



Public school teachers' perceptions of what promotes or hinders their use of outdoor learning spaces

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Abstract

The creation of outdoor learning spaces (OLS) such as school gardens is increasing in frequency in elementary and secondary schools in Canada. Previous research has indicated that students benefit from learning in OLS, but little is known about teachers' perceptions of their experiences using school gardens or other OLS. Given that teacher buy-in is essential for effective use of these learning environments, better understanding of the factors which affect teachers' adoption and continued use of OLS is needed. Thus, we interviewed elementary- and high-school teachers who used school gardens in Richmond, British Columbia, Canada, to explore their perceptions of their experiences of using school gardens and other OLS. We analysed interview transcripts, guided by Roger's Diffusion of Innovations theory, and identified key factors influencing teachers' adoption of school gardens or other OLS in their pedagogy: personal values, gardening experience, environmental education, and administrative support. Teachers' continued use of various OLS was supported by students' enthusiasm for learning in those spaces. Barriers to using OLS included lack of administrative support, principals' disapproval, and lack of professional development regarding their use. Insights from this study can be applied to support teachers in the adoption of school gardens and other OLS in their teaching.

Keywords Diffusion of innovation · Elementary-school teachers · High-school teachers · Qualitative research school gardens

Introduction

Outdoor learning spaces (OLS) are increasingly used as educational tools for critical issues related to health, climate change and social development. In recent years in Canada and other countries, adoption and use of schoolyard gardens as sites for outdoor learning have

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increased in frequency (Bowker and Tearle 2007; Desmond et al. 2004; Nowatschin et al. 2017). Important outcomes can be achieved through environmental education (Ardoin et al. 2018) and school gardens have been shown to have positive impacts on learning, curriculum, academic performance, student behaviour and social development (Blair 2009; Williams and Dixon 2013).

In environmental education, interdisciplinary and learner-centred approaches are used to increase students' understanding of the natural environment (Kahn and Kahn 2010). The importance of effective environmental education has been recognised by a variety of policy makers and other stakeholders. For example, the United Nations identified environmental education as an integral part of climate change mitigation and declared 2005 to 2014 as the decade of Education for Sustainable Development (UNESCO n.d.). In 2007, drawing from the UNESCO declaration, the provincial government of British Columbia, Canada, published the Environmental Learning and Experience Guide to provide guidance for teachers to integrate environmental concepts into class curriculum (Zandvliet et al. 2007). Environmental education, considered vital to developing environmental values among children and youth (Blair 2009), is driving the use of tools such as school gardens and other OLS in British Columbia and beyond.

Most research regarding the use of OLS has focused on its impact on student outcomes such as grades, motivation for learning, consumption of fruits and vegetables, focus/attention and reduction of anxiety or stress (Klemmer et al. 2005; Parmer et al. 2009; Smith and Motsenbocker 2005; Williams and Dixon 2013). Some previous work has explored teachers' motives for implementing schoolyard gardens and other OLS to promote specific outcomes. In that context, seven broad categories of motivation have been described: environmental education (Blair 2009; Kozak and McCreight 2013), community engagement (Kingsley and Townsend 2006), social development (Robinson and Zajicek 2005; Ruiz-Gallardo et al. 2013), health and food literacy (Blair 2009), promoting local and sustainable food systems (Bissonnette and Contento 2001; Carlsson and Williams 2008), behavioural improvement among disruptive and low-performing secondary students (Ruiz-Gallardo et al. 2013) and supporting students' academic achievement (Smith and Motsenbocker 2005; Williams and Dixon 2013). Only a few studies have explored teachers' experiences when using school gardens or other OLS (Dyment 2005; Passy 2014; Rickinson et al. 2004), yet additional insight regarding teachers' perspectives is essential. Given that teachers serve as 'gatekeepers' for students' learning in OLS, a better understanding is needed in order to identify what helps or hinders teacher use of schoolyard gardens (Blair 2009).

The Diffusion of Innovations framework (Rogers 2003) provides a conceptual framework for analysing and understanding how new practices are adopted and spread in social systems. It describes factors which increase the likelihood that a particular innovation will be implemented, such as the relative advantage of the new practice, its compatibility with one's values, the extent to which one can try out a new approach to determine if it is a good fit, and the observability of the results (Rogers 2003). It has previously been used to explore factors related to schools' implementation of physical activity and food policies (Masse et al. 2013). Using the Diffusion of Innovations framework to explore teachers' adoption and use of OLS could provide useful insights regarding factors which promote or reduce teachers' adoption of school gardens or other outdoor learning environments.

Richmond is a diverse city with a population of approximately 200,000 people in the Metro Vancouver Region of British Columbia, Canada. The Richmond School District (RSD) has a total of 48 schools, including 38 elementary schools and 10 secondary schools (RSD 2017). When this study was conducted, 26 of 48 (54%) schools in the district had at least one garden plot on their school grounds. The RSD developed an Environmental

Stewardship Policy in 2011 to increase the use of alternative pedagogical tools such as OLS (RSD 2011). As part of this initiative, the RSD offered to construct up to three garden plots on the grounds of all schools in the district. Creating OLS was recognised as a strategy to change the conditions in schools to be more supportive of environmental education (RSD 2011). The RSD tracks the number of schoolyard garden sites across the district, but these data reveal little regarding how teachers use and perceive these spaces. Therefore, the RSD sought to fill this gap by gathering teachers' perspectives on their use of OLS in order to identify factors that could enhance the use of OLS by other teachers and administrators across the district.

This study of teachers' perceptions of their use of school gardens and other OLS involved a qualitative approach to enable exploration of teachers' varied and complex experiences. Through personal interviews with teachers who use OLS such as school gardens, we were able to explore factors that promoted or discouraged the adoption of OLS in teaching. The following key questions guided this study: (1) how do teachers perceive their experience of using OLS? (2) what factors promote or discourage adoption of OLS? (3) can the Diffusion of Innovations framework (Rogers 2003) explain teachers' use of OLS?

Methods

Research methodology

We used a case-study design (Yin 2014) to investigate factors influencing the adoption and use of OLS in environmental and food literacy education. We selected Richmond, British Columbia as the case study site because the RSD had implemented a district-wide policy to build school garden beds and had expressed interest in exploring teachers' perceptions of using these spaces in their teaching. Teachers represent cases to help understand factors influencing adoption and use of school gardens and other OLS, such as the influence of workplace, district policies, values and beliefs, and environmental and food literacy pedagogy.

Data collection and analysis

We used purposeful sampling to recruit teachers who self-identified as using their school garden or outdoor grounds to teach curriculum. A recruitment message was included in a newsletter that was emailed directly to teachers by the RSD. Teachers who were interested in participating in this study contacted a member of the research team to schedule and complete an interview. Seven teachers (five elementary-school teachers and two secondary-school teachers) were interviewed. Interviews were conducted at teachers' schools (five elementary schools and two secondary schools) and lasted between 45 and 115 min.

A semi-structured interview guide was used to explore aspects of teachers' experiences with school gardens and other OLS, including their attitudes, values and reasons for using OLS. The interview guide included open-ended questions about teachers' experiences (e.g. why did you decide to try OLS? How was your initial experience with OLS? What did you observe with your students, other teachers and/or administrators when you used OLS?). Additional questions elicited descriptive data from participants (e.g. teaching context, number of years teaching experience), asked participants to describe how they use OLS,

and prompted them to reflect on their experiences with OLS as part of their pedagogy (e.g. how do you use OLS to achieve your learning outcomes?).

Interviews were audio-recorded and transcribed verbatim for data analysis. Teacher names were replaced with pseudonyms in written transcripts. Coding of interviews was determined inductively and deductively based on both open-coding of transcripts and the key constructs of the Diffusion of Innovations framework (Rogers 2003). Thematic analysis and pattern matching across teacher responses was used to identify emerging codes and explore themes derived from the literature. The study protocol was reviewed and approved by both the University of British Columbia Behavioural Research Ethics Board and the Richmond School District.

Results

Teachers in our sample had been teaching for 9–35 years and using OLS in their teaching for 2–18 years (Table 1). Two teachers had used OLS throughout their entire teaching career (17 and 18 years, respectively).

Factors supporting teachers' adoption of OLS

The various factors that participants identified as supporting their adoption and continued use of OLS could be classified into five categories, each consistent with a key aspect of Diffusion of Innovations theory (Rogers 2003): (1) compatibility with their pre-existing values; (2) feasibility because of prior knowledge and institutional support; (3) trialability, which enabled teachers to experiment and learn how to incorporate OLS in safe ways; (4) observability of impacts on students; and (5) relative advantage of using OLS compared with teaching similar concepts in a classroom setting.

Compatibility with teachers' values

All teachers considered it important to expose their students to the outdoors. All elementary-school teachers also voiced their concern at seeing fewer children playing outdoors while family leisure time is dominated by activities such as watching television or using electronic devices. Elaine expressed the value that she places on kids being outdoors by saying "...society [is] so plugged into technology that, when you look in the neighbourhood,

Table 1 Study participants' pseudonyms, grades taught, years taught and years of OLS experience

Teacher name	Current grades taught	Years of teaching experience	Years of OLS experience
Jasmin	Grades 1 and 2	35	15
Rachel	Grade 2	22	7
Elaine	Grades 2 and 3	25	5
Tamara	Grades 5 and 6	18	18
Linda	Grades 5 and 6	20	10
Clayton	Grades 9 and 11	9	2
Sasha	Grades 8, 11 and 12	17	17

nobody is outside playing... It is important for kids to be outside in nature.” Participants spoke of how their value for nature was related to their use of OLS in their teaching. For example, Tamara stated: “I have always loved the outdoors. I have always lived my life in the outdoors... When I came into teaching, it became a natural transition and a natural bridge to go outdoors.” Linda indicated that she tries to convey a value for nature and environmental stewardship to her students: “I want them to care about the outdoors. Then they will care about it and know about it, and then look after it.”

Feasibility because of prior knowledge and institutional support

Several of the teachers interviewed indicated that their prior knowledge of gardening made it easier for them to use a garden in their teaching. Four of seven teachers (57%) described gardening as a personal hobby and indicated that their knowledge of gardening reduced challenges associated with integrating the school garden into class curriculum. Elaine described her own history and how it influenced the feasibility of using OLS: “...People who are comfortable out there are the ones who are actually gardeners... because I am a gardener myself. My mother and my grandmother were gardeners; I have always had an interest in gardening. I felt it was a shame that these garden beds were not being used. So, I planted some bulbs and we started gardening in those small planter boxes.”

Previous knowledge of aspects of environmental education—and an interest in ongoing lifelong learning—also played a role in some teachers’ willingness to adopt the use of OLS. For example, Clayton viewed himself as a lifelong learner and pursued courses in eco-literacy and justice as part of his graduate studies. He said: “I guess that, before I took on the course and was planning the course, I wanted to work on that [using OLS]. I took a few graduate study courses in eco literacy and eco justice at UBC and read some articles on what it meant to have an [OLS].”

Participants indicated that their involvement with OLS was possible because of various forms of institutional support, particularly principals’ help with writing grants, organising fundraisers, professional development and resolving logistical issues. A supportive principal was identified as a key institutional support by being available to discuss and share ideas, identify teachers’ educational goals, and support teachers to meet their goals. Tamara described how a supportive administrative staff member “...makes a huge difference... [a principal] who is very keen on listening to my ideas and really keen on helping me implement them and just make [ideas] happen.”

While support from school principals and other administrative staff was helpful, teachers’ capacity to manage a school garden and develop strategies for using OLS in addition to regular teaching responsibilities was perceived as limited. Undertaking additional work in this regard was made more feasible by professional development days focused on using OLS, which constituted part of teachers’ ongoing employment responsibilities. Participants described professional development activities, including observing and learning from an instructor who was from a local non-profit organisation and was experienced in outdoor learning. Jasmin described how these workshops were effective in showing how curriculum could be taught through OLS because they illustrated how teachers could “integrate [the garden] and demonstrate how lessons can become more meaningful for students”, which she considered “powerful” for increasing teacher buy-in.

Trialability

Several teachers spoke of the importance of grant funding to make it possible to try using OLS in their teaching. For example, Clayton's school received an award from the school district to fund a non-teaching block to support school garden projects and assist other teachers with incorporating OLS into their teaching practices. Another teacher, Sasha, described the importance of funding support for teacher collaboration on the garden: "[we] got five paid days a year ... to meet in the morning ... [and] collaborate with each other to create units and projects together." This grant led to the involvement of seven departments and 13 different classes. In the absence of this grant, Sasha believes that this collaboration would not have occurred.

Observability of impacts on students

All teachers indicated that students were more enthusiastic and engaged when lessons were taught in OLS. Some teachers noted that learning in school gardens can support a variety of learning preferences, such as visual, kinesthetic and place-based learning. Sasha said: "[The students] are excited for it. They love being outdoors...It is kinesthetic learning and it is visual learning and so a lot of kids are doing really well through those strategies." Three of seven teachers (43%) described how students who tend to underperform or have behavioral issues in class often performed better outdoors. Tamara stated: "Especially for those kids who do not do so well in the classroom...those kids really succeed in [an outdoor] setting. Not being inside, on a chair and having a bit more freedom... They are more engaged, there are more outputs, they seem happier. Socio-emotionally, I think there are more benefits."

Some of the teachers described how schoolyard gardens can have a calming effect on students with special needs. Rachel indicated: "Those who are ADH outside are more calm. It is kind of like a natural relaxant. There is a physical difference when they are outside." Another teacher, Tamara, described her experience of using OLS with students with special needs by saying: "We called it the secret garden... where I put a table and some chairs and silent read, read poetry, and it really helped with my special needs kids. Their little sanctuary, their little place to go when things get a little bit too stressful...It was a very calming place..." These accounts describe how the effects of the outdoors could have a positive effect on students with special needs and help reduce behavioral issues.

Relative advantages of using schoolyard gardens

Several teachers indicated a preference for OLS over traditional indoor settings, speaking about the broader goals of education and different kinds of learning. Clayton pointed out: "I guess that there is a philosophy that you can learn things outside that you cannot learn inside. Or you get different learning." Another teacher, Tamara, pointed to this difference as a means of contextualising lessons by embedding learning in a real-world setting: "I think that the garden is actually a really nice place where we can put on a different lens. It is not a lesson; it is a way of seeing the world."

Tamara spoke of using her school garden as a tool to promote multiculturalism in ways that would be impossible in a typical classroom setting. In the context of her school's diverse and culturally-rich community, she described families speaking different languages and coming from different cultures, but the "one thing that bonds [all of the students] is the

food.” She spoke of “collecting food stories from the different cultures and asking parents and grandparents what they grew in their countries and for the recipes.” As a result, some of her students’ family members came to class to teach students how to cook with an item that they were growing in the garden, enriching students’ learning of both food and culture. She perceived clear advantages in using the context of the school garden as a means of promoting students’ learning about multiculturalism and food.

Barriers to teachers’ use of OLS

Although participants in this study had successfully used OLS such as school gardens in their teaching, each identified several barriers and challenges that could prevent other teachers from using OLS: shortages of time, resources and support; barriers arising from the school’s administration; and limited training and knowledge of gardening.

When asked why other teachers might not adopt or use gardens, participants responded that many teachers feel pressed for time and that there are not enough resources and supports available to facilitate the use of gardens. Participants in this study expressed that there is an implicit expectation that teachers should put in additional time and resources to advance projects in which they strongly believe and for which they volunteer their time for aspects of OLS that fall outside of their paid responsibilities and duties. However, some participants expressed the belief that taking on additional tasks, often outside their areas of expertise, is an unreasonable expectation, especially with respect to fundraising. Jasmin explained that “...a classroom teacher cannot be in charge of fundraising. There are too many hours [of planning involved]. You need administrative support to get the funding going.”

Clayton spoke about the challenge of implementing OLS with constraints on teachers’ time. “...It is easier for a teacher to carry on as usual instead of redeveloping a whole topic centred around going outside.” Access to resources (and uncertainty regarding what is required) was also perceived as an issue for teachers. As Clayton stated:

I think that a lot of the barriers are in the resources... Getting soil was a big thing for me, I didn’t know where to get soil and what to get, and there are different varieties at the hardware store... That can be intimidating because, when you go to [the store], there are five variety of soils, now what? Do I just grab any bag? How much do I need? Do I need 20 L? And how much does that cost?

While the motivation of teachers to engage in schoolyard gardens can be high, an unsupportive principal can be a strong barrier. For example, Linda stated: “We spend a lot of time outside. I got in trouble with that because I wasn’t following the curriculum. I thought that is the curriculum but it just doesn’t look like it to a textbook-oriented person.” A teacher’s desire to use OLS can be tempered if teaching outside is not considered as valuable as traditional classroom teaching.

For the three teachers in our sample with little to no previous experience with gardening, the additional barriers of limited skills and knowledge were reported. Knowledge of soil processes, seeds, amendments, plants, watering, weeding, harvesting, processing, consumption and composting were all perceived as areas outside their expertise and posed barriers to their use of OLS. Participants who were not familiar with gardening identified a need for formal training, resources or support (e.g. connections with other teachers or gardeners).

Discussion

Given increasing awareness of the importance of education to support environmental consciousness and sustainable development (UNESCO n.d.) and the multiple benefits of environmental education (Ardoin et al. 2018), it is important to understand factors which affect schoolteachers' use of OLS. This study provides important insights in this regard and demonstrates the usefulness of using a Diffusion of Innovations framework to understand teachers' adoption of OLS in their teaching. Whereas questions about the impact of OLS on student learning and behaviour have been the focus of previous studies (Klemmer et al. 2005; Parmer et al. 2009; Smith and Motsenbocker 2005; Williams and Dixon 2013), we explored the perspectives and experiences of teachers who currently use OLS. Users of OLS valued nature, sustainability, health and well-being and reported being motivated to use gardens in their pedagogical practice for a variety of reasons (community building and engagement; social development; curriculum and learning; environmental education; food literacy and health; and local food and sustainable agriculture linkages) consistent with Nowatschin et al. (2017). Teachers' roles in engaging students with OLS were diverse and included developing new lesson plans, assisting and mentoring other teachers, coordinating garden site management, and seeking funding and other resources for OLS. Because teachers are gatekeepers to students' learning in OLS, an understanding of what determines teachers' involvement is essential.

Our analysis demonstrated that factors which supported or hindered teachers' use of OLS could be explained by Diffusion of Innovations theory (Rogers 2003). This theory has been used to explain the adoption of new practices in diverse fields including public health (Bergeron et al. 2017), education (Norman et al. 2018) and sustainability (Karakaya et al. 2014). Using OLS to teach curriculum in elementary and secondary schools falls at the intersection of these diverse fields and this study demonstrates how Diffusion of Innovations can be used to understand teachers' use of OLS.

Diffusion of Innovations (Rogers 2003) identifies several factors which increase the likelihood of an innovation being adopted. For example, if a new approach is consistent with users' values (i.e., has high compatibility) and is feasible (i.e., has low complexity), it is more likely to be implemented. Comments from teachers in our study clearly reflected the importance of these factors in their adoption and use of OLS: participants indicated that using OLS was compatible with their values and pedagogical beliefs and feasible because of both personal knowledge and institutional support. Other characteristics which increase the likelihood of a new practice being adopted include trialability (i.e., the approach can be tried before making a full commitment), observability (i.e., the impact of the innovation is clear) and relative advantage (i.e., the new approach is better than existing alternatives) (Rogers 2003). These characteristics also explained our participants' use of OLS. Teachers in our study benefitted from being able to try OLS (either independently or with support from other teachers) and they observed clear benefits of using OLS in terms of students' learning and behavior. Participants also perceived advantages of using OLS for teaching certain topics, relative to a classroom-only approach. Barriers to using OLS participants identified were mainly factors which reduced feasibility. Consistent with the findings of others, these included limited teacher knowledge of gardening, shortages of time and resources and administrative constraints (Desmond et al. 2004; Rickinson et al. 2004; Robottom 1993).

Our participants' reflections on barriers which they had experienced and/or observed suggested several strategies that could be used to further promote use of OLS in elementary

and secondary schools. For example, teachers reported benefitting a great deal from professional development workshops regarding the implementation and use of OLS; similar professional development could be directed towards administrative staff to enable them to understand the benefits of OLS and identify strategies that they could use to support teachers in using OLS. Also, significant work remains in the development of curriculum (e.g., learning objectives, lesson plans) to support teachers in using OLS to provide effective education in a variety of contexts. In addition, the opportunities and support provided to teachers varies noticeably among schools even within a school district that actively promotes environmental education and the use of OLS. Ideally, school districts could support consistent use of resources to reduce barriers to implementing OLS programs, thus removing some of the onus from individual teachers, to enable a greater proportion of students to have access to these useful learning experiences.

Conclusion

This study provides important insights regarding teachers' experiences with using OLS to teach elementary and secondary students in public schools in a large multicultural Canadian city. Factors that supported or posed barriers to teachers' use of OLS could be explained by Diffusion of Innovations theory (Rogers 2003). Understanding teachers' perspectives can help to create more effective programs and policies to support the creation and use of OLS as sites of environmental education.

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