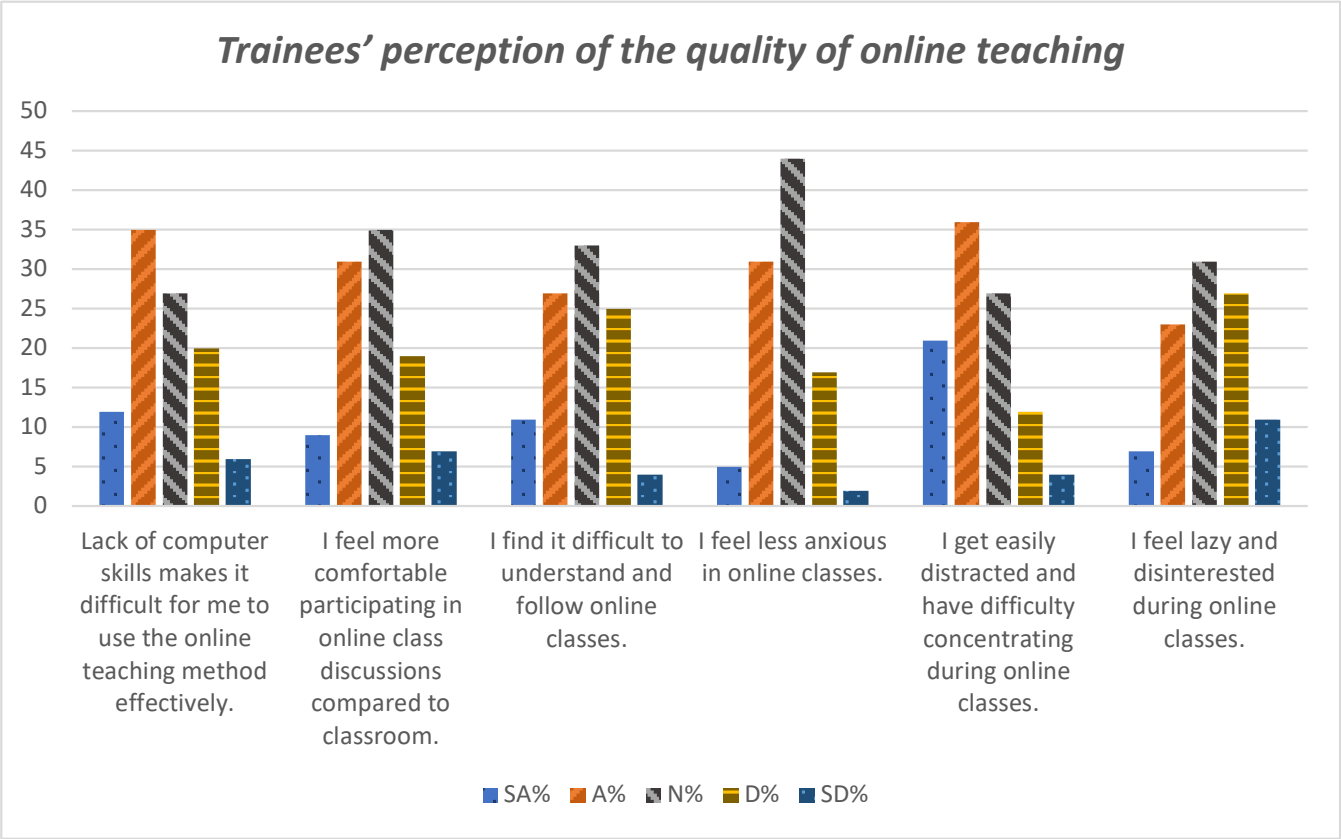


*Figure 3:* The figure above shows the perception of trainees on the quality of online teaching initiated in TTI Samthang during the COVID-19 lockdown. SA=Strongly Agree, A=Agree, N=Neutral, D=Disagree, SD=Strongly Disagree

were not interesting (78%). The other factor that made online teaching successful was that the data package provided by the management benefited them more (87%). 63% of the sample agreed that online education saves time.

## Trainees' perception of personal factors that affect online teaching

Looking at Figure 4, trainees perceived that personal factors have a more significant impact on the success of online teaching. Things such as lack of computer skills making it difficult, finding it difficult to understand, feeling less anxious in online classes and feeling lazy and disinterested during online classes were some prominent factors impacting the effectiveness of online classes. Even though today's generation is well-versed in technology, the survey showed that most of the sample reported that they lacked computer skills, which made it uncomfortable for them to use online channels.

## Perceived satisfaction

37% of the trainee respondents felt satisfied by online teaching, while 29% were not. This indicated that the satisfaction level of trainees on online teaching could not be confirmed. There were many reasons for not being satisfied with online teaching, such as lack of advanced gadgets in online classes (57%), lack of solid internet connection (71%), and distraction at home deterring online participation (55%). The sample also agreed that the absence of personal phones /laptops hindered online teaching (72%). See Figures 5a and 5b.

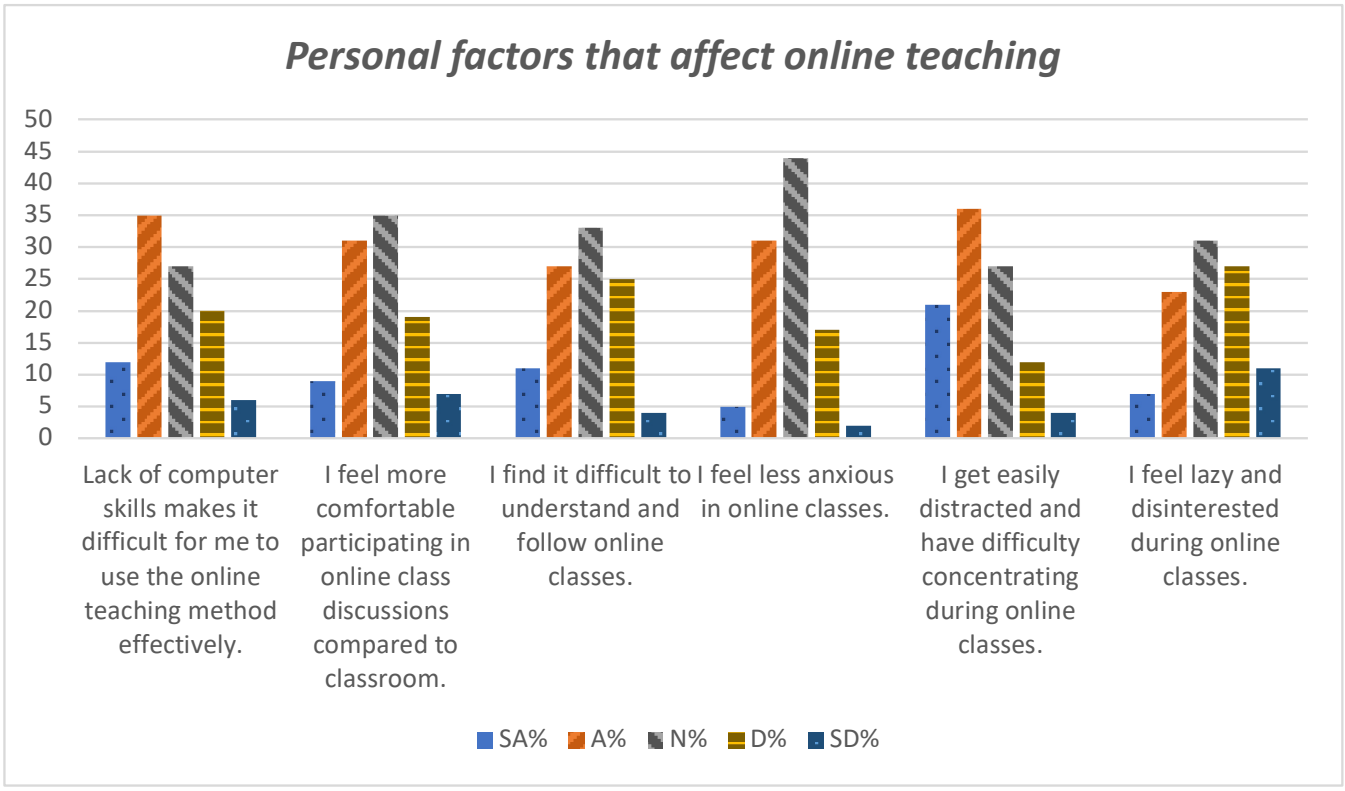


*Figure 4:* The figure above tells the impact of personal factors on the online teaching SA=Strongly Agree, A=Agree, N=Neutral, D=Disagree, SD=Strongly Disagree

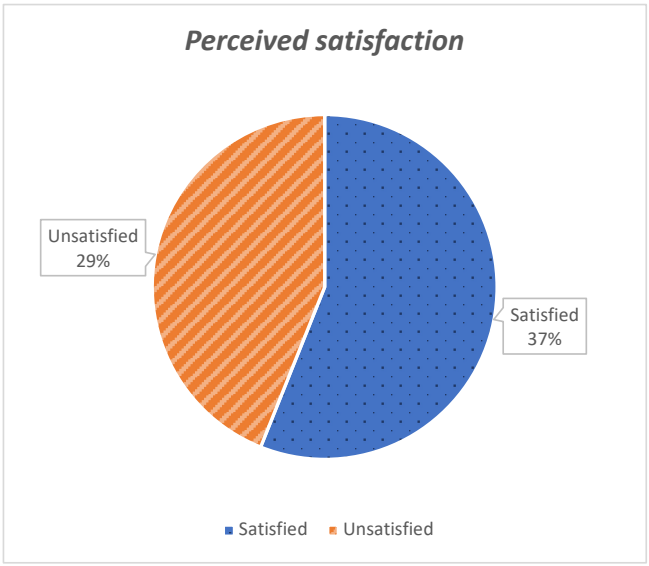


Figure 5a: The figure above indicates the satisfaction and dissatisfaction levels of online teaching.

## Personal factor of the trainer

Similar themes were used to collect data from the trainers involved in online teaching to compare their perceptions to the trainees'. Figure 6 expresses mixed perceptions like that of the trainees. An equal weighting of the trainers (38.5%) each believed they needed more computer skills to teach online more effectively. Trainers also felt that online classes make them self-conscious about their teaching. 38.5% felt that online teaching boosted their confidence level as teachers. 53.8% of the trainers felt satisfied with their online teaching experience.

## The Trainees' Personal Factor

It was ascertained that the trainees' personal commitment played a vital role in the success of online teaching. 84.6 % of the trainers agreed that trainees do not take online classes seriously. A similar percentage (84.6%) agreed that trainees make many excuses for not attending online classes. More than 61% said trainees lacked interest and involvement during class. Almost 70% of the trainers expressed that the trainees' home environment negatively affected online classes. See Figure 7.

## Barriers to online teaching

Concerning Table 1, which shows the twenty perceived barriers that hindered the successful implementation of online teaching in TVET institutions, most trainers (76.9%) perceived that insufficient skills to take advantage of new

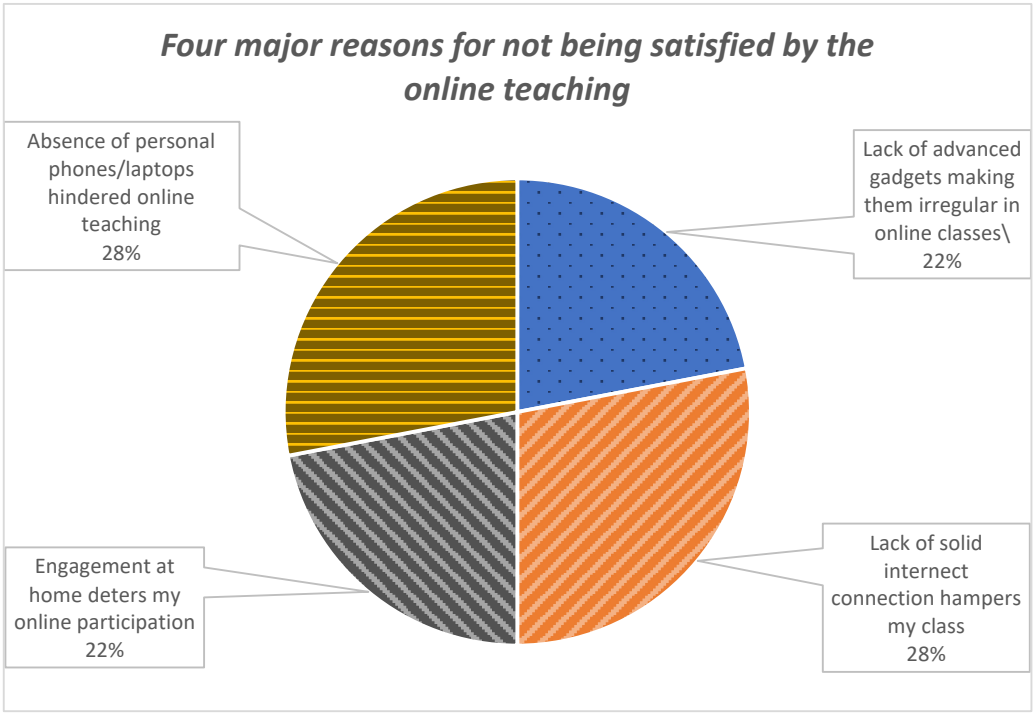


*Figure 5b.* The figure 5.b portrays the four major reasons for not being satisfied by the online teaching

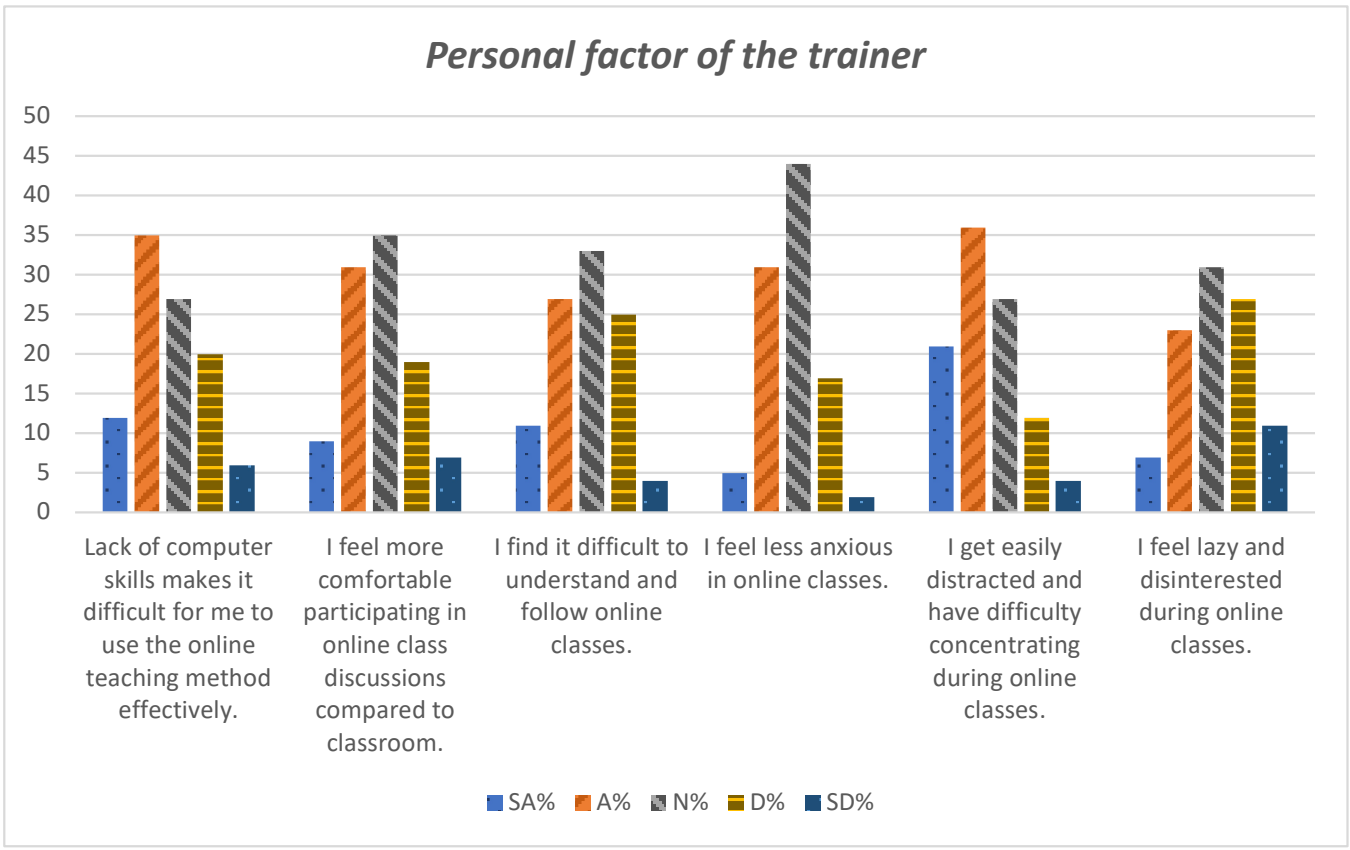


*Figure 6:* The figure above shows the trainers' personal factors that contribute to the success of the online teaching. SA=Strongly Agree, A=Agree, N=Neutral, D=Disagree, SD=Strongly Disagree

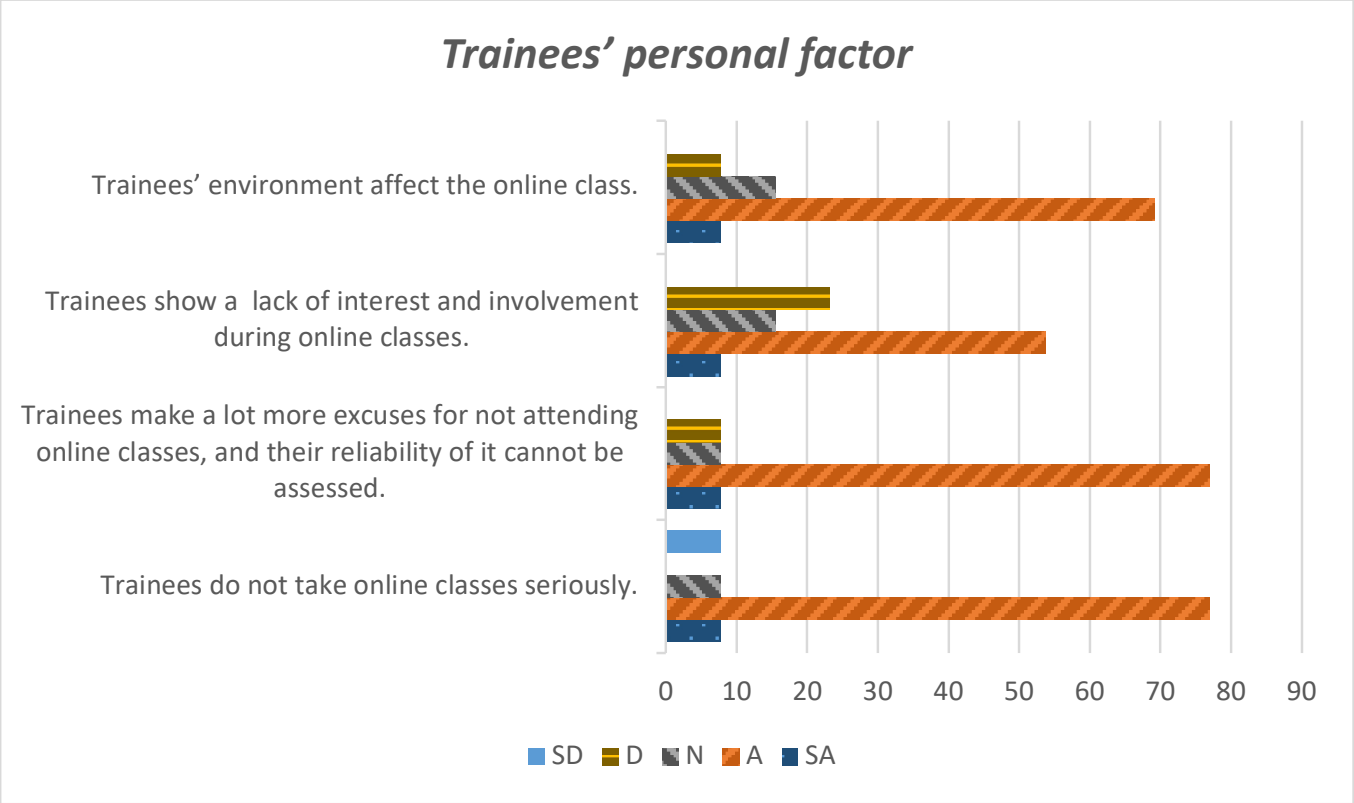


*Figure 7:* The figure above describes how personal factors play a pivotal role in the success of online teaching. SA=Strongly Agree, A=Agree, N=Neutral, D=Disagree, SD=Strongly Disagree

technologies restricted online teaching. About 77% agreed that the lack of high-speed bandwidth connection is a significant challenge, and 53.3% disagreed that the inability to work with computers is a drawback or hindrance. Further, more than 69% expressed concern about the effectiveness of online learning assessments. The other barrier to the problem was eye strain due to constantly sitting in front of laptops or cell phones.

| No. | Statements | SA% | A% | N% | D% | SD% |
|---|---|---|---|---|---|---|
| 1 | Need for more skills to take advantage of new technologies. | 7.7 | 69.2 | 23.1 | 0 | 0 |
| 2 | The lack of modern gadgets impedes learning. | 23.1 | 38.5 | 30.8 | 7.7 | 0 |
| 3 | Lack of high-speed bandwidth /Connectionwithin campus. | 38.5 | 38.5 | 23.1 | 0 | 0 |
| 4 | Classroom discussions were more challenging to participate in. | 15.4 | 53.8 | 15.4 | 15.4 | 0 |
| 5 | Learner-to-learner interaction is more difficult. | 23.1 | 46.2 | 23.1 | 7.7 | 0 |
| 6 | Assessment of learning is difficult. | 15.4 | 53.8 | 15.4 | 15.4 | 0 |
| 7 | More hard work due to intensive assignments and pressure to maintain deadlines. | 7.7 | 38.5 | 38.5 | 15.4 | 0 |
| 8 | Learners are not responsible for their learning. | 15.4 | 23.1 | 30.8 | 30.8 | 0 |
| 9 | Personality development is not possible due to no direct interaction with co-learners. | 15.4 | 46.2 | 23.1 | 15.4 | 0 |
| 10 | Less creativity and innovation ability due to less interaction with instructors. | 15.4 | 30.8 | 30.8 | 23.1 | 0 |
| 11 | Sense of loneliness and isolation when not actively involved. | 7.7 | 53.8 | 7.7 | 30.8 | 0 |
| 12 | Lack of required skills has an impact on learning. | 7.7 | 53.8 | 30.8 | 7.7 | 0 |

| No. | Statements | SA% | A% | N% | D% | SD% |
|---|---|---|---|---|---|---|
| 13 | Availability of proxy links for assessment can lead to academic dishonesty. | 15.4 | 46.2 | 30.8 | 7.7 | 0 |
| 14 | Concerns about the effectiveness of online learning and assessment. | 15.4 | 53.8 | 23.1 | 7.7 | 0 |
| 15 | Lack of supportive culture in the institution. | 7.7 | 15.4 | 38.5 | 38.5 | 0 |
| 16 | Inability to work with computers. | 0 | 7.7 | 38.5 | 46.2 | 7.7 |
| 17 | Insufficient computer and Internet skills. | 7.7 | 23.1 | 23.1 | 46.2 | 0 |
| 18 | Anxiety or stress related to technology. | 7.7 | 15.4 | 46.2 | 30.8 | 0 |
| 19 | Concerns of privacy or confidentiality online. | 7.7 | 15.4 | 46.2 | 30.8 | 0 |
| 20 | Physical health barriers such as eye strain. | 23.1 | 30.8 | 30.8 | 15.4 | 0 |

*Table 1:* The table above indicates the perceived barriers to online teaching in technical institutions.

## Discussion

It was interesting that trainees did not favor online teaching as they felt it could have been more effective than face-to-face teaching. It is reported that little more than 38% believed that online teaching is effective. It is also reported that the negative aspect of online teaching is attributed to the low level of knowledge transfer (38%), less structured than classroom teaching (53%), challenging to clarify doubts (53%), and teacher designing teaching learning materials not being interesting (78%). Similarly, more than half of trainers (53.8%) involved in online teaching were satisfied with online teaching. Sinhal, 2017, cited in Wangdi et al., 2021, argue that technology will find it hard to replace classroom teachers because it does not promote collaborative learning, depriving students of gaining social and organizational skills. The physical presence of a teacher promotes interactive learning that can excite and stimulate students' learning. In addition, a study conducted by Kaur et al. 2020 as cited in Wangdi (2021), reported that online learning is inferior to classroom teaching, so students were not satisfied with online learning. Harmoniously, the study conducted by Sintema, 2020 cited in Pokhrel & Chhetri (2021), found that the level of academic performance of the students is likely to drop for the classes held for both year-end examination and internal examinations due to reduced contact hours for learners and lack of consultation with teachers when facing difficulties in learning/understanding. In contrast, a study by Wangmo et al. (2020) discovered that students identified the interaction with teachers and peers as the most prominent factor that provided learning coupled with e-learning. Most of the students have a positive perception of e-learning and its benefits.

On the contrary, a study conducted in the Bhutanese education system by Wangmo et al. (2020) found that 81% of the sample agreed that e-learning was beneficial and was an interactive strategy. Similarly, 29% of the sample disagreed that online classes were more convenient than the classroom teaching method, while 25% agreed it was more convenient. Regarding the quality of discussion, 58% said that the quality of discussion in online teaching was low, whereas 20% agreed that the quality of discussion in online teaching was higher. Overwhelmingly, 76% of the participants believed that technical issues majorly disrupt the flow and pace of online teaching. The other factors attributed to the low quality of online teaching were the low level of knowledge transfer (38%), less structured than classroom teaching (53%), challenging to clarify doubts (53%), and teacher designing teaching learning materials not being interesting (78%). The other factor that made online teaching successful was that the data package provided by the management benefited them more (87%). Overwhelmingly, 63% of the sample agreed that online teaching saves time. The trainees' personal attributes significantly impact the success of online teaching. Lack of computer skills, getting easily distracted, and feeling laziness during online classes were some of the significant personal factors that the study reported. Thus, the findings of this study are in tandem with the previous study, where online teaching, especially in the Bhutanese context, is more challenging due to the lack of online teaching infrastructure and the non-participatory nature of students (Pokhrel & Chhetri, 2021).

Although COVID-19 allowed trainers to experience various online teaching platforms such as Google Classroom,

WhatsApp, Telegram, Zoom, Google Meet and Skype, almost all the trainers involved in online teaching preferred Google Classroom as the most helpful and convenient online platform. A study conducted by Nambiar (2020) shares a similar finding. He reported that 81.1% of their teachers used Zoom, followed by Google Classroom with 18.5%.

Although the COVID-19 outbreak has given room for the new paradigm shift in teaching pedagogy (online teaching), some issues and challenges have been encountered amid the first-ever online teaching in TVET institutions.

Most trainees and trainers were deprived of modern gadgets, and the internet speed impeded online teaching-learning. Further, online teaching in TVET institutions was aggravated by the lack of technological know-how to use online teaching interfaces and apps. Technical skill was one of the critical factors for the satisfaction of online teaching. In their study, N. Wangdi et al. (2021) reported similar findings. Teachers play an instrumental role in transforming traditional classroom teaching into online digital learning in a desperate time when the education system worldwide has collapsed due to the coronavirus. However, it is revealed that teachers failed to live up to the expectations of the students. Teachers were found incompetent in designing interesting lessons and making them available online for students to learn. This finding corroborates with N. Wangdi et al. (2021) study, which reported that teachers did not have appropriate digital skills to manage online classes.

One prominent issue that online teaching in TVET faced was the credibility of the assessment system. It was reported that online assessment is complex and challenging for trainers and learners. This finding closely concurs with Pokhrel and Chhetri's (2021) findings. The study found that timely feedback and accurate evaluations are crucial for learning. The capacity to provide online learners with timely feedback and effective formative evaluations is a critical component of online distance learning. The educational system and instructors find this to be difficult. Due to bigger class sizes, lack of online teaching infrastructure and professional development, and students' lack of participation, it is more difficult in the Bhutanese environment.

The study also discovered a few disadvantages of online teaching. The result vividly claimed that online learning could not use the pedagogy that is currently available and used for in-person instruction. Digitally illiterate teachers need sufficient professional development and training to focus on their students, even if various pedagogies have been developed for online and distance learning.

The survey also identified some advantages, including requiring teachers and students to learn new skills and adapt to new technology. This has raised their digital literacy and improved their capacity to use technology. It made it possible for students to carry on their education even while schools and institutions were closed. Students have more flexibility to learn at their own pace and at a time that works for them when they participate in online teaching and learning. This has dramatically helped students with other commitments, such as employment or family responsibilities. For students who might not have been able to attend conventional schools or universities owing to distance, a handicap, or financial limitations, it has increased access to education. Both students and educational institutions have found online instruction to be more economical.

Despite many advantages, a few disadvantages need consideration for future study. Online learning can alienate students who are used to interacting with peers and teachers in person. Social isolation and mental health problems can result from a lack of interpersonal engagement. Technology is a crucial component of online education, and technical problems like a poor internet connection, a malfunctioning computer, or a software bug can hurt the learning process. It might be challenging for teachers to give each student individualized attention in an online learning environment. Students who require additional assistance or support may find it difficult. Students not accustomed to self-directed studies may struggle to remain motivated in an online learning environment.

## Conclusion

Globally, the COVID-19 pandemic has impacted the education sector, and many institutions now confront difficulties due to this unexpected outbreak that established a new standard of almost complete integration of technology into daily life, notably in educational institutions. On the plus side, this pandemic has given everyone the chance to investigate and push the limits of TVET institutions all over the world to improve their teaching methods and infrastructure. In this study, the researchers focused on how COVID-19 affected the TVET education system from the perspectives of the learning environment

and relationships between teachers and students. Additionally, there are some difficulties that trainers and students encounter when teaching and learning online, such as lack of facilities, lack of technical skills, lack of social interaction between students and teachers, poor internet connection, issues with motivation on both sides and challenges with assessing and evaluating students. Therefore, the government must address these challenges to rehabilitate the impacted education system.

The abrupt virus outbreak had a profound effect on the educational system as well as the environment as a whole. To summarize the paper's conclusions, it was discovered that numerous earlier research studies emphasized the effect of COVID-19 on the educational system, which led to issues and difficulties with online learning. Movement constraints affected both how students learned and how their knowledge was measured. Due to the restrictions, traditional learning has to make way for online learning as the new standard for instructors and students. The use of technology and digital solutions by more families to keep kids entertained, interested in learning, and connected to the outside world was one of the topics highlighted. However, not all kids have the information, abilities, and resources to stay safe online. The winning side is only sometimes popular in e-learning. Even though e-learning helps teachers accomplish their goals for instruction and aids universities and colleges in facilitating students' learning, it has always been dependent on a reliable internet connection with a high-bandwidth link, and the rural lack of infrastructure required for online courses led to students being unable to attend virtual classrooms. As the emphasis shifts to the evaluation, online practical classes, practical exams, and performance testing are not applicable. Tests and assessments may be challenging for students without internet access. Lack of ICT infrastructure, support among educators and students, and limited money among educational institutions are the main problems in e-learning. Educators' and students' difficulties are interrelated, including the need for computers, internet connection, mobile network access, and ICT-trained teachers.

The conclusions of this study must inform critical authorities, including administrators of educational institutions, employees of the Ministry of Higher Education, and decision-makers. To ensure the success of online teaching and learning, they must create a solid plan and implement strategies to deal with difficulties. To encourage students to embrace online learning, universities and educators must develop programs that inform them of the problems they will face and how to overcome them. University administrators could consider providing training opportunities for lecturers to become familiar with the e-learning systems, expanding knowledge on developing content, and delivering it digitally to improve their online platforms. These steps are essential for preparing stakeholders in the education sector for e-learning and plans for education in times of emergency.

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The authors declare no potential conflicts of interest concerning this article's research, authorship and publication.


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ESSAY*

# Demystifying Organizational Health: What is it and Why Does it Matter?

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**Abstract**
As organizations seek to develop high-level leadership skills, improve employee engagement and work towards long-term growth, the theory and application of organizational health have begun to gain increasing importance both in the business world and in academia. Through a review of existing literature and business reports collated from research databases such as JSTOR and Research Gate, this essay provides an overview of key concepts of organizational health by dismantling commonly held myths on the topic. It emphasizes the role of leadership, growth mindset, creativity, innovation, psychological safety and vulnerability-based trust in this process. Maintaining consistency across these practices is critical to gaining long-term results. Benefits of organizational health include psychologically empowered employees, increased employee engagement, improved communication, strong leadership, higher profits and sustainable organizational growth. The essay concludes with highlighting the need for the development of organizational health within the Canadian context, particularly for marginalized groups.

> "Your role, and everyone's role, is to become a champion of organizational health."
>
> —Rubi Ho, Author of Many Parts, One Body

**The past two decades have seen a growing interest in** measuring the progress of societies. Deloitte's Global Human Capital Trends 2016 report shows organizational structure determines the health of a business at 92%, closely followed by leadership gaps at 90% and culture at 86% (cited in Teamworks, n.d.). At a macro level, these economic factors directly affect the physical, mental and emotional lives of workers.

Below is a list of common myths and debunking of misconceptions about organizational health—some of these may surprise you:

- **Myth**—Organizational health is a function of human resources.


***Essays** advance a new idea, summarize a development, or initiate or engage in discussion. They may be narrower in scope than the above categories, but the subject matter should be of general scholarly interest.

- **Fact—**According to McKinsey (2017), when we consider the well-being of an organization, it goes beyond the roles and responsibilities of a specific department or team. It is about an organization's ability to rally around a common purpose, successfully fulfill its mission, and constantly rejuvenate itself through innovation and creative thinking.
- **Myth**—Organizational health is a one-time initiative.
- **Fact**—The implementation of organizational health initiatives across an organization requires active participation and ongoing engagement by leaders in change processes, taking on board some responsibility for organizational change successes and failures and the ethical manner in which outcomes are achieved (By et al., 2022).
- **Myth**—Organizational health is separate from work performance.
- **Fact**—Findings from a study by Singh (2022) depict that the practice of organizational health and well-being leads to psychologically empowered employees, which in turn creates positive feelings and increases work engagement, contributing towards a conducive work environment, with organizational communication moderating these effects.

From the list above, it can be inferred that key ingredients of organizational health include—a long-term mission/vision, committed leadership, creativity, accountability, transparency and psychological safety. Although leadership plays a key role in this process, it should be noted that the conventional belief that top management teams are the sole drivers of organizational success has been challenged by researchers (Katzenbach, 1997). It has been argued that strong leadership and collaboration should be fostered at all levels of an organization and that high-performing teams can emerge from various parts of the organization.

In addition to the above, data from a study by the Neuro Leadership Institute has demonstrated that leading organizations have successfully integrated a growth mindset into various functions of their organization, such as onboarding, talent acquisition and employee engagement (Grant et al., 2021). Having a growth mindset involves believing in others' skills, potential to develop, and viewing failures as opportunities and redirection. Related to leadership and growth mindset is the concept of power, which typically has a negative association. However, the use of power to develop knowledge, skills and expertise, build stronger relationships and demonstrate emotional intelligence are effective tools in the facilitation of organizational health (NMAC, N.D.).

Given that organizations typically function based on factors such as employee engagement and work performance, a lack of identity safety within the organizational environment is likely to contribute to unsupportive workplace cultures and consequently, poor organizational health. Edgar Schein's theory (cited in Tharp, 2009) on the three levels of culture discusses how organizational culture emerges, evolves and influences various aspects of workplace dynamics.

> "The overall organizational health needs to be measured via employee engagement, culture readiness, business agility, and customer-centricity, etc."
>
> —Pearl Zhu, Author of *Digital Master* (book series)

Furthermore, the practice of vulnerability-based trust in developing a healthy organizational culture is an indicator of strong leadership. It allows for the cultivation of strong relationships by demonstrating the ability to foster relational connection, benevolence and integrity (Auten, 2023). In this manner, vulnerability-based trust is built over time through consistent actions that align with core beliefs, leading to a positive impact on employee engagement and retention, improved communication, increased profits and higher job satisfaction (Auten, 2023).

The use of moral courage and intelligence to practice intelligent disobedience is encouraged to push back against organizational structures that stifle creativity, innovation and change. Janice Charette, the recently retired top bureaucrat in Canada, emphasizes the significance of prioritizing organizational health in the public service to effectively manage crises. Charette highlights the importance of addressing issues related to employee health and well-being, particularly for marginalized groups (May, 2023). There is a need for thorough examination of organizational structures and processes to address work overload and stress while defining priorities for the future of organizational growth and success.

> "Organizational health is the single greatest competitive advantage in any business."
>
> —Patrick Lencioni, Author of *The Advantage*

## Note

*The Office of Research and Innovation welcomes expressions of interest by faculty members to partner with us and conduct research on organizational health as it relates to corporate culture and the new world of work.

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