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Beyond the portable classroom: investigating portable classrooms from secondary sources and reframing spatial needs in Canadian schools

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Abstract

Despite the prevalence of portable classrooms in Canadian schools, research on their characteristics, utilization, and effects is limited. This study investigates portable classrooms in Canada through a two-stage research approach. First, it explored news articles to identify common concerns about portable classrooms in Canada. The dataset comprises 243 news articles. The analysis revealed three overarching concerns about these structures: 1) The factors that lead school districts to use portable classrooms; 2) Safety and comfort in portable classrooms; 3) Strategies to alleviate accommodation issues. Then, Nair's (2014) principles of contemporary school design were used to critically interrogate the utilization of portable classrooms. The analysis highlighted the spatial characteristics and limitations of these structures. The study recommends improved funding and enhanced planning for schooling demand. It is suggested the design of new schools should consider more flexible modular structures that embody a clear pedagogical intentionality and promote the integration of surrounding communities.

Keywords

Portable Classrooms, Overpopulated Schools, Canadian Schools, Document Analysis, Educational Architecture

Summary for Lay Audience

While a few studies have investigated the impact of portable classrooms in schools, research on the subject in Canada is scarce. The issues and concerns about these structures demonstrate the need for further investigation.

This study is divided into two sections: For the first stage, I collected 243 news reports and identified the most common themes. The analysis found that while many school stakeholders are not satisfied with portables, schools end up accommodating their overflowing populations in these structures. Austerity-driven policies and reactive approaches to school planning mainly cause this situation. The most frequent concern in the news is the poor physical condition of portable classrooms. This theme became the guiding theme for the second part of the study, which compares the physical condition of portable classrooms with what educational architects advocate regarding the design of learning spaces. To address the concerns regarding the inadequacy of portable classrooms as educational facilities, the study suggests that school boards should consider future growth when choosing new school sites so that additional structures would not impinge on outdoor activities. Second, the structures, design, and materials must be improved. Third, pedagogical intentionality, adaptability, and flexibility must guide future changes. Fourth, communities at large should participate in identifying the spatial needs of schools.

Co-Authorship Statement

This integrated article thesis consists of two papers coauthored by the MA Candidate Marzieh Forozantabar and her supervisor, Dr. Augusto Riveros. The specific contributions of each author are listed below:

Marzieh Forozantabar: Data collection, organization of the database, creation of the NVivo file, analysis of the sources, manuscript writing.

Dr. Augusto Riveros (Supervisor): Conceptual and methodological guidance throughout the project, manuscript writing support, review, feedback, and advice.

Dedication

This work is dedicated to all educators who dare to challenge the prevailing assumptions within their societies.

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Chapter 1: Introduction

Scholars believe that physical spaces, shaped through architecture and design, are not just containers for our activities (Burke & Grosvenor, 2008). When it comes to designing educational spaces, school buildings and classrooms are more than just capsules in which education happens. In other words, while schools and classrooms provide a context for educational activities, they are not neutral backgrounds ; for example, the arrangement, shapes, materials, and colours in the schools may influence the users' social and educational experiences. As an architect, I am increasingly interested in how schools' physical spaces can affect people's experiences, which are not limited to teaching and learning but also include the promotion of well-being, fostering social change, social mobility, and positive self-identity. Despite widespread recognition that educational spaces are essential for student well-being (Shendell et al., 2004), many Canadian school boards are under pressure to accommodate growing student populations. Statistics and reports from school boards show that several school districts across the country are struggling to provide adequate accommodation for students. So they rely on portable classrooms as a temporary solution that has persisted far past their expected utilization timeframe (Riveros, 2023).

Portable classrooms have been introduced as temporary and cost-efficient responses to address school overcrowding. This solution is supposed to work during the peak population time or until a permanent solution is available. However, studies show that portables stay in place longer than expected (Lazaruk, 2011; Booth, 2011; Riveros, 2023). What is more, there are concerns about their physical condition and whether they

can support high-quality and equitable educational experiences. My review of the literature revealed that there is only one academic study about this phenomenon in Canada (Riveros, 2023). A few studies in the US and other jurisdictions have examined students' behaviour in portables (Branham, 2004) or measured the level of chemical concentrations and other environmental concerns in these structures, such as the level of Carbon dioxide or daylight (Ribeiro et al., 2016; Shelton, 2003). Meanwhile, while portable classrooms have become a typical response to address accommodation needs in many places, not all community members find them desirable.

This study is guided by the idea that educational spaces are fluid, constantly rewritten, and re-informed by each pedagogical moment. Moreover, educational spaces can reflect policy concerns (Gulson & Symes, 2007); that is, schools, as social spaces, enact different ideologies with their styles, forms, and materials. Furthermore, if we consider humans as physical beings, all their activities, including making sense of their situation, occur within space. Through such interactions, space becomes *place* (Soja, 2010). We bring our values and meaning to the place and create a sense of belonging. Place, as a lived social environment, shapes our self-identity.

Consequently, the degree to which people can read, interact, and use places can affect and maintain their sense of self (Riveros & Nyereyemhuka, 2023). A school can be a safe or dreading place for a child, a striving place for a teacher who can make their professional identity, or a sweet memory of smells, sights, and sounds in an older adult's mind (Burke & Grosvenor, 2008). Narratives of place can guide social actors through their experience in social spaces (Gulson & Symes, 2007). Thus, it could be argued that school architecture carries the history of communities and their social understanding of

teaching and learning. However, the school as a social space may change over time to meet community needs associated with social change (Burke & Grosvenor, 2008).

This thesis comprises two articles. The main argument of the thesis is that the spatial needs of users, established by education architecture scholars, still need to be met in the abundantly used portable classrooms across Canada. The following research questions guide the inquiry:

1. What do the discourses mobilized through news outlets reveal about the use and local perceptions of portable classrooms in Canadian school districts?
 - a. What topics or issues are discussed in the news in relation to portable classrooms?
 - b. What are the main concerns discussed in the news regarding portable classrooms?
 - c. What reasons are presented in the news for having and adding portable classrooms?
 - d. Why do portable classrooms stay in use for longer than initially anticipated?

2. How do the current uses of portable classrooms align or diverge from modern school design ideals?
 - a. What conceptualization of schools are appropriate to meet the spatial needs of users for a changing and mobile populace in Canada?
 - b. What are the shortcomings of portable classrooms from a school design perspective?

- c. In the context of population shifts across Canada, how should the school of the future meet the spatial needs of its users?

The first article discusses the context in which portable classrooms are used in Canadian schools. It should be noted that in Canada, education is a provincial, not a federal, responsibility, yet the phenomenon of portable classrooms is widespread across the country. Since academic research on this topic is scarce, and district-level data is costly and cumbersome to obtain, the data collection focused on secondary data sources, which in this case, included news reports. Student accommodation issues are prominent for communities, and this concern is often discussed in local news. The news articles report criticisms of the poor condition of portable classrooms. Including parents and teachers' dissatisfaction (Booth, 2011), poor ventilation, sub-standard physical quality (Shendell et al., 2004), lack of accessibility features (Kusch & Sanders, 2020), as well as concerns about the length of use and maintenance costs (Mertz, 2018). Shedding light on these concerns as a part of investigating how infrastructure impacts educational experience could provide administrators, planners, and policymakers with insights that, in turn, may lead to better educational experiences and outcomes for the next generations. This exploration is necessary as it provides valuable insights regarding the characteristics of this phenomenon at the local level, which could inform future empirical research on this topic.

There are different means for investigating social phenomena. The methodology of this study is inspired by Critical Discourse Analyses' (CDA) perspectives. CDA has its roots in linguistics, but with the critical lens, CDA tries to denaturalize the kinds of power buried in the texts and unravels the social practices represented in the language

(Machin & Mayr, 2012; Wodak & Meyer, 2013). Thus, discourses that are articulated around the phenomenon of portable classrooms by different actors, such as school administrators, teachers, students, and other community members, can be informative about the social context and implications of portable classrooms. The analysis shows the social and political interactions and disconnections among different stakeholders. Hence, the critical lens of CDA can open the door for further action to address the spatial needs of users in Canadian schools.

The second article starts with a review of the literature on key concepts that relate to school architecture and design. As noted above, educational experiences can be facilitated and enhanced by the relationship people have developed with place and space (Uline et al., 2009). The discussion in this article is informed by a relational theory of space, which emphasizes how the “spatial is social relations stretched-out” (Robertson, 2010, p. 15). Robertson (2010) traces the implications of space in creating social relationships in schools through the cultural, social, economic, and political discourses and practices of school actors. This is evidenced, for example, when teachers modify their classrooms to respond to the students’ needs and by the sense of place and belonging that is produced through social interactions (Uline et al., 2009).

One theme in the first article was selected for further investigation: “The physical condition of portable classrooms”. As noted above, several news articles discussed the spatial conditions and concerns regarding portable classrooms. In the discussion section, several issues related to the physical condition of portables are contrasted with selected conceptualizations of school architecture and design. Finally, this study puts forward some suggestions to improve the spatial conditions of Canadian schools. Spatial

conditions can significantly affect people's social experiences and, therefore, are important in educational research and infrastructure planning.

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Chapter 2:

Investigating the Use of Portable Classrooms in Canadian School Districts: A Secondary Source Analysis

Abstract

Student accommodation is a prominent issue for Canadian communities, often discussed in local news. However, academic research on this topic, particularly in relation to the use of portable classrooms, is limited. Aiming to expand academic understanding of this phenomenon, this study investigates the reasons for the widespread use of portable classrooms in Canadian School districts. We analyzed news reports from Canadian news outlets between 2010 to 2023. The data was sourced from two online databases: Google News and Factiva, yielding 234 reports in this period. Employing a two-cycle qualitative analysis with NVivo 14, three main themes emerged: 1) Factors that lead school districts to use portable classrooms, 2) safety and comfort concerns, and 3) strategies to alleviate accommodation issues. The findings indicate that while portable structures are often utilized to manage overcrowding, they are not the preferred option. Furthermore, the reports referenced various concerns about portable classrooms, including their suboptimal physical condition, a sense of isolation, and the encroachment on outdoor school spaces. Despite the negative perception of portables, stakeholders are frequently frustrated when seeking approval for permanent solutions, mainly due to inadequate planning for schooling demand, and funding limitations.

Introduction

The 21st century has witnessed the emergence of new educational discourses and practices. Architects and education theorists have been reimagining educational spaces beyond traditional box-shaped classrooms (Gore, 2012). Yet, despite advances in technology and the development of educational, psychological, and sociological theories, little has changed in school physical layouts since the 19th century, except for the introduction of open-space classrooms (Gore, 2012). Students typically attend schools with double-loaded corridors and self-contained classrooms, which might include a window, rows of desks, a whiteboard (or smart board), and some shelves. However, a more mobile, diverse, and increasingly inequitable society requires new forms of educational engagement, such as the recognition of diverse accessibility needs, and the integration of technological innovations (Gore, 2012). When planning and designing optimal learning spaces, the outcomes are heavily influenced by budget, time, and available resources. These constraints and the pressures of demographic changes mean that not all social concerns and pedagogical perspectives can be fully addressed. Public schools must be functional and provide equitable education, but most facilities are standardized and primarily focused on classroom instruction, which can stifle innovation. According to Li et al. (2005), we should not see learning as confined to classrooms; progressive educators must consider new learning spaces that are flexible, virtual, and adaptable for various pedagogical activities. Education is real life, contextual, and cross-curricular; students need to integrate new information with their existing knowledge holistically. Today's school buildings should be capable of reengineering and adaptation to accommodate societal changes and facilitate collaboration among users, planners, and architects. According to Harrison and Hutton (2014) and Li et al. (2004), forward-

thinking school systems should ensure that classrooms and corridors serve the community, link education with local services, promote continuous education, and foster civic development.

While scholars have explored the impact of school environments on learning and well-being (Uline et al., 2009; Branham, 2004; Crampton, 2009; Miles et al., 2011; Schabmann et al., 2016; Barrett et al., 2019; Tanner, 2008; Chan, 2009), the physical conditions of Canadian schools and their ability to meet the spatial needs of the community have not been sufficiently investigated in academic circles. For instance, Riveros (2023) found that many schools in Ontario operate beyond their enrolment capacity and rely on portable structures for student accommodation. Portable classrooms are meant as temporary solutions in overcrowding situations, however, they often remain in use longer than planned (Lazaruk, 2011; Booth, 2011; Riveros, 2023).

This research found only one academic study on this phenomenon in Canada (Riveros, 2023). There are a few studies from the US and other jurisdictions that examined students' behaviors in portables (Branham, 2004) or measured environmental concerns like carbon dioxide levels and access to daylight (Ribeiro et al., 2016). News reports often describe the poor conditions of portable classrooms, citing dissatisfaction among parents and teachers (Booth, 2011), poor ventilation, sub-standard physical quality (Shendell et al., 2004), lack of accessibility features (Kusch & Sanders, 2020), and concerns over maintenance costs and duration of use (Mertz, 2018). This study aims to provide insights into the use of portable classrooms in Canadian jurisdictions. Due to the scarcity of academic research, the high cost for large-scale data collection, and the difficulty of obtaining district-level data, this study focuses on secondary data sources.

We review how news outlets across Canada report on the use and local perceptions of portable classrooms in Canadian schools. The findings aim to stimulate discussion on the relationship between the reliance on portable classrooms, funding, and accommodation policies. This investigation offers administrators, planners, and policymakers insights to enhance school infrastructure, potentially leading to improved educational experiences and outcomes for future generations.

Literature Review

As the importance of the school environment has become salient, there have been attempts to improve the layouts, materials, and placement of portable classrooms. Nowadays, various types of portables are available, made by different manufacturers and offering diverse qualities, materials, amenities (such as washrooms), and durability levels. More advanced portables are eco-friendlier, aesthetically more pleasing, and provide better lighting and air quality (Israelson, 2022). Nevertheless, the stand-alone prefabricated portable remains the prevalent solution for accommodating students in many school districts in Canada and the US (Partnerships British Columbia, 2011), where the decision is often driven by cost-efficiency. Traditional stand-alone portables tend to have thinner walls with less insulation, noisier HVAC (Heating, Ventilation, and Air Conditioning) systems, and inadequate daylight (Gore, 2012). In a study by the Association of Collegiate Schools of Architecture (Gore, 2012), the authors engaged in a collaborative design exercise for portable classrooms, focusing on meeting educational and physical needs to improve learning opportunities. The resulting designs included shared spaces between classrooms and customizable finishing options such as cubbies for

kindergarteners. However, all design groups ultimately resorted to box-type models due to ease of installation, strength and durability concerns, and compliance with transportation standards like those of the Federal Motor Carrier Safety Administration. The designs utilized 8x40 feet portables with a flat-pack system for separately constructing floors, walls, and roof panels, simplifying shipping, storage, and replacement.

Air quality and health-related issues are prevalent concerns in the literature on portables. Shendell et al. (2004) assessed air quality in portable classrooms in California by sampling 13 units from two schools, noting that user behavior with doors, windows, and the HVAC system plays a crucial role in mitigating respiratory issues. A comprehensive study by Jenkins et al. (2004) aimed to identify problems related to mold, ventilation, temperature, chemical levels, and pesticides, emphasizing the need for high-quality, well-designed, and properly maintained HVAC systems. The study found that traditional classrooms had higher ventilation rates than portables, which suffered from noisy systems with weak filtration. The study also reported that low outdoor air exchange and poor lighting could affect the learning experience. Additionally, portables had more HVAC issues than traditional classrooms, including dirty filters, blocked outdoor dampers, and inadequate condensate drainage. In terms of temperature and humidity, portables were more likely to fall below ASHRAE standards and had slightly lower Relative Humidity (RH). It was revealed that teachers in 60% of portable classrooms turned off the ventilation due to noise, in contrast to 23% in traditional classrooms. Also, half of the portable classrooms experienced excessive noise levels and they were found to have lower lighting levels.

In another study by Shelton (2003), teachers reported health concerns in portables such as mold, dust, poor air quality, and insects. They complained about noisy heating and cooling systems, which also disrupted student concentration, with the classroom environment being excessively cold or hot at times. Ribeiro et al. (2016) observed that children are particularly vulnerable to toxins as they breathe more air relative to their body weight, and their organs are still developing. The study found that teachers and students in portable classrooms dealt with stuffy air and musty odors, often linked to mold and moisture, which can exacerbate health issues like asthma and allergies. High formaldehyde levels—emitted from materials like pressed wood, carpeted floors, vinyl, and wallboards—were also problematic in portables, which are more susceptible to air intake from nearby roadways and parking lots (Jenkins et al., 2004). In their investigation, Ribeiro et al. (2016) measured and compared formaldehyde levels in traditional and portable classrooms, finding that although formaldehyde emissions from pressed wood naturally decrease over time, they can increase under conditions of high temperature and humidity, compounded by poor ventilation.

Jenkins et al. (2004) recommend that teachers and other users be properly trained to adjust thermostats and identify pollutant sources in classrooms. They advocate for the implementation of pest management programs and chemical exposure guidelines in schools. Additionally, they suggest the removal of dilapidated portable classrooms and, where possible, the construction of new brick-and-mortar facilities or the design of new portable classrooms with improved health and environmental conditions. In comparing the age of portable versus traditional classrooms, the study found that over half of the portable classrooms were constructed within the decade prior to the study, whereas 88%

of permanent buildings were older than ten years, and 71% were over thirty years old. While the majority of portables were equipped with air conditioning compared to permanent classrooms, portable classrooms reported more issues with plumbing leaks and thermal regulation (Jenkins et al., 2004).

Studies have also explored other aspects of portable classroom infrastructure. Research has shown that the quality of infrastructure significantly affects dropout rates, as physical conditions influence perceptions and behaviors, potentially leading to feelings of lack of care, fear, or chaos. These conditions can, in turn, increase the likelihood of vandalism and other problematic behaviors. One study focusing on 266 schools in Houston, Texas, with diverse student populations and different levels of infrastructure quality (Branham, 2004), found that attendance rates were lower in temporary buildings and those requiring repairs or lacking adequate custodial services. The study concluded that the quality of school buildings is critical for providing quality education. Another study in North Carolina (McMullen & Rouse, 2012) assessed the impact of overcrowding on reading achievement and examined two policies: the use of portable classrooms and the implementation of a multi-track year-round calendar. This study found that these policies positively affected student achievement in severely overcrowded schools by mitigating the adverse effects of large class sizes. However, it noted in moderately overcrowded schools, portables have a negative impact on reading achievement.

As highlighted in the introduction, since portable classrooms address classroom-level concerns, issues have arisen regarding their relationship with the permanent areas of the school. The addition of portable classrooms can lead to congestion in common areas such as cafeterias and gyms (Branham, 2004). Moreover, Chan (2009) noted that the

commute between portable classrooms and the main building can exacerbate student misbehavior. Interviews with 14 teachers in Oklahoma, USA, who taught in portable classrooms (Shelton, 2003), reported some drawbacks, such as a sense of segregation and disconnection from activities in the main building. One teacher's observation of a student's painting, where they depicted themselves as not belonging to the school, illustrates this sentiment. Safety concerns were also prevalent, with the perceived risk of threats from outsiders gaining easier access to portable classrooms, which often lack alarm systems. The disconnection from the school environment and reduced collaboration with peers in the main building can adversely affect teacher morale. Furthermore, the time spent commuting to the main building for various activities can be distracting for students.

Studies on portable classrooms have examined the underlying rationales for their use. Riveros (2023), for instance, suggests that policy and funding issues have negatively impacted school infrastructure. As facilities become insufficient to accommodate growing populations, the use of portable classrooms has become a widespread and urgent response in various jurisdictions, a trend also observed in the US. A California Department of Health Services survey (Jenkins et al., 2004) found that one-third of Californian students attend school in portable classrooms. The study identified factors contributing to enrollment pressures, including enrollment fluctuations, policies to reduce class sizes in the 1990s, and mandates for cost-saving school designs, which led to schools financing their operations based on per-pupil funding and dedicating significant space to portable classrooms.

Hugh Mackenzie (2017), a public finance economist, argued that Ontario school boards have been underfunded for two decades, leading to a maintenance backlog of \$15.9 billion by 2017, despite an independent assessment suggesting an annual \$1.4 billion maintenance budget is needed. He criticized the inflexibility of funding formulas and the lack of standards for school repairs. Mackenzie also highlighted the government's reluctance to build new schools. This is problematic given the enrollment growth in most Ontario large school boards, as reported by Riveros (2023). Mackenzie pointed out that when school boards request new schools, the Ministry only considers current needs, not future projections. Despite various studies on the impact of portable classrooms on health, behavior, and educational experiences, there has been no comprehensive research on their use in Canada. As noted in this section, the existing literature indicates that portable classrooms often do not meet the learning and teaching needs of students and teachers.

Theoretical Framework: Critical Spatial Theory and Discourse Analysis

This study analyses the phenomenon of portable classrooms as a socio-spatial phenomenon. According to Soja (2010), humans are socio-spatial beings, all our activities are historically and geographically situated. Further, the social spaces that we inhabit are not just neutral or dead backgrounds, they have implications that shape identities, differences, and experiences (Riveros & Nyereyemhuka, 2023). In the same line of thought, Robertson (2010) argued that space is socially produced. She traced the implications of space in the circulation of power and the production of social relationships in educational environments, which led her to assert that space is relational.

This means that social events and processes should be seen in relation to other sets of social, economic, and political processes. According to Robertson (2010), society produces its own space, and thus, political action, differences, hierarchies, and related knowledge. Furthermore, cultural, political, and social hegemony can be evidenced through the spatial roles of social actors. Critical theorists of space, like Harvey (2009) Robertson (2010), and Soja (2010), argued that opportunity is unequally distributed across geography, which means that access to resources is stratified and mediated by location. For instance, access to jobs, internet access, nutritious food, political representation, quality housing, and schooling could be enhanced or disrupted by spatial circumstances, such as location.

There are different ways to examine social-spatial phenomena, including observation, quantification, and graphic representation (Cresswell, 2013). In this study, we examine the discursive representations of educational spaces through a critical analysis of discourse. Critical discourse analysis (CDA) is an interdisciplinary and multi-methodological approach used to investigate social difference and injustice (Wodak & Meyer, 2013). The focus of this approach is the representation of spatial difference through discourse. CDA researchers believe that language and meaning shape and are shaped by society (Machin & Mayr, 2012). According to Machin and Mayr (2012), CDA has its roots in the field of critical linguistics, which aims to unravel the ideological instruments used in texts. The critical stance has the purpose of denaturalizing language to reveal the kinds of power buried in texts (Machin & Mayr, 2012). Language is more than words, sentences, and grammar; it is a set of social practices represented in socio-cognitive moves and interactional discourses (Wodak & Meyer, 2013). In this regard,

CDA devises methods to investigate the relationships between language, power, and ideology, unwrapping the political and ideological investments behind the text (Fairclough & Wodak, 1997).

In this study, CDA is used to investigate the representation of social spaces. By analysing news sources through a defined research methodology, we are able to get insights into the phenomenon of portable classrooms. According to CDA, an analysis of discourses allows to demystify social processes and events (Wodak & Meyer, 2013). Hence, gathering discursive representations of portable classrooms from the news leads us to better understand the social and political implications of these structures. Furthermore, reflecting on the voices from administrators, families, teachers, students, school boards, Ministry officials, and other community members, highlights their intentions, interests, positions, and values. CDA believes that language is driven by social, economic, and political motives (Wodak & Meyer, 2013). News data, in this regard, enable us to understand the power relationships between these actors. Understanding the means that different stakeholders express their opinions about accommodations, would help policymakers and other policy actors, to act and to seek improvements to address the impact of portable classrooms in schools.

Methodology

This research was conducted by gathering data from news databases and analyzing it using document analysis. Document analysis is a "systematic procedure for reviewing or evaluating documents" (Bowen, 2009, p. 27). We searched for Canadian

news reports from 2010 to 2022 in two databases, Factiva and Google News. This period was chosen because a preliminary search in Factiva indicated a significant increase in reports beginning in 2010, and 13 years is a substantial timeframe to assess the development of a social phenomenon. The search utilized keywords such as "portable classroom(s)", "mobile classroom(s)", "relocatable classroom(s)", and "demountable classroom(s)". We located 243 reports on portable classrooms and saved them as text documents.

For the analysis, we created a project in NVivo 14, a qualitative analysis software, and uploaded all the files. The first step consisted of assigning attributes to each document, specifically the date, location, author, and publisher. According to Miles et al. (2020), these attributes are useful for classifying the data and later contribute to detecting patterns. This classification is facilitated by running various queries within the software. This method of inquiry allows for revisiting previous stages to identify nuanced themes and to formulate interpretations grounded in the original data, as Fereday & Muir-Cochrane (2006) suggest. After two cycles of coding, which proved crucial for retrieving and categorizing data, we executed queries using the codes and attributes (like location), and then we began noting observations on each subtopic by province. Miles et al. (2020) define codes as labels created by researchers that impart significance and establish crucial connections within the data. Moreover, coding fosters higher-level contemplation of the subject. It was a vital component of this project, as the 245 news pieces collected covered multiple topics; without coding, it would have been unfeasible to extract pertinent information, compile themes, and conduct the analysis.

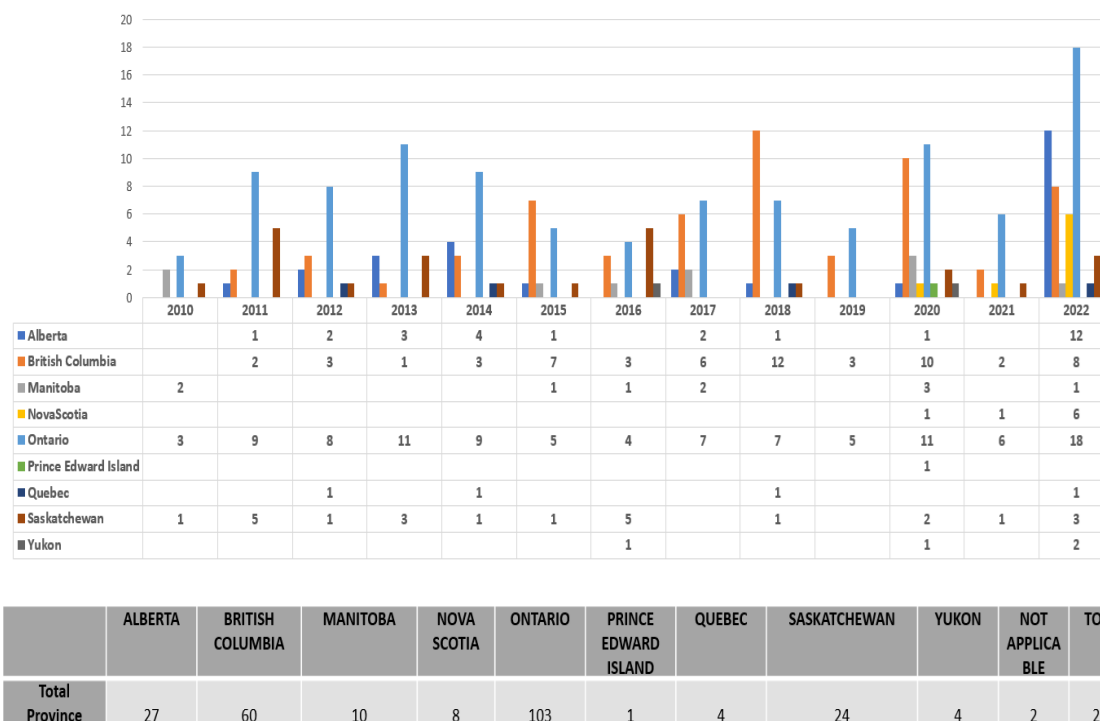


Figure 1-Distribution of news pieces about portable classrooms across provinces in Canada- 2010-2022

In the first coding cycle, the focus was on social actors, their perceptions, and their actions, what Miles et al. (2020) categorize as "dramaturgical coding" (p. 68), encompassing objectives, conflicts, tactics, attitudes, and emotions. This approach is suitable for interpreting power dynamics, human motivations, and agency. In this project, the first-cycle codes gathered perceptions and comments from various social actors regarding portable classrooms. These actors included teachers, students, administrators, and parents. Moreover, two holistic codes were defined based on the frequency of topics within the data: "planning and funding for school infrastructure" and "the physical

condition of portable classrooms." Holistic codes allow for the categorization of a large unit of data with a single code before proceeding to more detailed coding, as explained by Miles et al. (2020).

In the second cycle, new themes emerged from a meticulous review of the first-cycle codes through inductive coding (Fereday & Muir-Cochrane, 2006). This cycle, referred to as pattern coding by Miles et al. (2020), is shaped by the researchers' reflections on the initial codes. The patterns and themes identified became the foundation for interpreting the portrayal of portable classrooms. The first cycle revealed that portable classrooms are often viewed as an unwelcome but quick response to overcrowding in schools. Consequently, the second cycle shifted focus to the conceptualization of portable classrooms and the reasoning behind their use, examining the discussions about portables in schools and communities. The analysis emphasized the articulation of local educational spatial needs and the physical and architectural aspects of portable classrooms. As Miles et al. (2020) noted, the second cycle can elucidate causes and explanations of the subject matter. As detailed in the findings section below, the second-cycle codes are organized into three themes: What leads school districts to use portable classrooms, safety and comfort in portable classrooms, and alternatives to portable classrooms.

Findings

Theme One: Factors that Lead School Districts to Use Portable Classrooms

Some of the most widely discussed topics in the news pertain to the reasons for the proliferation of portable classrooms.

Overcrowding

Overcrowding consistently emerges as the primary driving rationale behind the prevalence of portable classrooms. For example, Booth (2011) reported that surging enrollment added significant pressure on the school system in the city of Surrey, British Columbia. The majority of Surrey's schools were using portable classrooms, with some schools employing more than a dozen, leading to over 300 portables citywide. By 2011, the district saw an enrollment exceeding 70,000 students, with an annual increase of approximately 1,000 students. This boom was linked to new housing developments. In response, Surrey requested an additional 2,700 spaces by 2020 to manage the student influx (Seal, 2016a). Despite the opening of a new school and expanding an existing elementary by 200 seats, portable classroom numbers in Surrey hit 333 by 2018, accommodating over 7,000 students (Reid, 2018). More recently, a high school which opened in 2021 added five portable classrooms to address overpopulation (Jung, 2022). The school district expects to add another 1,000 students to the current population of 74,000.

A similar situation has been noted in various cities across Ontario. In Ottawa, for example, significant growth in the eastern part of the city has put a strain on the school system. In 2011, a school had to add 12 portable classrooms after exceeding its capacity by 300 students, pending Ministry approval for a new school (D'Amato, 2011). In

Brampton, ON, Bascaramurty and Alphonso (2014) observed that some new schools began operations with nine portable classrooms already on-site. Brampton, as one of Canada's fastest-growing cities, saw an 11% rise in elementary student enrollment from 2009 to 2013. Similarly, a school built in 2018 in Windsor, ON, was already facing overcrowding challenges due to outdated enrollment projections from 2011. By 2018, the school had to add portable classrooms to accommodate more than 100 students in grades 4 and 5 (Viau, 2018). In London, ON, a school was operating at 200% of its capacity in 2021, just four years after opening, with 12 portable classrooms installed and with plans to add five in subsequent years (Lupton, 2021). Brantford, Ontario faced overcrowding too, as Ruby (2022) reported, one school operating at 178% capacity with projections of further increases due to residential development. Similarly, the Toronto District School Board announced in 2022 that they were using a significant number of portable classrooms—420 for students and an additional 100 for storage and organizational needs (Israelson, 2022).

Delays and a Reactive Funding Model

Insufficient funding and lengthy legal and operational procedures are frequently cited as reasons for the prevalence of portable classrooms. Budgetary constraints limit the expansion or construction of new school facilities, forcing school boards to rely on portable classrooms for student accommodation. Maintaining these classrooms can also be costly. For example, the Hamilton-Wentworth, School Board, in Ontario anticipated opening two new schools by 2020. However, due to funding uncertainties, schools already operating beyond capacity had to install additional portable classrooms (Pearson,

2016). Booth (2011) made a stark comparison, likening the funding challenges to the Dutch boy using his finger to stop a flood, stating it's like "plugging one hole, but the water is still rising" (p. A12).

Representatives from various school boards have expressed concerns about the lack of permanent solutions and the challenging process of obtaining approval for new buildings from education ministries. In British Columbia, neighborhood growth predictions are often enough to secure the Ministry's approval for new permanent spaces. However, as noted by Knox (2018) the Ministry's policy prioritizes current needs over projected ones. The report noted that the lengthy process of approving and constructing new school buildings has increased reliance on portable classrooms. The education minister was quoted in the report stating that the Ministry of Education was working to streamline this process, aiming to shorten the timeframe for school construction from seven years to three (Bell, 2018). Confirming this finding, a Surrey's school district official described Surrey as a rapidly growing and affordable area to live but pointed out that new schools would not be built until there was an actual presence of students, which required schools to be at 110% capacity before a request for a new building would be considered, worsening the situation annually (Reid, 2018). Another official with the district emphasized the inadequacy of capital funding, remarking, "We aren't allowed to base what we need on upcoming development ... the government won't even look at building a new school until every school in the area is at 110% capacity" (Mui, 2015, para. 11). This trend of continuous growth, a norm in many large and mid-size cities in BC for the past two decades, has contributed to the backlog (Seal, 2016b). The Ministry's hesitation to approve new constructions until schools are already over capacity, without

accounting for projected growth, has led to increased reliance on portable classrooms (Culbert, 2018).

In Ontario, delays in approving school expansions and construction have been identified as a primary reason for the prolonged use of portable classrooms (Hale, 2013). A notable example could be seen in Hamilton, ON, where the province rejected the request to fund the construction of a new school despite the board having acquired the land. Addressing this issue, the board's accommodation planner stated, "the ministry doesn't give funding until there's an imminent need" (Pearson, 2016, p. 2). A news report about an overcrowded school in London, ON, revealed that while the board received funding for a new school, they had yet to find a suitable site. Parents expressed frustration, pointing out that policymakers had not adequately planned for schools in new neighborhoods (Lupton, 2021). Another school in London, ON, which opened in 2018, started with 12 portable classrooms on site. The local school board's director attributed the overcrowding to the unexpected impact of the pandemic and a sudden increase in immigration to the city. The report also noted that the typical timeline to obtain approval for a new school is about five years, posing challenges in accommodating growth once the school becomes operational (Lupton, 2022).

Portable Classrooms as a Flexible Response to Enrolment Fluctuations

In addition to delays in funding and approval for expansion and construction, another factor contributing to the use of portable classrooms is the possibility of future decreases in school population, rendering the construction of large schools cost

inefficient (D'Amato, 2010). Also, high maintenance costs for under-capacity schools can put them at risk of closure (Ontario Ministry of Education, 2018). Consequently, some schools are intentionally designed as hybrids, combining permanent structures with portable classrooms. This design allows for the addition or removal of portables as the student population fluctuates. The primary rationale behind this model is to keep operational costs as low as possible. In some instances, the use of portable classrooms is preferred over other solutions, such as relocating students to different schools. Kline (2020) reported that in Kootenay, BC, the decision was made to add four portable classrooms to two schools operating at 106% and 107% capacity, instead of moving the excess students to other schools. In Ottawa, ON, a proposal to change a school boundary was rejected due to concerns about the safety of children crossing busy streets. In this case, the school board chose to alleviate overcrowding by installing portable classrooms (D'Amato, 2011). Similarly, in Nova Scotia, families advocated for the addition of portable classrooms to their local schools as a preferable alternative to sending their children to a different school located 45 minutes away (McPhee, 2022).

Another reason frequently cited for installing portable classrooms is flexibility (Hale, 2013). For example, the Waterloo Region District School Board in Ontario reported in 2014 that they had a total of 335 portable classrooms across their region. The board noted that these portables were necessary to meet various needs, including providing spaces for children to complete their homework (Waterloo Region Record, 2014). Additionally, the use of portable classrooms has been expanded to accommodate functions that were previously unavailable within school premises. For example, in the Greater Victoria district board in BC, the launch of an out-of-school care program led to

the request for portable classrooms at a Saanich school. An official with the Greater Victoria District stated that they sought four portable classrooms, referred to as "studios," to support before and after-school care programs (Bell, 2018).

Class Size Reduction

Another reason discussed in the news included the Supreme Court of Canada's decision that resulted in the need for smaller class sizes in British Columbia, which required more classrooms within each school (Bell, 2017). A report from Surrey highlighted that due to the new class size regulations and revised Collective Agreement language, the school board had to create an additional 168 learning spaces. To meet this challenge, the board installed portables and converted some common spaces into classrooms. This led to the loss of important services like computer labs (Reid, 2017). In a similar vein, the Greater Victoria District Board in BC added portable classrooms to comply with the requirements arising from the Supreme Court decision (Bell, 2018).

Theme Two: Safety and Comfort in Portable Classrooms

The second theme identified in the analysis explores the connection between the spatial attributes of portable classrooms and students' overall educational experience, encompassing both their physical and mental well-being.

Encroachment of Recreational, Green, and Public Areas

As previously mentioned, the presence of portable classrooms often encroaches upon green areas, recreational spaces, and sports facilities on school grounds, potentially impacting the promotion of healthy lifestyles among students. Public and common areas, such as washrooms and libraries, experience increased pressure due to a higher number of students sharing these facilities. A local education activist from Surrey, BC, succinctly summarized this concern, stating, "the washrooms are packed, the gyms are packed, there are staggered schedules, causing students to fall through the cracks" (Seal, 2016a, para. 10). The impact of portable classrooms is not limited to indoor common spaces; they also affect crucial outdoor spaces. A school administrator in Brampton, Ontario, discussed how portable classrooms strain various aspects of the school, including reduced play space, decreased gym time, or the need for multiple classes to share the gym (Bascaramurty & Alphonso, 2014).

Several reports have highlighted how portable classrooms occupy outdoor spaces, often necessitating the removal of trees and foliage from the school grounds (Mui, 2015; Simpson, 2022). For instance, in Victoria, BC, the introduction of portable classrooms at a school resulted in the reduction of basketball courts from three to just one (Shaw, 2018). In Ottawa, Ontario, a report mentioned that accommodating an additional portable required rearranging existing ones, highlighting issues related to both poor planning and limited space (D'Amato, 2011). Additionally, Kupfer (2019) reported that a school in the Ottawa-Carleton District Board had to shorten its sports field from 400 meters to 360 meters due to portables, with the possibility of needing even more portables in the future. The report also mentioned an online petition by concerned parents opposing the

placement of portable classrooms on the sports fields of a school known for its high-level athletic programs. Similar situations occurred in London, ON, and Brighton, ON, where the addition of portable classrooms in local schools led to reduced playground areas (Hamilton, 2022; Lupton, 2019, 2021).

Isolation

The sense of isolation is another significant concern raised by families, students, and teachers about their experiences in portable classrooms. Stakeholders in Chilliwack and Surrey, BC, have noted that students in portable classrooms often feel detached from the broader school community, potentially affecting their overall educational experience (Knill, 2018; Seal, 2016b). In Ontario, a report from Attawapiskat included a poignant quote from a student: "My education is all about isolation: Isolated portable, isolated community, minimal resources, and minimal funding" (King, 2011, para. 9). This feeling of isolation is not confined to students; teachers can also feel isolated when working in portable classrooms. A teacher in Brampton, ON, shared her challenges, including the daily task of carrying two buckets of water to her portable for cleaning the chalkboard and tidying up the classroom (Bascaramurty & Alphonso, 2014). Reports from Windsor and Hamilton, Ontario, highlighted difficulties in accessing washrooms or other essential facilities, raising concerns among parents about exposure to cold during winter and interactions with strangers (Viau, 2018; MacIntyre, 2021). MacIntyre specifically mentioned six-year-old students who had to walk from their portable classrooms to the main building for restroom use, a challenging distance for young children, even though the main building was only 30 meters away (MacIntyre, 2021).

Poor Physical Conditions

A significant and distressing concern highlighted in the news is the poor physical condition of portable classrooms, posing a serious threat to the well-being of students and teachers. An opinion piece in the *Waterloo Record* (King, 2011) focused on the dire conditions of schools serving Indigenous students in Attawapiskat, ON (King, 2011). In this community, students have been attending classes in portable classrooms since the local school closed in the year 2000 due to ground contamination by diesel fuel. The author described these students going to school in moldy, unheated portables infested with mice, and lacking proper gym or library facilities. Unfortunately, this situation is not unique. The Parliamentary Budget Office in 2009 reported that only 49% of First Nations schools were in good condition (King, 2011). A report from the *Waterloo Region Record* (2014) also highlighted the substandard state of portable classrooms, which were worn out and poorly received by parents. These structures, initially intended for temporary use, had been in use for much longer than anticipated. In London, Ontario, parents raised concerns about mold in a portable classroom (Lupton, 2019). In Oakville, Ontario, a parent expressed concern about their daughter's classroom being too cold at 18°C, negatively impacting her learning (Garbutt, 2015). In Okanagan, BC, parents voiced their worries about the increasing number of portable classrooms and the inconvenience of limited access to proper washroom facilities (Gerding, 2022).

In Brockville, Ontario, a teacher who moved her art class to a room equipped with musical instruments remarked, "it's a big difference from teaching the students in the portable to using professional recording tools" (Duffy, 2013, para. 13). In Windsor,

Ontario, after a school closed due to enrollment decline, the displaced students were sent to other schools and accommodated in portable classrooms, prompting concerns from parents: "The kids will be going from a warm building to a drafty portable" (Lajoie, 2013). In Waterloo, Ontario, parents expressed shock upon discovering, on the first day of school, that their children would be in a portable, isolated from the main building. They were particularly worried about young children coping with the winter climate (Robertson, 2013). In Nanaimo, BC, an elementary student couldn't attend a music class in a portable because it lacked a ramp (Yu, 2015). A teacher in Surrey, BC, commented, "Teaching in a portable is not the same as teaching and learning inside the school classroom" (MacKenzie, 2016, para. 8), mentioning issues such as the lack of access to sinks, loud furnaces, and poor air quality (MacKenzie, 2016). Another report from Victoria, BC, highlighted parents' concerns about portable classrooms without running water, where students had to go outside to use the bathroom, and the lack of accessible facilities (Shaw, 2018).

In Alberta, Mertz (2018) reported stakeholders' concerns about the prolonged use of portable classrooms. Interviewees shared their experiences of discomfort, highlighting issues like excessive heat, poor ventilation, headaches, drowsiness, flushing, noise distractions, and nausea. These adverse conditions in hot classrooms were seen as detrimental to the students' ability to learn. A teacher in Winnipeg, MB, recalled her time in portable classrooms, describing her class as having an unpleasant odor with stale air (Macintosh, 2020). In Saskatoon, SK, a school principal pointed out the differences between portable classrooms and the main building: they were physically separate, making it inconvenient to move between facilities, and tended to be colder than

classrooms in the primary building (Modjeski, 2016). In 2020, a teacher in Saskatoon, following the return to school from the pandemic, voiced concerns about the challenges of maintaining distancing and preventing illness in crowded portable classrooms (Short, 2020). Additionally, a news article from Yukon revealed that a school requested families to provide extra sweaters for students in portables due to the lack of an electrical system, leading to inadequate lighting and no fire alarm systems (Samson, 2016). A 2016 report from Saskatchewan highlighted critics' concerns about using portables as a makeshift solution to overcrowding, citing issues like cold temperatures and the perception that portables make schools resemble "trailer parks" (Modjeski, 2016).

Safety-Related Incidents

Within the dataset used for this study, approximately 40 of the 243 collected news articles reported incidents and accidents involving portable classrooms, such as fires (Parsons, 2015; CTV News Edmonton, 2022; Hauck, 2020; BBC News, 2022; Stricker, 2022), acts of vandalism (Hill, 2020; National Post, 2018; Renfrew Mercury, 2018), and car crashes (Wilhelm, 2016; Davis, 2019). The substantial number of these incidents raises questions that warrant further investigation. Shelton (2003) noted that many portable classrooms lack alarm systems. Most related news reports were published shortly after the incidents, often lacking specific details about the extent of the damage or the causes. However, some sources indicated severe damage to the portable buildings (Dangerfield, 2017; The Calgary Herald, 2022) or estimated the cost of the damage (Miller, 2017; The Calgary Herald, 2022). Additionally, some reports suggested that the fires were intentionally set (Stricker, 2022; Victoria Times, 2019). It's also noteworthy

that many of these incidents occurred early in the morning (Miller, 2017; Wilhelm, 2016; Moharib, 2012).

Theme Three: Strategies to Alleviate Accommodation Issues

Discussions in news articles about portable classrooms have revealed various strategies employed by school boards and communities to address school overcrowding. These strategies include busing students to out-of-boundary schools, redrawing school boundaries, merging English and French Immersion schools, using space temporarily in other schools, known as "hotel schools", and making further efforts to request permanent solutions such as advocating for changes in funding formulas. News reports indicate that these challenges have led some parents to seek alternatives, such as withdrawing their children from the public system and paying over \$30,000 a year for private schooling (Bascaramurty, 2014).

The distribution of students over location and time has been a common practice. A report from Surrey, BC, reported that to alleviate the strain on school facilities, high school students were required to attend in separate shifts (Booth, 2011). In Brampton, ON, which faced overpopulation challenges, multiple solutions were explored. In addition to using portable classrooms, the city undertook boundary redraws and introduced the concept of "hotel schools". These hotel schools were intended to temporarily house students while their regular schools underwent renovations. Despite their temporary nature, these hotel schools remained in use for many years, leading to various issues. Students often had to be bused from considerable distances, resulting in

challenges such as the need for extra clothing and difficulties in accessing medical care. Families also expressed concerns about the loss of community and interruptions to their social lives (Bascaramurty & Alphonso, 2014).

Also, sharing buildings with coterminous boards and repurposing programs and spaces have been among the approaches to address enrollment issues. A report indicated that in Quebec, a French school board shared a building with an English board through a three-year collaboration agreement (Branswell, 2014). Although the two schools operated on different schedules and had distinct resources, some teachers and principals were concerned about the potential for the French school to take over the English one, and people found it hard to adapt (Branswell, 2014). Additionally, allocating English classrooms for Francophone students raised concerns about the need for French students to have an environment conducive to learning the French language. The French board also began using previously closed English schools, although renovations and expansions required approval from the Ministry (Wilton, 2018). In Surrey, BC, the school district decided in 2016 to reduce the French immersion program to address overcrowding in addition to rebalancing student enrollment and changing catchment boundaries (Seal, 2016a). In Montreal, a 2018 news report highlighted that certain schools had repurposed their art and music rooms into classrooms while awaiting the construction of new schools. Some of these new schools were established through partnerships with other institutions, such as the YMCA and Concordia University (Wilton, 2018).

Various approaches have been adopted to respond to the growth of residential areas across Canada. In Winnipeg, MB, in 2017, a superintendent from the Seven Oaks School Division discussed the challenges resulting from unexpected growth due to new

residential subdivisions. Schools were forced to rely on portables and convert non-instructional spaces into classrooms to accommodate the increasing demand. The report also mentioned that many students in these new residential areas had to be bussed (Martin, 2017). In 2020, a school in the same city, after having a request for a new facility rejected, explored alternative solutions. They sought additional space within their existing buildings, aiming to find suitable areas in neighborhood schools within a one-hour bus ride. Their goal was to minimize disruption for families, considering busing students to nearby schools as a short-term, more cost-effective solution compared to installing portable classrooms, which cost approximately \$350,000.00 each (Crabb, 2020). In Ontario, the Bluewater District School Board planned to include a cautionary statement for prospective homebuyers in new subdivision agreements. This statement would inform them about the lack of a guaranteed new school in developing neighborhoods and the use of temporary solutions like portables, hotel schools, and community schools located outside the immediate area. In response, the mayor emphasized that the responsibility for constructing schools and providing student accommodation lies with the Ministry and the school board and requested the removal of the warning (Learment, 2022).

Funding policies exacerbate the challenges of constructing new schools. While portable classrooms are typically seen as a temporary solution to overcrowding by most school boards, they often seek new permanent buildings or extensions to better accommodate their students (Lacatusu, 2015). Shaw (2018) reported that the British Columbia Ministry of Education was considering changes to the funding formula since the existing "per-pupil basis" funding did not adequately address the needs of schools in

smaller and rural communities. This shortfall contributed to school closures and the necessity of busing students to other schools. A 2018 news piece from Saskatchewan (Oleksyn, 2018) highlighted a school divisions' proactive approach to securing funds for their spatial needs. Despite operating at full capacity, the Ministry of Education's funding formula required schools to exceed a capacity threshold of 35% to 40% to receive additional funding (Oleksyn, 2018). In a 2021 interview, a city planner in Cobden, ON, mentioned that although their local school had received a portable classroom, they recommended that the local school board apply for a long-term expansion (Zettler, 2021). In Fredericton, NB, the mayor, along with some parents and city staff, expressed dissatisfaction with portable classrooms. They hoped that the presence of portables would not impede funding for new school construction. A district spokesperson stated that establishing new schools could potentially lead to the closure of smaller schools located outside the city (Moore, 2017).

Discussion

The findings of this study reveal that portable classrooms often fail to meet some physical and educational needs of their users. For instance, there are concerns about air quality, temperature, humidity, mold, and noise levels. Additionally, they encroach on outdoor spaces and since their purpose is to add instructional space, they do not address the overcrowding in common areas of school. Further, portables are often detached from the main building, which may generate isolation, reducing the students' sense of belonging. Other concerns include the risk of fires and vandalism (Knill, 2018; Seal, 2016a). Shelton (2003) suggested that the ease of access to portable classrooms, without

needing to pass through the main entrance, may pose safety risks. Moreover, using these for extended periods may generate negative perceptions about public schools, which undermines support for public education. Regarding the reasons for the use of portable classrooms as a permanent solution to overcrowding, findings from this study align with observations by Riveros (2023), the Toronto District School Board (2018), and Mackenzie (2017). They all point to the levels of disinvestment in educational infrastructure and the absence of effective planning and funding policies. Policy challenges may lead to unintended consequences, including community disconnection, and missed or reduced educational opportunities.

The findings indicate that some schools have been operating beyond their capacity since the day they opened (Bascaramurty & Alphonso, 2014; Viau, 2018). While school boards take future growth into account in their accommodation plans (Thames Valley District School Board, 2022), funding from the ministry is allocated based on current need. To address this discrepancy, a report from the Toronto District School Board (2018) advocated for a proactive approach, suggesting the construction of new schools in high-growth areas in advance and considering other solutions before resorting to portable classrooms. The report also emphasizes the importance of flexible spaces, such as "raw" areas that can be expanded as needed. Stakeholders referenced in news stories from several jurisdictions suggested that a headcount-based funding formula puts educational spaces under pressure. As Mackenzie (2017) proposed, a relevant funding formula should be school-based with specific considerations and differential criteria for small schools. He emphasized that this revised formula should also account for various cost factors, including labor costs, climate, facility age, and market conditions.

Additionally, geographical location should be a factor considered in determining funding allocations.

The policy that requires filling empty spaces within a school board before requesting new schools (Ministry of Education, 2018; Thames Valley District School Board, 2023b) forces school boards to redraw their boundaries before applying for new spaces. However, transferring students from crowded areas to other areas presents certain challenges. This issue is exemplified in the 2023 plan of the Thames Valley District School Board in London, ON, which aimed to rebalance attendance in hopes of securing new facility funding from the Ministry. The plan was met with concerns from families, as documented on the board's website. They emphasized the potential impact on their children's mental health and sense of community, pointing out that young people need stability in peers, teachers, and extracurricular activities. Parents argued that the proposed changes could disrupt these essential aspects of their kids' education. Students in secondary levels who would be forced to change schools in subsequent years would be particularly affected. Additionally, students currently involved in extracurricular activities, like music, could lose these opportunities due to student redistribution. Furthermore, families argued that boundary changes and mergers could force French Immersion students into an English Track school, which may not be equitable and could limit students' educational experiences. Moreover, the plan to redistribute students based on their elementary schools would result in some being sent to secondary schools that are not the closest to their homes. Lastly, families wanted assurance that this change would indeed secure the Ministry's approval for new schools (Thames Valley District School Board, 2023a).

The reports indicate that the process of building a new school in Canada is a lengthy one, often extending beyond 5 years (Lupton, 2022; Bell, 2018). This extended timeline involves several challenges: schools are often responsible for finding suitable sites for new construction projects (Lupton, 2021), a process that can be time-consuming and add to the overall project duration. Furthermore, once a site is secured and a project is approved, the actual construction phase tends to take longer than initially anticipated, sometimes extending beyond the expected completion date (Bascaramurty & Alphonso, 2014). Delays in construction can exacerbate overcrowding and trigger the use of more temporary facilities. A recent study by Riveros (2023), gathering statistics about Ontario from 2010 to 2020, indicates that 45% of portables are kept between 5 to 10 years, exceeding the assumed timeframe for building a school (two to four years for Ontario). To address these challenges, as suggested in the report by the Toronto District School Board (2018), collaboration between city development planning and school boards in allocating suitable sites for new schools can expedite the site acquisition process. Being proactive in school construction by anticipating growth in student population can help reduce the duration students spend in temporary facilities like portable classrooms and hotel schools. Furthermore, utilizing modern construction methods, such as drywall, tilt-up construction, and modular panels, can accelerate the construction process while also being more cost-efficient than traditional methods.

Conclusion

This article offers insights into the state of portable classrooms across Canada, drawing from a substantial number of news reports spanning the past 13 years. The study

identified several reasons for relying on portable classrooms and highlighted spatial concerns from communities regarding these structures. Furthermore, by examining various attempts by schools to address their spatial needs, the challenges they face with accommodation policies become more apparent; these challenges, along with corresponding policies, were discussed. Our analysis of the news sources suggests that portable classrooms are often viewed as a less-than-ideal solution for accommodating students. They are typically seen as a reactive, stopgap measure, often described as a "band-aid" approach or a "Dutch boy finger" fix. This perception is based on the limited success of portable classrooms in providing acceptable noise levels, air quality, and comfortable temperatures, all of which directly affect the well-being and learning experience of students and staff. Additionally, the absence of basic facilities like washrooms and other essential amenities raises concerns about equity and accessibility. Portable classrooms can also encroach upon common areas, limiting learning and social opportunities, notably by occupying space on sports fields and adding more students to already crowded common areas.

The discussions presented in this study serve as a catalyst for further exploration into several crucial areas related to educational spatial needs, as well as education policy and funding. These insights call for deeper investigations to address the urgent accommodation needs of Canadian schools to improve current and future educational infrastructure. Some key questions and areas for future research may include: How can the time gap between identifying current or projected accommodation needs and having prepared spaces be minimized? In what ways does the current funding formula, primarily based on student headcounts and square footage, fail to adequately address requirements

for school accommodation? What aspects of existing accommodation policies need to be modified based on the findings and results highlighted in this study? Where do current policies fall short or prove ineffective in addressing the concerns associated with portable classrooms and school accommodations? And how can other organizations and communities be effectively engaged to support the accommodation needs of Canadian schools? These research questions can provide additional insights and recommendations to policymakers, educational architects, related institutions, and communities to improve the process of accommodating students in Canada. By addressing such issues, Canadian schools can better meet the educational needs of their students and create a conducive learning environment.

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Chapter 3:

Reimagining Educational Spaces in Canadian Schools: Beyond the Portable Classroom

Abstract

This article is part of a larger project that investigates the use of portable classrooms in Canada. A previous paper (Forozantabar & Riveros, submitted) analyzed news reports to explore how portables are perceived by education stakeholders, as well as the issues and concerns associated with their use in Canadian school districts. Many reports express concerns for health, well-being, and learning, highlighting dissatisfaction with the physical conditions of these facilities. This study continues this investigation by providing a conceptual discussion of the implications of portable classrooms as educational spaces. The previous study noted that isolation from the main building, poor air quality, ventilation, noise, accessibility issues, and their encroachment on outdoor spaces could impact students' and educators' experiences and sense of belonging. In contrast, contemporary school design features flexible spaces, open plans, and versatility for various activities and learning styles, features that are unavailable in most portable classroom configurations. In this paper, we offer suggestions for schools needing additional space. These include designing flexible structures that engage users; considering additional areas as learning zones with ample common spaces and services; creating meaningful atmospheres and connections between different zones; utilizing innovative structures with high-quality materials and technologies to ensure adequate

physical conditions; planning for projected growth to avoid using outdoor recreational and sports spaces for new structures; and fostering community usage and interaction with schools, thereby extending the uses of school structures beyond the traditional instructional purposes.

Introduction

Based on the premise that space can shape our experiences (Robertson, 2010), numerous studies have examined the role of space and architecture in influencing people's well-being, attitudes, and behaviors in educational environments (Uline et al., 2009; Branham, 2004; Crampton, 2009; Miles et al., 2011; Schabmann et al., 2016; Barrett et al., 2019; Tanner, 2008; Chan, 2009). According to Harrison and Hutton (2014) policies, including funding, planning, and governmental-driven codes and regulations, such as classroom size, impact school design. Other influencing factors in school configuration include economic shifts, demographic changes, markets, resources, and public expectations about education. Moreover, innovation in school design is shaped by designer approaches, organizational constraints, teachers' professional experiences, and fundamental questions about the nature and purpose of schools. The 21st century has seen the rise of new educational discourses and practices, including viewing students as co-producers of knowledge, blurring the lines between learning, living, working, and leisure, facilitating informal learning, and fostering social qualities like creating a sense of belonging (Harrison & Hutton, 2014). Additionally, Li et al. (2005) argue that learning is not confined to classrooms; contemporary educators are now considering learning spaces

that are more flexible, virtual, and fluid. Furthermore, real-life education is not subject-based but contextual and cross-curricular; students need to understand and holistically integrate new information into their existing knowledge.

Harrison and Hutton (2014) outline several architectural considerations in line with modern educational approaches. Schools should be designed for long-term use, serving the entire population rather than a small segment; they should cater to diverse local needs and aspirations. Furthermore, schools need to facilitate ongoing development among users, planners, and architects. They should be adaptable to new pedagogical requirements, and capable of operating year-round beyond conventional school hours. Additionally, their design should support living experiences and human interactions, rather than focusing solely on instruction for specific disciplines. Overall, educational spaces should be versatile for multi-purpose activities, accessible from various neighborhood locations, available to the broader community, adaptable to different timescales, and conducive to individual learning plans, and grouping methods.

This article is part of a larger project investigating portable classrooms in Canada. A previous study (Forozantabar & Riveros, submitted) analyzed news reports to explore themes related to the use of these structures. The findings indicate that portable classrooms often arise from the urgent need to accommodate students in overcrowded schools. Reports frequently highlight discomfort and dissatisfaction with the physical conditions of these facilities. This study aims to reflect on the shortcomings of Canadian portable classrooms as educational spaces. By reviewing concepts and principles of contemporary educational facility design, we assess how the temporary nature and common characteristics of portable classrooms in Canada align or diverge from

contemporary educational design ideals. Finally, we propose general design ideas to enhance future Canadian school learning structures by incorporating contemporary educational principles.

Methodology

As noted above, in a previous article, we explored the phenomenon of portable classrooms in Canada by analyzing data from news sources. The method used for that study included a two-cycle coding process. During the first cycle, initial codes were defined based on subject frequency, leading to the identification of two holistic codes. According to Miles et al. (2020), holistic coding involves categorizing large data units under a single code before progressing to more detailed coding. One holistic code identified in this first cycle was “the physical condition of portable classrooms”. This theme is further examined in this paper, specifically, we contrast this theme with key insights from the educational architecture literature. we hope that our examination will give education stakeholders new insights to address current and future concerns regarding portable classrooms.

To facilitate this exploration, we begin with a review of literature pertaining to educational architecture and design. Though not intended to be a comprehensive and systematic review of the literature, the discussion highlights some of the most significant and recent ideas in this field. Following Snyder's (2019) approach, our review of literature is meant to be integrated, as the topic is broad and encompasses diverse concepts and issues. An integrated review is the broadest type of review according to

Booth and Sutton (2016). It collects data from both theoretical and empirical literature, identifying important patterns and themes. It combines various viewpoints to gain a holistic understanding of the field (Synder, 2019). Aiming to organize the different sources into a coherent narrative, the review is structured around Prakash Nair's (2014) elements of school design which are listed as seven keys: 1) The collaborative nature of school design process; 2) The importance of informal spaces; 3) The necessity of flexibility and adaptability; 4) The considerations about physical conditions; 5) The importance of outdoor activities; 6) The establishment of a sense of belonging; and 7) The communal role of schools. Our review of the literature on school design and architecture revealed a series of key themes and principles. Aiming to systematize this body of work, Prakash Nair (2014) developed a framework that incorporates most of these themes. This article adopts Nair's framework to evaluate the earlier findings (Forozantabar & Riveros, Submitted) about the current conditions of portable classrooms in Canada.

The discussion section uses these categories to reflect on the current situation of portable classrooms in Canadian school districts. The purpose of this section is to discuss, using the lens of the scholarly literature on educational architecture, the current use of portable classrooms in Canadian schools. In the final section, we offer suggestions for expanding scholarly conversations about educational spaces. The discussion includes references to innovative school buildings, which aim to exemplify the application of the principles found in the literature review. Booth and Sutton (2016) suggest that synthesizing evidence helps us understand what works and what does not, and while these examples do not aim to generalize, they offer valuable insights for policymakers,

planners, and designers. To this end, this study aims to establish a relevant connection between the main contemporary architectural factors identified by educational architects and the themes that emerged in our previous paper regarding the physical conditions of Canadian portable classrooms.

Contemporary Conceptualizations of School Design

In this section, ideas regarding the design of educational spaces suggested by Prakash Nair (Nair, 2014; Nair et al., 2013), Randall Fielding (Nair et al., 2013), Jeffery Lackney (Nair et al., 2013), Andrew Harrison, and Les Hutton (Harrison & Hutton, 2014) are reviewed and categorised in the seven categories outlined above (Nair, 2014; Nair et al., 2013).

The Collaborative Nature of School Design Process

To create a school that is both enjoyable and functional, it's crucial to involve all stakeholders in the planning and design process (Care et al., 2015). Nair (2014) emphasizes that for meaningful spatial transformation, participation and collaboration are necessary to ensure consideration of all voices and needs. This involves discussions among stakeholders to explore the spatial requirements of new pedagogical approaches (see also, Alterator & Deed, 2013). Additionally, the active participation of students, educators, parents, business leaders, and government representatives in community workshops is required (Parnell & Patsarika, 2011; Young et al., 2020). Key aspects such as culture, ethos, and environmental sustainability should be considered. Long-term

visions must be collectively agreed upon to support the implementation of facility improvements (Nair, 2014). Collaborative efforts are not only more practical but also crucial for securing community support.

Care et al. (2015) argue that involving the community in the design process can foster a sense of ownership (see also, Branham, 2004). Nair (2014) adds that the visual literacy of school occupants plays a significant role in the improvement of school buildings. This involves understanding and interpreting the messages conveyed by the building. Users need to learn to decode these messages, expressed through design elements such as the welcoming atmosphere upon entering the building, the types of works displayed, the paths to the classrooms, the adaptability of learning spaces for different needs, seating areas, materials used, corridor lighting, space connectivity, and the extent to which the environment supports informal learning (Nair, 2014). Nair (2014) maintains that these factors demonstrate how welcoming, versatile, conducive, and positive the learning environments are (see also Uline et al., 2009).

Aside from fostering social engagement, involving users in the design process makes the building more responsive to the needs of the users. Nair et al. (2013) introduced the concept of primary design patterns, simple sketches that allow the community to contribute their aspirations and ideas to the development of design diagrams, further enhancing the design and functionality of school facilities. However, achieving successful participatory design can be challenging, particularly when involving young people. Parnell and Patsarika (2011) provide an illustrative example with the Building Schools for the Future program (BSF), launched in England in 2004. This extensive sixteen-year initiative aimed to renew and rebuild all secondary schools in the

country, emphasizing the active involvement of students in planning and decision-making. Their study also explored power dynamics and perceptions of this strategic approach. Parnell and Patsarika (2011) found that, in policy practice, children are often seen as mere consumers of school services, mainly preparing for future employment, rather than as active participants in shaping their educational experiences. Notably, students who excelled academically were often favored for participation in meetings. Another critical aspect is ensuring students receive relevant, jargon-free information to effectively contribute their ideas. For instance, interviews revealed that architects often struggled to communicate effectively with children.

While these observations highlight the imbalance of power in participatory processes, it is interesting to consider how the Building Schools for the Future (BSF) project influenced children's perceptions of their role in the educational setting and boosted their disposition towards the school experience. One observation was that children began to see their involvement as inclusive, fostering creative engagement and adding a dimension of joy to learning, an aspect often overlooked in the curriculum. Furthermore, a sense of agency, belonging, pride, and responsibility emerged among students. Gaining respect from adults and representing their peers, effectively challenged traditional hierarchies (Parnell & Patsarika, 2011). The process also facilitated social relationship development, as children had opportunities to present their culture and interests as active citizens within their informed community. Care et al. (2015) further elaborated on the educational role of participatory design for children, where children see their ideas become tangible realities. This holistic approach ensures that young

individuals not only participate but also witness the impact of their contributions, fostering a sense of ownership and engagement (see also Schabmann et al., 2016).

The Importance of Informal Spaces

Care et al. (2015) emphasize the importance of creating a school environment where students are active and engaged. This reflects human beings' natural inclination for social interaction, such as enjoying conversations and observing one another (see also Li et al., 2005). To foster a sense of community and motivation, schools should provide informal spaces that are inviting and welcoming to students. An example proposed by Nair (2014) is to reproduce the settings of a café as a school project. Cafés offer versatile settings that support different learning strategies, such as teamwork, access to technology for class projects and internet research, and room for teacher collaboration. These spaces can also be divided into smaller, cozy zones with thematic decoration and child-friendly furniture. Furthermore, students can gain authentic learning experiences by participating in the café's operations, involving activities like menu planning, table setting, advertising, cleaning, cooking, and learning about subjects like economics and biology (see also Damay et al., 2011). Another example of informal spaces within schools is hallways. Nair (2014) points out the inadequacy of traditional single-purpose corridors that often remain underutilized for most of the school day. He argues that such corridors can promote negative behaviors like vandalism and bullying (see also Fram & Dickmann, 2012). Therefore, he advocates for the transformation of these spaces into versatile,

efficient hallways, thereby enhancing their functionality and the overall learning environment.

The Necessity of Flexibility and Adaptability

School buildings should possess the fundamental quality of adaptability to meet evolving educational requirements. Nair (2014) raises pertinent questions in this regard: Can the school's physical space accommodate a multitude of activities? Is it transformable and personalizable by both teachers and students to suit their specific needs? Additionally, how well does the space adapt to changing curricula, future technology, and the mobility of student population? Care et al. (2015) note that flexibility in educational spaces means the ability to embrace change. Essentially, this involves providing users with the tools to regularly transform the environment, whether through movable partitions, swing walls, or even overhead garage doors (see also Uline et al., 2009). Harrison and Hutton (2014) assert the significance of open-plan learning spaces that offer the flexibility to cater to diverse work patterns, such as teamwork and independent study, as well as different subjects like art, science, and technology. These spaces have the potential to foster new experiences, generate excitement, and place children at the centre of their learning journey. However, this approach does not imply that children are left without a defined space, students should have their own "home base" space within structured environments.

Nair (2014) argued against the limitations of traditional unidirectional approaches that focus on a narrow range of learning styles. He advocated for the incorporation of

variety in learning environments, allowing users to adjust spatial quality to suit different learning modalities. These varied spaces can also stimulate critical thinking, problem-solving, and teamwork (see also Alterator & Deed, 2013). Essentially, these spaces should not be rigidly enclosed; instead, they should be multifaceted, featuring direct outdoor access, learning zones with specific themes, a play deck, movable partitions, and relocatable pods for individuals. To create versatile spaces, a wide array of furniture, materials, and textures should be utilized. Traditional hard plastic chairs could be replaced with options like stools, exercise balls, couches, and beanbags. The use of glass can introduce transparency, connecting students to nature and maximizing daylight. Additionally, designated colored walls can serve dual functions as surfaces for writing and painting (Nair, 2014).

Harrison and Hutton (2014) discussed the functional aspects of flexible, multipurpose open classrooms capable of accommodating up to 100 students. They addressed common concerns, such as high noise levels, with several recommendations. First, they suggested creating design separations using curtains and noise-absorbing materials to mitigate conflicts between noisy and quiet activities. Second, they stressed the importance of aligning classroom design with pedagogical approaches and ensuring teachers are trained to effectively utilize such spaces (see also Schabmann et al., 2016). Third, they advocated for flexible designs that allow for easy reconfiguration of the classroom to accommodate various group sizes and shapes, enabling active participation in modifying and using furniture, equipment, resources, and storage (see also Young et al., 2020). Finally, they noted that in the 21st century, socialization and interaction with

peers have become significant elements in education, blurring the distinction between formal and informal learning (see also Kolb & Kolb, 2010).

Nair (2014) emphasizes that learning encompasses various pathways beyond the traditional model, including not only instruction from experts (teachers) but also learning from peers, introspection, and experiential learning. Consequently, he advocates for a departure from conventional classroom layouts connected by double-loaded corridors, introducing innovative concepts such as Learning Studios, Learning Suites, and Small Learning Communities. Nair et al. (2013) further explain that transforming the rectangular classroom into an L-shape and using irregular plans can create educational spaces that accommodate multiple learning modalities through flexible zones. In support of peer-to-peer learning, Nair et al. (2013) introduce the concept of watering hole spaces, which serve as informal gathering areas fostering children's social and emotional development. These spaces can replace traditional corridors while simultaneously serving circulation purposes. Nair et al. (2013) also argue that quiet libraries are not the most effective environments for independent learning among children. Instead, they suggest cave spaces, which are various nooks and crannies that function as retreats, providing students an opportunity to be by themselves amidst the information overload in educational settings.

A learning studio comprises diverse learning centers like reading areas, meeting spaces, and dress-up corners. Learning Suites, on the other hand, are a combination of two or more studios, separated by movable walls or modular boxes. In Learning Suites, distinct zones can be established using movable walls or flexible furniture. Importantly, the design should encourage students to actively utilize the space while enabling effective

passive supervision. In the Small Learning Community model, which consists of one or two Learning Studios, four to five teachers can work collaboratively, sharing their unique characteristics and boundaries. Students also benefit from additional support from peers and adults. This design approach fosters collaboration among teachers in block schedules, reduces the sense of isolation, enables one-on-one assistance for students, flexible group arrangements, cross-age cooperation, and interdisciplinary projects (Nair, 2013).

From Nair's (2014) perspective, an integrated learning area should resemble a garage with a large door providing access to the outdoors for moving large objects, expanding projects when necessary, and ensuring excellent ventilation and natural light (see also Cuyvers et al., 2011). It should feature a raw floor to accommodate a wide range of activities, including self-directed projects and confidence-building activities, with maximum flexibility. Nair's rationale for this concept is based on the evolving landscape of education, where the internet has made traditional knowledge transmission less relevant. In a multidisciplinary world, conventional science labs with fixed tables connected to utilities like gas and electricity cannot support team-based work, social debates, extensive building projects, or technology-driven communication. Generally, these labs fail to support hands-on practices and skills demanded by current industries. Another example Nair (2014) presents is agricultural-based science studios, where students can explore chemistry, innovation, culinary arts, entrepreneurship, social sciences, food markets, and nutrition for health.

Considerations About Physical Conditions

Nair (2014) emphasized the importance of certain physical elements in creating a comfortable educational environment and consequently affecting the well-being of users (see also Gyure, 2023). First, abundant daylight is pivotal in promoting both student well-being and learning effectiveness. However, it is crucial to manage the lighting to prevent glare, which can be addressed using diffusers, filters, or shades, as suggested by Nair et al. (2013). Second, controlling sound reflection and preventing noise is essential for ensuring that students can hear well in the classroom. Inadequate sound absorption surfaces, such as soft seating, carpets, or acoustical panels, may require teachers to speak louder. Nair (2014) suggests that integrating trees into school surroundings can counteract disruptive outdoor noises. Third, educational environments should provide a standard level of fresh air through windows and ventilation systems. School buildings should also maintain a suitable distance from streets and school bus areas to prevent interference with fresh air and natural sunlight (Nair, 2014).

Moreover, scale, shapes, colors, materials, and graphics have implications for users' comfort. Nair (2014) stresses the importance of ergonomic and comfortable school furniture that aligns with specific activities. The size and weight of objects in the learning environment should be tailored to the needs and age group of the users (Castellucci et al., 2017). Compliance with standards regarding square meterage per student in classrooms and other spaces is essential (Branham, 2004). Additionally, overtly long and narrow corridors can contribute to issues such as bullying and misbehavior (Fram & Dickmann, 2012). Social spaces should be adequately spacious to cater to the school's population (Nair, 2014). While children generally prefer colorful environments, the choice of colors

should be deliberate, considering their impact on learning, behaviors, and attitudes (Yildirim et al., 2015). Brighter rooms can enhance the reflection of natural daylight, but it is advisable to incorporate accented colors instead of overwhelming the space with vibrant hues. For teaching areas, neutral-colored walls can enhance focus and reduce eye strain. Primary colors are generally discouraged due to their potential for overstimulation. The combination of colors with graphics and symbols can assist individuals in navigating the environments and foster a sense of security.

The Importance of Outdoor Activities

Nair (2014) references Kaplan and Kaplan's restoration theory to highlight the significant impact of the natural environment on human well-being. In this theory, the concept of soft fascination describes the effortless attention people pay to their surroundings and the objects they observe. This type of fascination serves as a cognitive restorative element, relieving mental fatigue and enhancing concentration (Fisher, 1984). Nair (2014) also emphasized that exploration of the world cannot be confined to traditional indoor spaces. Outdoor experiences offer numerous benefits, including developing a sense of wonder and imagination, fostering a lifelong passion for learning, reducing aggressive behaviors, cultivating observational skills and creativity, and increasing independence and autonomy (Mann et al., 2021). Nair et al. (2014) further explore the educational potential of outdoor environments, particularly the role of gardening in teaching science, sustainability, ecology, and healthy dietary practices. An example of this approach can be seen in using wastewater technology for irrigating

plants. Moreover, outdoor areas can be thoughtfully adapted to include shared reading spaces, pathways for learning, natural trails, spaces for animal care, and playfields, as detailed by Nair (2013).

Fostering a Sense of Belonging

According to Care et al. (2015), the entrance of a school serves as an initial portrayal of what the school offers. Nair (2014) further explains how our experiences when entering a building can significantly influence our emotions and, subsequently, our behavior. These experiences can include feelings of anxiety or being lost, adherence to specific rules, adopting a formal attitude, or sensing that one is in a pleasant place (see also Shojaei, 2016). For instance, creating a natural and inviting atmosphere with gardens and vegetation can generate a welcoming feeling while directing individuals toward the entrance and discreetly concealing parking areas. Architectural features such as gabled roofs or overhangs can be used to ensure entrances are easily visible (Nair, 2014).

Nair et al. (2013) discuss the community spaces people encounter after entering the building. Nair advocates for displaying students' works in these areas instead of featuring stock images or posters. This approach fosters authenticity, establishes personal connections for students and their families, and highlights the educational journey undertaken. Integrating the history of communities, their stories, and local heroes into schools resonates with their identity (Uline et al., 2009). Other features such as a fireplace, indoor gardens, a transparent wall leading to a robotics studio, the school's names, erected sculptures, displays in hallways or on facades, as well as the use of colors

and materials, all contribute to conveying the community's soul (Nair et al., 2014). Providing students with a home base, including spaces to store belongings or personal workstations, can help reduce incidents of vandalism (Nair, 2014). Similarly, teachers require their own dedicated spaces, including hygienic kitchens with running water and comfortable seating. These spaces support communication with colleagues and provide a place for class preparation. Research indicates that such opportunities can significantly enhance teachers' performance (Nair, 2014).

The Communal Role of Schools

Harrison and Hutton (2014) view out-of-hours activities and community utilization of school spaces as practical and beneficial. Nair (2014) expands on this idea by emphasizing the use of school facilities as community commons. This concept envisions a space where children and adults can come together for presentations, learning, and interaction under safe, yet passive, supervision. It offers opportunities for various activities. For instance, immigrant children can enhance their linguistic skills through programs like a grandparent reading program. Such collaborative efforts between the school and the community can also support economically challenged individuals. A range of amenities, including cafés, gymnasiums, libraries, swimming pools, health services, or classrooms that open into common areas, can be repurposed to serve as community centers. These facilities offer the potential to foster greater community interactions and provide valuable services beyond regular school hours.

Discussion: The Portable Classroom and Contemporary School Design

As mentioned earlier, our investigation of news sources (Forozantabar & Riveros, submitted) revealed the following concerns regarding portable classrooms in Canadian schools: a) they encroach on other spaces and activities; b) they foster a sense of isolation; c) they have poor physical conditions; d) they overlook the significance of flexibility and adaptability, as well as the role of common and informal spaces in well-being and development; and f) they show a lack of community engagement in the planning and design of these educational spaces.

Encroachment on Common Spaces

It is often reported in the news that portable classrooms often encroach on outdoor spaces such as sports fields. In some cases, with a multitude of portable structures, school administrators have claimed there was no space left to add more (Mui, 2015; Simpson, 2022; Shaw, 2018; Bascaramurty & Alphonso, 2014; Kupfer, 2019; Lupton, 2019; Lupton, 2021; Hamilton, 2022). Additionally, the widespread use of portable structures to provide additional instructional spaces places substantial pressure on common spaces within schools. As a result, shared areas like gymnasiums, libraries, and washrooms experience congestion (Seal, 2016). This presents a significant challenge, as numerous studies highlight the importance of outdoor activities for both well-being and education (Care et al. 2015; Harrison & Hutton, 2014). The outdoors offers ample opportunities to deliver curriculum subjects, with the outdoors being inherently stimulating for learning and exploring.

Harrison and Hutton (2014) reflect on the significance of outdoor spaces. Compared to indoor spaces, outdoors allow for more flexible layouts with changing materials. Students are more inclined to take risks while in the outdoors, and activities that support physical, emotional, and social well-being are enhanced when conducted in a more relaxed outdoor setting. Also, outdoor spaces can foster stronger relationships, as children often find their teachers more approachable there (Harrison & Hutton, 2014). The case of Gammel Hellerup Secondary School in Denmark demonstrates how innovative design ideas can provide outdoor activities even with spatial limitations (Care et al., 2015). For instance, rather than using the courtyard, the recreational and social spaces are situated five meters below ground level. The curved timber roof of this space not only defines an engaging area in the courtyard but also provides natural light for the underground space. Placing this common space at the heart of the school avoids the dispersion of functions around the campus, demonstrating how creativity can provide more space while establishing a strong visual identity for the school (Care et al., 2015).

Figure 2- Gammel Hellerup Secondary School, Denmark



Source: <https://www.publicspace.org/works/-/project/h010->

Triggering a Sense of Isolation

Portable classrooms have been associated with a sense of isolation for both students and teachers, as highlighted by Knill (2018) and King (2011). Also, as noted by Nair et al. (2013), teachers require ongoing collaboration to feel connected and supported in their professional roles. The sense of isolation is a recurring concern, Bascaramurty and Alphonso (2014) reported on teachers' reflections on their disconnection from their teams while in portable classrooms. Also, as noted by Viau (2018), students and teachers in portable classrooms often face the challenge of commuting to the main building to access common spaces. This transition can be cumbersome and disrupt the flow of the school day. Many portable classrooms lack washrooms, raising concerns for families, especially those with young children (MacIntyre, 2021). Creating a welcoming atmosphere in schools is paramount. Nair (2014) highlights the significance of the common space that users encounter upon entering the school (e.g. lobby, foyer, or corridors), referring to this space as the heart of the school. This space plays a crucial role in shaping a positive social climate and reflecting the school's culture. Additionally, it serves as a wayfinding tool, helping people navigate the school effectively. To achieve this, a well-designed common space (either semi-open or closed) can facilitate people's transition and wayfinding. For example, the High School in Canecas, Portugal, features a courtyard with a colonnade running around it, forming an entrance that connects public facilities to other courtyards (Care et al., 2015). Similarly, the Joensuu Lyceum primary school in Finland is divided into four distinct areas linked by a central foyer serving as a dining space. To personalize and identify each zone, different colors are used, and each wing boasts its ancillary facilities and storage areas (Care et al., 2015). In many Canadian

schools, however, most students who use portable classrooms do not experience a transition from the outside world to their school spaces. Portables are often detached from the main building so students must access them from the outside, missing the social interaction that occurs in common areas.

Figure 3 - Canecas High School, Portugal Figure 4- Canecas High School, Portugal



Source: <https://www.archdaily.com/394104/canecas-high-school-arch>

Poor Physical Condition

One recurring theme in the news was the of poor physical condition of portable classrooms. These classrooms are often used longer than initially intended, leading to wear and tear, deterioration, and ramshackle conditions (Corbett, 2015; Waterloo Region Record, 2014; Lupton, 2019). They also suffer from issues such as noisy HVAC systems (Jenkins et al., 2004), inadequate heating, and a lack of appropriate ventilation, which causes cold, moldy, drafty, and unhealthy environments (Lajoie, 2013; Robertson, 2013; Hyslop, 2022; MacKenzie, 2016; Macintosh, 2020; Modjeski, 2016). Some portable classrooms lack essential facilities like washrooms (Gerding, 2022) and ramps (Yu, 2015), raising accessibility concerns. This situation leads to discomfort and health issues for students and teachers.

Different studies have found that the poor physical condition of classrooms can affect students' health (Ribeiro et al., 2016; Shelton, 2003). Conditions such as containment, mold, dust, inadequate outdoor air, and insufficient lighting can trigger asthma, and allergies, and hinder students' overall performance (Ribeiro et al., 2016; Shelton, 2003). In this regard, educational architects have discussed the importance of daylight and fresh air, and the use of sound absorbers to reduce noise levels. Also, this literature has highlighted the need to use advanced HVAC systems and sustainable materials to reduce any potential negative environmental effects of prefabricated buildings. In 2011, The Government of British Columbia initiated a modular classroom project as an alternative to traditional standalone portable structures (Partnerships British Columbia, 2011). These classrooms offer high ceilings, ample windows for improved energy efficiency, and a life expectancy of up to 40 years, making them adaptable to changing demographics and educational needs.

Figure 5- The modular classrooms projected in 2011 by the Government of British Columbia



Source: <https://vancouversun.com/news/staff-blogs/presenting-b-c-s-new-modular-classrooms-for-full-day-k>

Issues of Flexibility and Adaptability: Undermining Common and Informal Spaces

Another common portable structure, known as “portapak”, is designed as rows of classrooms within double-loaded corridors (Portable Buildings for Sale, 2022). This design not only lacks flexibility for different educational activities and diverse learners but also forces users to commute to other parts of the school for community activities, without creating meaningful connections between spaces (Seal, 2016; Viau, 2018; MacIntyre, 2021). Nair (2014) argued that this classical model of double-loaded corridors, commonly referred to as "cells and bells" is inadequate in meeting contemporary educational needs. Firstly, as described by Li et al. (2005), defining educational facilities by the rigid standards of classroom instruction restricts the potential of educational experience. As highlighted by Nair et al. (2013), this model often overlooks the importance of community and informal spaces.

Community spaces play a pivotal role in informal education, providing users with opportunities for socializing and quiet zones for individual learning. Nair et al. (2013) advocate for the adoption of community common spaces in place of traditional corridors, proposing a Finger Plan that departs from the long, narrow layout of traditional corridors. In this plan, each "street" should house a maximum of 6 to 8 classrooms, with movable walls between each pair of classrooms to encourage teacher collaboration and team teaching. Some sections of the street's walls can be designed to be transparent, allowing for ample daylight and views. To foster collaborative learning, breakout areas between classrooms can serve various purposes, from presentations to hands-on activities, art, and science studios, or even gardening spaces. To fulfill the need for a sense of identity and

belonging, each wing—or "finger"—can cultivate its unique character by employing different architectural features and showcasing students' work (Nair et al., 2013).

Figure 6- Nair model for middle school learning community.



Source: <https://www.josieholford.com/learning-and-design-the-classroom-is-obsolete/>

A singular instructional function of detached portable classrooms, with their rigid shape, restricts the creation of innovative spaces that are adaptable to multiple functions. As contrast, Christ's College in Guildford, UK, boasts a central atrium that combines a sports hall and a theater, serving as a gathering place for students in the morning, and as an opening to the kitchen at lunchtime (Care et al., 2015). The modular classrooms projected in 2011 by the Government of British Columbia aimed to enhance more flexibility and modularity (Partnerships British Columbia, 2011). These modular classrooms, integrated into the existing building, represent a viable alternative to the

traditional standalone portable structures. The objectives of the modular project included innovative design to support educational flexibility, minimal disruption to ongoing programs during installation, expandability, higher quality, sustainability, and cost-efficiency. These modular classrooms feature wood panels for both interior and exterior spaces, creating an attractive, versatile, and warm environment (Partnerships British Columbia, 2011).

Figure 7- Christ's College, Guildford, UK



Source: <https://miesarch.com/work/1044>

Lack of Community Engagement in Planning

Involving students and other community members in the design and planning of schools not only fosters a sense of belonging and inspiration among its members but also results in more practical spaces tailored to users' needs (Care et al., 2015). What becomes evident from our previous exploration of the news is that portable buildings are often a quick and cost-efficient response for schools grappling with overpopulation. Users often express their dissatisfaction with portable classrooms, reflecting a desire for permanent buildings that may not be properly acknowledged (Modjeski, 2016; Lacatusu, 2015). In most cases, when it comes to using portables, the community is a passive actor in the process, that is, community members are not actively engaged in the design process. Portable structures are typically installed on school sites in an undesirable and invasive manner, as planning for their use often comes as an afterthought (Kupfer, 2019). Families have asserted that the decision to have their children in portable classrooms was a shock on the first day of the school year (Robertson, 2013).

A foreseeable expansion that is planned through design can shape community perceptions regarding the welcoming nature of educational spaces. This is exemplified by Bristol Metropolitan College in the UK (Care et al., 2015). The design of this school features learning clusters and central facilities connected through converted streets known as agoras. Additional learning clusters can be seamlessly added around the central resource area if needed. Importantly, each cluster maintains its own entrance, washrooms, library, staff base, and other essential features, ensuring a more cohesive and thoughtfully planned expansion. Another example of engagement of community and students in the design of school spaces can be seen in Hillington, UK. In this school, 40,000 Lego-

shaped blocks were installed with the creative involvement of students. Each child designed their part on paper before translating it into a pictogram from the modules, resulting in a truly unique building (Care et al., 2015). Other implications of community engagement through school spaces are demonstrated in Saints School in Mansfield, UK. In this school, an outdoor community space was defined through a collaborative installation project with students and staff. During this project, students were also involved in understanding scientific principles, including the 'Fibonacci sequence', exploring materials, and considering environmental sustainability (Care et al., 2015).

Figure 8- Cowley St Laurence School, Hillingdon, UK



Source: https://www.architectsjournal.co.uk/archive/what_architecture-unwraps-lego-clad-

Conclusion and Recommendations

In the Canadian context, policy and budget constraints have significantly limited the construction of permanent, state-of-the-art schools (Knox, 2018; Pearson, 2016; Booth, 2011). Additionally, decision-makers have become apprehensive about constructing large facilities due to the rapid demographic changes in many jurisdictions and the potential risk of vacant spaces and subsequent closures (D'Amato, 2010). The rapid social changes associated with a more mobile population suggest that the traditional rigid and fixed school building may be inadequate. Flexible learning spaces that respond to the educational needs of students and communities must be considered. Perhaps the prevalence of portable classrooms in Canadian school districts is a sign that school systems need to be better prepared and more adaptable to enrolment fluctuations without impacting the students' educational experience. This means that the problem of student accommodation is also a problem of school design, and as we have argued in this paper, these two issues are intimately related. Thus, a meaningful approach to school facilities planning must be interdisciplinary and collaborative. Scholars point out that policies are complex processes of interactions among varied stakeholders (Cairney, 2021), and, as educational architects suggest, it is essential to consider flexibility, changeability, and community participation in the school design process. The design should be seen as an ongoing and collaborative process involving architects, planners, educators, students, and community members. Hence, this study puts forward some general considerations and recommendations for improving the spatial conditions of Canadian schools based on our review of key school design principles (Nair, 2014, Nair, et al., 2013).

Planning and Projecting for School Expansion

In the initial planning stages, school buildings are typically designed to accommodate a specific number of students. However, it is crucial to anticipate future expansion requirements during site allocation. This foresight should ensure that the selected site can readily accommodate additional structures without encroaching upon active outdoor spaces and sports fields. Moreover, when choosing the location for the first school building, it is imperative to factor in potential extension zones to ensure seamless operations with future zones. By proactively planning for site extensions, educational institutions can better adapt to evolving needs and growing student populations. This means considering future schooling demand in sprawling neighborhoods and areas of increased population density.

Enhancing the Physical Condition of Structures

Recognizing the crucial role of the school environment in student's well-being, stricter policies must be in place to enhance the design, materials, placement, and length of use of portable classrooms. With advancements in construction technology, issues related to air quality, noise, insulation, and other physical discomforts in portable structures can be effectively addressed through meticulous planning and budget allocation. Portable classrooms from various manufacturers offer distinct qualities, materials, and amenities (such as washrooms), with differing levels of durability. Basic and less costly portables may feature thinner walls with limited insulation, noisy HVAC systems, and insufficient daylight (Gore, 2012). In contrast, more advanced portable

classrooms could be more environmentally friendly, and aesthetically pleasing, provide better lighting, and may offer improved air quality (Israelson, 2022). Such advancements reflect the potential for enhancing the physical conditions of portable classrooms to create more conducive and healthier environments.

Empowering Users in Designing Learning Communities with Flexible Structures

Portable structures have the potential to evolve into more flexible spaces, not only in terms of design but also in their arrangement and integration with other spaces. Building on the importance of user engagement in the design process, as discussed earlier, we propose that a similar participatory approach can be employed when schools seek to add built structures to address their spatial requirements. Instead of installing standard box-like structures, a modular flexible structure presents a preferable alternative (Partnerships British Columbia, 2011). This type of structure can be completed and customized to respond to the school and community's specific needs. These structures employ tilt-up modular panels that can be rapidly installed yet are adaptable based on feedback from users, architects, and other stakeholders. A modular facility of this kind allows people to arrange and define indoor and outdoor spaces, create common areas between units, personalize environments through painting and decoration, and would benefit from open plans that can be modified to suit educational needs. As Nair (2014) explains, the focus of design should shift towards ergonomic principles such as maximizing the use of daylight, ensuring natural ventilation, and fostering Small Learning Communities.

Some Design Considerations for Enhancing Learning Spaces

When contemplating the addition of new spaces to a school, it is essential to consider these new sections as self-contained, independent zones. This concept aligns with what Nair et al. (2013) propose as Small Learning Communities. The goal is to ensure that the introduction of additional spaces, often in the form of portable units, does not place undue pressure on existing facilities. These additional zones should be self-sufficient and include common areas like washrooms, eateries, social spaces, gyms, and so forth. Nair et al. (2013) emphasize the importance of creating smaller, more tightly-knit communities within a school environment, where children feel more connected instead of being anonymous bodies in a crowded setting. Regarding the layout of these spaces, Nair et al. (2014) suggest a departure from the notion of large, collective bathrooms, which can lead to issues like bullying and anxiety among students. Instead, they recommend that bathrooms be distributed throughout the site, with each location housing only a limited number of stalls (ideally two to five). Sense of belonging, security, and inclusion can be enhanced by making all washrooms comprehensive and gender inclusive. This means stalls should be fully enclosed and have all related facilities, including a toilet, sink, mirror, hand dryer, bin, and hooks (Nair et al., 2014).

New school structures should embrace open plans that can be adapted to and personalized by users to support student-centered teaching and learning approaches. According to Harrison and Hutton (2014), the importance of child-centered education lies in the fact that every student constructs knowledge based on their unique past

experiences, allowing them to express themselves and develop their attitudes, social skills, and emotional intelligence. Future structures should be characterized by flexible layouts and adjustable facades, enabling users to influence the arrangement, size, and shape of spaces. In a world where the boundaries between science and art have blurred, spaces should be equipped to support versatile curriculum combinations, such as integrating a model-building shop, a science lab, and an artist's studio. These spaces, as Nair (2014) emphasizes, should be designed to offer natural light and ventilation, feature durable water-resistant flooring, provide ample storage for tools and student materials, include preparation and display areas, offer easy access to water and clean-up, provide power supplies, maintain appropriate acoustics with noise control equipment, have transparent walls and windows, large openings with outdoor project decks, varied furniture and workspaces for 2D and 3D projects with advanced machines, and multiple seating, standing, and chairs with different heights and shapes.

Finally, the sequences for entering the school zones and the connections among them should be properly defined. Nair (2014) advises that entrances should be separated by age groups to prevent younger children from being rushed by older students. The school entrance and its adjacent outdoor space should be thoughtfully customized to create a distinct sense of place and to ease the transition from the outside environment to the school's interior. This can be achieved by displaying students' projects and artwork, introducing a signature architectural element, or including an informal social area with comfortable resting spots (Nair, 2014).

Community Integration in Learning Environments

A prevailing theme discussed extensively in educational literature is the vital integration of schools with the communities they serve (Miles et al., 2011). Allocating school infrastructure for afterschool programs and community uses offers a range of advantages, particularly in the context of Canada's social diversity. Flexible and adaptable school buildings have the potential to foster stronger relationships among stakeholders and could create more engaged communities. This resonates with the idea of schools as hubs for different generations, a concept developed by architect Carlo Testa. His notion of the "no leaving school", promotes the idea that schools are spaces for everyone, transcending generational boundaries (Care et al., 2015). Furthermore, this integration serves as an effective solution to concerns about maintenance costs and unused spaces within school premises. By dedicating school spaces to extracurricular and community activities, economic benefits can be realized, job opportunities created, and the security of these spaces enhanced (Care et al., 2015). As Care et al. (2015) suggest, community involvement can strengthen the sense of identity within these spaces, subsequently reducing misbehavior.

Limitations and Future Directions

Our reflections are built upon a previous study that used data from Canadian news resources. While our analysis reveals the concerns expressed by different actors, it is possible that the study may have overlooked concerns that may not have been discussed in the news. This study provides a holistic view of some architectural aspects that

Canadian school districts can adopt to improve the spatial needs of students and communities. The thematic synthesis review utilized in this study could be further expanded to investigate the possible application of the findings to other jurisdictions. We recognize that the recommendations offered in this paper must be evaluated through case studies, yet we believe that this study can contribute to current and future conversations about the planning for educational facilities in Canadian schools.

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Chapter 4: Conclusion

The first stage of this study collected and investigated 243 pieces of news about portable classrooms in Canada. The dataset spanned 13 years (2010-2023) and was derived from two sources: Factiva and Google News. The analysis revealed that although portable structures are not a preferable option, there are some reasons for their prevalence in Canadian schools. Primarily, they are chosen to accommodate the growing demand for schools' spaces when permanent facilities are insufficient. Other reasons include a reactive funding model driven by austerity; the perception that portable classrooms are a flexible and easily deployed option that can be removed as soon as the demand stops; and policy decisions about class size and composition.

The second theme gathered discourses around the physical conditions and comfort in portable classrooms. It is revealed that in many cases these structures encroach upon outdoor spaces in schools, such as sports fields, and green spaces. Moreover, most portables are not designed as self-sufficient units, which leads to two main issues: First, users need to commute between the portable and the main building, creating a sense of isolation. Second, once portables are added to the school grounds, existing common spaces (bathrooms, libraries, gyms, labs) become congested, as more people need to use these spaces. Furthermore, many reports suggest that the physical condition of portable classrooms is below standard in terms of ventilation, noise level, and temperature. Finally, reports about vandalism and fire settings in portable classrooms raise concerns regarding safety and a sense of belonging within this structure.

The third theme focuses on the strategies implemented to address spatial needs in schools. Actions include redrawing schools' boundaries, distributing students to other schools, rescheduling, and sharing buildings with coterminous boards and other institutions. The analysis revealed numerous challenges associated with accommodation policies and funding formulas, particularly in meeting community needs.

Believing in the essential role of space and architecture in human experiences, learning, and well-being, the analysis turns to the discussions of contemporary educational architects regarding educational spaces. In the second stage of this study, the investigation focuses on seven key architectural features of contemporary school design as discussed by Nair (2014). The second article contrasts these features with the most common type of portable classroom used in Canada, namely the detached single use prefabricated portable. As noted in the first article, portables encroach on common spaces and impinge on outdoor common areas and activities. The process of planning and adopting portable classrooms does not include users and other community members, which could have an effect in addressing the diverse needs of communities. Most school design literature calls for flexible and adaptable spaces, which clashes with the rigid and unidimensional use of portables. Basic architectural principles that directly affect the well-being and learning of users are unfulfilled in portable classrooms including aesthetic features, ventilation, accessibility, safety, and durability. Also, there is a concern that the lack of appropriate design could affect the students and other users' sense of belonging in the school.

Finally, the study suggests some general ideas for improving the overreliance on portables. This includes considering projected population growth when choosing sites for

schools, as well as improving the physical conditions of structures through a thoughtful design process, using high quality materials, and technologies. Also, engaging local communities in planning and designing learning spaces could increase engagement and a sense of ownership. This includes expanding the use of schools' spaces to wider functions such as health, adult education, or recreation.

This study aimed to bring awareness about the situation of portable classrooms in Canada. Searching amongst existing literature, I found that there is a gap in studies on this issue in the Canadian context. Studies in other countries particularly the US motivated me to delve into the issue by using secondary data, namely news reports. With a personal interest and academic knowledge in the field of architecture, I believe this study has the potential to contribute to current and future conversations on this topic. This study highlights that school spaces affect our physical and mental well-being, as well as our social interactions and learning abilities. Hence, this study found tensions and contradictions between the current spatial conditions of schools in Canadian provinces and some key educational architecture concepts. This study calls for further improvement of current school design principles. The result would lead to more desirable social and educational experiences for all stakeholders.

The second article puts forward some ideas about how the physical conditions of schools can be improved through collaboration. However, doing that in practice needs constant and dedicated engagement from policymakers and other stakeholders. Users should be educated to enhance their visual literacy skills. Then, they should actively participate in the design process. As discussed in the second article, innovation and flexibility in design can lead to more comprehensive spaces. Some of the examples

discussed earlier show educational spaces that have multifunctional applications or are capable of transforming, through modularity. Also, users will feel included as they will be part of the design process. The improved spatial outcomes and sense of belonging would not only would affect the students' learning outcomes and well-being, but also would bring about more social cohesion and solidarity.

Like every research, this study had some limitations. First and foremost, I had to work with secondary data, news resources, due to the reasons previously mentioned. As a result, although varied concerns from different actors are revealed, it is possible that other issues may not have been discussed in the news, thus may have been neglected in the analysis. This study gives a holistic view of some architectural aspects that Canadian school planners could delve into in terms of improving the spatial needs of students and communities. This holistic review may not include every architectural aspect that could be explored through more systematic approaches. The time limitations of a master's thesis constrain the amount of data that could be gathered and analysed.

These limitations call for further studies investigating the use of portable classrooms in Canada. First, there seems to be a need for field studies to gain more accurate data to understand the experiences of educators, students, and other stakeholders. Social, political, anthropological, and psychological lenses can be employed to investigate the different aspects of the phenomenon. The thematic synthesis review utilized in this study could be expanded to reveal the inconsistencies or limitations in the implementation of student accommodation policies in the Canadian context. The recommendations presented in the articles above invite a close investigation through case studies, and policy studies. This study, however, sheds light on the need for change and

articulates some aspects that should be reconsidered and in order to provide a better educational experience for Canadian students.

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