

The Impact of Introductory Nutrition Courses on Nutrition Literacy, Attention, Wellness, and Food Security Among Domestic and International College Students

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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

This quasi-experimental study assessed the influence of introductory nutrition courses on dietary habits, nutrition knowledge, food security, attention, and wellness among international and Canadian domestic students. Participants were students from a mid-sized public college in Ontario, Canada, enrolled in the Faculty of Health Sciences. The main outcome measures included dietary behaviour, nutrition literacy, food security, attention, and wellness. Two-way repeated measures ANOVAs were used to test the difference in mean outcome measures at the different points in time (week 1 and 14) and between groups (student category). Correlations between these measures and final academic grades were determined. Post nutrition courses, there was a significant rise in nutrition literacy ($p < .05$) and attention ($p < .05$). However, these gains did not correspond to measurable changes in dietary behaviour ($p > .05$). Wellness scores did not significantly increase over time ($p > .05$); however, international students reported significantly higher wellness scores than domestic students at both measurement points ($p < .05$). A negative correlation ($p < .05$) was observed between food insecurity and academic performance. Participation in introductory nutrition courses was associated with improvements in nutrition literacy and attention among both international and domestic students. These findings support the inclusion of nutrition education within post-secondary curricula while underscoring the importance of institutional strategies that address student food insecurity.

Introduction

Education is a key social determinant of health and provides an opportunity to influence health-related knowledge, skills, and behaviours across large student populations (Case & Deaton, 2017; Sasson & Hayward, 2019). However, post-secondary students are increasingly experiencing mental distress (Eisenberg, 2019), and food insecurity, which is defined as the lack of sufficient access to safe and nutritious food required to maintain an active and healthy lifestyle (Laska et al., 2021). These challenges highlight how factors outside the classroom can influence a student's ability to learn and thrive.

International students continue to represent a substantial population within Canadian post-secondary education. Even with recent federal cap policy implementations, Canada hosted 691,215 active study permit holders nationally at the end of 2025, with that number reaching 698,510 by early 2026 (Immigration, Refugees and Citizenship Canada [IRCC], 2026).

Newcomers to Canada, including international students, experience health declines within several years of arrival (Lu & Ng, 2019; Zhao et al., 2010). The decline in health among international students can be attributed to various social determinants of health, including food insecurity, unhealthy dietary behaviours, reduced nutrition literacy, and increased social isolation and loneliness (Kennedy et al., 2015; Lu & Ng, 2019; Zhao et al., 2010). To ground this analysis, dietary behaviour is defined as the frequency, quality, and patterns of individual food intake and dietary habits. Nutrition literacy refers to an individual's cognitive and social skills to access, find, understand, and apply healthy nutrition information. Wellness is defined holistically as a multidimensional state of being encompassing the creative, coping, essential, physical, and social self domains.

International students may be particularly vulnerable to these health challenges because they often navigate additional structural stressors, including academic pressure, financial precarity, and a lack of familiar social networks (Bauch et al., 2023). Research conducted in Canadian post-secondary settings suggests that the transition to independent living within an unfamiliar food environment may be associated with changes in dietary practices, including reduced fruit and vegetable consumption and greater reliance on convenience foods (Pilli & Slater, 2021). These post-migration dietary changes are frequently associated with negative physical health outcomes, including unexpected weight gain and increased fatigue (Alakaam & Willyard, 2020).

Despite evidence that international students experience unique social, cultural, and health-related challenges during their transition to Canada, less is known about whether educational interventions such as introductory nutrition courses have comparable effects across student populations. Examining differences between domestic and international students may provide insight into how nutrition education can be tailored to support diverse learner needs and promote equitable health and academic outcomes. The goal of this study was to evaluate the impact of introductory nutrition

education on nutrition literacy, dietary behaviour, food security, attention, and wellness among domestic and international college students.

One area in which these differences may be particularly important is food insecurity. Given the central role of food access in shaping dietary behaviours and overall wellness, international students may be especially vulnerable to food insecurity due to a range of structural and social factors (Lee et al., 2018). These same factors may also limit access to resources that could mitigate its effects (Farahbakhsh et al., 2017). This vulnerability is driven by distinct structural factors, including significantly higher tuition fees compared to domestic peers (Calder et al., 2016), limits on off-campus working hours under student visa regulations (Alakaam & Willyard, 2020; Calder et al., 2016), currency fluctuations, a lack of established local credit history, and the challenges of navigating local, low-cost, food retail systems (Bauch et al., 2023; Pilli & Slater, 2021).

Food insecurity negatively impacts the dietary behaviour of post-secondary students because lower-cost food is typically lower quality (Shi et al., 2021), negatively impacts health (Bruening et al., 2017; Freudenberg et al., 2019), and is associated with reduced academic success and increased levels of anxiety and depression (Coffino et al., 2021). International students report higher levels of mental health issues, such as anxiety, depression, and stress, compared to their domestic counterparts (de Moissac et al., 2020; Forbes-Mewett & Sawyer, 2019). Despite the importance of mental health support, international students may be less likely to utilize available services because of cultural stigma, language barriers, and limited awareness of support options (Forbes-Mewett & Sawyer, 2019). Poor psychosocial health and reduced attention may be important mechanisms through which food insecurity affects academic performance (Ahmad et al., 2022; McArthur et al., 2018; Raskind et al., 2019). Food insecure students have fewer support systems and experience higher rates of loneliness (Oh et al., 2022), which further exacerbates the impact of food insecurity (Laska et al., 2021) a strong indicator of long-term health issues (Oh et al., 2022).

Nutrition literacy poses another barrier to health equity for many international students (Silva et al., 2023), as some individuals face additional challenges when reading and interpreting food labels due to language (Mansour et al.,

2021) or cultural differences in food systems (Cowburn & Stockley, 2005; Mycek et al., 2020). Nutrition label use can be a positive determinant of more favourable attitudes and healthier dietary decisions among college (Graham & Laska, 2012; Rasberry et al., 2007) and university students (Cooke & Papadaki, 2014). Increasing nutrition literacy can improve dietary behaviour and overall health and wellness (Colatruglio & Slater, 2016) and is a key factor in health promotion (Silva, 2023) and health equity (Salman et al., 2021).

Increased food insecurity and reduced nutrition literacy can lead to nutritional deficiencies that negatively impact physical and mental health (Davison et al., 2017), increase hunger and reduce attention (Lu et al., 2019) and negatively impact academic success. Diet quality is purported to improve mental health (Adan et al., 2019). For example, diets high in fruits and vegetables are associated with increased mental health and wellness (Emerson & Carbert, 2019). Conversely, reduced diet quality negatively impacts mental health and wellness (Agrawal & Gomez-Pinilla, 2012).

Post-secondary education has the potential to promote skill development and positively impact key social determinants of health (food insecurity, nutrition literacy, dietary behaviour). Although several knowledge-based programs, such as short-term classroom lectures, workshops, online learning activities and health promotion programs, have successfully improved nutrition literacy, many studies have been limited by methodological challenges such as small sample sizes, the absence of control groups, and limited long-term follow-up (Brace et al., 2018). Consequently, it remains to be determined whether these educational gains successfully translate into sustained, long-term behaviour change. Furthermore, simply providing nutrition education does not address the broader, systemic basic needs and food security gaps that continue to affect student success (Landry et al., 2024). More research is needed to examine how educational courses affect students' knowledge and attitudes related to social determinants of health and to determine whether these effects vary among student subgroups, such as domestic and international students (Ozone et al., 2020).

While nutrition education research has traditionally focused on health outcomes, this study examines nutrition curriculum as a pedagogical intervention within a broader learning environment. Specifically, it investigates whether gains in nutrition literacy are accompanied by changes in dietary

behaviour, food security, wellness, and attention, recognizing that learning outcomes may be influenced by factors beyond the curriculum itself. Given the distinct social and structural factors shaping student experiences, particularly among international students, the study compares outcomes between domestic and international cohorts to explore how educational interventions intersect with broader social determinants of health. Therefore, the objective of this study was to investigate the impact of introductory nutrition courses on dietary behaviour, nutrition literacy, food insecurity, attention, and wellness among post-secondary students. Given the distinct social and structural factors shaping student experiences, outcomes were compared between domestic and international students.

From a teaching and learning perspective, this study examines nutrition curriculum as a pedagogical intervention situated within broader social determinants of health. By exploring how course-level learning interacts with student wellness and food security, the study contributes to Scholarship of Teaching and Learning (SoTL) scholarship and informs scalable institutional approaches to student success.

Method

Participants

This quasi-experimental study involved existing domestic and international students enrolled full time in the Fitness and Health Promotion (FHP) and Dental Hygiene (DH) programs, specifically those taking introductory nutrition courses; therefore, the students were not randomly selected. As full-time students, participants were concurrently enrolled in other courses across the 14-week semester. The FHP and DH programs are both health-focused disciplines that emphasize health and wellness and combine academic studies with practical components. Students were invited to participate in week 1 and were informed verbally and in writing through the informed consent form that they could opt out without penalty. Both introductory nutrition courses aim to enhance nutrition literacy and address healthy eating and dietary behaviour in alignment with Canada's Food Guide. They provide an understanding of nutrient functions, sources, and utilization by the body, as well as insights into eating behaviours, food classification and selection, and energy balance. The final analyzed sample of 25 full-time health-focused students who completed both baseline (Week 1) and follow-up (Week 14) measures, consisting of 14 Canadian domestic students and 11 international students.

Materials

A demographic questionnaire was administered which included age, gender, and student status (international/ domestic). Reliability of all the subscales of the questionnaires were measured using Cronbach's α , which determines the internal consistency or average correlation of items in the questionnaire to gauge its internal validity (Ravinder & Saraswathi, 2020).

At baseline and following completion of the introductory nutrition courses we assessed the following measures to determine the impact of introductory nutrition courses:

- dietary behaviour (Start the Conversation [STC]; Paxton et al., 2011),
- nutrition literacy (Short Food Literacy Questionnaire [SFLQ]; Krause et al., 2018),
- food security (Household Food Security Survey Module [HFSSM]; Marques et al., 2015),
- attention (Attention Control Scale [ACS]; Judah et al., 2014) and
- wellness (Five Factor Wellness Inventory [FFWEL]; Myers & Sweeney, 2005).

All are valid and reliable assessments (Myers & Sweeney, 2005; Paxton et al., 2011; Quigley et al., 2017; Zwierczyk et al., 2022). The STC is an 8-item simplified food frequency instrument that assesses dietary patterns and behaviours, with higher scores indicating healthier dietary behaviour (Paxton et al., 2011). The SFLQ is a 12-item measure of an individual's ability to find, understand and apply information about healthy nutrition, with greater scores indicating higher nutrition literacy (Krause et al., 2018). The HFSSM is an 18-item questionnaire assessing household food insecurity related to financial constraints, with higher scores indicating greater food insecurity (Marques et al., 2015). The ACS is a 20-item measure of attentional control, with

higher scores indicating a greater ability to focus, direct, and shift attention (Judah et al., 2014). The FFWEL is a 91-item assessment of overall wellness across the creative, coping, essential, physical, and social self domains, with higher scores indicating greater wellness (Myers & Sweeney, 2005). Academic success was evaluated based on the final calculated grade (%) in both courses (see [Table 1](#) for a schematic of the protocol).

Procedure

Students were asked to complete the questionnaires at baseline (week 1) and again following two nutrition courses (week 14). We utilized Microsoft Forms to administer the questionnaires and JASP (Version 0.14.1) to conduct the statistical analysis (Jääskeläinen, 2024). Consent from all participants was obtained in writing, and this research received approval from the institution's Research Ethics Board, following a limited, expedited review.

Data Analysis

Data was analyzed using JASP (Version 0.14.1). To determine the influence of introductory nutrition courses and student category (international versus domestic) on the mean measures (dietary behaviour, nutrition literacy, food insecurity, attention, and wellness) across the two timepoints (week 1 and week 14), two-way repeated measures ANOVAs were employed. These tests assessed for main effects of time (null hypothesis [H0]: There is no change in the mean measure over time; alternative hypothesis [H1]: There is a change), main effects of student category (H0: There is no difference in the mean measure between international and domestic students; H1: There is a difference), and their interaction effect (H0: The change in the mean measure over time does not differ between international and domestic students; H1: The change over time does differ). Homogeneity of variance, a key assumption for ANOVA, was assessed using Levene's test. Correlations between these measures

Table 1: Study Assessments Administered at Week 1 and Week 14

Assessment Item	Demographics	STC	SFLQ	HFSSM	FFWEL	ACS	Final Calculated Grade
Week 1	✓	✓	✓	✓	✓	✓	—
Week 14	✓	✓	✓	✓	✓	✓	✓

“✓” indicates the presence of an assessment item.

“—” denotes that the item is not applicable for that specific week.

and the final calculated grade were assessed to determine the strength and direction of relationships. The primary analysis for these relationships utilized Pearson's correlation coefficient, testing the hypotheses: H0: There is no correlation between the measure and final grade; H1: There is a correlation. Where the assumption of normality was violated, as determined by the Shapiro–Wilk test, the non-parametric alternative, Kendall's correlation coefficient, was used instead, testing the hypotheses: H0: There is no significant relationship between the measure and final grade; H1: There is a significant relationship. Statistical significance for all analyses was set at an alpha level of less than .05. The effect size was determined using Omega squared (ω^2), with values of .01, .06, and .14 signifying small, medium, and large effects respectively.

Results

Demographics

A total of 73 students were asked to participate and complete questionnaires at baseline (week 1) and following the courses (week 14). Only 45 participants completed the baseline questionnaire (response rate = 61.6%), and 25 participants completed both sets of questionnaires (response rate = 34.2%). Participants who had completed week 1 and week 14 questionnaires were included in data analysis (14 domestic students, 11 international students, mean age = 23.4 [$SD = 4.9$]). Participants self-classified as 18 females and 7 males.

Questionnaires—Internal Consistency

All of the subscales of the questionnaires demonstrated a Cronbach's $\alpha > .9$, indicative of excellent internal consistency (Ravinder & Saraswathi, 2020).

Statistical Analysis

The means and standard deviations for all outcome measures at week 1 and week 14, along with the results of the ANOVA analyses, are presented in [Table 2](#).

Significant Findings

Nutrition literacy (Short Food Literacy Questionnaire [SFLQ])

Levene's test for equality of variances was not significant ($p > .05$). There was a significant effect of Time ($F(1, 23) = 9.40, p = .005, \omega^2 = .094$). As shown in [Table 2](#), the average SFLQ measure increased from week 1 to week 14 for both international (3.17 to 3.36) and domestic (3.08 to 3.50) students.

Wellness (Five Factor Wellness Inventory [FFWEL])

Levene's test for equality of variances was not significant ($p > .05$). There was a significant effect of Student Category ($F(1, 23) = 4.91, p = .037, \omega^2 = .075$). [Table 2](#) indicates that international students had higher average FFWEL measures compared to domestic students at both week 1 (78.47 vs. 70.45) and week 14 (80.45 vs. 73.92). There was no significant effect of Time or Time x Student Category interaction.

Attention (Attention Control Scale [ACS])

Levene's test for equality of variances was not significant ($p > .05$). There was a significant effect of Time ($F(1, 23) = 4.75, p = .045, \omega^2 = .023$). [Table 2](#) shows that the average ACS measure increased from week 1 to week 14 for both international (51.82 to 55.00) and domestic (49.57 to 51.50) students. There was no significant effect of Student Category or Time x Student Category interaction.

Non-significant Findings

Dietary Behaviour (Start the conversation [STC])

Levene's test for equality of variances was not significant ($p > .05$). There was no significant effect of Time or Time x Student Category. As shown in [Table 2](#), mean STC scores remained stable from week 1 to week 14 for both international (6.82 to 6.82) and domestic (7.21 to 6.93) students.

Food Security (Household Food Security Survey Module [HFSSM])

Levene's test for equality of variances was not significant ($p > .05$). There was no significant effect of Time or Time x Student Category. Although not statistically significant, [Table 2](#) indicates that mean HFSSM scores trended higher for international students compared to domestic students at both timepoints and trended upwards for both groups from week 1 to week 14 (International: 3.09 to 4.27; Domestic: 1.07 to 2.00).

Measures

Correlation with Academic Success (Final Calculated Grade)

No significant correlations were found between FFWEL, ACS, SFLQ, STC and final calculated grade ($p > .05$).

Household Food Security Module [HFSSM]

There was a violation of normality (Shapiro-Wilk $p < .01$), so we used the non-parametric alternative to Pearson's

Table 2: Mean (Standard Deviation) for Outcome Measures at Week 1 and Week 14 by Student Category and Associated ANOVA Results

Variable (Measure)	Week 1 (International, n = 11)	Week 1 (Domestic, n = 14)	Week 14 (International, n = 11)	Week 14 (Domestic, n = 14)	Significant Effect(s) (ANOVA)	p-value	Effect Size (β)
Nutrition Literacy (SFLQ)	3.17 (0.52)	3.08 (0.37)	3.36 (0.56)	3.50 (0.37)	Time	.005*	.094 (Medium)
Wellness (FFWL)	78.47 (7.91)	70.45 (9.61)	80.45 (9.43)	73.92 (9.28)	Student Category	.037*	.075 (Medium)
Attention (ACS)	51.82 (6.46)	49.57 (8.97)	55.00 (6.53)	51.50 (7.28)	Time	.04*	.023 (Small)
Dietary Behaviour (STC)	6.82 (2.33)	7.21 (2.33)	6.82 (1.17)	6.93 (2.67)	None	>.05	-
Food Security (HFSSM)	3.09 (4.57)	1.07 (1.82)	4.27 (6.33)	2.00 (3.23)	None	>.05	-

Note: Significant differences are indicated by an asterisk ($p < .05$)

correlation coefficient (Kendall's correlation coefficient; Puth et al., 2015). Kendall's (tau) correlation showed a significant correlation between HFSSM (post) and academic success ($\text{tau} = -.33, p = .036$) indicating that as food insecurity increased (i.e., higher HFSSM scores) the final calculated grade decreased (see [Figure 1](#)). There was variability between students in terms of food security status. Sixteen students were classified as food secure, with HFSSM scores ranging from 0 to 1. Three students experienced moderate food insecurity (scores between 2 and 5), while six students reported severe food insecurity, indicated by scores of 6 or higher.

Discussion

From a teaching and learning perspective, the most important finding may not be the increase in nutrition literacy, but rather the absence of corresponding changes in dietary behaviour. Students demonstrated gains in course-related knowledge; however, these gains did not translate into measurable behavioural changes during the semester. This finding suggests that educational interventions alone may be insufficient when students continue to encounter barriers such as food insecurity, financial constraints, or limited access to healthy food. The results therefore highlight the importance of considering student learning within the broader contexts in which learning occurs.

Nutrition Literacy

Participation in introductory nutrition courses was associated with improved nutrition literacy, with a medium effect size. This finding suggests that the courses were effective in achieving a key educational objective: increasing students' ability to access, understand, and apply nutrition-related information. Similar findings have been reported in previous nutrition education research. For example, nutrition education interventions among college students have been associated with improvements in nutrition knowledge and dietary awareness (Brown et al., 2014), while other studies have demonstrated improvements in healthy eating literacy and food-choice behaviours following nutrition education interventions (Jung et al., 2019). Together, these findings support the role of nutrition education in enhancing students' nutrition literacy within post-secondary settings.

However, improvements in nutrition literacy were not accompanied by measurable changes in dietary behaviour. This finding is consistent with previous research demonstrating that increased nutrition knowledge does not necessarily translate into healthier food choices or measurable changes in eating habits (Natour et al., 2021). For educators, this finding suggests that increasing knowledge alone may not be sufficient to influence dietary behaviour. To be effective, nutrition education should be integrated

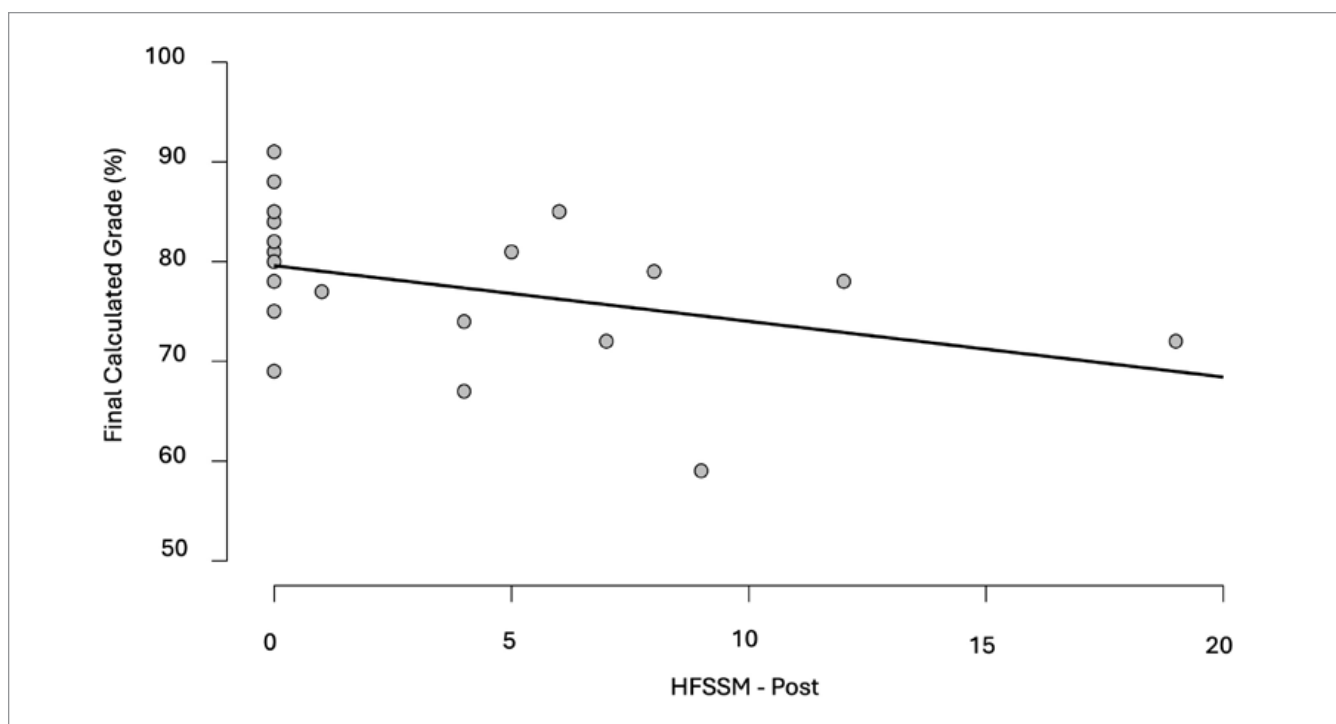


Figure 1: Association Between Post-Course Food Security Scores (HFSSM) and Final Calculated Grade (%).

with strategies that address additional barriers such as cost, access, and food preparation skills. While education improves nutrition literacy, further research is needed to understand its impact on actual dietary behaviours as other variables may impact behaviour change, including poverty and access to resources (Natour et al., 2021).

Attention

To succeed in higher education, students need to develop sustained attention, motivation, as well as the skill to choose and manage effective learning methods (de Boer et al., 2012). Students vary in their ability to maintain motivation and control their learning process, including skills like setting goals, managing time and the environment, and seeking assistance when needed (Barnard-Brak et al., 2010). Our finding of increased attention following nutrition education, with a small effect size, indicates a greater capacity to direct, focus, and shift attention. From a teaching and learning perspective, increased attention may support cognitive engagement, self-regulated learning, and academic readiness, all of which are important contributors to student success in post-secondary education. Our finding suggests that a nutrition course in post-secondary education may enhance nutrition knowledge while also being associated with improvements in attention. As students progress through health-focused programs like FHP and DH they may

develop coping strategies and a greater awareness of factors influencing their well-being, which could indirectly support improved attention. This finding aligns with research indicating that participation in a mindfulness course can increase mindful awareness and attention, potentially helping students cope with stress and improve academic success (de Bruin et al., 2015).

Our finding of a significant increase in student attention over the semester is in contrast to the work of Lieberman and Remedios (2007), who noted a decline in students' motivation to master their subjects as they progress through their program of study. Typically, as students progress through their programs, they may face increasing academic demands and potentially experience increased fatigue, stress, and cognitive load, which can detrimentally affect sustained attention (Aitken & MacMahon, 2019; McCabe et al., 2023) and learning (Palmer, 2013). However, our cohorts demonstrated a significant rise in attention over the 14-week period. This divergence suggests that while students often experience increased academic demands and fatigue as the semester progresses, participation in a health-focused curriculum may have helped offset some of these effects. By engaging students with practical topics related to nutrition, wellness, and self-care, these programs may help support sustained attention throughout the semester.

An increase in attention following the courses is an encouraging finding with positive implications for academic success, as reduced attention has been previously linked to lower academic performance (Lagacé-Leblanc et al., 2022) and students in higher education typically require sustained attention, motivation, and effective learning methods to succeed (de Boer et al., 2012). Enhancing attention levels further can be addressed through campus-wide initiatives such as time-management programs, mindfulness courses and wellness programming. These initiatives help students develop skills to manage their time effectively, reduce stress, and improve overall well-being, thereby enhancing their ability to maintain attention and focus.

Wellness

Although wellness did not significantly increase over time, international students reported higher wellness scores than domestic students at both measurement points, with a medium effect size. This is not in line with other work that found that international students were more likely to experience emotional distress (Sawir et al., 2008), were less likely to seek assistance (Yakushko et al., 2008) and had reduced mental health literacy (Clough et al., 2019). Several factors may help explain this difference. Because data collection occurred in the second semester of the FHP program and the fourth semester of the DH program, students may have already had time to adapt to their educational and social environments and engage with institutional supports. The institution's International Education Office also provides immigration assistance and transition-related supports that may contribute to student well-being. Cultural, spiritual, and religious influences may contribute to these variations, influencing international students' perspectives on well-being and mental health. For instance, certain cultures may attach a stigma to mental health concerns (Krendl & Pescosolido, 2020), affecting how individuals perceive wellness and access mental health assistance. A recent Canadian study demonstrated that international students were more likely to report higher life satisfaction and mental health, higher self-esteem, and increased body image; were less likely to discuss their mental health challenges; and had fewer coping mechanisms as compared to domestic students (de Moissac et al., 2020). English language proficiency may also be a mediating factor that positively impacts acculturation (Lashari et al., 2023).

Overall, the trend towards increased wellness following introductory nutrition courses is an encouraging finding as

wellness is associated with increased productivity and has a protective effect on health (Keyes et al., 2012). Increased wellness may be attributed to the health and wellness curricula emphasized in the FHP and DH programs. Other research has highlighted the positive impact of a college health and wellness course on students' health literacy, mindset, and lifestyle choices (Ward et al., 2022), and engagement in wellness activities was a predictor of increased physical activity and increased consumption of nutritious food (Daud et al., 2017). This suggests that wellness can improve as students progress through post-secondary education, particularly with the support of wellness programs and courses. Increased wellness may also be due to increased adjustment and sense of belonging to the college community as students progress through their program of study, which is consistent with other work (Kusurkar et al., 2011; Dancy et al., 2024). Increased engagement during post-secondary education has been linked to improved social-emotional development (Lemberger & Clemens, 2012). Therefore, it is essential to prioritize support and resources that encourage student engagement and connectedness throughout their post-secondary education (Lemberger & Clemens, 2012). Although causal relationships cannot be established, the higher wellness scores observed among international students suggest that wellness experiences may differ across student populations in ways that are not fully captured by commonly reported risk factors. Future research is needed to better understand the factors contributing to these differences and to examine how institutional supports, learning environments, and student experiences shape student wellness outcomes.

Food Insecurity and Academic Success

Our finding of a significant negative correlation between food insecurity and academic success aligns with other research in which students experiencing food insecurity are more likely to report lower academic performance and higher levels of stress, anxiety, and depression (Ahmad et al., 2021). These findings are particularly relevant within the current context of post-secondary education, where the prevalence of food insecurity is increasing (Wang et al., 2023). Food insecurity has a significant negative impact on academic success, and it is associated with lower academic motivation, poorer diet quality, and increased mental distress (Nagorny et al., 2023). Behavioural variations, such as coping methods and financial management, further exacerbate the issue of food insecurity (Hagedorn & Olfert, 2018). Additionally, food insecurity can act as a barrier to academic success,

affecting class attendance and performance (Silva et al., 2017). Food insecurity may be a symptom of poverty, as it is tied to economic factors (Laska et al., 2021). The observed relationship between food insecurity and academic outcomes suggests that access to adequate food may be an important prerequisite for student achievement, suggesting that food security may represent an important, and often overlooked, factor influencing educational outcomes. Furthermore, the high variability in food security measures suggests a diverse range of experiences within the student population that warrants further investigation through qualitative methods to fully understand the challenges related to food access.

Recommendations

Addressing food insecurity and supporting student success in post-secondary education may require a comprehensive institutional approach that extends beyond traditional financial assistance. The observed relationship between food insecurity and academic success suggests that addressing students' financial needs alone may be insufficient. Institutions may therefore benefit from coordinated approaches that integrate food security, academic support, and student wellness initiatives. Several practical strategies that may support this integrated approach are outlined below:

- **Integrated Course Outline Outreach and Digital Platforms:** Faculty may play an important role in reducing the stigma associated with seeking assistance by proactively sharing food security and wellness resources directly within course outlines and through the institution's primary digital learning management system at Durham College. Normalizing help-seeking behaviours within the academic environment may help ensure that support services are visible and accessible to students from the outset.
- **Targeted Advising and Peer Mentorship:** Institutions may benefit from enhancing outreach efforts to vulnerable student groups, particularly international students, through program advisors, campus-assigned mentors, and international student advisors available through the Durham College International Education Office. Peer mentors can provide direct outreach and connect students with important transitional supports, including workshops related to off-campus housing, income tax filing, and study permit compliance.

- **Coordinated Food Security Initiatives:** Expanding readily accessible food resources may help reduce immediate barriers to food access. Potential strategies include increasing awareness and utilization of services such as Durham College's Student Association food aid programs and campus food pantries, developing partnerships with community organizations and local retail networks, and expanding affordable, flexible campus meal plans (van Woerden et al., 2019).
- **Financial Counselling and Literacy:** Financial counselling and structured financial literacy programming may help address some of the economic factors associated with food insecurity and poverty (Choi et al., 2016). Equipping students with practical budgeting and money management skills may support their ability to navigate tuition expenses, high living costs, and currency fluctuations.
- **Holistic Wellness and Academic Support Integration:** Student wellness and attention may be further supported through greater engagement with specialized campus health and educational services. Academic departments may benefit from coordinating with services such as the Campus Health Centre to promote proactive wellness check-ups and partnering with specialized support centres, including the Access and Support Centre and Student Academic Learning Services at Durham College, to provide integrated academic and wellness supports that foster student resilience and long-term success.

Taken together, the findings suggest that nutrition education may contribute to student outcomes extending beyond discipline-specific knowledge acquisition. While improvements were observed in nutrition literacy and attention, broader behavioural and structural factors, such as food access and financial constraints, may limit the translation of knowledge into changes in dietary behaviour. These findings highlight the importance of situating educational interventions within broader student support systems. If institutions wish to extend the benefits observed in course-level interventions, integrating nutrition literacy into first-year transition, student success, and wellness initiatives, alongside food security and mental health supports, may represent one scalable approach to promoting student learning, well-being, and equity.

Limitations

Several limitations should be considered when interpreting the findings. The current study was conducted at a single college, following two cohorts during a single semester with a small sample size ($N = 25$), which limits the generalizability of the findings and prevents comparative analyses across different semesters or academic faculties. In addition, the substantial attrition between baseline and follow-up may have introduced response bias, as students who completed both questionnaires may have differed from non-completers in motivation, engagement, wellness, or academic performance. Furthermore, the absence of a control group makes it challenging to determine if observed differences can be attributed solely to introductory nutrition courses or other alternative explanations such as progression through a college course, maturation, or other factors (stress, fatigue, or cognitive load). Therefore, given the quasi-experimental design and the lack of random selection, there is the potential influence of unmeasured confounders to impact our results. In addition, as the study included multiple statistical comparisons, there is the potential for Type 1 errors. Taken together, these limitations suggest that the findings should be interpreted as exploratory rather than definitive. Nevertheless, the study provides preliminary evidence that can inform future research and supports the need for larger, multi-institutional investigations examining the relationships among nutrition education, student wellness, and academic success.

Future Research

Future studies should include larger sample sizes, control groups, and longer-term longitudinal designs spanning multiple semesters to better determine the temporal ordering of observed effects. Additional work could explore potential mediating variables. For example, does food insecurity directly impact academic success, or does it indirectly impact other factors (coping strategies, stress, cognitive load, mental health, sleep quality) that, in turn, influence academic outcomes? Moreover, employing a mixed-methods approach that includes qualitative input would provide insight into the experience of international students and the variability in food insecurity. It is important to investigate the finding of increased wellness in international students through interviews or open-ended questions to understand the factors that contribute to improved wellness.

Impact

This study contributes evidence regarding the potential role of nutrition education in supporting student learning, nutrition literacy, and student well-being within college environments. Nutrition education can enhance food literacy and attention while simultaneously highlighting the importance of addressing food insecurity as an academic barrier to success. This study and its findings may inform future curriculum development, institutional wellness initiatives, and student support programming, particularly in colleges serving diverse student populations. As post-secondary institutions continue to welcome international students, integrating and combining nutrition education with broader health promotion and food security initiatives may enhance equitable learning environments and contribute to more equitable student outcomes.

Conclusion

This study investigated the influence of introductory nutrition courses on nutrition literacy, dietary behaviour, food security, attention, and wellness among domestic and international college students. Participation in introductory nutrition courses was associated with improvements in nutrition literacy and attention, while food insecurity was negatively associated with academic success.

From a teaching and learning perspective, knowledge acquisition alone may be insufficient to produce meaningful behaviour change when students encounter persistent structural barriers. Although students demonstrated improvements in nutrition literacy and attention, these gains did not translate into measurable changes in dietary behaviour. These results highlight that curriculum-based learning occurs within a broader context of social, institutional, and personal influences. Improvements in knowledge may therefore be most impactful when students also have access to resources that address barriers to learning and well-being.

This study contributes to SoTL scholarship by illustrating how the educational impact of curriculum may be shaped not only by what students learn, but also by the conditions that influence their ability to apply that learning in practice. As colleges continue to support increasingly diverse student populations, integrating educational interventions with broader wellness and food security supports may help foster more equitable conditions for student learning and success.

Conflict of Interest

The authors declare no conflicts of interest.

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