Integration of Food and Nutrition Education Across the Secondary School Curriculum: Two Experiential Models as Two Case Studies

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Abstract

The aim of this paper is to present the implementation and evaluation of two recognised programs, one from Australia and one from Denmark, that endeavour to integrate and enhance food and nutrition education across the secondary school curriculum and whole school programs. This paper details descriptions of design, delivery mode, core components and evaluation of each program based on existing detailed reports and original research investigations. Resultantly, one program in Australia (Stephanie Alexander Kitchen Garden Program) and one program in Denmark (LOMA or LOkal MAd = local food) are reported as two case studies. The target group for both programs is secondary school students in Years 7–12; both programs are conducted within secondary schools and within school hours. Both interventions focus on developing secondary students’ food production and food preparation knowledge and skills. Their evaluation methods have consisted of pre- and post-intervention surveys, single case study, and focus groups with both students and teachers. Both programs have reported possible integration across secondary school subjects and modifications in students’ knowledge and skills in food and nutrition. These programs have focused on developing an experiential and localised learning model for food and nutrition education, which may also address food insecurity concerns among adolescents which has been shown to correlate with poor nutrient intake and consequential health complications. Their overall model can be adapted taking into account the social, economic, and environmental context of a secondary school.

Keywords: nutrition intervention, food education, school curriculum, secondary school, integration

1. Introduction

In 2020, the global population witnessed the onset of a pandemic (COVID-19), which further exposed the inequalities in the existing food, health, and economic systems. As indicated, these inequalities have resulted in decades of rising food insecurity (Carey, Murphy, & Alexandra, 2020). Food security has been defined by the 2012 United Nations Committee on World Food Security as the status “when all people at all times have physical, social and economic access to food, which is safe and consumed in sufficient quantity and quality to meet their dietary needs and food preferences” (Committee on World Food Security, 2012, p.8).

Vulnerable groups, such as those under the age of 18 years, have been shown to be more susceptible to food insecurity (Burns, Bentley, Thornton, & Kavanagh, 2011). According to the 2019 report from the Food and Agriculture Organization of the United Nations, 17.2 percent of the world population (1.3 billion people) experience food insecurity at moderate levels (uncertain access to foods); the combination of moderate and severe levels (limited access to foods) of food insecurity brings the estimate to 26.4 percent of the world population (about 2 billion people).

Clinically, food insecurity has been linked to health complications such as mental health concerns (Gundersen & Ziliak, 2015) and obesity (VicHealth, 2015) due to poor nutrient intake. For instance, research conducted by Kulkarni, Swinburn, & Uter (2015) has demonstrated a clear association between quality of diets and mental health status among socially disadvantaged New Zealand adolescents who had inadequate nutrients intake; the mental health score was raised by 5 points in adolescents consuming healthy diets.
While the interaction between food insecurity and obesity is complex, recent research has highlighted key factors such as food choices (determined by higher cost of healthy, nutrient-rich foods relative to nutrient-poor foods) as a major link between food and obesity (VicHealth, 2015). In Australia, the rate of overweight and obesity is significantly higher among children and adolescents (aged 5–17 years) with food insecurity concerns such as those from low socio-economic background (32 percent), as compared with the national average figure of 24.9 percent (Hardy, Mihrshahi, Drayton, & Bauman, 2015; Australian Institute of Health and Welfare, 2020).

Although the relationship between food insecurity and health concerns are complex, the influence of food insecurity can be moderated by sociocultural elements such as enhanced food skills and knowledge and better access to various food choices (VicHealth, 2015). Enhanced food skills and knowledge can be achieved through comprehensive food and nutrition education which confer attention to all factors (e.g., environmental, and economic factors such as food insecurity) which may influence individuals’ eating behaviours (Worsley, 2015). One possible proposal for such a comprehensive food and nutrition education program within schools is the integration of food literacy and food numeracy across the secondary school curriculum as researched by the authors (Shakeri, Fethney, Rolls, Papatraianou, & Myers, 2021).

Food literacy has been defined as “scaffolding that empowers individuals, households, communities or nations to protect diet quality through change and strengthen dietary resilience over time” (Vidgen, & Gallegos, 2014, p.54). Research acknowledges the contribution of enriched food literacy on enhanced food planning skills such as budget consideration when purchasing fresh foods (Fordyce-Voorham, 2013). Application of food literacy skills within secondary schools has been defined and categorised as basic, intermediate, and advanced skills (Fordyce-Voorham, 2017; Ronto, 2017).

Food numeracy is a newly introduced term by the lead author who also recently provided its substantiated definition and key concepts, and anticipated application across secondary school curriculum. As defined, “food numeracy involves the use of numerical, graphical, and statistical concepts and skills and consists of critical evaluation, interpretation, application, and communication of mathematical information related to a diversity of food practices” (Shakeri, McDaid, & Fethney, 2021). Application of food numeracy concepts across the secondary school curriculum is anticipated to act as conduit for secondary school students to consult on discernible issues such as cost of sustainable and unsustainable food production systems (Shakeri, Bucher, Eather, & Riley, 2020).

It is anticipated that integration of food literacy and food numeracy across the curriculum may provide sufficient opportunities for secondary students to comprehensively enhance their knowledge and skills in food and nutrition (Shakeri et al., 2020) which has been shown to moderate the effects of food insecurity on health (VicHealth, 2015). The feasibility of this integration across secondary school curriculum has been recently investigated by the authors. Teacher training, teaching resources, and lack of provision of both theoretical and experiential learning methods are some of the stated barriers (Shakeri, et al., 2020; Shakeri, et al., 2021). This paper aims to exemplify two existing programs that have endeavoured to trial an integrative and experiential learning approach through addressing some of the stated barriers, as detailed in the results section. These programs have also endeavoured to alleviate food insecurity concerns by increasing reliance on localised (school-based) food production and food preparation. The knowledge and skills generated by each program can be adapted based on an individual secondary school’s socio-economic and environmental context.

2. Method

A systematic search of digital, Health and Education Databases, (including CINHAL, MEDLINE, Ebsco, and Proquest) was conducted based on the devised inclusion criteria (i.e., nutrition education programs which were integrated across the secondary school curriculum and were held within secondary schools by the teachers of all subjects, both in Australia and internationally). Three waves of search were conducted with devised keywords (food education, nutrition intervention, high school, primary school, integration, curriculum). A detailed review of 549 retrieved scholarly peer-reviewed (including abstracts and full texts) and grey literature revealed insufficient research on the inclusion criteria. Hence, two recognised and established programs (Stephanie Alexander Kitchen Garden Program in Australia, and LOMA in Denmark) who had endeavoured to provide two experiential models for integration of food and nutrition education across the secondary school curriculum were contacted for further investigation and presentation as two case studies. The sources of evidence for the two case studies have included interviews, documentation, and reports (Yin, 1994, 2009).

The first author communicated with the Stephanie Alexander Kitchen Garden Foundation who also provided all the evaluation reports conducted (2018-2021) for the duration of the program in secondary schools in Australia. A summary of the information provided has been presented as the first single case study. The second author has developed, researched, and documented the program in Denmark which has been presented as the second single case study.
3. Results/analysis

3.1 Case Study 1: Stephanie Alexander Kitchen Garden Program (Australia)

3.1.1 Intervention Background and Strategies

Stephanie Alexander Kitchen Garden Program (SAKGP) for secondary schools commenced in Australia in 2018, with the aim of integrating experiential food education across the secondary school curriculum. The role out of this program has consisted of six project phases within indicated timeframes (Table 1). As indicated, the ongoing evaluation, which has led to the development of teacher training and teaching resources for expansion across more secondary pilot schools, has been ongoing over the past 36 months.

Table 1. SAKGP roll out phases (2018-current) *

| Project Phase Description | Time frame |
|---------------------------|------------|
| Initiating the program with initial involvement of 3 diverse pilot schools to develop a prototype program | 6 months |
| Developing the elements for a pilot test prototype program, such as teaching resources and teacher’s professional development | 18 months |
| Activating and improving the Pilot Deliver (prototype) program to 10 pilot schools | 18 months |
| Ongoing evaluation of the program | 36 months |
| Promoting the program | 36 months |
| Engaging one volunteer community group (AstraZeneca employees) | 36 months |

*Source: First Person Consulting. (2018). Secondary Years Kitchen Garden - Pilot Project Evaluation Interim Report. Shakeri S. Personal Communication, July 22, 2020.

In 2021, there are 14 pilot secondary schools implementing SAKGP; Table 2 shows an overview of example activities in two pilot schools.

Table 2. Overview of SAKGP core components and example activities in two schools (school case study 3 & 4) *

| Core component | Example activities |
|----------------|--------------------|
| Teaching sessions | 3 sessions/week (75 minutes of cooking and gardening, 45 minutes on academic work, and 45 minutes working in garden or researching future projects) |
| Integration of Kitchen Garden Program into subjects | Integration approach across curriculum in subjects (Science, Mathematics, Arts and Design, and Food Studies), e.g., woodwork students working on the garden design and cooking facility |
| Whole School Approach | Working with school canteen to make food for the disadvantaged communities |
| Student Participation | Students were involved in developing the budget, networking with SAKGP and local businesses |
| Student Product | Year 10 students measured the garden site and drew proposed designs; years 9–10 focused on food and enterprise; and years 7–8 cooked from the garden |

*Source: First Person Consulting. (2018). Secondary Years Kitchen Garden - Pilot Project Evaluation Interim Report. Shakeri S. Personal Communication, July 22, 2020.

3.1.2 Intervention Evaluation

SAKGP Evaluation Committee has conducted seven evaluations to develop further teaching resources and teacher training programs (Table 3).
Table 3. SAKGP evaluations and descriptions

| Evaluations | Description |
|-------------|-------------|
| 1           | SAKGP secondary school students’ survey across Australia |
| 2           | Feedback survey on the SAKGP teacher’s professional development from secondary educators |
| 3           | Case study with 4 secondary school teachers (school case study 3) on existing Kitchen Garden program (KGP), exploring the barriers and enablers |
| 4           | Case study (school case study 4) with SAKGP team, students, and teachers, looking at planning, barriers, and enablers |
| 5           | Interview with 10 advisory SAKGP group members |
| 6           | Workshop for 3 pilot secondary schools |
| 7           | Final interviews with 22 educators, focus group with 5 students, & student survey |

1 First Person Consulting. (2018). Secondary Years Kitchen Garden - Pilot Project Evaluation Interim Report. Shakeri S. Personal Communication, July 22, 2020.

2 First Person Consulting Secondary Years Kitchen Garden Project Student Outcomes Summary Report Prepared for Stephanie Alexander Kitchen Garden Foundation and AstraZeneca. (2021). Shakeri, S. Personal Communication, February 12, 2021.

3.1.3 Intervention Evaluation Outcomes

1. SAKGP secondary school students’ survey across Australia reported the following responses from students (n=1034) with the corresponding percentages for each response (Table 4).

Table 4. SAKGP secondary school survey across Australia*

| Student Responses                                                                 | Percentages for responses** |
|-----------------------------------------------------------------------------------|-----------------------------|
| Lack of knowledge about recommended number of fruits and vegetable serves per day  | 51%                         |
| Not eating vegetables on a weekly basis                                           | 17%                         |
| Eating at fast food chains at least once a week                                   | 29%                         |
| Indulging in hot chips every week                                                  | 23%                         |
| Convenience and cost driving their decision (eating microwave meals at least 1/ week) | 59%                         |
| Considering cost more important over how healthy something is                    | 73%                         |
| Considering the sugar content of foods                                            | 25%                         |
| Considering the fat content of foods                                              | 19%                         |
| Considering the salt content of foods                                             | 13%                         |
| Not knowing where avocados come from                                              | 22%                         |
| Not knowing how to bake a potato                                                  | 30%                         |
| Knowing how to roast a chicken                                                   | 42%                         |
| Not knowing how to boil pasta or boil an egg                                     | 18%                         |
| Adolescent boys helping their parents cook a meal at least 1/ week compared to girls | 29% vs.17%                |
| Consider learning to cook to be very important                                   | 99%                         |
| Own school providing any health and food education programs                       | 30%                         |
| Taking part or considering taking part in a KGP                                  | 77%                         |

*Source: PureProfile Consumer Survey commissioned by the Stephanie Alexander Kitchen Garden Foundation and AstraZeneca Australia. (2019). Shakeri, S. Personal Communication, June 3, 2020.

** No frequency, missing response rate, demographics, or other details were available in the provided reports.
2. Feedback survey on the SAKGP teacher’s professional development from secondary educators (n=157) reported the following responses with corresponding percentages (Table 5).

Table 5. Feedback survey on the SAKGP teacher’s professional development from secondary educators (n=157) *

| Anticipated outcomes to be achieved by developing a KGP in own school | Percentages for responses** |
|---------------------------------------------------------------|-----------------------------|
| Enhanced food habits in students                              | 95%                         |
| Enhanced food sustainability                                  | 88%                         |
| Enhanced applied learning e.g., cooking and gardening skills  | 79%                         |
| Enhanced community engagement                                 | 66%                         |
| Enhanced school’s food culture                                | 65%                         |
| Enhanced student wellbeing                                    | 60%                         |
| Enhanced student engagement                                   | 52%                         |
| Enhanced student leadership                                   | 50%                         |
| Enhanced integration in subjects such as Science, Technology, Engineering, Mathematics | 45%                         |
| Enhanced career pathways                                      | 35%                         |

*Source: First Person Consulting. (2018). Secondary Years Kitchen Garden - Pilot Project Evaluation Interim Report. Shakeri S. Personal Communication, July 22, 2020.

** No frequency, missing response rate, demographic or other details were available in the provided reports.

Four other evaluations were conducted with teachers (Table 3, evaluations 3–6). These were qualitative evaluations which identified the following themes as barriers and enablers to successful KGP implementation in schools (Table 6).

Table 6. Barriers and enablers to successful implementation of KGP*

| Category         | Identified themes                                                                 |
|------------------|-----------------------------------------------------------------------------------|
| Barriers         | -Lack of resources such as time and human resources                              |
|                  | -Student safety issues such as injuries in the garden                            |
|                  | -Teacher and students’ engagement                                                |
|                  | -Maintenance during school holidays                                              |
|                  | -Funding                                                                         |
|                  | -Provision of an integration curriculum                                           |
| Enablers         | -School nurse to take coordination role                                           |
|                  | -Developing routine and structure in school timetable                            |
|                  | -Involving relief teachers                                                       |
|                  | -Enhanced communication among key stakeholders                                   |
|                  | -Support from school leadership                                                   |
|                  | -Involving community and family members                                          |

*Source: First Person Consulting. (2018). Secondary Years Kitchen Garden - Pilot Project Evaluation Interim Report. Shakeri S. Personal Communication, July 22, 2020.

Final evaluation consisted of interviews with teachers, and student surveys after the implementation of SAKGP across the pilot secondary schools and reported the following main responses (Table 7).
Table 7. Responses from students and teachers*

| Stakeholder | Reported responses                                                                 | Percentages for responses |
|-------------|----------------------------------------------------------------------------------|--------------------------|
| Students    | Reported an increased understanding of the benefits of cooking and eating seasonal fruits and vegetables | 61% (n=115)              |
| Students    | Reported an increased confidence on growing and/or cooking fresh food             | 64% (n=143)              |
| Teachers    | Reported that students had gained a better understanding of the benefits of cooking and eating fresh and seasonal fruit and vegetables | 100% (n=18)              |
| Teachers    | Reported that students were more confident when it came to growing and/or cooking fresh food | 91% (n=21)               |

*Source: First Person Consulting Secondary Years Kitchen Garden Project Student Outcomes Summary Report Prepared for Stephanie Alexander Kitchen Garden Foundation and AstraZeneca. (2021). Shakeri, S. Personal Communication, February 12, 2021.

3.1.4 Discussion/Recommendation

Teachers’ time constraints and challenges in seeking approvals from education authorities are barriers to continuous evaluation of SAKGP integration in pilot secondary schools. Currently, SAKGP has trialled an integration approach (Table 2), however, no evaluation report on the extent of integration across all subjects has been completed. The program organisers have developed teaching resources and teacher training modules to facilitate the integration of SAKGP across the school which are only available by subscription. The only indication to the extent of integration is given in their feedback survey where teachers (n=119) most agreed that SAKGP’s curriculum-aligned resources will be most useful in the following areas: Home Economics (63 percent); Science (17 percent); Mathematics (8 percent); and Health and Physical Education (12.6 percent).

On the other hand, the extent of integration of garden program across all subjects has been measured in a 2017 study by Gardner Burt, Kock, & Contento, where 21 school gardens registered with Grow to Learn program in New York city (USA) were surveyed for this purpose. The first purpose of their survey was to determine whether the garden programs met the criteria for a well-integrated garden; at minimum, the garden must be valued by the administration, and used regularly for academic instruction across all subjects. These schools reported that 16 different subjects with corresponding percentages for integration were taught in the school garden, including Science (95.2 percent), Food/nutrition (95.2 percent), Agriculture (76.2 percent), English (71.4 percent), Mathematics (66.7 percent), Environmental Science (61.9 percent), History (61.9 percent), Health (61.9 percent), Home Economics (61.9 percent), Art (57.1 percent), Community Service (57.1 percent), Social Studies (42.9 percent), Computer Technology (23.8 percent), Physical Education (19 percent), Foreign Language (9.5 percent), and Theatre Arts (4.8 percent).

The impact of the specifically designed SAKGP teaching resource (for integration across all subjects) on students’ knowledge and skills in food and nutrition has also not yet been fully evaluated by SAKGP evaluation committee. Their current evaluation report focuses on the effectiveness of their program i.e., 61 percent of students reported an increased knowledge and 64 percent reported an increased confidence level (Table 7). However, the significance and need for these shelf-ready, curriculum-aligned resources for teachers who may lack confidence in teaching food and nutrition education has been indicated in recent studies (Love, Booth, Margerison, Nowson, & Grimes, 2019; Shakeri et al., 2020). Further, in a 2018 study, Lavallee, evaluated the impact of a specifically designed curriculum (Nutrition Nuggets) across all subjects, in a single intervention study with junior high and senior high school students in USA (n = 111). This study reported improvements in the following covered topics: healthy-eating efficacy (p<0.05); internal regulation (p<0.05); opinions regarding safety of genetically modified foods (p<0.01); healthiness of organic foods (p=0.10); knowledge of food safety principles (p=0.01); and knowledge of types and sources of fats (p<0.01). Therefore, it is anticipated that further provision of shelf-ready teaching resources can facilitate integration of KGP across all subjects.

The evaluation of teacher training programs for SAKGP showed the significance of both face-to-face and online training and discussion modules. These teacher training modules were also shown to enhance teachers’ knowledge, skills, and attitude in food and nutrition which are important for implementation of an integrative pedagogy. In the 2018 study, Lavallee, also evaluated the provision of hybrid training in food and nutrition for teacher professional development (professional development= 8 hours of online coursework, and 8 hours of face-to-face workshop). This intervention reported significant improvement in teachers’ cooking attitudes and all five eating competence scores (overall eating competence, eating attitudes, food acceptance, p<0.05).
The other health impact of school garden in whole school programs has been explored by Lam, Romses, & Renwick, in a 2019 study which explored the relationship between school gardens, food literacy, and mental well-being in youth using photovoice strategy (photography and writing). In this study, youth shared their experiences, observing that their engagement improved some aspect of their mental well-being. Through the photovoice process, youth recognised how their involvement in green outdoors enabled bonding with others, and improved aspects of their personal health, knowledge and skills in food and nutrition, and overall mental well-being.

Finally, school gardens can be a learning model for creating localised, accessible, healthy, sustainable, and equitable food systems. A recent study with secondary school teachers in NSW (Australia) which aimed to ascertain their opinion on integration of food literacy and food numeracy in whole school programs, reported the positive impact of school gardens on local economy (e.g., garden produce was being utilised for lessons, school canteen and distribution to students and local community) (Shakeri et al., 2021).

In conclusion, the integration of school garden programs (as an experiential model) across all subjects can enhance food skills and knowledge and access to various food choices which may in turn address food insecurity concerns and related health complications in local communities.

3.2 Case Study 2: LOMA LOKal MAAd (Local Food) (Denmark)

3.2.1 Intervention Background and Strategies

Current research takes the point of departure in certain challenges regarding school food occurring in Denmark from 2010–2020. During this period, there was no national school food program. Pupils were expected to bring food from home in the form of a ‘packed lunch’ and an afternoon snack. However, this food system was characterised by system errors, because the packed lunch was often not brought to school or was not eaten. The result of this food system was hungry pupils during school days (Ruge, Puck, & Hansen, 2017). Furthermore, research documented that often packed lunches from home did not provide sufficient nutrition for a whole school day (Mikkelsen, Andersen, Andersen, Benn, Brinck, & Zinck, 2010; Stovgaard, Thorborg, Kragelund, Andersen, & Wistoft, 2018). Furthermore, the Health Behaviour in School Aged Children report (Denmark, 2019) about the health of Danish students documented that a system based on packed lunches from home tended to disfavour pupils from limited socio-economic backgrounds (Rasmussen, Kierkegaard, Rosenwein, Holstein, Damsgaard, & Due, 2019).

This kind of school food system seemed to have a limiting effect on pupil participation in school, possibly leading to reduced learning outcomes (Mejdung, Neubert, & Larsen, 2017) and structural inequality among all pupils (Stovgaard et al., 2018; Weaver-Hightower, 2011). Consequently, headmasters of schools looked for ‘local level’ solutions and articulated a need for holistic and ‘whole-school’ approaches (WHO, 2020) to school food. Current challenges in diet-related health concerns among children and youth also contributed to the need for health-promoting initiatives within schools. For the lower socio-economic groups, unhealthy living conditions and lifestyles, such as unhealthy eating and sedentary behaviour, were still driving social inequality, both in learning and in health (Rasmussen, et al., 2019).

The LOMA-local food approach was developed as a response to these concerns. The first pilot school to trial this program was Nymarkskolen, a secondary school with 650 students, in the municipality of Svendborg (Denmark). LOMA’s educational initiatives aimed at integrating food skills across all subjects and whole school programs and was expected to lead to improved well-being and motivation for learning in school (Ruge, 2015). A doctoral research project was conducted, as a single case study (Yin, 1994), in parallel to the development project, which was managed by the municipality of Svendborg. Based on results from this research and the first experiences from educational activities at Nymarkskolen (Ruge, Nielsen, Mikkelsen, & Bruun-Jensen, 2016), a new LOMA project was launched with financial support from the Nordea-fonden (independent Danish philanthropic foundation). The aim was to expand the approach to five more pilot schools in Denmark. The project was initiated in January 2015. Table 8 shows the components of LOMA project such as its whole school approach and integration across all subjects. The health promotion issues that this case study investigated in LOMA intervention were: 1) Which basic insights regarding student food and meals in schools can be identified? 2) Are there indications of a relation between food in schools and students’ cognitive and emotional capacity? 3) Are there indications of an impact from the intervention on students’ knowledge about food and on students’ development of skills in cooking healthy food, as a collaborative activity in school and at home? Selected results from students attending the pilot secondary schools are presented in this single case study (Yin, 1994).
Table 8. Overview of components in the LOMA intervention

| Topic | Activity |
|-------|----------|
| Whole-school-approach | Teachers have gained a common perspective on a local school food landscape through teacher training course |
| Teaching plan | A teaching plan for a 5-day week of teaching that is project-oriented and workshop-based |
| Integration of LOMA program across all subjects | LOMA teaching is pursued according to common goals, where competence goals are translated into learning objectives in several subjects, e.g., Danish, Mathematics, Science, Health, PA, Arts, and Computers. |
| Students’ product | Students deliver a product in the form of a report, media production or similar that can be subject to evaluation. |
| Students’ participation | Students participate in planning, serving and preparation of healthy food for peers. |
| Shared meal | A daily common and shared meal for students and teachers |
| Open School | There is collaboration with local food producers, field trips, guest teachers |
| Locally sources ingredients | A certain proportion of locally produced ingredients – min. 30% organic – are used in the menu. At least 1 day pr. Week is a ‘meat free’ day. |

3.2.2 Intervention Evaluation (Sample Population and Duration)

Research was organized as a comparative case study (Yin, 2009). Quantitative data was collected according to a LOMA research protocol (Ruge, 2015). Each school was recruited based on the following criteria: it was a public school; had facilities for cooking meals for approximately 100 pupils on a weekly basis; was ready for teacher training for teachers of all subjects. Following this, pupils from 6 pilot schools (n=2754) participated in the LOMA project from 2015-2017. Out of this number, 639 pupils participated in the quantitative part of the research, either baseline or post-intervention. The questionnaire distributed as a link to SurveyXact to students, who had participated in the LOMA intervention. The survey was anonymous to the researchers, as each student had been assigned an identification code. The study is registered with the Danish, Data Inspectorate. There were 387 complete answers in the baseline. At end line, 356 completed answers were received. After the dataset was cleaned of respondents who did not answer both the baseline and end line measurements, 299 respondents had answered both the baseline and end line measurements - panel data rate of 299 / (387 + 356-299) = 67.34%. The percentual share of secondary students (age 10-13) was 60 percent at baseline. Data was analysed by statistical methods.

3.2.3 Intervention Evaluation Outcome

3.2.3.1 Secondary students feeling hungry in school

In the SurveyXact, 64 percent of students answered that they were ‘sometimes’ hungry in school during afternoon lessons. The 5-day LOMA intervention was not expected to diminish students’ experience of being hungry during afternoon lessons. Nevertheless, the high percentage of hungry students was surprising and provided an insight that schools needed to act upon.

3.2.3.2 Knowledge and Participation in ‘Cooking Food for Peers’

Evaluation of the SurveyXact showed that 64 percent of students had been involved in ‘cooking for peers’ before the intervention. At end line, 95 percent of secondary students had participated in cooking for peers. Additionally, students seemed to be motivated for participation in cooking for peers again, as 96 percent of pupils marked ‘yes’ to that question. The intervention elements were investigated in relation to students’ development of knowledge about vegetables and fruit by participating in cooking for peers. Results indicated a positive development in students’ knowledge about vegetables and fruit from baseline to end line: correct answers for vegetables at baseline (48 percent), at end line correct answers (58 percent); correct answers for fruits at baseline (64 percent), at end line correct answers (72 percent).

3.2.3.3 Follow-Up ‘One-Year-After’ the Intervention

In 2018, Department of Applied Research in School and Education, University College of Lillebelt (Denmark) conducted a ‘one-year-after’ study among students who had participated in the LOMA intervention (n= 399). The share of students at secondary level was 30 percent (n= 121, age=12-15). Main results indicated that students were still enthusiastic about ‘cooking for peers’ and, asked about what they had learned from participating in LOMA, students answered “How food and health is connected” (62 percent), “How to cook healthy food” (67 percent) and “How to talk
about food” (52 percent). Additionally, secondary students answered that participation in the LOMA project had given them ‘increased courage’ for cooking healthy food at home (54 percent) and for collaborating around cooking food (41 percent). Secondary students responded that after participation in the LOMA they became motivated for eating more vegetables (46 percent) and fruits (51 percent).

3.2.4 Discussion/Recommendation

The limitations of this project were the lack of funding to evaluate the full extent of the integration of the LOMA project across all subjects and its full impact on enhancement of food and nutrition knowledge and skills. The LOMA project (2015-2017) was also evaluated by the Danish Evaluation Institute (2017a). The evaluators emphasized that the LOMA project had led to increased motivation among students and to increased ‘food courage’, knowledge and skills about vegetables and fruits, and to improved social relations among students. The evaluators concluded that the LOMA teacher training program, in combination with the varied learning environment (e.g., students’ involvement in planning, serving, and cooking for peers), may have caused the positive effects and the integration of LOMA across several subjects such as Health, Mathematics, and Science. This project had also addressed students’ hunger concerns with only 24 percent showing hunger signs after afternoon lessons (pre-intervention, 64 percent).

In conclusion, the LOMA intervention focused on pupil development of knowledge about vegetables and fresh food. The program was shown to enhance student and teacher participation in the health-promoting learning environment and to an experience of enthusiasm (Danish Evaluation Institute, 2017b). In addition to the recognition of improved relations among students, the Danish Evaluation Institute emphasized that the collaborative and creative approach in the LOMA project also seemed to have improved relations among staff of all subjects as well. This was regarded as an indicator of food-and health related action competence and effect of participation in the LOMA intervention. Results also indicated that secondary students had a positive development in food and health related knowledge, skills, and motivation for a healthier lifestyle (Ruge, 2021).

4. Conclusions/Future Implications

Integration of each program (SAKGP and LOMA) across the secondary schools’ curriculum (and whole-school) can enhance students’ knowledge and skills in food and nutrition. It may also enhance access to localised and diverse food sources; both these elements can alleviate food insecurity concerns and consequential health complications. However, both programs may also face certain challenges depending on the schools’ available financial and facilitating resources such as easy access to funds and space for a garden, cooking, and food sharing. Both programs require a collective collaboration among all involved stakeholders such as Education Authorities (at national, regional, and local level), community organisations, students and parents and require provision of teacher training and teaching resources. Therefore, although, provision of such experiential programs is highly desirable, it cannot be mandated, and must be assessed and appropriated based on individual school contexts, inclusive but not specific to their social, economic, cultural, academic, and geographical status.

5. Strength and Limitations

This paper aims to provide an overview of these programs which can be adopted or initiated by each school community. Both programs have provided indications about the benefit of integration across all subjects and whole school programs. Stephanie Alexander Kitchen Garden Foundation program for secondary schools (single case study 1) has provided some indications about the procedure for integration across all subjects; the resources facilitating such integration (i.e., teacher training and teaching resources) are not publicly available to be noted in this paper. LOMA program for secondary schools has provided case-descriptions of how integration across subjects was conducted at secondary level at the participating schools which is now publicly available, in both Danish and English language (Ruge, 2018).

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