



THE BENEFITS AND SUSTAINABILITY OF SCHOOL GARDENS:
A CASE STUDY OF ST. FRANCIS SCHOOL GREENHOUSE (HARBOUR GRACE, NL)

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1. Executive Summary

Purpose

The purpose of this study was to investigate the greenhouse program at St. Francis School in Harbour Grace. This is a pilot study that will inform further investigations into a number of school garden programs in NL. The rationale to investigate and promote the existence of school garden programs in NL is based on literature about the many potential benefits to schools and communities that results from school gardening initiatives. Further adding to the rationale for this study are a range of social and economic factors unique to NL such as increasing outmigration and rising concern about the health and sustainability of our current food consumption. The objective was to provide a detailed analysis of how students, teachers, community members and government officials experience and perceive the school greenhouse including a description of motivating factors that led to the development of the greenhouse program, expectations and perceptions about participation in the garden, facilitators and deterrents that the stakeholders involved identify, and the practices that are deemed most beneficial by stakeholders in using the gardens to achieve health, learning and other outcomes.

Methodology

This case study of St. Francis was based on a number of interviews with a broad range of stakeholders involved in the greenhouse program in Harbour Grace. A socio-ecological framework provided the structure for the span of this investigation. This meant seeking the combined experiences and perceptions of students, teachers, community members and government officials. The socio-ecological approach adopted for this investigation helped to provide a systematic view of the how the greenhouse affects multiple stakeholders.

Findings and Recommendations

The knowledge and experiences shared by teachers, community members and government officials about the long and impressive history of the St. Francis greenhouse provided an essential, useful and unique perspective on the actions and the range of potential benefits of school gardening in NL. Main findings are outlined below.

Students benefitted from hands on and cooperative learning, from exposure to healthy food and the raising of ecological consciousness. Students also became exposed to the agricultural potential of NL. In many cases participants felt that the types of lessons that students learned in the greenhouse were needed by and were not currently a normal part of the educational experience of students outside the greenhouse.

Recommendation: The range of benefits and lessons learned for students provided via the St. Francis greenhouse has the potential to affect the health of the school and the broader community. However, people interviewed in this study did not necessarily associate social benefits with health. Linking learning outcomes and social outcomes with health helps bridge connections in the school community and forms the basis for a comprehensive approach to health. Future school garden programming should focus on raising awareness about the multiple dimensions of health in order to fully capitalize the wide range of program benefits.

The greenhouse helped to create and depended upon an enriched partnership between the school and community. By forming connections with other schools in the region and engaging in learning projects with the whole community, the greenhouse helped to build community capacity which has potential implications for community health, rural development and youth engagement. There is also evidence that the particular social and economic climate of NL provides increased challenges and opportunities to sustaining this school garden program.

Recommendation: School gardening programs can be considered a community resource when school learning is embedded with community needs and context. This type of learning is called place-based learning and there is reason to promote and research the potential for place-based learning to answer to the labour and skill development needs of rural communities in NL.

School gardening depends on extra resources that are hard to come by in the current economic climate. Participants in this study witnessed the dramatic effect that the presence of funding had on the impact of programming. Previous studies on school gardening reveal that having a broad base of support is essential in keeping programs sustainable.

Recommendation: As the school garden program in St. Francis was recognized to have inter-sectoral benefits, there is a need for a broad leadership base in sustaining these benefits. Future gardening programs could be supported through enhanced communication and shared knowledge about the role of school gardening within multiple government departments.

This study clearly shows the range of potential benefits that school gardening programs offer in rural environments and has provided the tenets for future studies of school gardening in NL. Although this pilot research is a preliminary stage in my research program, there is enough valuable material to influence policy makers and other individuals likely to promote and support the creation of school gardens in this province.

2. Research Background and Purpose

While school garden initiatives are cropping up in schools across this province, there has been no investigation into the form and function of these gardens. The purpose of this study was to investigate the greenhouse program at St. Francis School in Harbour Grace before beginning further investigations into a number of school garden programs in NL. The objective was to provide a detailed analysis of how students, teachers, community members and government officials experience and perceive the school greenhouse, including a description of motivating factors that led to the development of the garden, expectations, facilitators and deterrents that the stakeholders involved identify, and the practices that are deemed most beneficial by stakeholders in using the gardens to achieve health, learning and other outcomes. In addition to the case study of St. Francis School in Harbour Grace, an environmental scan of the prevalence of school gardens across Canada was undertaken to provide context for this NL-based research.

A range of local social and economic demands frame this research. This province's cultural understanding of food (including production and consumption) has changed dramatically over recent decades as we have shifted from depending on our local environment (the soil and the ocean) for a large proportion of our food, to our current dependence on food imports and a globalized, industrialized food system. The province has a rich history of food production (1), but those with the knowledge and skills to produce food are aging. The issue of Newfoundland and Labrador's aging population is exacerbated by the steady out-migration of youth (2). This problem is magnified in rural areas and has an impact on regional economic development and therefore community health.

While agricultural knowledge disappears, the youth of this province, with the capacity to reinvigorate food production and to build communities, are at risk of

being increasingly unhealthy possibly due to a more sedentary lifestyle amplified by unhealthy diets. Both health and education policies advocate the importance of active learning and healthy eating in schools (3, 4). Policies of the current government acknowledge these critical socio-economic realities. Economic policies assert the importance of retaining youth for our province's future (2) and agricultural policies press upon the need for enhanced food security and skill development among young people(5). This is the background climate in which school garden projects are spontaneously arising in schools across the province and offer the potential to tackle some, if not all of these issues.

3. Literature Review

School gardens have the potential to bring benefits to both schools and their surrounding communities. Some of these benefits include the promotion of healthy eating and active living, an enhanced sense of school community and social inclusion, the greening of school grounds and the raising of awareness about the environment, climate change and agriculture (6-12). In addition, school gardens have been found to improve overall academic achievement and to promote experiential learning (6, 7). The development of school gardening programs can also be considered a type of place-based education, where the school plays a central role in using the local community and environment to strengthen the teaching of concepts taught in the curriculum (9, 13-17). Building a garden within the school community can teach students about their place in the natural world and their place in the ecosystems (agricultural systems, food systems) (7, 10, 11). The enhanced sense of belonging developed through integrating the school into the local community can elevate social competence and the development of positive relationships (9, 17). This place based education model explains how school gardens lead to positive developments at both an individual and a societal level.

The different kinds of benefits and functions that schools gardens can provide reveals their complex nature as there are multiple pathways that each specific garden program may follow and various ways these programs may impact individuals. In a review of school gardening research, Ozer promotes the socio-ecological model to study school gardens. A social-ecological framework involves a holistic understanding of social development that draws attention to the different contexts that shape one's life and how they may influence each other and the individuals involved. This framework proposes that change in multiple systems including personal, inter-personal, organizational, community, and government, and also interactions between these systems may lead to diverse outcomes (7, 19). Using this systems perspective helps to unravel the complex school environment (20-22) and allows a study of how school garden programs can adapt to this complexity for the benefit of all the stakeholders involved.

The individual and societal benefits that can be reaped from school garden programs are especially relevant in NL where much of the knowledge about surviving off the land and engaging with the ecosystem is being lost as young people leave rural communities in search of education and employment (2, 23). This loss of knowledge has dire consequences for community well-being and sustainability. There is ample research stating the benefits of school gardens (1-7) and there are some examples of research into the potential of school gardens in Canada (11, 24, 25). However, there is a lack of rigorous peer-reviewed research to demonstrate how developing an understanding of the unique context and environment of the school is a critical factor in sustaining positive outcomes (6, 7, 12, 21, 22). This pilot study of a school garden in Harbour Grace, NL, part of a broader research program, aims to cover this gap. It is the first comprehensive documentation of the impact of the school gardening movement in Newfoundland and Labrador.

The objective of this case study was to provide a detailed analysis of how students, teachers, community members and government officials experience and perceive the school greenhouse. The reason for this multi-level approach was addressed to build a systemic understanding of:

1. motivating factors that led to the development of or participation in the garden,
2. experience and perceptions about the garden
3. facilitators and deterrents in sustaining the garden, and
4. practices that are deemed most beneficial in using the gardens to achieve health, learning and other outcomes

4. Environmental Scan of School Gardens in Canada

There is an amazing number of school gardening initiatives across Canada. The search criteria guiding this environmental scan involved looking for provincial government publications that mentioned school gardens. Beginning on the west coast, where both the weather and the social climate support gardening, the Vancouver Board of Education (VSE) passed a school food garden policy statement and process to help schools that want to start a garden or set up a composter endeavor. The document, published in February 2010, states that the VSE encourages the development and maintenance of school food gardens because of the many benefits involved, including opportunities for learning, increased access to healthy food, promotion of enhanced social and emotional development and to the greening of school grounds and the building of green spaces for neighbourhoods in Vancouver (26). The Vancouver School Board also has a draft *Food Action Plan* which contains strategies to increase food security within the VSB's school food system and the VSB has started the *Vancouver Schools Food Network* which organizes food related professional development opportunities for VSB schools(27). The VSB is part of a 5 year SSHRC funded project with UBC called *Think&EatGreen@School*. This project looks at all aspects of school food systems

including the growing of food, purchasing of food, school nutrition, school garden design, making curriculum connections and much more. The project website has resources for teachers and policy makers (28).

Moving westward, in 2011, the Government of Alberta's Department of Agriculture produced a guide to encourage the creation of school gardens in Alberta. This Guide provides support for starting and maintaining a school garden, including the involvement of students and community members and provides support for learning opportunities that can be integrated across the curriculum (29).

In Saskatchewan, the Saskatchewan School Boards Association has recently commissioned a research report to provide guidelines for school garden or greening projects (30).

In Manitoba, there is a *Healthy Schools* initiative which is a partnership of Education, Healthy Living, Seniors and Consumer Affairs and Healthy Child Manitoba. The *Healthy Schools* initiative has encouraged school gardens in this province and has funded a number of school garden projects through its Healthy Schools Campaign funding (31).

In Ontario, *Sustain Ontario*, a province-wide, cross-sectoral alliance (representing diverse sectors, including farming & farmer training, education, health & nutrition, legal aid, and service & retail) takes a collaborative approach to research, policy development, and action by addressing intersecting issues related to healthy food and local sustainable agriculture. On the web they have created a number of *Good Food Policies for Education*. One of these policies suggests providing infrastructure grants for schools to enable them to build kitchens, buy food-processing equipment and create school gardens. Last year, *Sustain Ontario* declared May 24th the first official celebration of School Garden Day in Ontario and on their website they provide a space for people to share their experiences and questions about school gardens (32). A number of non-profit organizations in Ontario are also working to support school food growing initiatives including the *Ontario Healthy Communities Coalition*, *Seeds For Change* (SFC) and *Food Share Toronto* (33-35).

My search for school garden initiatives or policies in QC revealed no results and a French search would be mandatory to reveal the current situation in QC.

In NB, the *NB Food Security Action Network* has documented a successful school gardening initiative but there do not exist any official government publications on the subject (36).

In NS, the department of Agriculture has published a school garden resource guide and the department issues small grants to schools in NS to help defray the cost of developing a garden (37). Also, the *NS Food Policy* group has a report on its website entitled, "A Review of Public Institution Local Food Initiatives", which gives information about a number of school garden initiatives in Nova Scotia (38).

In PEI, there are no official government publications about school gardening, however there is a CBC news article about the *Culinary Institute of Canada*, based in Charlottetown and its process of growing a school garden and incorporating it into the school's curriculum (39).

Here in NL there is no government policy or publication about school gardening. The *Food Security Network*, however, has a resource page full of links to guide children's gardening projects and there are a number of schools who have begun gardening projects (40).

There are two nation-wide school gardening related initiatives. The first is the *School Garden Network*, an initiative of *Nutrients for Life Canada*, which is designed to be a resource of value for all science-based gardens by providing a showcase for existing school gardens and by fostering collaboration, innovation and best practices (41). Also *Agriculture in the Classroom* (AITC), a Saskatchewan based charity promotes agriculture education and awareness across the country. *Little Green Thumbs*, a project of AITC is run in almost 400 classrooms in Alberta, Saskatchewan, Manitoba and Newfoundland. *Little Green Thumbs* gives students and teachers an opportunity to incorporate garden-based learning into the curriculum (42).

Searches for the Northwest Territories, the Yukon and Nunavut did not reveal any school garden policies or initiatives. However, throughout the country, policies promoting the use of school gardens are appearing. The support for school gardening initiatives comes from agriculture, education and health departments and also from provincial non-profit organizations concerned about agriculture, food security, sustainability and health.

6. Pilot Study Methods

Data Collection

To answer my research questions I used a combination of open-ended semi-structured interviews, a focus group and a student survey. Approval was obtained from the Health Research Ethics Authority and informed consent was solicited from all participants in the study.

Participants and Recruitment

All those involved with the greenhouse program at St. Francis were invited to participate in the study. As Harbour Grace is a small town, I could effectively use the snowball technique to make contact with any people who had been, who are, or

who intended to be active in the greenhouse program at St. Francis in Harbour Grace.

Interviews and Focus Group

I conducted semi-structured interviews with eight teachers, three parents/community members and three government officials who were either directly or indirectly invested in the St. Francis greenhouse program. The purpose of these interviews was to explore the participants' ways of thinking and insights related to the program. A question guide framed the interview and space was provided for spontaneous discussion on topics of interest (43). Aiming for a participatory approach, every participant received by e-mail a summary of his/her interview to confirm, correct, reflect or provide additional feedback to what they had expressed, allowing space for a further self-reflective process. A summary of the interview findings was shared with participants who were willing to participate in the focus group.

After I had sent all study participants a copy of their interview transcript and made some initial observations from the interview transcripts, I invited the study participants to come to a focus group. The purpose of the focus group was to have an initial discussion about the research results and gather additional feedback from study participants. Eight people participated in this focus group. The focus group was transcribed and analyzed.

Student survey

The second part of my data collection attempted to include students who have participated in the greenhouse program. I intended on meeting the students after I had a chance to connect with their teachers and/or parents so that the teachers and/or parents would understand the goal of the research project thereby enhancing the informed consent process. Students were contacted via the school principal. The principal gave students a package including the consent form for the parent, an information sheet, an assent form and a survey for the student. The survey aimed to get the student's thinking about their experiences in the garden. I sent out 50 student surveys but only received 5 in return. The low response rate is due in part to the fact that at the time of this research there was a pause in the greenhouse program as the school was facing administration changes and the transition from being a junior high to becoming a kindergarten to grade eight school.

7. Research Results

Background



St. Francis School in Harbour Grace (44)

St. Francis is a school in Harbour Grace, a town in Conception Bay on the south east coast of NL. Harbour Grace has about 3000 residents(45). St. Francis originally opened in 1961 and had to be rebuilt in 1974 due to a fire. Currently St. Francis serves students from Kindergarten to grade 8, but in its past the school has been both a high school and a junior high.

The St. Francis greenhouse is a 2400-square foot poly-carbonate structure that was built in 1992 to give this school's students hands on exposure to the greenhouse industry. At the time that it was built, the structure cost several hundred thousand dollars and was a model for technological innovation including the automation of watering, temperature (through roof shade control, ventilation, and heat), and lights. Jack Rose, the vice-principal who was also a farmer outside of school time, was the driving force behind this greenhouse. He felt automation would be the best way to manage the greenhouse in the already busy school environment. What this meant for the staff and students of St. Francis was that they could grow almost anything, any time of year, and that they also forged into the use of new technologies. When the greenhouse was still new, teachers were tasked to create courses that would expose children to the greenhouse. Two horticulture courses and a computer course, which taught about the greenhouse computer system, were introduced. The greenhouse turned out to be a source of inspiration for the technology teacher, Norm Littlejohn, who sought out webcams and broadcasting

technology in order to share greenhouse developments both in each of the classrooms of the school and also to other schools around the province. This made the greenhouse not only a resource for the St. Francis School but for schools everywhere.

The project base for these developments was the greenhouse and the development of the greenhouse can be traced back to a dedicated janitor named Gus Reinhart, who always kept flowers planted outside the school. He was a devoted gardener and kept an old wooden greenhouse in the back of the schoolyard. When the greenhouse officially opened it was named for this man. Out of these humble beginnings came the structure that 20 or so years later was tasked to produce vegetables to feed the athletes of the 2012 Summer Games including lettuce, tomatoes, cucumbers, peppers. In September 2012, the overflow of vegetable production was fed both into the local nursery home and the school cafeteria.

Twenty-one years is a long way for any structure to go and the greenhouse has naturally depreciated. Currently, there are some light bulbs that need to be replaced and only one side of the greenhouse roof is working, which can create more work when growing plants, requiring the manual opening of doors on the hot weekends and summer days when school is out. The school and surrounding community seem determined to keep the greenhouse program functioning. Having seen its impact on the school and its potential for the past number of years, community partners including the provincial government, local farms, Lower Trinity South Regional Economic Development Board and the school board have kept the greenhouse going with projects that have been recognized on a national level multiple times. The greenhouse was the National Entrepreneurship Development Institute national award winner, was recognized by the Pan Canadian Public Health Network in *"Bringing Health to the Planning Table: A Profile of Promising Practices in Canada and abroad"* and has been featured in Reader's Digest and on numerous occasions in local newspapers including the Telegram and the Compass.

The greenhouse has altered the very landscape of the school. A shed was built to house equipment and outdoor gardens have been built around the building. A plan has been drawn up and land allotted for an outdoor classroom. Trees and flowers grown in this school's greenhouse decorate the school's landscape.

The greenhouse has also altered the environment of this school changing the way teachers teach, the way children learn and the way the school interacts with the surrounding community. The following results provide a description of how these changes were experienced at multiple levels of the socio-ecological school/community system. These levels include the students and teachers, as well as the school, the community and the broader socio-political environment.

Participants' Perceptions of Students' Experiences in the Greenhouse

When teachers, community members and government officials were asked to comment about the students' experience with the greenhouse, there were five common themes that surfaced. These were a) the multiple benefits of hand-on learning, b) students' exposure to the agriculture industry, c) students' exposure to healthy food, d) students' development of work skills and e) students' exposure to environment and environmental science

A. The Multiple Benefits of Hands-on Learning

Research participants mentioned a number of positive outcomes related to the hands-on learning aspect of gardening at school. Further investigation of the pathways in which hands-on learning creates a range of positive developments for children at school would be warranted. The following five positive developments for children have been witnessed by participants: i. sense of ownership, ii. sense of responsibility, iii. enhanced learning, iv. inclusive opportunity, v. aesthetic opportunity.

i. Sense of Ownership

When teachers were asked to describe how the greenhouse impacted children the most common response was how much children benefitted from hands on learning. According to the teachers, involving students directly in the growing process led to the development of a sense of ownership, "*...it's hands-on. They can see the benefits of their investment of time and work, they can take pride in that as a sense of self-fulfillment and accomplishment and contributing...*". The development of a sense of ownership was accompanied by a number of positive feelings for children including pride, motivation, excitement and purpose, "*...it was amazing to see how much pride those students showed in terms of what they were able to accomplish in the greenhouse*". Students were excited to take their plants home "*at the end of the year they get to take it home and say 'Look Mom, here's what I did all year!...This is mine, I grew this pumpkin'*". This positivity was directly connected to an enhanced sense of purpose: "*...I truly believe in a lot of cases, it gives some students a purpose. They felt by going out and watering the plants and whatever else they were doing on it, they felt important. And for a lot of kids, they wouldn't have been able to experience that without the greenhouse...*".

ii. Sense of Responsibility

Teachers felt that the sense of ownership developed by students also helped shape their character, noticing a sense of responsibility growing in the students. Students learned to care about their plants and felt a duty to water them at lunch, learning that plants need to be comfortable to grow. This finding was echoed by

community members who observed students, “...whatever they had, they were able to take it home and look after it then during the summer...when we would come back in the fall we would have them saying ‘Ms., I had this many tomatoes on my plant and I had these many green peppers, I had this many zucchinis’. So it showed you they looked after their plant over the summer. Because they planted the seed and they had ownership of it... And to see them leave the greenhouse with it in their arms, they were so gentle with it, so caring...” One government official noted that it wasn’t necessarily that the children needed to have ownership over the plants, but that the act of seeing the results of their labour led to the development of self-confidence, “... that ‘I can do it!’, ‘I did it, and ‘I want to do more!’...it’s the physical ability of saying, ‘I did it.’”

iii. Enhanced Learning

Teachers noted that when students become the actors in hands on learning they formed stronger memories, “I think the kind of learning the kids got from this kind of stuff was the kind of stuff that sticks.” Because the greenhouse was such a different experience for students, it was an experience that stayed with them, “...the students, if you talk to them maybe years down the road this’ll be one of the things they will talk about. Say “remember when we had the worms”, whereas they don’t talk about, “remember when we’d sit in class so many days in a row”. Community members also remarked on how learning/memory was enhanced by hands on learning, “The teacher then will go back and talk about it in the classroom and talk about the outcomes and they’ll say ‘Remember when we did this in the greenhouse?... and they can visualize the things that they have done and it stays in their memory longer and it means more to them... because they had an actual part in it.”

The learning in the greenhouse also exposed children to failure, “...we had a hot spurt during their holidays and somebody had volunteered to come in and check on them, of course it wasn’t done, somebody forgot, you know. And we lost all our pumpkins...But I mean that’s the kind of stuff that happens. Kids learn from that too”. One teacher also noted that creativity is a product of hands on learning as children master the skill and attempt to use the skill in different ways.

iv. Inclusive Opportunity

Teachers found that the greenhouse’s alternative learning environment offered students an entry point for learning, especially for the kids who didn’t excel at pen and paper activities. One respondent reflected on how learning in the garden is equalizing, “they took a worm out on a plate, they pick it up and touch it and all that stuff and they prepare the bed for them... and they can all do that so I think it just made everybody the same which is nice sometimes...that program put everybody on the same wavelength”. A government official also noticed the equalizing nature of the greenhouse environment, “...the ones who came in fast and furious and moved fast and quickly, had to slow down, because there’s hoses and things to trip over. And you gotta get the plant in the centre of the pot, you can’t rip out the root. So that type of personality who was fast and furious had to slow down. And the one that was kind of

shy, meek, and mild did end up, 'My turn in there, my turn!'". The equalizing and balancing effect of the garden was also accompanied by the development of a sense of cooperation among students as noted by one government official, "*...very quickly, the two that were close in age would, not necessarily buddy-up, but they cooperated, they had never cooperated before together, but they cooperated. They were two different personalities, one was loud and one was quiet, but they were the same age and grades together. And you saw them cooperate*".

Another government official described how the enhanced social nature of learning and the development of confidence in the greenhouse has a direct impact on the health of the students, "*...anything that helps with the coming together of people, is going to help improve the collective health of the group, because we know that sense of connection and diminishing of the isolation, sharing of skills and ideas, the sense of camaraderie, whatever you want to call it, helps with it....if people have that connection, the chances are that they're going to feel better about themselves and feel like they have the skill: they're good at something*".

Community members noted how the opportunity to garden could be used as a reward for children with special needs, "*they were able to stay on task...it's a good reward because...they knew that something that they really enjoyed was coming and of course that can be used for any group, any child... it can be used as a focus*".

v. Aesthetic Opportunity

Students were also positively motivated by the aesthetics of the greenhouse, "*they really liked playing in the dirt. I think they thought, sensory-wise, it was probably, you know, very sensory fulfilling. Plus, they like, there's something about the light out here and the heat and, like, the building structure itself, the greenhouse, they seem to really enjoy that part of it, right.*" The possibility of growth in the greenhouse was also inspiring for students, "*...they love it when they see a seed sprout come through the soil or when they are out in the middle of winter and they can see green things growing and it's so exciting and warm in the greenhouse and outside it's probably a snowstorm, but we're in gardening, they love that*". One government official emphasized the therapeutic nature of working in the dirt, "*...whatever it is they feel better, for most people. There's some kind of a relaxation, or a therapy feeling with it...*". The observations about the therapeutic nature of playing in the dirt was countered by another interesting observation from some teachers and this government official, "*...first time that I ever come across kids - and it's probably the age and the time - where they wanted an apron and they needed gloves. And I'd say, 'Why? Why? Who told you can't get your hands dirty?'...I think it's the antibacterial soap, I think it's something that's come up in the last eight to ten years, that we're teaching our kids, 'Don't get your hands dirty', or 'Cover them up'. Which is okay, right. I mean it could be my philosophy is wrong...*".

B. Exposure to Agriculture

Naturally the action of being involved in crop growth and maintenance exposed the children of St. Francis to the industry of agriculture. In the past, the greenhouse partnered with a local farm to expose children to the potentials of this industry with the direct intention of addressing the decline in the number of farmers in the province. This teachers expressed how kids do not get very much exposure to the agriculture industry, “ *once they’re in level one, they’ve got their first set of courses picked, their teachers and their counsellors are talking about, well this is the way you’re going - you’re going to go engineering, you’re going to be a teacher, nurse, doctor, lawyer - nobody mentions farmer, you know, unless your dad and grandfather and your Uncle Tom, whoever, was a farmer. You really didn’t have that exposure.*” The year the school partnered with the farm, the students of an enterprise class grew the lettuce in the greenhouse and then transplanted all the plants to the local farm and made regular visits to check on crop development. When the crop was ready to be harvested, “*they brought it back here, we washed it, we packaged it, we labeled it, and the kids went up to [the local grocery store] and did a presentation to the produce manager, here’s locally grown lettuce, grown by St. Francis - we had a little sticker ‘Made Right Here’, and they sold it. And every couple of weeks then you’d get a call - well not every couple of weeks - but once a week we’d get a call from [the local grocery store], ‘We need more lettuce’. So they’d package up - we sold all the lettuce like that.*”

In later years, when children were participating in the garden as part of the school’s gardening club, part of the programs run by the Lower Trinity South Development Association or part of the Special Education class that grew crops in the greenhouse, students were able to learn about what kind of crops could be grown in this greenhouse, the fact that crops in the St. Francis greenhouse were grown without pesticides and herbicides, how they could use compost for fertilizer, and how to process vegetables into salads and preserves. A government official noted that students grew conscious of the fact that agriculture is possible in NL, “*...a lot of them didn’t have the faith that it could be done in Newfoundland.*” Another government official expressed how students learned about food security by developing an understanding of what it takes to grow food in NL. This awareness was an inspiration for one student who had been hired to help grow vegetables, as she was “*... discussing changing majors to go to biology or something and had started to look at the agricultural college.*”

C. Exposure to Healthy Food and Activity

i. Healthy Food

An extension of being exposed to the agriculture industry was that children were exposed to healthy food and they also often brought this food home to share with their families. As highlighted by one of the teachers, “ *I think some students*

were exposed to foods that they probably wouldn't have been from home. You know, I look back at last year at the young students seeing the peppers and some students had never had a pepper before at home. So the exposure to different types of foods was actually fantastic. They loved that to be able to take it home and show it to their families and their parents. And in some cases people just can't afford different types of foods." Community members and government officials echoed this sentiment, "And what we found is that if children grow it, they will try it. They may say 'You know I don't like it' but if it was their seed and they grew it they are more apt to try it..." One government official was hesitant to make a direct connection between growing food and eating healthy but felt there was indirect impact through the development of "...the children's awareness and interest and skill-building."

The possibility also existed that families would continue growing some of this produce throughout the summer as students became motivated by the skills they had learned at school, " *...some of them probably haven't been in a greenhouse, haven't planted any fruit or vegetables before and for some of them it's probably an eye opening experience, so: 'Oh my goodness, I can grow my own things and Ms., when I go home this summer now I'm going to ask my mom and I'm going to grow something else myself'"*

ii. Activity

There was not a conclusive response as to whether the act of gardening at school had any impact on the student's level of activity, " *Some of them have said however, a few in the last several years, 'You know Ms, I was so excited about this that I went home and I gardened with my pop this summer'. You know pop probably had potatoes or something. So that's a nice sized garden. Kind of hard for me to know cause I'm not with them but I'm hoping that they're telling the truth and they do something with it, some fresh air, get outside, experience something, right?'"* Many teachers noted that the act of gardening is a physical one but there appeared to be no explicit connections made between gardening at school and increased physical activity. One reason for this may be that generally, people conceive of activity only in terms of the intentional physical education - related activities, such as walking, running or exercising and they might not automatically think of gardening as a source of activity for young people.

D. Development of Work Skills

For a number of years, the greenhouse would hire students in the summer to help take care of the greenhouse, " *So in the summertime they kept things growing or they moved them outside to harden off. Or they sold them to parents or community people that came in to buy some trees or whatever we had there, right."* The idea for offering students this type of opportunity is that one day this experience might lead to employment opportunities and in this example, " *one kid went to Ontario... Anyway he went from just somebody doing the shelves to being in charge of the whole fruit and vegetable section. And his father is home and said he wouldn't even be able to look for*

a job there, except for what he learned at the greenhouse and stuff like that." This type of work experience was also important for special needs students, one of whom was reported to have found work in the local nursery after learning skills at the St. Francis greenhouse.

Community members were especially involved in the development of entrepreneurial programs connected to the greenhouse. The Lower Trinity South Development Association acquired funding "*...to do an actual hands on program because most entrepreneurial programs, they do the idea and the thought process but they don't sometimes have an actual product to take right through from start to finish and do sales and do income and advertising... [students] grew tomatoes and once they were harvested we partnered with the College of the North Atlantic and were able to take the tomatoes to the kitchen to make salsa so...they learned a lot about food safety and food security...They worked with the biologist there and with the kitchen...and then of course once it was bottled they were able to sell their salsa and make a profit.*" . For this particular project, a group of students from a different community connected to this project via the greenhouse webcams and they were able to participate and learn that "*...you can have a business venture anywhere as long as you have access to your clients and you have access to the internet. So it gave them an experience of doing a business online and partnering.*"

Working in the greenhouse exposed children to a specialized working environment and the development of skills unique to this environment. As noted by one government official, "*...the [student] by the end of the summer, had no qualms putting on steel toe boots, rain gear and whipper snipping.... I mean I now know there's two [students] out there who will pick up a whipper snipper and don't balk at outdoor work...*".

E. Exposure to Environment and Environmental Science

Connected with the sense of responsibility that students developed from having ownership over the plants, teachers felt that children developed environmentally friendly attitudes from learning to take care of plants, "*And in terms of appreciating your own ecology and your own environment, I mean...where else is the best lesson in that than to see what the earth can produce and what it needs to produce and you've gotta look after it. If you don't look after it, it dies. So our world is no different than that.*" Another community member described how students learned to calculate food miles, "*...looking at how much carbon is used if you have your food transported in from Ontario, PEI or anywhere...look how much it costs and how much pollution is generated getting that food to the supermarket.*". Students also took part in vermi-composting and learned about "*...the soil and how important everything that lives in the soil is to our environment and the job of worms and actually what they do for our soil.*"

Teachers, Community Members and Government Officials' Experience, perceptions and motivations with regard to the Greenhouse

Following the above summary of how respondents felt that students were motivated and impacted by the greenhouse comes a summary of why respondents were motivated to participate and how they were impacted by the greenhouse. The most common themes were a) the desire to teach children about food, and b) the recognition of positive opportunities offered by the greenhouse.

A. Desire to Teach Kids About Food

Many of the teachers who took part in the gardening program at St. Francis were gardeners themselves and were motivated to share their passion with their students. A number of teachers also spoke about their concerns about food both in terms of the health benefits and their broader concern with food security. As one of the teachers emphasized: *"you're producing vegetables, so you've got healthier food to eat, which is a big thing with pesticides and you hear about different issues with foods and what's added to foods to preserve them and whatnot. So and the other - I guess on another level, we've gotten away from growing our own vegetables as a family over the last fifty or sixty years. So I think that that's something that we should all get back to..."*.

Community members were also motivated by chance to teach kids about food and by their concern about food, *"It's healthy eating and it's healthy living now...what better ways than to grow things on your own...we're gone back to nature, because of health reasons and the different illnesses that are out there, people are saying it's in foods."* Community members also echoed the need to teach kids traditional food ways, *"We depended on the ocean for the fish, my father was a fisherman, my mother and all the kids - all my brothers and sisters - we worked in the gardens and worked on the land and grew all of our own vegetables, everything that we needed! ...it was a necessary way of life. So I don't like things to be lost, and I believe in my roots and I think we should be passing more of the historical things we used to do and survival things - Because if there's hundreds of students there and only one or two or three who learn something probably, you know, gets into the growing of their own vegetables, I thought that in itself would be success..."*. Community members made an explicit connection between retaining traditional knowledge and keeping children healthy, *"to educate on healthy living and healthy living is just not going to try to find something in the supermarket. Healthy living would give a better understanding, better feeling if there were more schools doing what Harbour Grace is doing"*.

Government officials also emphasized the importance of teaching kids how to grow food, *"There needs to be somewhere within the province...there's got to be support for those who want to pass on the knowledge, got the green thumb; there's got to be some kind of support to get that out to kids...it's definitely needed..."*. This government official repeated the importance of this skill set for our culture,

“Probably not every child is going to get to do it, and not every community is going to have a garden, or school is going to have a garden. But at least if it's in the milieu of what's happening in some schools, then it doesn't get lost.”



Picture from the inside of the greenhouse, courtesy of Norm Littlejohn (St. Francis Teacher).

B. Recognition of Positive Opportunities Offered by the Greenhouse

Teachers reported being motivated by the possibility of learning in the greenhouse, *“so part of it was, I guess for me to learn a little bit more, you know what I mean, like ‘Can we grow corn?’, ‘How do we grow corn?’, being able to start corn in the greenhouse, you know - ways for me to try to learn as well as try to teach the students...I think the whole thing has been a really good learning process, not only for the kids but for me and the student assistants.”*

Teachers also reported pride and positive memories as motivating factors for being involved with the greenhouse, *“I had friends all over the place who said, ‘Oh yeah, I bought some trees and I think they came from Harbour Grace, do you know anything about that?’, and I said, ‘Oh yeah, I packaged those, they were our trees.’”*

The experiences that teachers shared with students in the greenhouse were a source of positive memories, *"I do remember the looks on their faces and how exciting it was to be outdoors and to be gardening in October"*, and motivation *"It's that spring in your step when you get that little bit of excitement from a kid who, you know - and that's one in twenty. It makes it worthwhile."* Government officials also shared this sense of amazement about the potentials of the greenhouse, *"...it was exciting just to see the green peppers in the garden, because they took us for a tour first. And it was amazing to see green peppers that were beautiful..."*.

The aesthetics of the greenhouse appealed to teachers as well as students, *"...and it's such a beautiful greenhouse, such a beautiful facility. I love to see it. When you glance by and you're on duty and there's so many beautiful things growing"*. Teachers were able to derive a sense of peace from the garden, *"I must say I like it out here. I find it therapeutic out here"*.

How the Greenhouse Impacted the School

Participants commented on how they felt the garden impacted the school community. The three major themes identified were: a) connections between the greenhouse and the curriculum, b) benefits and relevance of hands on learning, and c) enrichment of the school culture.

A. Curriculum Connections

Teachers noted the potential connections that could be made between activities in the greenhouse and multiple school subjects including science, social studies, technology, art, language and math. Teachers also recognized that the potential to incorporate greenhouse activities into the curriculum is limited by resources *"You achieve the same outcomes at the end of the day, but it's just a little bit of different thinking for staff. But I think the potential is there"*. In the past the school did create courses that were specifically catered to the greenhouse, however the transition of the school from a high school to a junior high and then to a K-8 school has changed this, *"There's no dedicated teacher who's a gardening teacher. There's no structured link to the curriculum that's set out in a guide for someone to use...if there was a guide linking curriculum objectives with activities you could do in the greenhouse, then someone could take the guide and do that."* Community members and government officials who had participated in greenhouse programming also recognized the flexibility of the greenhouse when it came to fitting it into the curriculum, *"...it crossed all the curriculums with health and science, biology...So we can always come up with different programs to accommodate whatever subject the teachers are doing."*

B. Benefits of Hands and Relevance of Hands-on Learning

Teachers were convinced of the benefits and need of hands-on learning for their students, *“And it was hands on and it makes everything they learn more realistic. It brings it alive, I mean no play on words there, but it does bring everything alive, you know. It gives roots to the facts and the figures and the big words and the big sentences that are in the book. It takes those and give life to them. Gives a picture to them and just breaths life into education”*. However teachers were conscious of the fact that hands on learning requires extra attention and resources from the school system. One government official echoed this fact describing how hands on learning requires a change in mind-set about learning, *“...it’s a different way to learn. So how do you test kids on it?”*

Community members recognized learning hands on practical skills like gardening was essential for community development: *“...in schools we should be teaching carpentry, we should be teaching more general stuff that people who have got a talent for that can develop and that has happened in the schools... The woodworking and the plumbing and the electrical and the engineering, that’s there, big time, in a lot of schools. But not the agriculture...not everybody is going to be doctors and lawyers and business people. We have to have mechanics and we have to have other labour people and in particular we have to have people to grow food”*.

C. Enrichment of School Culture

Participants found that the greenhouse enriched the school culture in three ways: i. it helped to build school community, ii., it acted as a leverage for resources and iii. it helped build a healthy school culture.

i. Build School Community

Teachers commented on how they felt the garden impacted the school community both in reality and in potential. One teacher noted that had the greenhouse not existed, he never would have been motivated to start a gardening club. The greenhouse club offered to students at St. Francis was *“...another extra curricular [activity] they can avail of, it’s probably something they have never experienced...”*. Gardening as an extra-curricular activity was found to be a hook to school *“...you look at a certain populations within our school and there’s really not a lot in terms of extra or activity that they can be involved in. When you look at the greenhouse and gardening, I mean, anybody can get involved really.”*

The presence of the greenhouse also had teachers looking to make connections with the community. Teachers and members of the School Council are in the beginning stages of trying to start a community garden at St. Francis and are also interested in making food grown in the greenhouse available in the school cafeteria. Another interesting connection that demonstrates how the greenhouse impacts the school’s community is the fact that one of the former students of the greenhouse is currently a teacher at St. Francis who has taken the initiative to bring

her class out into the greenhouse to learn about and engage in producing a variety of crops.

ii. A Leverage for Resources

There are not many schools in the province that have had such a large investment into such unique facilities and in the case of St. Francis this fact has inspired them to see the potential for and to acquire more resources. One teacher expressed how the greenhouse acted as a leverage when he sought out funding for the school, “...and I was applying for different grants... and people saying alright what he’s doing out there, he’s pretty innovative, so we’ll give him that grant...”. By using the greenhouse as their project base, the school has found funding to replace every computer in the building, to build a video production unit and to develop a broadcast system including a TV and smart board in every classroom. These new technologies allow the school to share what is going on inside the greenhouse both throughout the school and around the world.

The importance of having made a large initial investment was echoed by this government official, “...Twenty-five years ago whoever had the foresight to say I’m spending a lot of money and I’m getting the best facility I can. I’m not going with wood and plastic, I’m going with glass and steel. And that greenhouse has stood pretty solid for up to 20 to 25 years... when I walked in, my first impression was, “Wow! This is an expensive facility”...And that they had the foresight to say, ‘We’re going with the top-notch, we’re not going half in, we’re not going slap-happy. We’re investing in a solid structure’. And to me that was one of the best decisions that they made...”.

iii. Health

One health official noted that the incorporation of gardening into the school culture is an effective way to promote health, “...that fits very well with *Healthy Kids, Healthy Schools*” [‘the province’s Comprehensive School Health campaign (4)].

How the Greenhouse Impacts the School’s Environment

When teachers were asked how the greenhouse altered the school’s environment. They responded that the greenhouse changed the actual physical environment of the school with the enhancement of the school grounds with flowers and trees that had been grown in the greenhouse and the development of school composting. The school board’s policy recommending that the greenhouse be kept free of insecticides and pesticides sets an environmentally friendly precedent for the students and surrounding community.

How the Greenhouse Impacts the Community

Participants expressed multiple and potentially far reaching benefits that the greenhouse program introduced to the community including a) community building potential, b) potential economic influence, c) health benefits, and d) environmental benefits.

A. Community Building Potential

One teacher remarked that the involvement of the surrounding community with the greenhouse program helps to create community. The St. Francis greenhouse has actively partnered with schools from as far as Trinity, Burin and Bay de Verde. Students from these schools have been given the opportunity grow plants and learn from the greenhouse. Using both smart boards and webcams, St. Francis has connected with these schools throughout the growing process so students can check in on the growth of their plants. Community members saw this ability to connect with other schools as proof that the greenhouse could benefit the entire region, *“They don’t have to build greenhouses anywhere else, they can have some of our space, look at it from the classroom and see what they’re doing.”* One example of this cross-school learning was when the school in Old Perlican (an hour and a half from Harbour Grace) grew herbs in the greenhouse. They came to St. Francis to plant the herbs and then program facilitators looked after the plants. When the herbs were ready for sale, they were transported back to the students who then had sales for them as part of their Entrepreneurship program. The Lower Trinity South Development Association became very active in running greenhouse programs recognizing that the St. Francis greenhouse could be a resource for the entire region. One community member stated that the greenhouse could be more easily sustained if multiple schools had a vested interest in programs offered at this facility.

The greenhouse has helped to build community with the incorporation of place-based learning into the school. Place-based learning occurs when the school works with the local community and environment to strengthen the teaching of concepts taught in the curriculum (14). An example of this, although it wasn’t denoted ‘place-based’ education by the teachers, was an occasion when students grew beets at a local farm and were overwhelmed by the amount of beets that they produced. In this case, *“...The truck backed them down here by the greenhouse, and I was expecting, you know, to send down half a dozen kids to help unpack the beets...and when he opened the door, I mean it was a huge grocery truck and it was full. We filled the greenhouse, we had to put some out in the garage, and said what in the heck are we going to do with all the beets? And we had parents who volunteered to take the beets, well the kids were involved in it too in terms of the washing and the peeling. And the parents then started taking them. We sold beets by the bag for a while, until we ran out of customers, because mostly we just did it in the community as a fundraiser. So you’d buy a bag of beets for ten dollars, or whatever, and you just gave them the beets in a sack. And it must have been seventy or eighty sacks of beets we had, we had so many beets I figured they’d rot here. And then we had a group of parents get together once we started more or less begging, alright we’ve got these beets, we’ve got to get rid of them, the school year is coming to the end, how would you like to bottle*

them up. Actually, you know that was just before Christmas, because I remember we had a Christmas craft fair here. And parents came and took all the beets... they took the beets home, cleaned them, bottled them, and had Newfoundland tartan covers to go over the top and had a little label on it, 'St. Francis Beets'. Anyway we sold them at the Christmas craft fair, so that's how we got rid of the rest of the beets. So that was kind of fun." In this example, the community was brought together to help grow, process and consume the beets. The school encountered a challenge in terms of the abundance of their harvest and the community pulled together to help solve this problem. This is an inspiring example of how the greenhouse enables the school to work with their surrounding community.

B. Potential Economic Influence

Many participants mentioned how the St. Francis greenhouse had the potential to grow an amazing amount of food and plants throughout the years because of support from government programs. The greenhouse was also able to contribute economically to the community in terms of job creation. One teacher remembered having fifteen workers employed in the greenhouse at one point. There was an Older Worker program run through the greenhouse and also a program where people with disabilities were hired to learn about greenhouse production. The Older Worker program brought the additional benefit of intergenerational learning. The older workers had skills in growing things because many of them had grown through their lifetime and they were able to share these skills with the students. A government official also noted how there should be a link between the skills taught in the greenhouse and the government's Poverty Reduction Strategy, as people learn to grow their own and thus become more food secure.

An issue with school greenhouse production is the possibility that the greenhouse could threaten or compete with local nurseries and greenhouses. Teachers spoke of the fact that the greenhouse had made a deal with local producers that they could not sell the same products that were being offered by these businesses. The issue would be that the greenhouse would have an unfair advantage if it sells the same produce as other local growers and it does so with the help of government funding.

One community member described how the economic benefits from this program are also indirect in that the program has the potential to develop the greenhouse industry by creating support for and education about this industry, *"You get a return on it for goodness sake, you get a big return. And we're not just talking a return financially, but return for people who normally would never be involved in it...once it gets in the school system, then the kids - kids will become involved then they'll go home and tell their moms and dads 'this is what I'd like to do', right? I mean, and that's the way we get the best support, from the kids telling their grandparents."* Community members and government officials provided evidence that the St. Francis greenhouse had increased the number of people in the community who

were willing to grow their own vegetables, *“And I have to say, two kids out of the five had actually convinced their parents to either break ground or put up a greenhouse”*. Exposing young people to the ability to grow food not only has benefits for the agriculture industry but also has implications for community health. As this community member describes, *“We need the opportunity for jobs, outside traditional jobs, we need different people with an interest and support of a good lifestyle, financially, as well as healthy. It all comes together. And yes Harbour Grace could be a beginning for the future...”*.



Picture of tomatoes growing in the St. Francis Greenhouse, courtesy of Norm Littlejohn (St. Francis Teacher)

C. Health Benefits

One community member described how teaching children about growing healthy food deals with health in a preventative rather than a reactive way by encouraging children to bring the topic of health out into the community, *“ I look at their reaction as they see the seed grow and they get that actual plant that they can actually eat, ...it’s something that’s needed and it’s something that the children certainly do benefit from and what they are learning they take home as well so they tell their parents why this is good for them and why they like this, so I mean it’s going to be integrated into the home and into the family and their friends. I mean wherever*

they are. They are the new messengers or the new voice of healthy eating so it's got so much potential there and the need is there..."

D. Environmental Benefits

Just as the plants grown in the greenhouse decorate the school yard, so do they decorate the surrounding community. In the past, the school used to give tree seedlings to a variety of organizations. The seedlings were sold by these organizations to raise funds. One teacher reported hearing from a friend, *"I've got trees in my yard now, you should see the trees I got from your school, they're like fifteen feet high now - twenty feet high, you know"*.

How the Community Impacts Greenhouse

As the greenhouse extends benefits outward into the community, so does the community have an essential role in sustaining the greenhouse. As this teacher says, *"...So I know with our current budgets in terms of school board, we wouldn't be able to sustain or keep the greenhouse going, so without the community support, it probably wouldn't be able to continue or even exist any longer... the community support is absolutely essential... that is the extra support that the staff needs sometimes to be able to use the greenhouse."* Surrounding community members bring to the greenhouse knowledge, expertise and resources that are necessary to keep the programs going, *"...they [a local landscaping company] were more than willing to come down...saying, if you want us to talk to your kids about something, we'll come down. And the partnership that we had with them was more or less an expert to ask, I don't know how to do this. What do I need to order for next year?"*.

Community members have helped facilitate programs helping to reduce the workload of teachers, *"And of course we would meet with the teacher and say 'This is what we've planned, we've gone over this curriculum. How does this fit with you? Is this the way you'd like to see it or is there something you would like to add to it or something else that we may have missed?' So we'd be talking back and forth through email and we would plan it. And then they would come each week or every two weeks depending on their schedule, you would work around the teacher's schedule. And they would come over and be able to tend to their plants and look at the results each time, so it was great to be able to work with the teachers that way..."*

The St. Francis greenhouse has had multiple partners from the community throughout the years including the Eastern School District, the School council, the Town council, the Lower Trinity South Development Association, Environment Canada. A few years ago when the government wanted to remove the greenhouse, the school council lobbied very hard against it recognizing the greenhouse as a unique resource in the province. The greenhouse is a source of pride and identity for community members including local politicians who have used the greenhouse as a

backdrop for special announcements and have supported the greenhouse at various times over the years.

Facilitators and Deterrents to the Greenhouse

When teachers were asked to comment on facilitators and deterrents to the greenhouse program the most common themes were a) the complexity of the school environment, b) the loss of traditional knowledge, c) the impact of the state of agriculture in NL and d) the impact of funding programs.

A. The Complexity of the School Environment

In the twenty-one years that the St. Francis greenhouse has existed, there have been drastic changes in the organization of the school. One teacher noted that the change from non-secular to secular schools had a big impact on the school culture, *“But when they did what they thought was a wonderful thing back x number of years ago, making it all secular schools, as good as that was in terms of saving money and all that kind of stuff, it costed us a lot...”*. This teacher described a loss of control at the school level and an increasing amount of bureaucracy. Another teacher commented on a change in school culture *“...like before it was kind of a staff thing, like these big projects that we did, everybody wanted their hands in it somewhere. You’ve still got that, but...because we’ve had so many configurations and people are trying to hang on, you’ve got new people coming in probably too late...”*.

Many teachers noted that they are pulled to capacity in their current positions and don’t have the time to contribute extra to creating greenhouse programming. Community members were aware of the problems with over-burdening already busy teachers, *“Because everybody’s taxed with their workloads”*. Community members also mentioned how the timing of the school day made it difficult for parents to help out, *“...it’s difficult because most parents are working or they are home with small children, so to be able to come during the day, it’s hard.”*

The complexities inherent in the school environment also cause delays or interruptions in trying to move projects forward as is shown in this teacher’s description of his attempts to form a community garden at the school, *“...and that was in process and we got delayed with some permissions to use the land. And that stalled then for most of the year, then a key member of the committee that I was striking got sick, and suddenly we were into May of the year. Then school was over.”*

One community member spoke about the issue of liability being a deterrent to forming a community garden at the school site, *“...but you can’t do an open community access gardening because it is attached to a school and that’s just for liability”*. A government official also pointed how any programs to be run in the

greenhouse need to be subject to security clearances, occupational health and safety requirements, insurance regulations, etc. , *“But again, if you're sitting down and you're a part of a committee and you're planning, well then that's part of the planning, right. You need to know about that.”*

B. The Loss of Traditional Knowledge

Many teachers shared the perception that the gardening program at St. Francis school is an important response to the loss of traditional knowledge encountered among children today. Teachers hypothesized that because of a lack of time today, children don't know where food comes from or how to prepare it. As this community member describes, *“a lot of them had never seen vegetables grow. It's not like years ago I mean I grew up growing our own vegetables...our parents grew a variety of things, lettuces and root crops. To me it was something familiar but most children now don't know where it comes from, they think it just comes from the supermarket and that's all they think about. But when they grow it here, then they actually see how it grows, they know where food comes from...”*. The loss of traditional knowledge served as a rationale to keep this program running, *“...it's all going to be lost if we don't introduce it and get other people interested in how to do it”*.

C. The Impact of the State of Agriculture in NL

Many community members shared the view that there was a lack of support provincially for developing young farmers. In the following statement, this community member describes how much of the agriculture that has occurred in the province was done out of necessity, *“...the parents did it because they had to do it. It was a matter of survival...it's no longer a matter of survival. So the parents are not encouraging their children or whatever to get involved in agriculture in a survival, or commercial, or a self-sufficient way for food.”* This community member felt that if there was no provincial agricultural or education policy to reinforce the skill set of growing food, than it would be lost. At one point in the past the Carbonear campus of the College of the North Atlantic, located twenty minutes from St. Francis, offered a two-year agriculture program but this has now been discontinued. Another community member felt that agriculture could not be a profitable industry, *“because talking to farmers in the years past, growing your root crops, which are all important but they are not getting a whole lot for their product, as they did years ago, the price has not gone up for what they are growing and it's very labour intensive. So I think if you are going to get into agriculture, you may want to get into products with niche markets where there is a higher end for profit.”*

A government official spoke of the fact that while the number of farmers has decreased, there is no initiative from the Department of Natural Resources to train young farmers. This government official stated how a program like the St. Francis greenhouse could not currently be funded under Natural Resources funding because they have a criteria that they only support financially viable farms.

D. The Impact of Funding Programs

Teachers remarked that at one point in the school's history there was a lot of money available for the greenhouse program which allowed the hiring of students in the summer and the development of courses. When this funding was no longer available it became impossible to continue these types of programs. This community member echoes this sentiment, *"I think that resources were made available when it started and when it was on a high. Resources now are not the same as what they were"*. Community members were aware of a drastic change in funding availability, *"Schools, like everybody else, they're cutting back to hell too."* From healthy schools funding to employment programs, this government official stated about the current economic climate, *"...no social program is going to fly these days. Whether it's adult literacy, whether it's greenhouses for schools, any social program that was reliant on Rural Development Corporations is - if not gone - pretty close to going"*.

One community member expressed a larger concern for the future of rural NL, *"...it's disappointing because you see all those beautiful commercials for rural NL and tourism and it's all rural but where is rural NL going to be if there is no resources there for it's people and if there is no one living there. And can you have ties to the beauty of NL if there is no one there to show you?"*.

Necessary Conditions for Sustained School Garden Programming

When teachers were asked to comment on the sustainability of the greenhouse program, the most common themes were: a) greenhouse dependence on energy and resources, b) that there are a wide range of potentially available resources, c) the possibilities and challenges of having inter-departmental benefits.

A. Dependence on Energy and Resources

Every teacher who had participated in the greenhouse was aware of the incredible time, patience and energy that teachers had to invest to keep greenhouse projects running. This often required coming to the greenhouse after hours and on weekends. Greenhouse programming also required extra knowledge about plant production, curriculum development, extra supervision of students and even project development and management, *"...And resources weren't there for that."* In the past the school had a committee responsible for keeping the projects moving and there is now discussion about setting up a committee to oversee the greenhouse program, but in reality even the start-up of a committee takes extra time and resources.

Community members commented on the fact that opportunities are dependent on resources and leadership, *"...the opportunities are endless. If somebody had the resource to take it and run with it."* While community members are eager to help, they are aware that of the intensity of greenhouse operation and that it requires more time than volunteers can contribute and also requires knowledgeable

volunteers, “...we've spent a lot as school council just trying to work with it, but we didn't have the expertise...”. Government officials agreed that the continuation of greenhouse programming required training and expertise in the community and opportunities for professional learning. However, teachers and community members, having seen the greenhouse in its heyday, emphasized that because the greenhouse has not properly been resourced during the past years, it has been underutilized.

B. Availability of Potential Resources

A number of potential resources were mentioned by participants including i) the potential of fundraising and ii) a vast network of community connections.

i. Potential to Fundraise

There were a number of examples of times in the past when the school used the greenhouse as a fundraiser and one teacher noted that the initial goal of the greenhouse was for it to be self-sufficient in operation. In reality though, teachers expressed some doubt as to whether you could make enough money growing plants to sustain the greenhouse. This community member did note that the Enterprise classes made profits on their greenhouse grown produce, “...they did make a profit. On the herbs, I think they made close to \$800 for that class and then the salsa...it was profit because the tomato was grown here and the College gave their time so they didn't have that kind of overhead, so they made about \$1200 off the salsa. So that was great and that was something for their enterprise class that they could put back into the school.” One government official also mentioned the possibility that the greenhouse could rent out growing space for community gardening.

ii. Connections to Community

Community members involved with the greenhouse have extended their networks out into the community to find resources. A local landscape architect has drawn up plans for an outdoor classroom and MUN Botanical Gardens has been contacted and used as a resource. The proximity of the school to the College of the North Atlantic (CAN) and the connections already established with the CNA makes the processing of food grown in the greenhouse very easy. Community members recognize these resources, “...the potential is here, the grounds, the building, the college, for a year round operation and getting more people involved...”. A government official remarked that communities like Harbour Grace should start a directory of people in the community who have farmed or who have some expertise with gardening so that the school could contact these people if they wanted to start gardening. This government official also recognized the potential for the province to offer a gardening workshop to teachers across the province as a professional development opportunity. Another resource pointed out by a government official was the availability of land that most rural communities have, “...the opportunity for

these things to thrive really is in rural Newfoundland, or in places where they reserve green-spots, like if you're going to put up a subdivision and there's no allocation for extra land or bigger sized lots...then it's probably not going to happen".

C. The Possibilities and Challenges of Having Inter-Departmental Benefits

In order to keep greenhouse programs running in the past, community members have partnered with multiple organizations to find funding, *"Sometimes we've got some small amount from Environment Canada and then a small amount from Provincial Wellness so that we can put them together and make one program..."*. In partnerships like this, multiple objectives need to be met. The school requires that educational objectives be met with each program and in the past environmental and health objectives have also been met. In a recently proposed project, the school would partner with community, industry and agriculture and still meet educational objectives. This government official recognizes how the programs offered in the St. Francis greenhouse cross multiple departments, *"Yeah, it's an interdepartmental thing for sure...because your benefits are expanding way beyond what kids have to learn...if you're going to bring in parent involvement or other community-partner involvement, then you've got a municipal thing happening. And you've got a skill-set and a knowledge-base being built in the community. Then you've got your health promotion piece that goes with it..."*.

With these multiple potential benefits, the articulation of the benefits becomes more important and more complicated. While teachers expressed the importance of keeping good records and following up with students to be able to see the long-term benefits of the program, these benefits become harder to trace when you are talking about health promotion or community development. As this government official states, *"...can you say, 'Okay we build a garden and chronic disease goes down'? Probably not. But if you want to be able to make that environment, then do you want to make that investment to...because eventually things become mainstream. They become the common"*.

Searching for funding also becomes more complicated when the benefits of the greenhouse program expand beyond the horizons of education. As this government official says, *"Well see, this is where it gets muddy or less clear, because like mandate of the Department of Education is curriculum and resources and professional development. So I see this as more of an interdepartmental approach, not just Education..."* The greenhouse cannot be considered strictly agricultural either as this government official says, *"... I guess in our funding system...it's got to be agricultural, it's got to be economical. You know, we have certain criteria that you got to meet...And for our department [Natural Resources], we've always known it's there. I heard about that greenhouse since I started.... And we've heard wonderful things, the Federation of Agriculture talks about it when they talk about agriculture in the classroom. You know, it's recognized around - it's recognized amongst us that it is the, maybe the one and only, and that it's had a long history. But how do you necessarily*

put money in?" Another government official speaks about how the greenhouse impacts the health of the community from a broader sense of health, "...it ties into health promotion, because it's something that communities can be part of and they're active, they're involved with it, they're mobilized for - to use the language - and you can get only good things coming out of it. So I think it moves health from people's common view that, you know, it's the hospitals and the dialysis machines and all that stuff, that this too is part of health, it's all - it all fits together with the acute and long-term care, plus, you know, the stuff at the community level, where people are living. That if they can feel good about what they're doing and there's interesting things happening in their community, it's only going to be for the better."

These multiple benefits are a definite advantage but also a stumbling block when it comes to determining who is to take the lead of this project, as this government official states, *"I think with the greenhouse it's like any project, there has to be someone who owns it to keep it together, to keep it going and coordinated and organized. If no one claims the ownership, in a sense, then... it'll go dormant, no one will make sure things are happening."*

Student Survey Responses

The student survey had a low response rate (n=5) but of those responses there was some confirmation of what participants observed about students. Most students stated that they were involved in the gardening program as part of their obligatory class activities and almost all respondents said that they wanted more opportunities to go to the greenhouse. Students felt that gardening had some impact on their eating habits but that it did not impact their levels of activity.

Question	Most Common Response
Number of years in the program	1-6 years
Description of Activities	Planted seeds, took care of worms and plants, watched plants grow
Motivation to participate	Obligated as part of their class activities
Favorite thing about gardening	Getting to watch the plants and see the progress
Least favorite thing	Not getting to go to the greenhouse often
What have you learned?	How to take care of plants.
Does gardening influence what you eat?	Yes

Does gardening make you active? No

What changes would you make to this program? There should be more opportunities to garden.

8. Discussion and Recommendations

The purpose of investigating the greenhouse program at St. Francis in Harbour Grace was to provide a multi-level analysis of how students, teachers, community members and government officials experience and perceive the greenhouse program. The reason for this was to build a systemic understanding of:

1. motivating factors that led to the development of or participation in the garden,
2. experiences and perceptions about the garden
3. facilitators and deterrents in sustaining the garden, and
4. practices that are deemed most beneficial in using the gardens to achieve health, learning and other outcomes

The results from this study provide insight into how school gardens in NL are framed uniquely based on the social and economic climate of this province. The interviews with stakeholders revealed a range of perceived benefits for students, the building of capacity within the community, the potential of school gardening to help develop the agriculture industry and the potential and need for a broad range of stakeholders to help in the continuation of the program. This case study has provided initial findings about the potential of school gardening in NL and the results will be used to inform further investigations into the adoption of school gardens across the province.

One important flaw in this study is that none of the information collected about this school's gardening program involved the direct observation of what happens in the school garden classes. Previous studies of school gardening have revealed that to assess the relative effectiveness of garden programs, it is important to observe the wide variation in how many students are participating, the intensity of participation and the extent to which material taught in the garden is reinforced in the rest of school, at home and in community(7). Due to the timing of this project and the fact that there have been substantial administrative changes in the school, there was no active gardening project occurring at the time of this study. However, the knowledge and experiences shared by teachers, community members and government officials about the long and impressive history of the St. Francis

greenhouse provide an essential, useful and unique perspective on the action and the range of potential benefits of school gardening in NL.

The social-ecological framework that guided this investigation helped to conceptualize the school garden as a systemic intervention. That is, an intervention which is defined by and helps to define the multiple contexts that convene in the school environment, these include students, teachers, community members, government and the different potential interactions and effects this school domain may have on the different stakeholders and vice versa. This discussion will revisit key themes from each aspect of the social-ecological framework to help build an understanding of the multiple pathways by which school gardening programs may lead to the healthy development of students and the short term and long term impacts for the broader school and community(6, 7, 12, 18).

Perceived benefits for students, teachers, and for the school environment

The strong link between hands-on learning and the positive development of students found in this case study supports existing research (6, 7, 12, 18) but also requires more, preferably longitudinal, investigation. In this study, school gardening was found to enhance i. sense of ownership, ii. sense of responsibility and, iii. learning. It appeared that providing children with the opportunity to contribute helped them to build character as they developed confidence and a sense of responsibility. Also, children found meaning in their contributions which was found to strengthen memory formation. These findings relate to past findings regarding the ability of school gardens to impact students' feelings of attachment, pride and belonging to their school. Importantly, students' level of bonding or connection to schools has been related to health and achievement outcomes. Adolescents who report feeling more connected to school show lower levels of emotional distress, risk behavior and aggression (7).

The finding that the greenhouse provided opportunities for enhanced inclusion at school has also been found in other studies of school gardening. In gardens, students tend to work together to achieve tasks and projects draw on skills and interests not necessarily associated with high achievement in the regular classroom (such as physical strength, visual spatial skills or experience in building). This finding is valuable as cooperative learning is often associated with better peer relationships as well as higher academic achievement (6, 7, 12, 18).

Considering that in this study there was no direct observation of an active garden program and student feedback was minimal, it is difficult to ascertain what relevant mediating factors might effect the future achievement of these positive outcomes. For example, do students learn better through hands-on inquiry because they are able to achieve a better understanding of concepts or because they have developed a strengthened bond to school and they care about how their teachers view them, or are both factors relevant? Such teasing apart of variables would be

required in future investigations and has been recommended by Ozer in her review of school gardening literature (7).

It was interesting to find that the teachers, community members and government officials felt the same types of positive benefits that they reported seeing in students. They shared the excitement and pride that students exhibited and they were motivated to participate because of these positive feelings. Teachers, like students responded positively to the enhanced aesthetics of the greenhouse environment. It would be relevant to engage in further research to see if these positive responses might act as a buffer to the stress and enhanced workload experienced by teachers in the school environment. More likely, the teachers and community members involved seemed already very much familiar and engaged into gardening practices.

The exposure that children at St. Francis got to the agricultural industry, to healthy food and to the environment is a reflection of what gardening programs have been able to achieve elsewhere (9-11,15), where it is common for organizations concerned with sustainable agriculture and food systems to provide support for school gardens. In this study the finding that children's level of environmental consciousness developed as a result of learning to take care of a plant is significant as children today are becoming less exposed to the natural world. Previous studies have found that adults who had a significant and positive exposure to nature as children were more likely to be environmentally sensitive, concerned and active (6, 48).

Students at St. Francis also learned more about the ecological system by developing an increased knowledge about how to grow food in this particular ecosystem, increased knowledge about the larger food system and our dependence on transported foods. In the particular context of NL, it's significant that participants felt that children have a lack of exposure and opportunities when it comes to agriculture and the eating of healthy food. The ability of this greenhouse program to expand student's knowledge of what could be grown and also eaten in a NL environment is powerful. The potential of vegetable gardening to teach food system ecology is important because today's supermarkets' constant supply of heat loving vegetables makes many cool season crops unfamiliar and therefore unpalatable. Blair notes how gardening in northern regions during the school year helps strengthen children's knowledge and taste for cool-season vegetables, particularly for dark leafy greens (6).

A number of participants reflected on the fact that students were exposed to eating healthy food and this benefit is potentially magnified by the fact that eating vegetables in a garden program at school is a peer activity. Thus there is the increased potential that peer social influence helps promote the view that consuming fresh produce is a normal practice (7). Teachers, community members and government officials interviewed in this study all shared a view about the importance of teaching about food and maintaining traditional skills. It would be

interesting to further investigate people's consciousness of change in the food system and their concerns about the healthfulness of our current diet.

School based health promotion research demonstrates how program effectiveness depends on school-wide integration of programs. In other words, norms that are taught in the garden could be enhanced with reinforcing school policies and interactions between school, home and community (7, 49, 50). An interesting factor when observing responses about how the garden program impacted the school was the fact that while many respondents noted that the garden lead to the exposure of healthy eating, not many people conceived of the positive social benefits, such as enhanced community involvement and student cooperation as having an impact on the comprehensive health of the school environment. Although the province has adopted a comprehensive school framework, this broader definition of health surely needs more emphasis. For example, the fact that respondents did not view the act of gardening as a physical activity is another example of this need to redefine health (51). There may be important resources, such as municipal recreation resources, for school garden initiatives that are not currently being accessed because people are not framing the benefits of gardening with a broader view of health in mind.

The Greenhouse and the Community

"Gardens are intensely local. Everything except possibility the purchased plants and seeds are part of the natural local environment. The clouds, rain and sun the seasonal cycle, the soil and its myriad organisms, the insects, arachnids, birds, reptiles and mammals that visit the garden teach about place" (6, p.17).

The people interviewed in this study were directly involved and passionate about the St. Francis greenhouse and therefore they readily saw the benefits that the greenhouse brought to the community. The initiative taken by St. Francis to make connections with surrounding schools in the region is the type of grassroots organizing that helps create community capacity. The schools involvement in the lettuce project and the beet project provided opportunities for the students to feel an integral part of their communities and to feel that the community was an integral part of the school. There is evidence in the literature about how place-based learning has been correlated with enhanced enthusiasm for learning and increased standardized test scores (6). Not only has place-based learning been found to foster student learning but it has been linked with facilitating youth development and bettering the health of communities (52, 53). Other potential benefits that come from nesting formal education in the immediate context of the community include youth engagement and rural development. In this study, the evidence collected about St. Francis' experience with place-based education was not observational but anecdotal. It would be beneficial to observe a place-based education project in

practice in NL to observe whether students, teachers and community members experience some of these benefits.

The participants' understanding that the teaching of agriculture was an essential step in leading to economic diversity and the development of an agriculture industry is meaningful. People are aware that agriculture needs to be redefined but also the fact that the history of agriculture has important lessons for the future of agriculture in NL. In a recent report entitled '*Building Agricultural Capacity in NL*', Quinlan states how a lack of supportive agricultural policies hinders community health, dampens rural development and imposes barriers to small scale farmers. To counteract this, Quinlan suggests the need to promote labour and skill development in this area (54). The fact that participants shared a belief that there is a loss of traditional knowledge, which is not being taught in schools, is both a threat to program sustainability but also an opportunity for developing relevant programming.

Community capacity is an important concept to public health and community development and refers to the skills and knowledge that a community can access to address problems. Literature about community gardening supports the fact that community gardening can lead to community capacity building (7). The above examples of place based learning and the community's recognition of the potential for the greenhouse program at Harbor Grace to facilitate the growth of agriculture require further examination in order to understand whether the greenhouse programs lead to the development of skills and knowledge that can be directly linked to an enhancement of community capacity.

How to Keep the Greenhouse Alive

Issues that St. Francis has had with sustaining its greenhouse program are not unique to this school's garden initiative. Reviews of school garden sustainability echo the problems with lack of time on the part of teachers, lack of funding, lack of gardening experience and curriculum materials (6, 7, 55). Ozer has suggested that these common limits to school garden sustainability highlight the need to develop a broad base of support for the garden program and the continued involvement of all stakeholders (7). The multiple community resources mentioned by participants are essential to the sustainability of the greenhouse. Some of the resources that were mentioned were partnerships with the Carbonear College of the North Atlantic, the creation of a directory of people in the community who have farmed or who have some expertise with gardening and who might be interested in engaging with the school's program, and the potential of offering a gardening workshop to teachers across the province as a professional development opportunity.

In connection with program sustainability, one interview respondent spoke about the importance of filling the greenhouse with plants in order to maximize plant growth, "*...if you leave the greenhouse half empty, you don't fill it up right, you*

never get the humidity built up because...you don't have enough plants in there to be doing what they're supposed to be doing... so there's a fine-line between a sparse greenhouse [being] really easy to take care of 'cause it's less time to water, plants are nice and far apart, you can pick leaves easy, compared to: 'I'm going to space them together and just having that many in there respiring in the night-time, there's a whole difference of that condition in the greenhouse..."

This observation is an interesting metaphor for the potential sustainability of the St. Francis School gardening program. It seemed many respondents felt that the greenhouse could not be sustained without a leader. The problem is, the school has the priority of meeting educational objectives and they are busy doing that. The interview responses demonstrate that the benefits of the gardening program extend beyond educational benefits. Thus, there is a necessity for multiple leaders to maximize the development of the greenhouse's multiple potentials. With leadership from solely agriculture, solely health or solely education, the greenhouse might only flourish in that direction. However, if there is a combination of multiple leaders there is the potential for multiple outcomes. An important question for future research is how the approaches that garden programs elicit to gain support from teachers, administrators, parents and students relate to the effectiveness and long-term sustainability of programs(7).

The continued endurance of the St. Francis Greenhouse over two decades of existence provides a unique window into the subject of school garden sustainability in NL. This greenhouse program has ridden the waves of funding influx and exodus. At a low point, the school board entertained the thought of shutting the greenhouse down and dismantling it. The fact that the school and community came together to fight for the continued existence of the greenhouse is the best evidence of its having an important role to play in the school and community.

9. Knowledge Mobilization

In November 2013, initial findings from this study were presented at MunButtoned. In February, 2014, I will be presenting the results of this study in two FSN sponsored teleconferences focused on the topic of school gardening. I will be submitting the results of this study to the Aldrich conference in February 2014 and will also present the results at the Newfoundland and Labrador Environmental Educator's conference in April 2014. I'm currently working with my supervisor to publish the results of this study in the Journal of Agriculture, Food Systems and Community Development.

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