LANDSCAPES FOR TRANSFORMATION: A Framework for Planning Greening Design Strategies in Low-Income Schools in Chile

by

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B.Arch., University of Chile, Chile 2006

A THESIS SUBMITTED IN PARTIAL FULLFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ADVANCED STUDIES IN ARCHITECTURE

in

The Faculty of Graduate and Postdoctoral Studies

(Architecture)

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

September 2014

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ABSTRACT

The design of the physical environment has the potential to impede or enhance learning outcomes. The outdoor environments of low-income schools in Chile in particular often suffer from physical neglect, where barren expanses of asphalt that offer little to no stimulus for children are found. Researchers have noted that children may be increasingly lacking access and contact with nature, resulting in alienation from the natural world. Reintroducing nature into school grounds may bring several cognitive, psychological, and health benefits for children including an increased ability to concentrate and reduced stress and aggression levels. Beyond these benefits, researchers agree that the direct involvement of students in a greening process can spur environmental awareness and allow them to acquire skills related to democracy, participation and citizenship, and carry these skills into adulthood to become engaged and responsible members of their communities. This thesis provides a framework for planning a school ground greening process. The thesis aims to support school administrators in their goal to provide enhanced and greener learning environments for children. The thesis analyzed three case studies of greened low-income schools in Chile to identify cross cutting aspects between them relevant to accomplish change. The results indicated that applicable actions can be grouped in four categories; building engagement, aligning management, integrating curriculum, and creating partnerships. The proposed framework synthesizes relevant aspects within each of these categories, yielding important findings. First, a greening process is successful only as it involves and engages the entire school community including children, teachers, parents, neighbors, administrators, and the broader community of stakeholders. Second, in order to effectively sustain design outcomes, these need to be firmly connected to the curriculum during the planning, use and maintenance stages of the greening process, with teachers providing interdisciplinary learning opportunities. Finally, it is necessary that educational authorities convey a clear and strong message for schools by providing supportive greening policies, which is the only way to make these processes effective and become mainstream. The thesis aims to aid policymakers in these efforts.

PREFACE

This thesis is an original intellectual product of the author, Maria J. Valdebenito. The case studies presented in Chapter 4 were revised and approved by UBC Behavioral Research Ethics Board, Minimal Risk Certificate Number: H12-03621.

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ACKNOWLEDGEMENTS

I would like to thank my thesis advisor, Joseph Dahmen, for his continuous help and guidance during these two years, and for encouraging me to pursue my research on the present topic. The later was extremely valuable, as I rediscovered an area of my interest that would inspire me day after day.

I would also like to thank my thesis committee, Raymond Cole and Samia Kahn, for their knowledgeable feedback and dedicated time; this work would have not been possible without their contributions.

Special thanks to the schools and their communities that generously opened their doors and showed genuine enthusiasm for my research. Their endless efforts in providing better learning environments for their students made me think about the kindness behind these actions, and the urgent need to provide real opportunities for children in more disadvantaged contexts to progress and flourish.

Thanks as well to my friends in Vancouver and Chile, who permanently supported me with their nice and cheerful words. Special thanks to Iman and Picu who always had time to listen, even to my most trivial concerns and constantly offered a helping hand.

I would like to thank my family in Chile, especially my parents, Maria Eliana and Juan Enrique, my sister Pauli, my brothers, Juanse and Mati, my nephew, Ki, my mother in law, Tita, and my sister in law, Paula, for unconditionally calling us every other day and making us feel like the distance was not so.

Finally, I would like to thank my husband Luis, my daughter Josefina, and my son, Gaspar. We dreamed, learned, cried and laugh together; the memories of this experience are embedded in our minds and hearts forever. I simply could have not wished for a better team.

To Josefina and Gaspar

1. INTRODUCTION

1.1 PROBLEM STATEMENT

An emerging international movement is concerned with the design and culture of school grounds with a view to improving the quality of children's educational experiences. This movement focuses primarily on the concept of school ground "greening" whereby students, parents, teachers, neighborhood residents, and school and city officials work to upgrade the physical environment and to re-establish some of the natural attributes that existed prior to them being covered by asphalt (Dyment J., 2004). Greening can include a range of changes to school grounds, including naturalization, habitat restoration, tree planting, food gardening, among other similar efforts to bring nature back to the school setting (Dyment & Bell, 2007). Although several terms have been used to describe these changes (i.e. "school ground gardening", "school ground naturalization", "school ground restoration"), the term "school ground greening" will be used for the purpose of this thesis to describe the process by which schools incorporate design strategies that work with nature and other architectural features or built elements that complement the educational purpose (such as seats, paths or trails, shelters, rock amphitheaters, etc.), and are intended to improve the school's setting, and particularly, the school grounds.

The greening of school grounds has the potential to provide opportunities for children's contact with nature, which has been observed to have psychological, physical and cognitive benefits. These include the increased ability to concentrate, reduced stress and aggression levels, and reduced risk of obesity (Faber Taylor & Kuo, 2006; Stephen Kaplan, 1995; Kellert, 2005; Lachowycz & Jones, 2011; Nancy M. Wells & Evans, 2003). Furthermore, a greening process can promote ecological literacy, where children can become cognizant of the place where they live and develop environmental care and awareness (Orr, 1992), and help them acquire skills related to democracy, participation, and citizenship, which has been argued to be among the most important goals of greening (Dyment, 2004, 2008; Hart, 1997). Research also indicates that a green school ground can provide opportunities for formal and informal learning (Malone & Tranter, 2003; Moore, 1996; Moore & Wong, 1997) and increased interaction with the natural environment (Moore, 1995). Also, students appear to benefit from safer and less hostile outdoor environments (Cheskey, 2001) as well as improved academic performance (Lieberman & Hoody, 1998; Ozer, 2007).

In Chile, there have been some governmental efforts to initiate a greening movement across schools, particularly through the creation of the "National Environmental Certification for Schools", program sponsored by the Ministry of Environment and the Ministry of Education that has been important to start an environmental conversation among related schools' stakeholders. There are also other initiatives aimed to support the certification program by making schools participate in entries for public funding, such as "My school garden" program, and other intended to provide formal training for teachers, such as the "Eco-educators" network, where teachers learn about environmental education and can share experiences with other teachers.

Despite these efforts and the benefits that greening strategies might bring to schools in Chile, these types of initiatives have yet to become widespread, and barren schools grounds are still the norm. Neglected school grounds are particularly critical in disadvantaged schools in Chile and especially those located in urban contexts. Moreover, there have been a number of schools engaged in greening interventions but many of them have abandoned their efforts halfway due to a lack of sustained support from higher authorities in delivering relevant policies for the greening of school grounds. The few existing documents supporting environmental initiatives lack advice on how to start and conduct relevant changes, often resulting in wasted efforts. The question, then, is how to bridge the gap between existing school ground conditions and significantly improved landscapes that integrate the educational, cultural, social and health needs of students and the larger community without a set of working principles and coherent objectives to address. In keeping with this question, the objective of this thesis is to identify relevant aspects during the planning phase of a greening process that will help schools initiate and sustain greening design strategies and achieve a successful environmental transformation in the long term.

1.1.1 An overview of the educational context in Chile

Why focus on low-income public schools?

In Chile, primary and secondary education is currently provided through a mixed system, with the participation of the public and private sector in its production and financing. According to the Ministry of Education there are 12,174 schools in Chile (MINEDUC, 2012), which can be classified in four different typologies, according to their administrative dependency and funding relationships as follows:

• Municipal: schools that are entirely subsidized by the Chilean government, representing the universe of "public" schools in Chile. According to the Ministry's Statistics Report,

municipal schools constitute 45% (5,514) of the total number of schools.

- Private subsidized: there are two different groups among these schools: those that are entirely funded by the government and those that receive both government and parental funding, known as "shared funding system" (sistema de subvención compartida). According to the Ministry's Statistics Report, this is the larger school typology in Chile, constituting 49% (5,965) of the total number of schools.
- Private: schools that receive no government subsidies and operate entirely on parental funding. According to the Ministry's Statistics Report, these schools constitute 5% (625) of the total number of schools in Chile.
- Delegated administrative corporations: these correspond to business associations and private corporations that administer publicly funded technical-professional schools through agreements. These constitute 4% of the total number of schools in Chile.

From the total of 3,410,178 students enrolled in Chile in 2012 (MINEDUC, 2012), 1,294,759 (38%) of them are enrolled in municipal schools and 1,815,456 (53%) in private subsidized (public or private) schools, constituting 91% of the total number of students enrolled in the Chilean educational system. The remaining 9% of the students are enrolled in either private schools or delegated administration corporations (Fig.1).



Fig. 1. Percentage of total students enrolled per administrative dependence Source: Statistics of Education 2012 Report, Chilean Ministry of Education

In addition to serving the greatest number of students in the country, public schools also serve the poorest ones. More than 80% of the students on each of the lowest income quintiles (from I to IV), attend public and subsidized schools (Table 1), and for whom presumably, the benefits of a greening intervention would be most significant.



Table 1. Percentage of students attending subsidized schools by income quintile (2000-2011 period) Source: CASEN survey, Chilean Ministry of Education

Furthermore, public schools in Chile have consistently had the lowest achievement scores. According to the most recent results on standardized tests at a national level on the assessment tool SIMCE (Sistema Nacional de Medición de la Calidad de la Educación), private schools have consistently outperformed municipal and private-subsidized schools over time (Table 2).



Table 2. SIMCE results for the period 1999-2012 in mathematics. Source: National Agency for Quality in Education, Ministry of Education

According to the OECD (2004), the educational system in Chile as it is today, has not succeeded in improving learning outcomes and has intensified student segregation by allowing private schools to admit students by selection and expel low-performers. Private subsidized and private schools also require that parents contribute financially, making it harder for poorer families to have a fair choice. The systemic application of this rationale for more than three decades has contributed to deepening the social segmentation and inequity of the Chilean educational system. This is an issue of critical concern, especially considering that both the number of schools and student enrollment has decreased over time (Table 3) in the public educational system (MINEDUC, 2012). The migration of students from public to private schools leaves the more disadvantaged students behind, emphasizing existing inequities among socio economic groups and not necessarily improving academic performance results (OECD, 2004; Social, 2006; Valenzuela, 2008).



Table 3. Enrollment evolution per year and school category (in percentage) Source: Statistics of Education 2012 Report, Chilean Ministry of Education

All of these arguments indicate that in Chile, opportunities for students of disadvantaged backgrounds remain a challenge. While there are other significant causes of lower learning outcome in these poorer schools, the continued state of inattention suffered by school grounds and the overall school setting has accentuated the current crisis of public education in Chile. The physical environment of the school has consistently been overlooked in its role for learning (Shamsuddin, Bahauddin, & Aziz, 2012). A greening intervention will improve the school setting, consequently providing enhanced teaching and learning opportunities for students in these contexts.

Furthermore, the greening of school grounds would have special significance in disadvantaged contexts. As studies in environmental inequality suggest, low-income children would be underexposed to nature and green spaces in comparison to their wealthier counterparts and, as such, are less likely to have regular access to safe outdoor spaces and have positive experiences in them (Strife & Downey, 2009).

Finally, it has been argued that a greening intervention can be done at relatively low costs as compared to other educational costs (Stewart, Purner, & Guzmán, 2013), and maintained with the commitment of regular volunteers, aspects that are especially relevant for low-income schools. In this sense, another key component derived from a greening intervention that can strengthen disadvantaged schools and their students is the creation of strong partnerships among families, teachers and local communities, working together to overcome socio-economic adversity and achieve a common goal.

1.1.2 The physical learning environment of schools in Chile

The government's expansion policy during the 1970s and 1980s to provide facilities for all students in urban and rural areas in Chile resulted in a standardized massive construction that favored quantity over quality, and which coupled with the use of obsolete regulations, gave place to poorly designed and constructed public schools. Moreover, in the early 1980s, the government transferred the administration and infrastructure of all public schools to municipalities in an effort to descentralize the educational sector from the Ministry. As a result, the state lost prominence and presence in education and the responsibility for the provision of education was dispersed among several hundred inexperienced and untrained municipal personnel and more than 3000 private ones, with the government becoming unaware of the real conditions of schools (Raczynski & Muñoz, 2007). Over the years, lack of maintenance led to the current deteriorated condition of many of these facilities.

Yet, the majority of schools in Chile are urban schools, with barren school grounds lacking natural elements. Almost 70% of the schools in Chile are located in urban areas (Fig. 2), with a quarter of these schools located in Santiago, the capital (Fig. 3).



25% Number of school facilities located in Santiago

Fig. 2 Percentage of school facilities per geographic location in Chile. Source: Statistics of Education 2012 Report, Chilean Ministry of Education

Fig. 3. Percentage of school facilities located in the city of Santiago. Source: Statistics of Education 2012 Report, Chilean Ministry of Education

Changes from the traditional double-shift day, where children attend school in 2 differentiated shifts (generally higher grades during the morning and lower grades in the afternoon), to full school day (where all grades together attend full school day), also required modifications on the schools' physical environments. The government provided funds specifically directed at solving space shortage and providing schools with enough classrooms to support the time extension (García Huidobro & Concha, 2009). However, these have not been sufficient to reach every single school; there are still many schools functioning in precarious conditions and outdated facilities. A negative aspect derived from this situation is that since the full school day required an increase in classroom space, in many cases it had to appropriate much of the surface that was originally destined for playgrounds and sports grounds (Sotomayor, n.d.), as shown in Figure 4.



Fig. 4. Typical condition of school grounds in public schools in Chile Left: "Lichán" School, Nuñoa district. Right: "Antiñil" School, La Reina district

Currently, there is still a long way to go to attain quality spaces for children in public schools. Many of these schools, especially those in disadvantaged socioeconomic contexts cannot fulfill contemporary occupant's needs. They suffer of having inadequate classrooms and barren schoolyards, where teaching and learning has become an undesirable challenge. Children in lowincome communities, who are also the ones at greater risk of failing or dropping out, have no other choice but to attend these schools, and thereby further adding to the negative perception that already exists about the overall educational context.

1.1.3 Policy context and environmental initiatives in education in Chile

Over the last 10 years environmental concerns in Chile have consistently been gaining greater importance. The Ministry of Environment and the Ministry of Education are the two main governmental agents promoting an environmental transformation in the country. Through diverse

initiatives, they advocate for the need to instill environmental awareness among children and society in general and to create tools for citizen participation in local environmental initiatives.

The "National Policy for Sustainable Development"¹ is a broad initiative, devised with the intention to be a reference framework to educate citizens, individually and collectively, strengthen their values, and develop skills, attitudes and knowledge in the pursue of a more sustainable society. At the school level, a concrete intervention to promote a cultural change towards sustainability is the "National System for Environmental Certification of Educational Facilities" or SNCAE (Sistema Nacional de Certificación Ambiental para Establecimientos Educacionales)², program developed in 2010 together by the Ministry of Education, the Ministry of Environment and UNESCO. The goals of the program, as they have defined, include: to foster sustainable development, acquire environmental management, and ultimately, improve the quality of education. According to the Ministry of Environment to April 2014 there are 882 certified schools along the country and the number continues to grow. Over the years, the certification program has become well-known throughout Chile and attracted more schools. This has created a green school movement that has served among other aspects to start an environmental conversation and bring on a gradual transformation.

Although the imperative has been posed and authorities in higher education have explicitly stated the importance of sustainable development, these ideas and concepts have not been materialized in concrete supportive policies that speak directly to curriculum and school environmental management, and due to this, schools receive an unclear message. The current challenge for ministries and local authorities is to develop environmental policies further and link them with educational goals already established, encouraging in this way, their widespread use and application.

1.1.4 Greening precedents in the developed world

Countries that have demonstrated leadership in promoting environmental transformations in schools are the UK, the US and Canada. The UK, for example, has developed a program for schools called "Framework for Sustainable Schools", explicitly stating that "the government would

¹ Information retrieved from http://www.mma.gob.cl/educacionambiental/1319/w3-propertyvalue-16375.html, on March 2013

² Information retrieved from http://www.mma.gob.cl/educacionambiental/1319/w3-propertyvalue-16362.html, on March 2013

like every school to be a sustainable school by 2020" and providing especific tools and resources to be used by teachers, pupils, governors and other school's leaders (DCSF, 2008). The California Board of Education promotes school gardens as part of an overall program to improve child nutrition as well as develop progressive educational opportunities. In Canada, the Nova Scotia Department of Transportation and Public Works has produced one of the most comprehensive policies on school grounds that speaks to the need for school site design to respect the physical environment and addresses the role played by school landscapes in protecting children's health and instilling environmental values (Evergreen, 2002a). The Toronto District School Board developed its EcoSchools program with the intention to support "environmental literacy for all students", explicitly recognizing green school grounds as part of a larger school board vision for education into the future (Dyment & Reid, 2005). These initiatives are all charaterized by a strong leadership and support from higher authorities. According to Evergreen (2002a), successful approaches to school ground greening always include supportive policy at higher levels. Greening practices can become even more relevant if schools are provided an appropriate context within which to operate. A fundamental aspect within policies for curriculum is to make direct reference to environmental education. In the Nova Scotia example, school boards need to provide hands-on learning experiences through problem-solving and project-based activities that involve the school ground landscape. Likewise, the Ministry of Education in British Columbia considers sustainability as a major organizing principle within the curriculum and has developed board-authorized courses and concrete resources for schools that wish to begin offering sustainability-focused contents.

When green school grounds initiatives are explicitly embedded within a national, provincial, and/or school board policies, a strong message is sent that the potential of these initiatives is understood and supported and that they are an integral part of a much larger vision of educational reform (Dyment and Reid, 2005). Schools in Chile aiming to start a greening process are still lacking this kind of support. These schools are still mainly relying on their own 'trial and error' or 'learning by doing' without a clear and substantial message from higher educational authorities. If such interventions are expected to advance, they need to be positioned within a broader institutional context, one that provides supportive policies for school grounds greening and builds necessary connections to deliver the fomal curriculum.

This research aims to provide a supportive framework for school administrators to plan a sucessful greening transformation on their school grounds. Adequate planning has been argued to be determinant in sustaining greening interventions. The results of this research also seeks to be an instrument to support environmental initiatives in schools in Chile that are being currently

promoted by the government and, ultimately, generate a discussion that affects and informs environmental policies targeted to the creation of improved and greener school grounds.

1.2 RESEARCH QUESTIONS

The questions explored in the research are as follows:

1. What processes will enable low-income schools in Chile to implement greening design strategies on their school grounds?

2. What are the key aspects driving and impeding change in low-income schools?

3. Who are the relevant agents involved to attain such changes?

1.3 GOAL AND OBJECTIVES

The objective of the thesis is to provide a framework for planning greening design strategies in low-income schools in Chile. It is aimed to guide administrators at the school level in this process, but also to be a complement for environmental policies targeted to the creation of improved and greener school grounds. The framework also identifies relevant agents and their roles in the process.

This objective might have the following effects:

- Address issues of social justice in Chile by focusing in low-income public schools.
- Spread the benefits of school ground greening in line with the government's environmental initiatives in education.
- Improve the physical context of the school by the introduction of greening design strategies, and thus, enable enhanced teaching and learning opportunities for children.
- Provide a cost effective method for low-income schools to improve student learning.

1.4 METHODOLOGY

The thesis applies a case study approach based on interviews and site visits to develop a framework for greening low-income schools. The framework was also supported and informed by

other documented experiences from a literature review in order to understand those aspects that have been argued to facilitate or impede change.

Three schools located in a low-income community in Chile were selected as the case studies and were approached through e-mail correspondence and site visits. These schools were able to articulate a greening process and were distinguished as successful examples of school ground greening projects by the local authority in the district.

The process by which these schools undertook a greening transformation was analyzed in detail. On a site visit to the schools, the researcher interviewed the principal and 2-3 teachers at each school. Also, photographs and notes on the greening strategies and the school grounds were taken during the visits. The specific actions performed by these schools to accomplish the different greening strategies were mapped to create a model for each case study. From the analysis of the three models, greening actions were identified across them for their role in serving four major goals, which were distinguished as the pillars to achieve a successful transformation. Also, relevant agents and their participation during the greening process were identified to develop the final framework.

The literature review can be divided in two main areas of study. The first analysis was done in order to understand how has the physical environment of the school and particularly its outdoor setting evolved in regards to learning, with an eye on finding possible explanations to the neglect of some schools' contexts. This was undertaken by studying two important research trends; progressive education models, firsts to ascertain the value of the physical setting, and the discipline of environmental psychology, which has been studying human-setting transactions during the last 50 years. The second part of the literature review investigates school ground greening processes and the benefits derived from such processes for children, placing special emphasis on those aspects affecting disadvantaged communities and schools that could be translated to similar contexts in Chile.

1.5 LIMITATIONS OF THE STUDY

One of the limitations of this research is associated to the number of schools within the study. As the final goal of this thesis is to provide a generic framework for greening school grounds, a greater number of schools was desirable and originally planned. From 12 schools approached, a final number of 3 schools demonstrated a strong commitment to the study, essential aspect to develop a successful work.

A second aspect is the fact that this research is based in mapping processes of schools that have implemented greening strategies in the past and relies in the information given by the people involved in these processes, for which gaps in recalling the exact events might exist. However, this information was complemented with an historical record of pictures of the pre-existing condition and contrasted with the direct observation of interventions and design strategies on site. Also, a written document in the form of a book was provided by the principal of one of the schools, and that was previously the science teacher of a second school under analysis. The book provides an overview of the greening processes of the 2 schools in which he was directly involved.

1.6 FUTURE DIRECTIONS

The results of this thesis will be a first stage in a long-term project that will continue when the researcher returns to Chile. This later phase will include testing the proposed framework on another school located in a low-income community. This school also currently suffers from barren school grounds and a general neglected physical condition. Formal communication with this school is already in place, and the principal have agreed to apply the results of this research to start a transformation. Moreover, future work will explore issues related to maintaining greening strategies over time and prevent them from being neglected.

2. THE IMPORTANCE OF THE PHYSICAL ENVIRONMENT TO EDUCATION

Growing concerns regarding the inability of schools buildings to support contemporary educational needs has raised interest regarding school design. Since the emergence of environmental psychology, a field that investigates the transactions between people and their environments (Gifford, 1987), a growing body of literature is focusing on the ability of the physical environment to support human behavior, attitudes, and overall development and well-being. The investigation into this realm of knowledge is especially important in education as it would provide the clues to drive appropriate decisions on future school design and propel a fair assignment of resources. Most importantly, however, this would help to think of the physical environment as a critical piece in children's learning and development, which I argue, has not been completely acknowledged by educators and school managers.

According to Clark (2002), the physical environment of the school has been neglected in part due to a lack of guidance in the form of research-based evidence, which in turn, may have affected the effective management by school managers. He points out; "Investigation into the physical environment as a variable influencing learning outcomes has been largely ignored in favor of research into pedagogical, psychological and social variables". Other authors (Earthman & Lemasters, 1996; Rivlin & Weinstein, 1984; Sanoff H. in Walden R., 2009) have also argued that the impact of the school physical setting on students' behavior and performance has continuously been overlooked, especially because of the difficulty in demonstrating a statistically significant relationship between both. This, coupled with methodological flaws in some of the studies, researchers claim, had contributed to increase the research gap on this area, leading in turn, to the sustained state of inattention suffered by many schools today. Furthermore, Orr (1993) has stated that we have not thought of academic buildings as providing a pedagogical role and we should encourage a multidisciplinary approach to the design of spaces where learning is supposed to occur. This situation is particularly sensitive for schools in the developing world, which need to cope with additional difficulties such as lack of economic resources, poor administration and social issues. An important role of architects is to help others envision the physical environment as a critical agent within the larger educational framework.

The following section will analyze two disciplines that have influenced the study of school environments: studies regarding new visions of the learner and his surroundings as described by

progressive education theories, and the growing field of environmental psychology concerned with person-environment relationships.

2.1 THE RISE OF PROGRESSIVE EDUCATION THEORIES

During the late 19th century, a progressive educational movement emerged in Europe and the United States. This movement was largely in response to the general social critique of the public educational system (Walden, 2009). The progressive movement is traced primarily to educators such as Friedrich Froebel (1782-1852) in Germany, Maria Montessori (1870-1952) in Italy, and John Dewey (1859-1952) in the United States. The latter characterized traditional education as "taking bodies of information and of skills that have been worked out in the past and transmitting them to the new generation" (Dewey, 1938). These methods typically included direct and wholeclass instruction, memorization and learning by rote, standardized subject matters and standardized tests, and emphasis on grades and competition. In contrast, Dewey and his advocates favored educational philosophies that entailed new 'developmentally appropriate' approaches to pedagogy and curriculum. These included beginning with the child's experience. encouraging direct, active involvement with the subject matter, and organizing a social structure within the school that facilitates spontaneous interchanges between students, teachers, and the community resources (Sutton, 1985). These early theories were complemented by Piaget's (1896-1980) research, which pointed to individual discovery and play as important conditions for cognitive and affective development (Sutton, 1985). These ideas led to methodologies that were an effective response to the existing dilemma, and since 1960 on, many programs developed in the primary schools used individualized, active learning as the cornerstone of alternative approaches to education (Sutton, 1985). Their materialization was first seen in Europe as The British "infant" (elementary) schools and what the English called "informal education", and later, patterned after it, "open education" by American educators (Walden, 2009).

2.1.1 John Dewey: linking education to aesthetic experience of environment

There are several concepts from Dewey's educational philosophy that are fundamental to this research. The first one is "the idea that there is an intimate and necessary relation between the processes of actual experience and education" (Dewey, 1938). In contrast to the dominant pedagogical theories at the time, Dewey maintains that "education in order to accomplish its ends both for the individual learner and for society must be based upon experience – which is always the actual life-experience of some individual" (Dewey, 1938). Also, in his book "Art and

Experience", he holds that a "live creature" cannot be separated from the world in which it lives, and that the "moments when the creature is both most alive and most composed and concentrated are those of fullest intercourse with the environment, in which sensuous material and relations are most completely merged" (Dewey, 1934). Dewey thought about thinking and doing as two seamlessly connected halves of the learning process. For Dewey, each experience depends upon its context, history, composite factors, and a particular satisfaction that must exist for an experience to be complete. These ideas, which can be extended to suggest that the built environment is a fundamental, intrinsic component of a complete learning experience, are central to this research. The physical school environment, addressed through architecture, cannot be left unattended if successful learning outcomes are an objective.

Although Dewey highlights the importance of experience and environment to learning, he also suggests that not all experiences are educational. In fact, some experiences can be misseducative when they stymie the growth of further experiences. According to Dewey, the central challenge to experience-based learning is to create fruitful experiences and organize them in progression to guide students' learning, not disconnected experiences that promote dispersive and disintegrated habits. Dewey states that "young people in traditional schools do have experiences, the trouble is not the absence of experiences, but their defective and wrong character –wrong and defective from the standpoint of connection with further experience" (Dewey, 1938, p. 27). In this sense, the educator's duty is essential, but the physical setting has a critical role too. When the environment is recognized as an integral part of the learning/teaching experience it has the potential to become a valuable resource to assist in the educational intent, and consequently, enhance the learning process. As designers, a primary role lies in acknowledging this and helping to reveal the environment's affordances by creating settings that enable high quality-learning experiences.

Critical to Dewey's notion of education is what he calls an "aesthetic experience". Education that is aesthetic is consciously constructed and perceived by the intellectual, emotional, and physical self. Educational experiences are aesthetic when students engage directly in the making, whether it is the production of an artwork, a historical investigation, or scientific exploration, rather than merely learning about what others have done (Provenzo & Renaud, 2009). While students are involved in their learning, they are also actively aware of what they are doing, and reflect upon it. Dewey drew from the work of the German philosopher Friedrich Froebel (1782-1852) and Swiss educator Johann Pestalozzi (1746-1827), who were among the first to articulate the process of educating the "whole child", wherein learning moved beyond the subject matter and ultimately rested upon the needs and interests of the child, involving body, mind and spirit (n.a., n.d.). Since

then, the concept of the "whole learner" has widely influenced contemporary educational researchers and practitioners in their search for integral learning experiences. Consideration into the physical environment is essential to accomplish this goal because it provides a platform with the potential to trigger different developmental processes in children, if designed to instill enthusiasm for learning and encourage positive social relationships, actions that are in turn, compatible with more attractive and interesting learning environments.

2.1.2 Translating progressive ideas to the physical environment through architecture

Dewey's ideas and progressive educational concepts did not remain abstract, but were translated into actual school design during the 1960's and the 1970's when an increasing number of elementary schools were designed to house educational programs based on progressive concepts (Sanders & Wren, 1976). In Britain, through the "British infant school" movement were the first to adopt these new concepts. Later, in North America this was manifested in the growth of "open education classrooms" and "open space schools", both of which implied new approaches to using classroom space. But according to Peters (1971), it is important to distinguish the difference between them. Open education is an approach to learning based on the structure of a learning environment conducive to discovery, manipulation, and enjoyment of learning. It is a set of teaching practices that reflect the belief that children learn best when they can actively explore an environment rich in materials, when they are given the responsibility to make meaningful choices about what is to be learned, and when they are able to interact informally with their teachers and with one another (Walberg & Thomas, 1972). On the other hand, the term open space schools refers to a new type of building construction, that grew out of aesthetic concerns for a modernistic architectural imagery (Sutton, 1985). Although British infant-style and American open education frequently occurs within facilities without walls, open space is not a necessary prerequisite of an informal approach to education, as it can also be supported by any feasible facility affording opportunity for movement (Peters, 1971). However, according to Weinstein (1979), open space schools are often intended to support learning options that a self-contained classroom is unable to support, which better align with progressive educational concepts.

For both the British infant school and open education classrooms, the value of direct experience was a central theme. Their programs were based on concepts such as the use of all the senses – including touching, feeling, smelling– which provides a concrete understanding of phenomena, and hands-on experiences, which make an impression that cannot be matched by abstract concepts (Lowenfeld, 1982; Strong-Wilson & Ellis, 2007). Choice was another ingredient in the

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sense that by exploring an environment that was full of visual stimuli, children could engage in intrinsically motivational exploratory behavior and learn to make choices (Sutton, 1985). In order to achieve these conditions, the traditional rows of desks were replaced by a number of interest areas where children could work alone or with groups, resulting in more informal, flexible arrangements within the classroom (Weinstein, 1979). Also, each area is typically supplied with materials and equipment, displayed on open, accessible shelves, where children are usually free to move from one area to another as they wish. Strategically designed learning environments became a key component in pursuit of the values that progressive education theorists were trying to promote, and helped to give meaning to the physical environment of the classroom. But important to note here is what Weinstein (1979) states about open space schools, which she defines as "the first major architectural departure from the traditional "egg-crate" building of one hundred years ago". Although, as explained before, open education theories could also be taken into practice adapting a traditional classroom space, (Getzels, 1974) argues convincingly that changes in classroom design were not merely the result of architectural and engineering advances but reflected our vision of the learner. Here learners started to be seen as an exploring, curious and stimulus-seeking being, also most consonant with the teaching practices theoretically characteristic of open-plan designs.

These new concepts in education regarding direct, physical, and explorative learning were translated into some of the best-known examples of progressive models today: Waldorf, Montessori and Reggio Emilia schools. Specifically, Loris Malaguzzi, founder of the Reggio Emilia approach was the first one to coin the terminology today widely utilized among educators, "the environment as the third teacher", meaning that children learn from interactions with their physical environment and from the people in their daily lives (Strong-Wilson & Ellis, 2007). On the other hand, the Italian physician, Maria Montessori, believed that children learn through sensory stimulation and that learning could be improved by exposing young students to an enriched sensory environment (Sutton, 1985). Finally, the philosopher and scientist, Rudolf Steiner, founder of the Waldorf schools, believed that imaginary play was the most important "work" of the young child and the activity through which the child grows physically, intellectually, and emotionally.

Particularly significant for this research is that progressive approaches encouraged for the first time the use of the natural environment as a learning tool. (Berlyne, 1960) stated that nature is full of vivid sensory impressions that can stimulate a child's ability to observe and explore. Also, educators found another important trigger in physical activity, where children could engage in play while exploring the boundaries of their physical selves, as well as the limitations and possibilities

of materials. These ideas implied that learning processes needed to be extended to the use of the outdoor environment, advocating that direct encounters with nature were essential in children's development and behavior. In this way, the architecture of classrooms, evolved to providing direct access from indoor to outdoor spaces that allow children to move freely into a prepared outdoor environment, ideally consisting of gardens, forests, or fields, and windows allowing plenty of natural light, and designed in order to permit children observe the outside environment without any difficulties (Demetriou, n.d.). Of significance here is that nature and outdoor learning were for the first time endorsed within a theoretical framework that would promote further investigation and permit wider recognition among the general public.

Progressive advocates strongly support the idea that learning occurs through an exploratory and experiential process enabled by the setting where it takes place. By propagating such a framework, the main legacy of progressive educational models relies in the acknowledgement of the physical environment as a fundamental educational agent, interrelated with the rest of the learning resources available. Along with teachers' role in connecting the curriculum with the physical setting, it is imperative that school design offers a multidisciplinary perspective, with designers assisting in this mission and providing thoughtfully designed learning environments, capable of sustaining children's developmental requirements.

The following section will investigate theories in environmental psychology, a discipline that has reinforced the connection between human and their environments, and as progressive educational theories, has also contributed in assigning high value to the physical setting. Particular attention will be given to research in the field undertaken on children and schools.

2.2 THE EMERGENCE OF ENVIRONMENTAL PSYCHOLOGY

The emergence of environmental psychology in the 1930's, and its growing popularity in the 1960's contributed to an understanding of the physical environment as a critical agent in learning. This subfield of the larger discipline of psychology aims to understand the many transactions between individuals and their physical settings. Conceptually, in this transactional approach, an individual's behavior is determined by the social and physical environment, and the individual in turn changes reality by his or her behavior (Walden, 2009). Although the field can be traced far back into the 1930s, it was not until the late 1960s that it gained a wider recognition. In his book "Environmental Psychology: Principles and Practice", published in 1987, Gifford stated: "These are still the pioneer days of environmental psychology, when most studies uncover previously

unknown territory as much as they further our knowledge of the known terrain". Due to the many kinds and complex relations that develop between human behavior and the surrounding world, even now, researchers have stated that our knowledge of certain behavior-environment relationships has become quite advanced and exhaustive while other topics remain relatively unexplored (Davis & Buskist, 2008). For example, vast research has been done in relation to humans exposed to suboptimal environmental conditions such as noise, crowding and poor housing quality, but only recently are researchers beginning to explore on the restorative or healing effects of natural versus urban environments on people.

Because of the vast diversity of topics addressed, research on environmental psychology has encountered several limitations. Particularly in school environments, studies have suffered from conceptual or methodological problems, such as lack of statistical testing, overreliance on self-report data and nonrandom assignment of subjects, among others (C. S. Weinstein, 1979a). Clark (2002) also stated that it is a daunting task to isolate a range of physical factors and measure their effect on learning. However, a significant contribution of environmental psychologists has been their strong advocacy to field research, conducted for the purpose of addressing genuine human-environment interactions as they unfold in the "real world" (Davis and Buskist, 2008), and consequently, a great number of these studies have been conducted in actual classrooms and schools settings, under naturally occurring conditions. According to (Steg, van den Berg, & de Groot, 2013), the value of these studies lies in that they are relatively high in external validity, which refers to the extent to which the results can be generalized to other populations or settings. This is why, studies on school settings and their impact on children have consistently relied on environmental psychology foundations to support their hypothesis (Durán-Narucki, 2008; Evans, 2006; Shamsuddin et al., 2012).

2.2.1 The relationship between the school physical environment and learning

Some of the first studies in the field of environmental psychology were undertaken in hospitals (Gifford, 1987), but these early studies were quickly extended to other types of settings such as prisons (e.g. Wener, 2012), and nowadays, considerable interest is directed to residential buildings and offices (e.g. Oborne & Gruneberg, 1983), the latter to demonstrate the link between an improved environment and greater employee satisfaction and productivity.

There has also been a considerable amount of research within the discipline on schools. Weinstein (1979) developed a comprehensive review of the research on the physical environment of the school, where she stated that until 1979, concern with the physical environment of the school was limited to the establishment of minimum standards for size, acoustics, lighting and heating. In her study she stated: "The assumption seems to have been that as long as these basic requirements were met, the child's learning depended solely on pedagogical, psychological, and social variables". Following Weinstein study, three years later, another massive study was done by McGuffey in 1982, which synthesized research findings on the effect of physical variables of learning environments such as school building age, thermal, visual and hearing factors, color, and the presence or absence of windows on student's performance. McGuffey's (1982) overall conclusion was that old and obsolete buildings do have a negative effect upon the learning process of students, whereas safe, modern, and controlled environment facilities enhance the learning process. As noted in these two major studies, a general concern on environmental psychology was that it was initially limited to the research of relatively specific independent physical variables and mainly focused on achievement scores in standardized tests as the main, if not the only, measurable outcome. Although the environment was beginning to be recognized as an important factor in education, most approaches simply assumed that meeting minimum standards was sufficient.

During the late 1900s and early 2000s, research expanded to the understanding of physical variables and their effect on behavior (such as attendance and concentration) and attitudes (such as motivation and self-esteem). Studies of physical variables in the past helped to realize that the classroom environment could affect "nonachievement" aspects, which could in turn, have an impact on performance (Clark, 2002). Well-being and readiness to learn are influenced by both, external (spatial) conditions, and also by internal psychological processes: arousal, adaptation, stress, distraction, overload, and fatigue also have their effect on well-being, social relationships, and learning performance (Walden, 2009). For example, Weinstein (1979) indicated that high levels of density and crowding resulted in dissatisfaction, decreased social interaction, and increased aggression, while "soft" classrooms were associated with better attendance, greater participation, and more positive attitudes towards the class, the instructor and classmates. While some early studies (Collins, 1975) indicated that windowless classrooms appeared not to have much impact on students, today the absence of windows on any habitable space is unconceivable. Concerns are now placed on designing windows that provide adequate indoor comfort, while maintaining views to the outside for occupant's well-being. Researchers have stressed that good lighting can affect learning through mental attitude, class attendance and ultimately student performance (Hathaway, 1995). Likewise, access to outside views and the quality of these views can affect psychological well-being by offering the opportunity to stay in touch with conditions in the outside world – weather, time of day, and action on the street (Gifford,

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1987). Contemporary studies are looking beyond architectural features, such as the restorative benefits that contact with nature would bring to children, performing better at certain activities in school after for instance, a walk in the outdoors (Hartig, Mang, & Evans, 1991). This relationship has prompted investigation on how, for example, could nature affect learning performance when placed inside the classroom environment (Han, 2009), and opened several question for further research such as how much and what kind of exposure to nature would be right to maximize learning benefits.

With emphasis placed on the understanding of the effects of the physical environment over the social and emotional aspects of learning, the role of the school setting has also broadened to provide an adequate environment where to integrate the physical, psychological, and intellectual areas of the learner. This has raised a challenge for designers required to create design strategies that are pedagogically relevant for teachers and stimulate children's learning in all developmental areas. Importantly, this has encouraged designers to rethink the typical sterile schoolyard into a place where children can nurture their intellect and imagination, progress that will be reviewed in the following section.

2.2.2 The inclusion of outdoor environments

Acknowledging the importance of the outdoor environment on learning is to a large extent a legacy of Dewey's progressive educational approach. His models promoted the idea that natural environments stimulate a child's ability to observe and explore, and that play and the physical activity that accompanies it are important to the development of problem-solving and creative thinking (Sutton, 1985). Dewey believed that play and playground experiences of young children helped their cognitive skills and social development (Tai, Taylor Hague, McLellan, & Jordan Knight, 2006). In this way, during the late 1900s, it became more accepted that children's learning could be significantly influenced by play activities, and with this, research on the physical design of play areas also became important (Barbour, 1999; Hart & Sheehan, 1986; Hayward, Rothenberg, & Beasley, 1974; Weinstein & Pinciotti, 1988). More contemporary researchers (Staempfli, 2008; Sugiyama, Okely, Masters, & Moore, 2012) have also stated that play is essential for children to develop intellectually, physically, emotionally, and socially. They explain that through play children learn to express their thoughts and feelings, develop language and social skills, and become aware of cultural diversity in their community. They argue that it is the child's fundamental tool for exploring the world, their environment, their interpersonal and physical relationships, and their sense of self, gaining a genuine understanding of reality and the world around them. Also during this period, environmental psychologists started developing the idea of environmental competence, which refers to the ability to interact effectively with one's surroundings, to perform independently at a level appropriate for the person's developmental stage, both physically and cognitively (Bronfenbrenner, 1974; Maxwell, 2007; Gifford, 1987). A crucial function of the designed environment is to enhance this drive for competence by allowing children opportunities to develop mastery and control over their physical surroundings. In particular, competency enabled in outdoor settings offers complexity, encourages exploration and fosters a child's place identity (Vygotskiĭ, 1986; Weinstein & David, 1987).

In this way, as attention was given to outdoor settings, playgrounds and play yards became the first architectural manifestation of outdoor spaces especially planned and designed to support children's development. As described by Hayward et al. (1974), these have varied from the traditional type (with slides, swings, seesaws, and so on), to the contemporary type (which typically joins or connects all of the different pieces to form a continuous structure that is usually aesthetically pleasing and often includes undefined play areas), and the adventure or "junk" playground (which allows children to create their own environment and/or equipment out of old tires, discarded lumber, packing crates, and so on. Lately, Staempfli (2008) also describes a modified type of adventure playground in the form of city community gardens, nature interpretative centers, and interactive youth centers that have become multipurpose gathering places for children and youth, primarily used for outdoor educational purposes.

Nowadays, playgrounds are moving beyond the long established form of a single large piece of equipment in a park or schoolyard to a mix of commercially manufactured equipment and the incorporation of natural elements such as sand, water and plantings (Tai et al., 2006). Today there is a growing naturalistic approach, with schoolyards extending well beyond the playground to include nature trails, outdoor classrooms, and gardens of many kinds, that presents children with extensive opportunities to explore natural surroundings and are not only inexpensive to build and maintain, but provide diverse and stimuli-rich features with endless options for learning through play, exploration and observation (Fjørtoft, 2001; Fjørtoft & Sageie, 2000; Hart, 2002). Today it is possible to point to examples of school ground greening in many different countries throughout the world, where educators advocate for children's need for nature and the benefits of outdoor learning. This greening movement has progressively gained traction during the last decade and focuses primarily on the design, use and role of school grounds, with a view to improving the quality of children's play and learning experiences (Dyment & Bell, 2007). It is particularly prominent in countries of the developed world such as Canada, Australia, the United Kingdom, the United States, Scandinavia, New Zealand and South Africa, where school are

transforming hard, barren expanses of turf and asphalt into places that include a diversity of natural and built elements, such as shelters, rock amphitheaters, trees, shrubs, wildflowers meadows, ponds, grassy berms and food gardens, with the final goal to promote children's sense of wonder and offer diverse opportunities for development (Dyment & Bell, 2007).

However, several barriers have been associated to the integration of nature into children's settings and outdoor learning environments. According to Freeman & Tranter (2011), children's play is still generally undervalued, particularly play that involves contact with nature, as well as a lack of understanding of how play provides learning opportunities. Learning that occurs through play is often considered peripheral to that which occurs in the classroom. Moreover, Frost (2006) maintains that in recent years the majority of playground for school-aged children fall short on integrating garden and natural areas, constructive play materials and symbolic play props into outdoor play and learning environments. To a great extent this has been the result of parent's increasing concerns about safety of their children. Play practitioners have pointed out that our obsession with the control of the natural environment and the elimination of possible and imagined risks to child development has resulted in children growing up in an artificial world (Staempfli, 2009). Nowadays, there is a growing concern among health professionals regarding an increasing lack of challenging and stimulating outdoor play environments, with the consequence of a limited exposure to nature and green spaces that will eventually have serious physical and psychological health ramifications (Faber Taylor & Kuo, 2006; Kaplan, 1983; Kaplan, 1995; Kellert, 2005).

Furthermore, it is urgent to address the condition of access to safe and quality outdoor areas for vulnerable children in low-income communities. Studies in environmental inequality suggest that poor children would be underexposed to nature and green spaces in comparison to their wealthier counterparts, among other reasons, because they are less likely to have regular access to safe outdoor spaces and have positive experiences afforded by them. Moreover, research suggests that children disproportionately suffer the long-term developmental consequences of limited experiences in nature (Kellert, 2005), making it imperative to place children and their differential contact with and experiences in nature at the forefront of environmental inequality research. In this sense, school settings inherently acquires particular significance in providing safe and stimulating outdoor spaces for play and learning for children in vulnerable conditions. Moreover, it has been argued that the presence of nature in schools can be especially beneficial on originally harsh environments, that can soften violent and aggressive behavior, increase feelings of self-esteem and foster a child's place identity, among other aspects particularly relevant to low-income communities. Finally, strategies associated to the introduction of nature in the physical

setting may be done at a relatively low cost in contexts where resources are scarce. These and other challenges and opportunities, with particular emphasis on their impact for children in disadvantaged contexts, will be reviewed in Chapter 3.

2.3 CONCLUDING THOUGHTS ON THE IMPORTANCE OF THE PHYSICAL ENVIRONMENT TO LEARNING

The theories reviewed in this section have helped to situate the physical environment as an important agent in learning. First, progressive theories promoted the idea that learning occurs through an exploratory and experiential process enabled by the setting where it takes place. The use of the physical environment as an educational resource was then, for the first time, endorsed within a formal framework that would permit wider recognition. Progressive approaches also regarded the use of the natural environment and outdoor settings as providing important opportunities for learning. Second, by studying the transactions between settings and their users, the discipline of environmental psychology has helped educators and related stakeholders to understand that the school setting can either promote or hinder the learning process, by enabling different reactions in children and affecting their overall physical, emotional and cognitive condition. By promoting the use and study, progressive theories and environmental psychology respectively contributed to advancing the provision of quality spaces for teaching and learning.

These studies have shown that there is a direct relationship between the qualities of the physical space of the school and children's development and learning. Physical variables such as lighting, visual and acoustic factors, color, furniture, the presence or absence of windows among others, can affect children in positive or negative ways. How the physical environment is designed can afford or hinder opportunities for learning. Particularly, outdoor school settings can offer endless options for play, exploration and observation if crafted with nature and the design of diverse and stimuli-rich features that will foster children's overall development. In contrast, the lack of such places and limited exposure to nature may eventually bring negative consequences for children.

Addressing these aspects is especially urgent in more vulnerable contexts, where the physical space is consistently overlooked due to a lack of resources, and where existing resources are used in favor of other educational needs. Here, the neglect of the physical space might be causing unsuspected damage, impeding children's adequate learning and development. Educators and architects have a responsibility to acknowledge this as an urgent problem and advocate for conditions to change. In this scenario, it is much more sensible and fair to use

creative design and take advantage of the numerous opportunities for learning and well-being that outdoor settings can offer for children in these contexts.

The following section will review school ground greening processes and the benefits derived from such processes for children, placing especial emphasis on those aspects affecting disadvantaged communities and schools that could be translated to similar contexts in Chile.

3. GREENING SCHOOL GROUNDS IN DISADVANTAGED CONTEXTS: OPPORTUNITIES AND CHALLENGES

The physical environment influences children's development in myriad ways, and adequately designed learning environments can provide opportunities for enhanced learning. In particular, a green school ground is capable of providing diverse and stimuli-rich options for learning, enabled by the presence of nature and other design features derived from it. According to Coffey (2001), schoolyards can embrace a diversity of natural and built elements, including shelters, amphitheaters, ponds, shrubs, wall murals, and pavement paintings among others, and many interesting learning areas that can be achieved through creative use of natural elements. Bringing nature back into the school grounds has been defined as the process of greening, which can include several strategies such as naturalization, habitat restoration, tree planting, and food gardening among others (Dyment and Bell, 2007). Such processes have been argued to provide numerous benefits for children. Besides extensive options for learning through play, exploration and observation, green spaces may bring several health, psychological and cognitive (Han, 2010; Largo-Wight, 2011; Pretty, Peacock, Sellens, & Griffin, 2005; Kaplan, 1995; Faber Taylor and Kuo, 2006; Kellert, 2005). Students with access to green school grounds have demonstrated an increased ability to think creatively and critically, an improved performance on standardized tests, and a renewed enthusiasm for learning (Dyment, 2005; Lieberman & Hoody, 1998), a creation of environmental awareness (Cheng & Monroe, 2012; Nisbet, Zelenski, & Murphy, 2009; Nancy M. Wells & Lekies, 2006), and the development of a sense of place (Orr, 1992; Pyle, 2002).

Although the benefits of children having contact with nature and especially those derived from a green school ground may be well documented, less research has been done in documenting relevant aspects to consider when planning for the implementation of a greening process. This section will investigate opportunities and constraints associated to a greening process that will complement the analysis of the case studies that follows. Although the majority of documented examples on greening come from the developed world, this research will place special focus on those general principles that could be significantly translated to vulnerable communities in Chile.
3.1 GROWING CONCERNS REGARDING DISCONNECTION BETWEEN CHILDREN AND NATURE

Greening school grounds would address important concerns arising from children relationship to nature today. Researchers have emphasized that today, there not only may be less nature for children to access, but children's access of what remains may be increasingly sporadic (Rivkin, 1997; Kahn, 2002; Kellert, 2002). According to a study done by Hofferth and Sandberg (2000) (2000) in the United States, while children age 3 to 12 spend 1 percent of their time outdoors, they spend 27 percent of their time watching television, playing video games, and using computers. Lives filled with programmed activities leave children little time for exploring or free play outdoors leading to alienation from the natural world (Freeman and Tranter, 2011). As a result of children spending less and less time in the natural world, educators and parents are becoming increasingly concerned about whether today's "de-natured" children, as Louv (2008) has defined, will want to protect and care for the natural environment in the future, and which may lead to a dwindling knowledge about biodiversity, less pro-environmental attitudes and reduced participation in environmentally friendly behavior as adults (Bixler, Floyd, & Hammitt, 2002). The lack of access to nature and green spaces has been also related to health issues, such as childhood inactivity and obesity (Boldemann et al., 2006; Ewing, 2005; Sturm, 2005), and mental and cognitive problems such as depression, hyperactive disorders and concentration problems (Taylor, Kuo, & Sullivan, 2001; Kaplan & Kaplan, 1989, Kaplan, 1995).

Children in disadvantaged contexts may be even more vulnerable to the lack of contact and access to nature. Poor children are underexposed to green spaces in comparison to their wealthier counterparts, among other reasons, because they are less likely to have regular access to safe outdoor spaces and have positive experiences in them (Strife and Downey, 2009). Kuo (2001) indicates that green space and vegetation are usually not well distributed in urban neighborhoods and often privilege areas with a higher economical status. This is typically most evident in residential and office buildings where physical proximity to natural amenities – water's edge, parks, green space, etc., and higher quality and natural content of views – are usually restricted to the wealthier sectors of society. Poor urban neighborhoods with barren areas increase crime, vandalism, social incivilities and illegal activities (Kuo & Sullivan, 2001a), with people reporting more aggressive and violent behaviors than their counterparts in greener buildings (Kuo & Sullivan, 2001b). A study done by Stewart, Purner and Guzman (Stewart et al., 2013), found that elementary school gardens across Santa Clara County, California, were more prevalent among the economically stronger and ethnically less diverse neighborhoods, showing that disparities can also be found among schools.

Furthermore, the environment of childhood poverty is accompanied with multiple disadvantages. According to Evans (2004), poor children face a daunting array of suboptimal psychosocial and physical conditions that covary and do not occur in isolation. School risk factors include teacher experience, teacher and student mobility, teacher absences, and school building quality, while neighborhood risk factors include proportion in poverty, parental education attainment, housing quality, residential crowding and neighborhood deterioration among other aspects (Whipple, Evans, Barry, & Maxwell, 2010). Specifically among physical factors, low-income children would be exposed to poor indoor air quality, inadequate thermal comfort, crowding and noise, associated to the poor-quality conditions of homes and schools (Ahrentzen, Jue, Skorpanich, & Evans, in Evans 1982). Such poor-quality conditions are associated with increased exposure to mental health stressors, such as violence, crime, and social seclusion (G. W. Evans, Saegert, & Harris, 2001). Cumulative risk within the various social and physical domains, as well as their interaction, significantly influences children's school-wide achievement and development (Bronfenbrenner, 1974; Whipple et al., 2010).

Schools can provide disadvantaged children a beneficial environment for learning that provides opportunities for child-nature contact and the benefits derived from this interaction. Nearby nature moderates the impact of stressful life events on the psychological well-being of children, which is strongest for the most vulnerable children, those experiencing the highest levels of stressful life events (Nancy M. Wells & Evans, 2003). The presence of the nearby nature also benefits urban children by increasing levels of cognitive functioning (Wells, 2000) and promoting creative play and healthy development (Dowdell, Gray, & Malone, 2011; A. F. Taylor, Wiley, Kuo, & Sullivan, 1998). A study done by Taylor, Kuo and Sullivan (2002) found that the presence of nature enhanced levels of self-discipline, especially among girls, reducing the likelihood of negative outcomes such as underachievement, juvenile delinquency and teenager pregnancy. Nature can restore mental fatigue, and thus, inhibit crime by reducing precursors to violence (Kuo, 2001; Kuo and Sullivan, 2001a; Kuo and Sullivan, 2001b). Also, Pretty et al. (2005) suggested that exercise in pleasant environments such as rural and urban green spaces significantly increased feelings of self-esteem and mood.

3.2 ENABLING TRANSFORMATIVE LEARNING: RELEVANT ASPECTS FROM SCHOOL GROUNDS GREENING

A greening process substantiates and maximizes the benefits of children's contact with nature. According to Coffey (2006), teachers interviewed across the UK who have experienced over time the process of transforming school grounds report that enriching the student's learning outdoor environment reduces anti-social behavior such as violence, bullying, vandalism and littering. Also, research indicates that a greened school ground offer increased play opportunities and options for children to be more physically active (Arbogast, Kane, Kirwan, & Hertel, 2009; Moore, 1996), more inclusive environments (Malone & Tranter, 2003b; Titman, 1994), and less classroom management problems (Lieberman and Hoody, 1998).

While the majority of these benefits influence students after the greening process, what current research is pointing out, and what seems to be an essential aspect, are the benefits that emerge for young people during the process itself (Hart, 1997). According to Dyment (2004), researchers agree that an important – if not the most important – outcome of the school greening is allowing young people to acquire skills related to democracy, participation, and citizenship during the process of greening. As she explains, young people will carry these skills into adulthood, allowing them to become political, engaged and reflexive adults who know their rights and responsibilities as members of a community.

3.2.1 Beneficial effects of community participation for children

Walden (2009) explains that participation is understood as involvement, by individual or groups, in decisions affecting the life of the respective individual or group; "in this, participation is seen as both a means: toward the end of articulating and ensuring the consideration of concerns, as well as an end in itself, in the sense of self-realization through participation". The process of greening the school grounds would allow children to be involved at both ends, by having a voice in decision-making and by participating in the creation of the project itself. Walden (2009) concludes that these processes are essential, as they give students the opportunity to interact more directly with their learning environment and to identify with it. Benefits are twofold; first, it would permit a sense of "appropriation", which has been defined by architectural psychology as having one's own form of environmental control, to take possession of the environment, to use it, to endow it with meaning, and to be able to change it according to one's own requirements (Lynch, 1976 as cited in Walden 2009), and which would be particularly relevant for schools in disadvantaged contexts as it would discourage vandalism, a negative form of appropriation. Likewise, Stedman (2002) suggests that attachment and satisfaction have both an important effect on willingness to engage in behaviors that maintain or enhance valued attributes of the setting. Second, it would increase motivation to learn and perform, as children would be immersed in a feeling of ownership of their learning process. To be motivated to learn, children must feel that they are discovering their own path, with the teacher working with them to ensure the path has continuity and educational value (Moore & Wong, 1997).

In the same way, participation can be a means by which to empower the broader community to take action within the school. Schools can promote cohesion within the community and provide an inclusive, welcoming atmosphere that values everyone's contribution (Wheeler, 2012). When community members become part of a visioning process, they are more willing to work together to set goals, solve problems, and ultimately, provide their schools with the kind of ongoing support necessary to make them successful (Sanoff, 2009). Without support and engagement of parents and community leaders at the local level, any attempts at improving schools will likely be ineffective. Involving them since the earliest stages will traduce in the creation of ownership and belonging to the school, which in turn, will make them want to take care and sustain changes made to the school environment.

The primary aim of involving children and the school community in a greening process is educational. Through such processes people can be empowered to be good citizens. According to Orr (1992), there is a need to recover civic competence, which implies a wide understating, competence, and commitment to the common good. He further indicates, "the way education occurs is as important as its contents", promoting that students learn in a setting that teaches them to live differently, in response to real needs and the life situation of the learner. In this sense, real learning is participatory and experiential, not just didactic. Thus, the greening of school grounds acquires special significance as a mean to develop citizens that act and behave responsibly, aware of their social and ecological context. It would have a particular value, as Orr (1992) has stated, in reeducating people in the art of living well where they are, and rediscovering how much they can do for themselves in small places, that would lead to the creation of local well-being.

3.2.2 Making sense of the greening process: connecting to the curriculum

According to Dyment (2005), researchers who have investigated the potential of green school grounds as outdoor classrooms generally agree that when the context for learning changes from an indoor, book-centered environment to an outdoors and nature-centered environment, students find it to be a more meaningful context for education, where learning easily comes alive, as students are able to handle, touch, smell, and even taste the materials they are learning with and from. Teachers working at schools that have been greened report unique opportunities for

curriculum development (Moore and Wong, 1997). A diverse environment, with a broader range of curricular options available to the teacher, and where direct interaction with elements is permitted, is more likely to cover the full range of the developmental needs of the children and meet the needs of the whole child and the whole curriculum (Moore, 1996, 1995). It has been pointed out that a green school ground can also provide opportunities for informal learning, which is intrinsically motivated learning that happens without teacher intervention (Moore and Wong, 1997; Titman, 1994). It occurs when students have unstructured time on the green school ground and learn social and behavioral skills (Adams, 1993). Opportunities to develop these kinds of connections with the curriculum depend on teachers' level of involvement with the project. The more involved they are, the more ownership they feel, and thus, the more they will use the physical setting of the school as a teaching tool (Stowell, 2001 in Grant and Littlejohn).

The transformation of the school grounds through a greening process is crucial in the creation of ecological literacy, meaning to educate children to care for their environment in the most profound way (Orr, 1992). In this task, the understanding of the importance of place in education is vital as people become deplaced. Orr argues that in order to create inhabitants and not just residents, it is necessary to provide children opportunities to "soak in a place" and develop an intimate, organic, and mutually nourishing relationship with it. To achieve this, a detailed knowledge of a place is needed that should be provided by opportunities for intellectual and experiential learning involving different disciplines working on tangible problems. Here, he makes a call to rethink contemporary education; "...a great deal of what passes for knowledge is little more than abstraction piled on top of abstraction, disconnected from tangible experience, real problems, and the places where we live and work. In this sense it is utopian, which literally means *nowhere*". For this reason, the school needs to take a primary role in delivering such kind of learning, one that is founded on the perspective to instill in children a sense of rootedness, responsibility and belonging, awake environmental consciousness, and learn to become inhabitants that love and are cognizant of the places they inhabit.

Titman (1994) has stated that every school building and its landscapes has an attachment to a "hidden or informal curriculum" that tells a story to the children about the culture and ethos of the school. In his essays on "Architecture as Pedagogy", Orr (1997) further expands in this concept stating that the curriculum embedded in any building instructs as fully and as powerfully as any course taught in it, can teach connectedness to where you are, and interconnectedness to the surrounding living and non-living systems. Dyment (2005) states that the greening of school grounds specifically, provides endless opportunities to learn about interconnections. Through

better design, particularly of our learning environments, children can be taught ecological competence and mindfulness.

However, we have come to believe that education is solely an indoor activity. According to Orr (1992), if effective environmental learning is desired, we need to provide opportunities for more direct contact with the natural aspects of a place, with soils, landscape, and wildlife, which is the only way children understand the relation between their well-being and the health of the natural systems. He explains, "The problem is that environmental education is most often regarded as an extra in the curriculum, not as a core requirement or as an aspect pervading the entire educational process" (Orr, 1992). The first step towards developing ecological literacy is the recognition that "all education is environmental education", a model where children learn that they are a part of, not apart from the natural world, and develop a profound knowledge, necessary to comprehend interrelatedness, and an attitude of care or stewardship.

A greening process accompanied with strong connections to the school curriculum and integrated across subjects would allow creating meaningful knowledge and reconnect children with the natural world. In order for this to happen, higher and local authorities need to support environmental education formally within school programs, by departing from traditional curriculum to integrate these new relationships among existing educational policies.

3.2.3 Challenges in the greening process

Although the benefits associated to a green school ground have been widely acknowledged, researchers have also found certain barriers that would be impeding their advancement. For example, Dyment (2005) found that teachers lacked the confidence or skills about how to use the green school ground as an outdoor classroom. She also identified curriculum constraints, indicating that the mandated curriculum does not explicitly endorse or support the use of school grounds for curriculum delivery. In this sense, teachers' training courses need to recognize that outdoor learning is an important part of core competencies. Also, the potential role of green school ground programmes need to be fully endorsed by making explicit curricular links that radically enhance the teaching and learning experiences of children, and are situated within other programmes that work together towards a common vision.

A green school ground and its benefits can also be limited by poor designs. It is fundamental to provide schools with assistance to ensure proper and quality design that will enable enhanced

learning opportunities. It is important to recognize the changing role of the architect and other design specialists in this scenario. According to Wheeler (2010), a challenge for them is the need to be able to act not only as experts in sustainable design, but as agents for change; as intermediaries and orchestrators of processes that foster different sort of relationships to the natural and social environment.

Challenges have also been found during the implementation of a greening process, being those associated with funding among some of the most important. Dyment and Reid (2005) have stated that generally, schools are required to seek their own funding for greening initiatives. The large majority of this funding is available for very specific projects, and few funds are available for maintenance over the long term, which would be a shortcoming for schools in their planning, support and coordination. Stewart et al. (2013) have also mentioned that, as the most important sources of garden funding are donations, parents, volunteers and grants, schools in low-income neighborhoods are likely at a disadvantage, as less disposable income and possible also less expertise in fundraising is available. They also stated that difficulties can include the substantial long-term commitment on the part of teachers, parents, administrators and community members. However, a counterargument would highlight the importance of integrating the school community into greening projects from the earliest planning stages (Ozer, 2007), a strategy that has proved to be effective in order to carry out a greening project successfully (Evergreen, 2002). Greening design strategies such as school gardens for example, can be initiated and maintained with moderate resources compared to other educational costs, including a school garden coordinator, planting area, a small annual budget, and support by the school community as regular volunteers (Stewart et al., 2013). Moreover, Kuo (2001) has stated that in disadvantaged contexts, greening would be a low cost intervention in comparison with most social service programs intended to address poverty, and that greening efforts in poor neighborhoods "could play a surprisingly valuable role in the arsenal of weapons against poverty".

3.3 CONCLUDING THOUGHTS ON OPPORTUNITIES FROM SCHOOL GROUND GREENING

Research findings presented above indicate that contact with nature is essential for children's overall development and health. The implementation of a green school ground would ensure the availability of green areas, especially in low-income contexts where children would be deprived from them, provide a platform for outdoor learning and maximize the benefits derived from it. A school ground greening process would enable the creation of ecological literacy, instilling in

children a deep understanding of their context, and thus, a sense of place and belonging. As we become cognizant of our environment by participating in a greening intervention, we are able to enhance its qualities according to local needs. As such a process happens, it has the potential to spur a social, ecological, and pedagogical transformation. But children and the school community will only make sense of a greening process if they are fully involved in its conception and development, and allowed to participate during the entire process. This is the only way the project will achieve a successful outcome, where participants develop a sense of ownership and are willing to materialize it, use it, and maintain it with meaning.

It is vital to ensure that the quality of the learning environment does not fall short of children's needs, which is particularly urgent for children in disadvantaged contexts. Wells (2000) has suggested that remarkably simple interventions regarding the incorporation of green areas into the physical setting may have a significant impact on children's welfare; "small differences accumulate into big differences and provide ways for children to overcome disadvantage". Thus, an appropriate greening design intervention in a school ground would affect great change. Although it is clear that a number of things need to be addressed from various disciplines in these vulnerable contexts, what relies within the architectural field, one might expect that purposefully and carefully greening design interventions in the school physical environment could result in huge leaps, especially considering the low base from which these schools are currently operating. For architects, recognizing that there are important implications in the provision of nature within the school is the first step to envision greening design strategies that are appropriate for children's environmental learning and at the same time, restore the physical context of the school. In developing countries like Chile, greening low-income schools does not mean to introduce highend technology or systems, but to pertinently manage available resources in a way to create social and environmental improvement, and think of creative interventions that are not mere architectural features, but are drivers for a significant educational change.

The next section will describe and analyze three case studies of schools located in a low-income urban district in Santiago, Chile that have gone through the process of greening their school grounds. The schools will be analyzed in order to understand those aspects that were determinant in bringing the greening process alive and achieving the successful implementation of greening design strategies. This analysis will be used to construct a framework that can inform and guide other schools in Chile with their efforts to implement similar interventions. The framework will be complemented with outside information when relevant, particularly regarding other examples of successful greening school projects, and the observations on how such processes came about.

4. CASE STUDIES

A green school ground provides children access and contact with nature, which has been shown to have a beneficial effect on learning. Besides allowing for direct contact with nature, the implementation of a greening project enables children and the school community to participate in the improvement of their physical context, taking ownership, and creating local well-being. This is particularly relevant in low-income contexts where children generally lack access to safe and quality green spaces.

This section will describe and analyze three case studies of low-income schools in Chile that have recently implemented a greening process on their school grounds. The main objective of this analysis is to understand relevant aspects across them in the planning and implementation of the greening process. This analysis will be used to construct a framework that can guide other schools in achieving a similar transformation. The construction of the framework will also be supported with outside information when relevant.

4.1 SELECTION CRITERIA

The selection of the case studies was based on the following five criteria:

1. The schools needed to be located in a poor and vulnerable area of the city. As such, districts allocating low and medium-low income families were selected, based in the income per capita of the population living in that district.

2. The municipality of the district needed to show a commitment to green schools by supporting their enrollment in the "National Program for Environmental Certification of Schools". Here, a publicly available directory of schools enrolled in the program was reviewed in order to identify and assure the existence of greening interventions on schools within that district.

3. In addition to being public (or administered by the municipality of the district), schools needed to share the following common characteristics in order to be fairly compared; urban, which are almost 70% of total schools in Chile and affected by a lack of green areas; deliver primary education, in order to affect earliest stages of children's behavior and development, and which

has been argued to affect environmental awareness in the future; and be a small school, which are typically found in low-income contexts in Chile, categorized as having 300 students or less.

4. The schools needed to maintain an historical record of their greening activities, as accurate as possible, including schedules, pictures, and/or any other material useful in the process of documentation. Also, they should be open to provide the researcher with this information and willing to coordinate a site visit during the school year.

5. After approached, the municipalities needed to demonstrate willingness to collaborate in the study by promptly answering emails and set a meeting for further discussion on how to proceed with the schools.

Case-Study Selection

Based on the above criteria, three districts were selected; Recoleta, Nuñoa and El Bosque. The department of environmental education in the municipality on each of these districts was approached. Also, a total number of 8 schools were approached individually through the publicly available email contact provided in their webpages, in order to have a larger sample of potential case studies. In both cases, the first approach, to municipal representatives or the school administrator respectively, was done via e-mail (see Appendix A). All three municipalities seemed interested in the study and replied they could act as communication channels between the schools and the researcher. From the individually approached schools, 3 replied within a 2 days span. On a second e-mail, the researcher asked both, municipal representatives and school administrators, to formalize the collaboration by setting an estimated date for a site visit with the intention to collect relevant information. From the individually approached schools, one replied they had prioritized other areas in the school and consequently, they were about to loose the environmental certification label. A second school replied they have not maintained an accurate record of all the greening activities they have developed at the school and thus, were not able to give the information requested. The third individually approached school did not reply to the second e-mail. Among municipal representatives, Recoleta had a 3 weeks delay in responding to the second e-mail, for which no longer interest was assumed. The municipality of Nuñoa asked 3 schools in the district to participate in the study. Unfortunately, only one school committed to participate. Later, this school would also back down due to internal management issues. Finally, municipal representatives from El Bosque were very enthusiastic since the start and promptly committed to the study. They immediately selected 3 schools they believed to be the best examples in the district and directly contacted them via e-mail to explain the project scope. Also, they set a preliminary meeting date between the school's principals and the researcher, which they would also attend. Motivation and commitment shown by El Bosque is in part due to a larger vision set by the municipality to address environmental issues in the district, including the creation of health and safety standards, and participatory programs for the its inhabitants³. For the reasons explained above, the three schools contacted by the municipality in El Bosque constituted the final sample of case studies to be analyzed.

4.2 DATA COLLECTION: SITE VISIT AND INTERVIEWS

A qualitative research approach was used in the analysis of the case studies. The main objective was to gain a detailed insight of the greening process on each of the schools in order to construct the framework based in these schools' experiences. For this, semi-structured interviews were carried out with the principal of each school and 2 to 3 teachers (see appendix B), generally being the science teacher, the teacher in charge of the "Environmental Committee" of the school at that time, or one actively involved on it. Representatives from the "Department of Environmental Education and Health" of the municipality were also interviewed, since they played a central role as administrators of the schools (see Appendix B). The interviews were undertaken during the site visit to each of the schools and lasted around 15-20 minutes with the principal and about 20-25 minutes with each teacher. Municipal representatives were interviewed in their offices in the municipality for about 20-25 minutes. The interviews were recorded with the previous consent of the participants.

Site visits were made during the month of July 2013, when the three of these schools had already a greening process in place and achieved a number of different greening design strategies that will be described later. During the visit the researcher could perform a visual inspection of the different strategies implemented, in a site tour guided by the principal and the teacher in charge, where they described and explained in detail each of the projects accomplished, how were these accomplished, those currently being developed, and how each was being used. Municipal representatives were also present during the visit. In total, the time spent on each school was approximately 2 ½ hours. Photographs, diagrams and notes were taken during the visits.

Each of the case studies provided relevant information on the overall greening process, from the genesis of the idea and concept, to the implementation of each of the strategies and how they

³ Information from http://www.imelbosque.cl/, retrieved June 2013

were currently being used and maintained. Detailed documentation of the greening process for the three case studies allowed the researcher to identify substantial aspects across them to construct the framework. Some of the aspects highlighted by the interviewees were regarding how the different greening projects were conceived, fundraising strategies, people involved, time taken in the planning and implementation, support received or partnerships created, current use and maintenance plans, and some of the barriers they found during the process that will be further investigated in the following sections.

4.3 CONTEXT DESCRIPTION: EL BOSQUE DISTRICT

"El Bosque" (Literal translation: "The Forest"), is a district located in the southern area of Santiago, the capital of Chile (Fig. 5). According to the last census done in 2002, the district has a population of 175,594 inhabitants. It has an overall surface area of 14.2 km², where 83% of the total area is occupied by the residential–commercial sector.



Fig. 5. El Bosque district location within the city of Santiago

El Bosque was incorporated into the process of urbanization within the capital during the mid-1940s. Previously, the land was occupied by small groups of people, mainly linked to agricultural activities. Today, with the expansive growth of the city of Santiago, almost all available urban sites in the district have been developed, mostly to solve housing demand for medium to lowincome population. This can be observed by the poor quality of the built environment. According to CASEN 2002 results, a 23% of the population is poor and 4.4% indigent. In the government's socioeconomic regional ranking, El Bosque was classified as the fourth poorest district in the region, which indicates a very high level of poverty. Also, its highly residential role has made it dependent on nearby districts for public infrastructure and general public services. To address this problem, the municipality has divided the territory in different planning areas in order to work more efficiently with existing communities and is assigning funds to solve public open space and infrastructure scarcity within the different neighborhoods.



Fig. 6. Street view in El Bosque district (photo by the author)

The educational network in El Bosque is comprised of 22 municipally (or public) administered schools and 60 subsidized (private and public) administered schools. Figure 7 shows the case studies' location within the district.



- 1) "Salvador Allende" Public School
- 2) "Ciudad de Lyon" Public School
- 3) "Paul Harris" Public School

Fig. 7. Location of the case studies within the district

4.4 CASE STUDY DESCRIPTION AND ANALYSIS

This section will present the greening process occurred in the schools as described by the interviewees and the observational study developed during the site visits. The analysis for each case study will highlight the following aspects:

- A. The factors related to the initializing of the greening process
- B. Design outcomes (or greening design strategies such as the school gardens, grounds naturalization, tree planting, mural painting, etc.)
- C. Environmental initiatives that support the greening process: those actions undertaken by the schools to provide a supportive context for design strategies to operate, which do not necessarily lead to a design outcome, but that indirectly affect their achievement (such as the mission statement, enrollment on certification programs, creation of committees, etc.). These actions also reinforce or emphasize the environmental character of the school.

General information such as number of students, teachers interviewed and available information in the school will also be provided for each of the case studies.

Finally, in order to examine how the greening process unfolded and provide a detailed understanding of the greening process, the actions described by the interviewees and the design outcomes observed on the site visits were mapped and represented in a model at the end of each case study description section. From this base representation of the specific greening process, further analysis was done to construct the final generic framework.

4.4.1 Case study 1: "Salvador Allende" School

General information

Address: Nueva Imperial 956, pr37 Principal: Mr. Jacob Chacón Nº of students: 516 Level of education: Primary



Fig. 8. Salvador Allende School's location

At Salvador Allende School, the principal and three teachers, math, science, and history were interviewed. Also, two members of the environmental educational and health department of the municipality were present during the site visit. After the interviews, a tour through the school was done to examine the greening strategies deployed and complement relevant information given during the interviews. Also, the researcher took pictures and notes while the school staff explained the most relevant aspects of each project, including genesis of the idea, participants, funding if existed, timing frame, current use, encountered barriers, and future opportunities.

From the case studies, this school was the only one able to provide an historical photographic record of most of the greening projects. The following analysis will briefly describe each project, showing the original condition on pictures when available, versus the current condition of the school area under analysis, and will highlight associated aspects based on participants' statements.

The greening process at Salvador Allende School

A. Origins

According to the history teacher, when the greening process started, the school grounds were harsh and barren. This situation was noted by one of the teachers, specifically the science teacher at that time, who was the first one to state that this could be changed by introducing greenery into the school. He would later become the principal of another school in the district, which constitute the second case study in this research, and write a book describing both experiences. In his role as a science teacher, he was convinced that a greening process would help improve the physical condition of the school and create a softer and more enjoyable learning environment for the children. On his interview, the principal recalled his conversations with the science teacher:

"He believed that the school ground greening would affect student behavior. He took this idea to the rest of the teachers and then to the students. At first I observed that some teachers were reluctant and some seemed engaged. He started with a group of 4 or 5 students in his class who wanted to help and they stayed every Friday afternoon working on the school grounds. The first project was food garden"

The teachers and the principal decided that a food garden would be part of a broader project called "Green school, I want you green" ("Escuela verde que te quiero verde"), implemented in the

school between 2003 and 2008. The food garden, also called "Center for agricultural experimentation", would be the first impulse for a series of other greening actions to be developed in the school (Segovia, 2012).

B. Design Outcomes

The school garden

As described by the science teacher, the initial group working on this project was a small group of around 5 students and 3 teachers. Together they cleaned up the area and prepared the earth for the seeds.



Fig. 9. Original state of the area intervened (Used by permission of Salvador Allende School)



Fig. 10. School staff involved in the development of the school garden (Used by permission of Salvador Allende School)

As the school community became aware of the project, they decided that it was important to formally include students in this early stage of the project. The principal stated:

"We first started with around 10 students from all levels (from 1st until 8th grade) that were selected based on their behavior and academic grades in class to be the environmental leaders. We asked them to wear a bracelet. We created a group that was call "the ecological brigade". Later, the method changed because we realized that we had more and more students interested in participating, so from then on everyone who was willing to participate could give ideas for environmental projects. The group remained in place but it was now called "environmental shapers", name that was given by the students themselves".



Fig. 11. Children involved in the development of the school garden (Used by permission of Salvador Allende School)



Fig. 12. Children involved in activities associated with the school garden (Used by permission of Salvador Allende School)

From being simply an idea, the school garden was actually becoming materialized with the combined efforts of the school staff and the students. The math teacher said on his interview:

"Maybe at first it was like an utopia because we started thinking that this was just one school activity more, but it was when we start seeing the cooperation of all the teachers and the students that we realized we could take this project further"

With time, parents also got involved. According to the principal:

"After the first year of having the school garden, the parent's council decided to make a grant application for the school garden with the support from the municipality. We were positively surprised to know that it has been granted to us. With these resources we were able to buy seeds, tools and general equipment, and finally we could transform this project in a more solid one. Moreover, the fact that we could earn this grant had a positive effect in the school community that saw a concrete recognition of their efforts"



Fig.13. Teachers involved in creating a hydro garden and planting medicinal herbs (Used by permission of Salvador Allende School)

According to the art teacher of the school, the food garden is a project that has required patience and demanded a considerable amount of sustained time and effort, but has been rewarding. She stated:

"The school garden project at first was long and tough. We had to wait for a long time to see the seeds grow and some crops even died. But when we saw our first carrots and lettuces it was really stimulating and exciting for the kids and also for us. I think from that moment on, we start believing firmly that we could do something good"

As the garden started to take shape, teachers realized that they needed to modify curricular contents to make them relevant to the projects being implemented in the school. In this case, the science teacher was the one leading the greening process, so he was the first to make his classes pertinent to what was happening in the school. In his words:

"One day I taught children about worms and composting. Children became engaged and wanted to create a vermiculture project, so we started working on it. The children now go once a week to collect food waste from the street market to feed their worms, and then we use the compost as a bedding material for our food

garden. The fact that children interact with the community generates collaborative bonds. We are gradually making this project not only ours, but also expanding it to the rest of our neighbors"



Fig.14. School garden Info graphics done by students and displayed on walls (Used by permission of the author)

With time, children planted different types of crops and included hydroponics, medicinal herbs, and composting. They have also created decorations for the garden walls made out of recycled materials, such as plastic bottles or packs that can hold plants or flowers. The science teacher said:

"Today we have a really nice school garden, with different kinds of crops, vegetables, herbs, and hydroponics. We even made a bedding containing different kind of substrates to test which plants worked better on each of them"

The art teacher also indicated:

"The food garden is a place where the students can go and experiment different tasks guided by the teachers, it is about experimentation more than food production"



Fig. 15. Different strategies implemented in the school garden (Taken on site visit by the author)

The school garden currently being used as a hands-on platform for science, math and arts. In the future, teachers plan to include other instructional areas and find resources such as new instructional materials to support teaching. The 'Environmental Shapers' student group and the parents' council are the ones involved in planning activities conducive to its maintenance over time.

According to the principal, the environmental shapers' group started with around 12-15 students, while today there are more than 50 students enrolled. He stated, that this is an indicator that they are doing things right and that so far, the initiative has been successful among students. Likewise, the parent's council has also attracted more participants over time.

The "Pergola"

After the school garden, the pergola was the second project to be planned on the school grounds. This project considered the central area or plaza of the school, around which the classrooms are located. The size of this area allowed for the implementation of different design strategies, but after a survey among children, parents and teachers, they decided that the new design should incorporate green areas with trees for shade, a playground and an outdoor classroom.



Fig. 16. Original condition of the 'Pergola' area intervened. The sign reads: "We need to improve this yard" (Used by permission of Salvador Allende School)

This area was originally used for students to gather before entering to their classroom. As observed in figure 17, it was an extensive area of asphalt with no meaningful learning opportunities to offer.



Fig. 17. Original function served by the "Pergola" area intervened (Used by permission of Salvador Allende School)

According to the history teacher, the pergola project was envisioned as a green area where children could sit outdoors while the teacher read a book or teach about a specific topic. It was not considered to function as a formal outdoor classroom, but it eventually came to be after some time. According to his interview:

"We decided that we needed an outdoor learning area. It was only a green area with seats at first, but once we had the basic materials to do it, we organized a communal lunch pot during 2 following weekends where students, parents and teachers worked together on the construction of the structure that would shelter the area. This eventually became our first outdoor classroom"

According to the math teacher, to have an outdoor classroom required an adjustment in the mindset of the students:

"Students at first did not understand that this outdoor area could be for learning, like an actual classroom, they thought this was just a play area. It was a long process for them to understand what was an outdoor classroom. For us, it was also a challenge to use appropriate methods for teaching outdoors. We all learnt on the way" As explained by the teachers, the pergola project is an iconic project for several things: it is the most important school yard, due to its location and extension; it was the first large project undertaken together with the whole school community; and it was also the first one that required a collective effort in fundraising and hands-on participation of the parents and neighbors for its materialization. The history teacher on his interview said:

"The pergola project has been iconic in the sense that gave all of us the consciousness to say this is mine, I did it, and therefore, I care. This is totally opposite when a company comes, makes the project and leaves, there is nothing, there is no sense of ownership left"



Fig. 18. View of the "Pergola" project as it is today (Permission to use by the author)



Fig. 19. Current condition of the playground area (Permission to use by the author)

The "Court Plaza"

This area is located next to the basketball and soccer field and for this, it was called "the court plaza". As it is seen in Figure 20, before the project, this was one of the most underused, neglected areas of the school.



Fig. 20. Original condition of the court plaza intervened (Used by permission of Salvador Allende School)

Like previous projects, students helped in cleaning and setting up the area for seeding and planting trees, plants and flowers.



Fig. 21. Students preparing area for planting (Used by permission of Salvador Allende School)



Fig. 22. Initial progress on the plaza (Used by permission of Salvador Allende School)

Besides improving the overall image of the school by introducing green areas, the idea of this plaza is to be an outdoor learning area, complementing the central area (the pergola) and at the same time an extension of the school garden, where children could designate an area for crops. Teachers explained that this area is used for outdoor learning when the pergola is too crowded or noisy. It is also used as an outdoor dining area or just as a recreational area.



Fig. 23. Current condition of the court plaza (Left: picture taken on site visit by the author. Right: used by permission of the author)



Fig. 24. Current use of the plaza (Permission to use by the author)

The Green Roof

The green roof project has been one of the latest projects developed by the school. It has an important significance, as it was the first project to get external funding from the private sector. The principal stated:

"The green roof was done with support from a private company called "Green Roof", who believed in our environmental project and helped us materialize it. It's been very important for us to have their support, because we became the first public school with a green roof in the country"



Fig. 25. Green roof project done at the school (Permission to use by Salvador Allende School)

According to the history teacher, despite being an iconic project, the green roof has presented certain limitations on its use. According to the teacher, the green roof was not designed to be used and maintained by 6 to 14 year-old children, which has limited its potential to be used as a teaching and learning tool. There are important safety and security issues to solve around the green roof. However, children could see the process by which it was constructed and they have been taught the theory behind its benefits. The green roof also provided a lesson when considering the appropriateness of the design and functionality of the projects. Other roofs' surfaces are being decorated with plants and flowers, but with a purely ornamental purpose.

The Laboratory

Although the school started with simple greening interventions mostly related with the naturalization of the school grounds, over time, and particularly, with the creation of different public and private partnerships, the school was able to implement more complex projects, which complemented the overall environmental emphasis that the school was working to achieve. Among these projects we can find a science laboratory and a recycling station.

For the laboratory, teachers wanted to recondition one of the classrooms, incorporating new furniture, including long tables, high chairs and blackboards. They also needed a wet area and new scientific instructional materials to start with. According to the principal, establishing the necessary funds for this project was a long and difficult process that lasted over a year, but all came up to a successful end with the parents' help into organizing several fundraising events and promoting them among neighbors and the overall community. The history teacher indicated that this project was finally able to be materialized with a grant from the 'National Corporation of Environment' (CONAMA), today the Ministry of Environment. In the lab, children learn things such as soap and candle making, which they sell in environmental fairs and fundraising events. The principal affirmed that the science lab has been a huge asset, where they can foster hands-on learning experiences that are attractive and fun for children.



Fig. 26. Classroom renovated into a laboratory (Picture taken on site visit by the author)



Fig. 27. Products made by children at the science lab (Used by permission of the author)

Over time, there have been a series of projects developed in the school. As the math teacher explained:

"I have witnessed the entire renovation process and would say there has not been one project that is more important than the other. In fact, each and one of them have been significant from different angles and have contributed to drive motivation over time. As we continue on this path, we realize more needs arise and the willingness to solve them is what keeps the stimulus alive. This is how we have achieved important things such as gray water recycling, school gardens, school ground naturalization, a recycling station, green roof, and a playground among many others"

C. Environmental Initiatives that support the greening process

The "Mission Statement" of the school

The mission statement of the school was developed at an early stage of the greening process. As the principal explained in his interview, the mission statement was first developed as a draft and was a result of several brainstorming sessions with teachers. As he said, the greening process has enabled a gradual learning transformation for all its participants, reflected on the changing character of the mission statement. As he said at the time of the interview, they are confident today to create a vision and mission that reflects their environmental goals:

"Educate the whole child by providing a meaningful and constructive learning that enhances the capabilities and skills required for a sustainable community development"

The principal also indicated that they relied on the "Earth Charter" as its foundation. This document is promoted by the United Nations and contains a comprehensive approach to the challenges of the planet, as well as proposed changes and shared goals that can help solve them. According to the principal, its review was fundamental in aiding them achieve a thoughtful concept. He described the school institutional vision:

"All students on this school learn within a framework, which essential values are constituted by the principles established in the Earth Charter; 1. Respect and care for community life, 2. Ecological integrity, 3. Social and economic justice, 4. Democracy, no violence and peace" The mission statement of the school is displayed in every wallboard inside each classroom, strategy that motivates children and teachers to remember their environmental commitment every day (Segovia, 2012).

Figure 28 shows a sign that was displayed when the school was granted funds to develop a project called "Native medicinal herbs crop and their use among the local community". In the sign the school also displayed their mission statement, along with a mural made by students. The sign also invites people to join their efforts and visit the school to know the environmental projects developed so far.



Fig. 28. Sign displayed by the school with an environmental message (Permission to use by the author)

Enrollment in the national environmental certification program

During his interview, the principal indicated he wanted to find relevant sources, public or private, that could help the school achieve its environmental goals. Thus, together with the science teacher they prepared their application to enroll on the national certification program for schools promoted by the government in Chile. He believed this would bring several benefits, starting with the fact that they would be able to apply for funds specifically destined for schools in the program. Besides financial aid, the principal stated that enrolling in such program has given the school a major goal towards which to work, motivating the school community to achieve the different levels of environmental certification through the accomplishment of the greening design strategies by the school community. Salvador Allende School started the environmental certification process on 2003 and achieved "basic" certification level on 2004. According to Segovia (2012), this was the first public school in the district to achieve environmental certification, and "excellence" level a few

years later. According to the history teacher, being enrolled in the program has helped the school community become more engaged and sustain motivation as they work collectively towards a common goal.

Creation of an environmental committee

Once the original idea from the science teacher was presented to the principal and the rest of the teachers, some of the teachers who were more engaged decided to create an environmental committee. This action was fundamental within the greening process because it permits further progress through an organized team. According to the principal, the committee has several responsibilities, but among one of the most important is to keep the school community engaged in greening activities. The principal stated:

"The environmental committee is sort of "the brain" of the body. They need to lead the greening process in a meaningful way, define adequate connections to the curriculum, and constantly think about strategies to involve as many participants as possible to keep the project alive"

Following, in order to provide a comprehensive understanding of the greening process described above, environmental actions and design outcomes achieved at Salvador Allende School are represented in a graphic model (Fig. 29). The model synthesizes relevant aspects since the origin of the greening process until the time of the researcher's visit to the school.



Fig. 29. Model mapping the greening process at Salvador Allende School

General information

Address: Almirante Riveros 10122 Principal: Mr. Sergio Segovia Vicencio N° of students: 312 Level of education: Primary



Fig. 30. Ciudad de Lyon School's location

Similar to the previous case study, information in this school was also collected from interviews and a site visit to the school. At this school, the principal and the science teacher were interviewed. Later, a tour around the school site observing the greening projects was conducted. As with the previous school, representatives from the municipality were also present during the visit. Unlike the first school analyzed, this school was not able to provide the researcher with an historical record of pictures showing the original condition of the areas intervened. However, the principal was especially careful in giving a detailed description and explanation of the greening projects developed in the school. The researcher took pictures and notes while the school staff explained the most relevant aspects of each project, including genesis of the idea, participants, funding, timing frame, current use, and future opportunities, among other aspect. It is important to mention that this school is particularly affected by the socio economic condition of its students, who live among the several villages that surround the school, constituted by social groups of extreme poverty.

The Greening Process at Ciudad de Lyon School

A. Origins

The greening process in this school started out of the conviction of a single person; the principal. He was previously a science teacher at "Salvador Allende School", where he had been the founder and most active promoter of the whole greening process. In his own words: "There was a position available to be principal at this school, so I applied. I have been always convinced that we should have more environmental schools in the district, for what I started the greening process as soon as I came to the school. I have witnessed the establishment of a successful greening project in my previous school as a teacher and now I wanted to reproduce it in this school. What I first did was to set a meeting with the rest of the school staff and explain them the project. I showed them a video from the previous school describing the greening project and presented it to my teachers as a challenge. I ask them: Are we able to do something similar or better? I also talked to the principal at the previous school and asked him if I could visit the school with my teachers and explain them the project on site. After that, we came back and created our own 'Environmental Committee' and immediately got down to work"

According to the science teacher, when the greening process started, the school was in a state of total neglect:

"The school had several areas in total abandonment, which many were used as "old stuff" graveyards, piling unwanted furniture and things were "stored". The situation was so extreme that even neighbors threw away their garbage over the school walls"

Because of his previous experience, the principal had a much more clearer idea from where to start the greening process in this school. According to him, one of the most important things in the initial stages is to give the teachers an adequate training. As he explained:

"One of the first things I did was to foster self training on teachers in order to get initial knowledge on environmental topics. I also complemented this with relevant lectures, so they could be able to incorporate these topics on their classes and engage children"

According to the principal, teachers need to internalize these new concepts first in order to be able to transmit them on to children, parents and the rest of the school community. He stated that since environmental issues were not part the school cultural heritage, it was necessary to initiate an awareness campaign, which included visiting food gardens, hydroponics farms, earthworm culture farms and rescue what was significant from these experiences to be able to apply them into their own school (Segovia, 2012).

Teachers need to be completely convinced and motivated to transmit this awareness on to parents. The principal explained:

"The way we integrated parents is by closely explaining them our project. We set a meeting to explain them our main ideas and possible projects. Later on, the teachers and I gave them a complete class on hydroponic crops, vermiculture, composting, recycling and other environmental topics. Parents come, listen and start asking: What can we do to help? and we suggest how they can participate. This is how we make them aware of our project and start working together on the first greening activities"

B. Design Outcomes

The school garden

According to the principal, the first project is always significant. In the early stages of the project, the principal, the science teacher and a small group of students started working on it after school hours. They first cleaned up the site and prepared the soil for seeding, defined crop areas and dug ditches. As explained by the science teacher:

"The school garden was the first greening strategies deployed. It was a good decision because with the school garden you can actually see the results of your work. We had to wait for a while but when we could see the first crops coming out, such as carrots, onions and tomatoes, we became really enthusiastic. To see this ugly furniture graveyard and dump turned into a garden was something that motivated even the more indifferent ones"

The following are pictures taken during the site visit to the school that show the current state of the school garden.



Fig. 31. Hydroponic garden at Ciudad de Lyon School (Used by permission of the author)



Fig. 32. Medicinal herbs garden at Ciudad de Lyon School (Used by permission of the author)



Fig. 33. Horticultural garden at Ciudad de Lyon School (Pictures taken on site visit by the author)

The principal also stated that because of the lack of space, many strategies involve children's creativity to use what space is available in the most efficient possible manner. This is how they have come to create the hydro garden and vertical gardens to solve this issue. He stated:

"Many of these techniques are also seen and learnt by the parents, that with their children, replicate these at home, for example, using dispensable bottles to plant things they use daily such as coriander and parsley"



Fig. 34. Different design strategies and planting techniques deployed in the school garden at Ciudad de Lyon School (Pictures taken on site visit)



Fig. 35. Signs displayed in the school garden with a pedagogical purpose (Used by permission of the author)

Mural painting

A fair amount of effort has been directed at repainting the school. The principal and teachers have found in the school walls a useful resource to display every kind of environmental messages and using them as a teaching tool to educate not only the children. Importantly, the rest of the school community are able to see these messages on the school.



Fig. 36. Mural painting (Picture taken on site visit)

Also with a pedagogical purpose, teachers decided to name each of the classrooms after a native tree in Chile, and displayed a brief description and painting of the tree on the entrance of the classroom.



Recycling station

According to the principal, it was previously normal to see garbage left in the classrooms and schoolyards, especially after recess time. He recalled:

"What was not normal, was to see the school staff members, including the principal and teachers collecting this garbage and placing it where it should be. This was how we started a 'no garbage' awareness campaign. Students became surprised with our action and naturally joined us in our efforts to keep the school clean. This was the starting point for our recycling station"

The recycling station was initially built with old plastic bins identified with a sign for the different types of garbage. Later, the municipality helped to improve the project by providing udated garbage containers with colors. The science teacher explained they did a pedagogical activity with 7th and 8th grade students to create a "degradation timeline" for different products to be displayed over the bins in the station.



Fig. 38. Progress on the recycling station, initial and current condition (Used by permission of the author)

Outdoor classroom

This space is used as both an extension of formal indoor classes where teachers can decide whether is pertinent or not to take children outdoors, and as a gathering space, where children can develop social relationships by playing chess or other board games.

The principal explained they gathered funds from a school fair to get the raw materials. Skilled parents who were willing to collaborate on the construction helped with labor. Professionals from the architecture department from the municipality supervised and provided technical support as well. He indicated that it was important to have an outdoor area that allowed quiet sitting time, listening and complement other outdoor activities with a sheltered space to protect from sun or rain. The principal also stated that besides having this outdoor classroom, it is necessary in the school to improve the quality of existing classrooms, and have themed rooms and laboratories.


Fig. 39. Outdoor classroom at Ciudad de Lyon School (Used by permission of the author)

The principal is also emphatic in stating that this is an eco-recreational project and as such it aspires to provide children with pleasant green and open areas where to sit and enjoy at school. In his words:

"Besides being an ecological project, this is an 'eco-recreational' project. Nice sitting areas, green plazas with benches and other features make children come sit, share their snacks, talk, and be calm. All these things foster and improve social relationships"

C. Environmental Initiatives that support the greening process

The "Mission Statement" of the school

According to the principal, the school needed to have a hallmark, something distinctive to be identified among the rest of the schools in the district. The principal and the teachers together worked on the vision of the school:

"Environmental commitment, together with quality and equity in education are our main targets. Giving our students a quality education, with equity and social justice, and committed to the environmental cause by protecting the local and global ecosystem, are the values that inspired our mission statement"

To create the mission statement, first, the principal drafted some ideas, and then, together with the environmental committee, arrived to what reads today: *"Educating with quality, equity and commitment to the environment"*, and is displayed in the main entrance of the school.



Fig. 40. Mission statement displayed in the main entrance (Picture taken on site visit by the author)

Enrollment in the national environmental certification program

The principal explains that starting the environmental certification process is seen in the school as having a way to be formally recognized by local authorities in their greening efforts. After approximately 2 years of work, the school received "excellence" certification level, the highest level possible and on the principal words "a record" if compared to other public schools. According to the principal, to enroll in this process allowed them to have the support from the municipality to consolidate the project. He stated that the certification process is a driver for some of the most important environmental initiatives; the creation of environmental committees, the elaboration of a greening plan, and a trigger for teachers' training. The principal also explained that schools voluntarily subscribe to the certification process, so deciding to start this process requires that overall motivation and awareness are in place. The principal of Ciudad de Lyon school concluded that a great satisfaction exists among the entire school community, stating that in the course of 2-3 years, they have been able to achieve significant change, beyond expected, and can proudly state they have accomplished a successful transformation.

Creation of environmental committees

Like Salvador Allende School, Ciudad de Lyon School also had an "Environmental Committee" in place, with teachers responsible to lead environmental activities and plan curricular changes associated to them. A group of 2-3 teachers are in charge to coordinate academic changes or adaptations to support and implement the environmental program. In this school, the committee was born as one of the first requirements explicitly posed by the principal. After taking the

teachers to visit other environmental schools and giving them a couple of lectures, the principal asked teachers to form a committee to lead the greening process.

Ciudad de Lyon also formed a children's committee with the name "Environmental Shapers" and constituted by children from different levels. Their main task is to look after the application of the school's internal environmental policies and encourage other students to join the group. Also, they are the ones in charge of explaining the projects when there are visitors to the school and give lectures and talks at the different environmental fairs and events taking place within the school.

Following, in order to provide a comprehensive understanding of the greening process described above, environmental actions and design outcomes achieved at Ciudad de Lyon School were represented in a graphic model (Fig. 41). The model synthesizes relevant aspects since the origin of the greening process until the time of the researcher's visit to the school.



Fig. 41. Model mapping the greening process at Ciudad de Lyon School

4.4.3 Case study 3: "Paul Harris" School

General information

Address: Av. Las Perlas 11208, Santa Elena Village Principal: Mr. José Nazar Clavería Nº of students: 292 Level of education: Primary



Fig. 42. Paul Harris School's location and west façade entrance to the school

In this case study, the principal and two teachers, arts and physical education, were interviewed. Like the previous schools, the site visit consisted on a tour through the school where the principal was the main guide, with teachers and municipal representatives offering comments based on their experiences and appreciations of the different projects. This school was not able to provide an historical photographic record of the greening strategies. However, the principal gave a detailed description and explanation of the projects accomplished. The researcher took pictures and notes while the school staff explained the most relevant aspects of each project, including genesis of the idea, participants, funding, timing frame, current use, future opportunities, and some constraints encountered on the process. Following is a brief description of each project, showing current condition and highlighting important aspects based on participants' statements.

The Greening Process at Paul Harris School

A. Origins

The greening process in this school did not start as a personal initiative of one of the teachers or the principal as in the other two schools. In the interview, the principal suggested that the school has been a testing ground, where they have tried to implement different initiatives such as science and sports, but unfortunately not being totally successful in any of these. This is why, as part of a new educational program, together with the teachers' council, they decided to integrate environmental activities, replicating the initiatives currently in development by other schools, and hoping this could produce an improved overall effect on the school community. As the municipal representatives stated, this school has placed an emphasis on children's awareness to take care of the school, particularly by avoiding any kind of graffiti on walls or furniture and preventing additional cleaning. Paul Harris School started their greening process in 2012 and has been working since then towards a transformation of the school grounds. According to the principal the school achieved "basic" certification level during this year, but lost the category due to internal administrative issues in 2013. He stated that there were critical areas that needed to be addressed, such as not having an adequate number of teachers and staff, before they could successfully incorporate the environmental focus. However, today the school has a formal "Environmental Plan" developed by the teachers together with the principal, containing the guidelines for the environmental initiatives they want to pursue during the school year.

ACTIVIDADES	ACCIONES	ENCARGADOS	INSUMOS	TIEMPO APLICACIÓN	RECURSOS HUMANOS	GRADO DE AVANCE
VIVERO	Implementar el vivero escolar. Distintos tipos de plantas con fines pedagógicos-curriculares.	Claudia Vásquez	Madera, fertilizante, plantas, semillas, herramientas.	Enero a Diciembre	Horas docentes. Asesorías	
APADRINAMIENTO POR CURSOS DE ÁREAS VERDES.	Responder por un sector o área a cargo de su implementación y mantención como área verde.	Cada profesor jefe. Maria Angela Menz	Plantas, pasto.	Enero a Diciembre	Horas docentes. Estudiantes. Apoderados.	
BRIGADA ECOLÓGICA (25 ALUMNOS)	Implementar una brigada de 25 estudiantes para cuidar, mantener el medio ambiente en torno de la escuela.	Daniel Maturana.	Poleras, gorros, herramientas.	Marzo a Diciembre	Horas Profesor.	
MURALES TEMÁTICOS	Crear murales temáticos	Clara Currihual	Pinturas, brochas, rodillos, pinceles.	Marzo a Diciembre	Muralista.	
CLASIFICACIÓN DE BASUREROS (RECICLAJE)	Implementar 3 recipientes o contenedores por sala y 3 generales en el patio.	José Segura	Tarros plásticos. Contenedores.	Marzo a Diciembre	Horas docentes. Asistentes. Auxiliares.	
HUERTO ESCOLAR: a) HORTALIZAS. b) PLANTAS	Implementar huertos escolares a través de la recuperación de espacios.	Udia Arratia. Maria Angela Menz	Herramientas. Plantas.	Marzo a Diciembre	Horas docentes.	
RECUPERACIÓN DE AGUAS	Reutilizar las aguas de los lavamanos en regadios de áreas verdes.		Cañerias.	Marzo a Diciembre	Ambientalista.	
REFORESTAR CON ESPECIES ARBÓREAS Y ARBUSTOS FLORIDOS.	Reforestar con especies arbóreas rotulados y arbustos floridos.	María Loreto Castillo.	Arboles, arbustos.	Marzo a Diciembre	Horas docentes. Estudiantes.	
CONFECCIÓN DE COMPOST	Hacer compost utilizando desechos orgânicos.	Nadia Ortiz. Claudia Vásquez	Desechos orgánicos.	Marzo a Diciembre	Ambientalista.	
DIARIOS MURALES TEMÁTICOS	Implementar en cada pabelión diarios murales con temas.	Lidia Arratia	Planchas de plumavit, letras, géneros.	Marzo a Diciembre	Horas docentes.	

Fig. 43. Environmental plan developed at Paul Harris School (Permission to use by Paul Harris School)

The way this school has worked so far is by identifying deteriorated and/or underused areas within the school and defining the actions that would improve those areas. They organize these activities in the environmental plan and designate one class and its head teacher to be in charge of that specific activity.

According to the principal, the first collective project they undertook, including teachers, children and parents was called "Improving our environment", with the intention to make children aware of the physical condition of their school and involve them in taking care of it. The principal indicated:

"On March, in the beginning of the school year, we did an activity where children and parents, guided by the teachers, developed several maintenance activities, including wall painting, classroom furniture restoration and green areas maintenance, among others. We decided that an effective way of making children aware was by asking them to donate a small amount of money to be able to buy basic materials. What we collected from them was not even enough to buy a paint bucket but it does not matter, because they did not know it. From our experience, a child who has been involved in gathering the funds and later in the activity itself, develops a sense of care and ownership and is less likely to destroy or vandalize what he just did"

B. Design Outcomes

The school has implemented several greening strategies such as a school garden, wall painting, recycling and decoration by planting, among others. They also have an outdoor dinning area where children can have their lunch or be used as a recreational sitting area. However, as observed on the site visit, greening strategies appear to be more like isolated actions than thoughtfully planned and designed initiatives being part of an overarching concept. Besides the school garden, being used during science classes, other greening strategies do not seem to serve as pedagogical resources or form part of a predetermined environmental curriculum.



Fig. 44. Dining area and school garden at Paul Harris School (Picture taken on site visit by the author)

The principal stated that they were still working on the introduction of environmental topics into the curriculum and recognized this was one of their weakest aspects. Some of the strategies deployed in the school appear to have a mere decorative purpose, and do not seem to provide a continuity of the learning experience, explained in previous sections to be important in an effective learning. Also, the principal stated that the previously mentioned "Improving our Environment" project, was created at the beginning of the school year and only revisited twice during the year, reinforcing the fact that these would be isolated projects without clear continuity.



Fig. 45. Planting decorations with reused materials (Pictures taken on site visit)

From the 3 schools analyzed, Paul Harris School is not as advanced as the others regarding the introduction of greening design strategies into the school grounds. As can be seen in the following pictures, there are still several areas lacking adequate design and currently underused, which could otherwise constitute a huge potential for outdoor education and an overall improvement of the school's physical environment.



Fig. 46. Underused outdoor areas at Paul Harris School (Pictures taken on site visit)



Fig. 47. Underused playground areas at Paul Harris School (Pictures taken on site visit)

As previously explained, the principal declared having addressed other priority areas before they could focus on environmental issues. However, during their interviews, the other two schools also mentioned the critical contextual aspects they need to cope with, especially regarding the difficult social background where these children reside. Also, they explicitly expressed concerns regarding poor results on performance tests and severe behavioral problems among students. Nonetheless, they expressed that the driver to conduct an environmental program were precisely a response to these issues. Both schools manifested the need to keep working on improving academic results, but since the introduction of the environmental initiatives they recognize a more positive attitude and enhanced behavior among students, besides the evident improvement on the overall physical environment of the school.

Mural painting at community center

According to the school principal, the only way to make a project relevant is by including all of the school community, children, parents and neighbors. He stated that they have placed especial emphasis in providing children with decision-making capabilities, making them decide how and where to start. Also, there were critical aspects to address within the community. He stated:

"For our school, it was really important to involve neighbors in our environmental project somehow, because we had seen them throwing garbage into the school. We needed to alert them and let them know about children's work so far. This is why with a group of four parents, we decided to plant trees around the school exterior perimeter, so that neighbors could directly see children and parents doing this. After this, we invited members of the neighborhood council to learn about our project and invited them to plant trees with us. Little by little, neighbors started to care about our surroundings as well and we have not seen these kinds of issues anymore. Also, we saw another opportunity in painting the community center walls with environmental messages with students. As our project spreads out and become noticed, we also gradually progress towards creating community awareness and involvement"



Fig. 48. Mural painting at community center (Picture taken on site visit)

C. Environmental Initiatives that support the greening process

Implementation of "eco-recreational" sessions

In her interview, the art teacher indicated that they created "eco-recreational sessions" in order to improve school attendance. These are sessions specifically intended to learn through playing. She indicated they want children to enjoy coming to school, and thus, enjoy learning. She stated:

"Every other Friday afternoon is destined for an eco-recreational session. These are instances where we offer children different kind of workshops, including computer labs, arts and crafts, and agriculture among others where they can choose from. Another times we've also immersed children in learning about our local culture by playing typical Chilean games and dances"

The mission statement of the school

Although the other two schools used mission statements to promote environmental awareness and commitment, at Paul Harris School it did not make direct reference to an environmental concern. This could constitute an important flaw by not giving a clear message to the school community.

Following, in order to provide a comprehensive understanding of the greening process described above, environmental actions and design outcomes achieved at Paul Harris School were represented in a graphic model (Fig. 49). The model synthesizes relevant aspects since the origin of the greening process until the time of the researcher's visit to the school.



Fig. 49. Model mapping the greening process at Paul Harris School

5. FOUNDATIONS FOR GREEN DESIGN OUTCOMES: RELEVANT ASPECTS ACROSS THE CASE STUDIES

The following analysis was undertaken to identify common aspects across the models that permitted greening design outcomes and enabled the overall transformation of the school. These relevant actions could be synthetized in four categories:

- A. Building engagement
- B. Aligning management
- C. Integrating curriculum
- D. Creating partnerships

The specific actions are filtered by category (A, B, C, D) and represented within the models previously developed in section 4 for each school. Section 5.1 analyzes the actions that constitute each category. The models also show the actions' approximate location within the timeline. Of relevance here is to compare the models and understand which actions are necessary to happen earlier in the greening process and those that can happen at different times. Finally, this section also shows design outcomes achieved throughout the greening process at each of the schools.

The analysis is complemented with outside information when relevant, to support or contrast applicable aspects identified from the models. Section 6 synthetizes these findings in the form of a framework to guide future policymakers.

5.1 ACTIONS FOR TRANSFORMATION

A. Building Engagement

In the case study schools, it was observed that there were some actions conducive to build engagement, spur awareness, and create a collective vision among the school community, aspects that in turn, were relevant to start and sustain the greening process. It was also observed within the models that actions filtered in this category happened at different times during the process, demonstrating that the building of engagement is necessary along the complete process to achieve a successful transformation.

Following, figures 50, 51 and 52, show the actions filtered within this category. Then, the synthesis and analysis of these actions is explained.



Fig. 50. Actions that build engagement at Salvador Allende School



Fig. 51. Actions that build engagement at Ciudad de Lyon School



Fig. 52. Actions that build engagement at Paul Harris School

Identify a figure of leadership

For the three schools, the first step in the greening process was to build engagement. Having a person leading this process was considered to be an effective way to initiate this process. In two of the three schools an inspired teacher or principal was responsible for awakening motivation, and igniting a transformation. In the third school the greening process started with a general concern among teachers about the physical condition of the school that drove them to start the process, but later, it would also be the principal the one to acquire a leadership role. However, fundamental in both cases, was the subsequent engagement of other participants within the school community. As Berlinic (2002) has stated, "The vision may well have been ignited by a single individual but it requires the support and enthusiasm of many people if the project is to be sustainable". Stowell (in Grant and Littlejohn, 2001, p16) also stated, "The initial spark that sets an outdoor classroom project in motion may come from one inspired teacher, parent, or community member. However, for the spark to be sustained and the project to succeed, there must be leadership from a wide variety of stakeholders".

It is necessary then to inspire others with the vision, clearly articulating goals, and recognizing they will evolve and grow as more people become involved. Being able to communicate the scope of the benefits of transforming the school grounds; educational, environmental, social, behavioral, and even economic, can inspire others (Evergreen, 2002). In this sense, the role of leadership is an essential catalyst in the orchestration of community involvement, aiding to stimulate ideas, help articulate goals, and guide progress towards meeting them (Moore and Wong, 1997).

At Salvador Allende School, the teacher leading the process was trying to promulgate a vision of an improved, safer and softer school, with decreased levels of aggression and social-behavioral problems that were currently occurring, and that he firmly believed could be achieved by putting greening process in action. As he described it, the introduction of green strategies was seen as improving the physical context of the school and by giving children an eco-recreational project, with plazas, sitting and gathering areas, they would provide opportunities for positive social relationships. As a principal in Ciudad de Lyon School, he wanted to reproduce this experience and address similar problems happening at this school. His ability to lead the process first as a teacher, and then as a principal, also demonstrates that the role within the school is secondary, as long as the motivation exists.

Adopting a participatory approach

Adopting a participatory process means inviting everyone who might have an interest in the school grounds, or may be affected by them, to provide input and participate (Evergreen, 2002). In the school, a participatory approach focuses on the needs of children as the primary users, along with the related needs of teachers, parents, and residents (Moore and Wong, 1997). According to Coffey (2006), making sure everyone is involved will help to achieve the best results for the school, including the long-term use and maintenance of the grounds. Ozer (2007) also emphasizes the importance of integrating the school community into greening projects since the earliest stages, as many greening strategies, such as school gardens, rely on donations of funding, expertise, labor, and materials from school and community members.

Administrators (municipal authority)

According to the principal at Ciudad de Lyon School, to involve the local authority through the "Department of Environmental Education and Health" at the municipality was fundamental. He stated that it was necessary to inform them about the project as soon as possible as they were able to provide relevant guidance during the process, suggesting and linking them with potential sources of funding and technical support. In two of the three case studies this relationship was fruitful and beneficial during the entire greening process. The third school indicated that the perceived lack of support from higher authorities was a detriment to affect change. He made direct reference to the lack of an overall greening policy at the ministry level and particular links to environmental education. The principal at this school stated that he prioritized the school timetable to comply with the regular curriculum delivered by the ministry. This demonstrates that despite having support from the local authority, for this school, the message from higher authorities was not clear that translated as an impediment to achieve progress. However, change happened anyway in the other two schools working closely with the local authority that could also be an indicator of their greater desire for change.

Teachers

The principal at Ciudad de Lyon School stated that in order to engage more people in the greening process, first, he had to engage teachers. He argued that if teachers became engaged, they would help him in transmitting their motivation onto students, parents, neighbors and the broader community, in that order. With this purpose, one of the first strategies applied by the principal was to conduct a research with his teachers on other greening projects and initiatives, in order to generate an initial understanding and awareness. He used audio-visual resources and

field visits to food gardens, farms and other institutions, and sought first-hand testimonials from other schools that could inspire his teachers. Then, the principal and teachers together conveyed this knowledge and motivation on to children and the rest of the school community.

According to Stowell (in Grant and Littlejohn, 2001), in a greening process teachers serve as mentors, resource aids, facilitators, co-workers, and cheerleaders. They should strike the balance between taking the lead to push the project forward and stepping back to allow for student initiative. In essence, the teacher plays a pivotal role, that of coach. She also states that showing teachers ways meet learning standards and curriculum requirements through the greening projects will help them become engaged with the process. Evergreen (2002) recommends that once you have the support of the principal and a few teachers, you can get the students involved.

Children

All of the case studies analyzed involved children from the earlier stages of the greening project. Also, almost all teachers interviewed in these schools identified the importance to generate and implement learning activities that were pertinent to the projects particularly during the use and maintenance phases. Only one school mentioned that students were involved during the planning phase of the first project, by asking them to draw their "dream schoolyard".

According to Stowell (in Grant and Littlejohn, 2001), student leadership and initiative is the driving force behind any successful greening project. Their vision for the school grounds is what should be cultivated and thought of as the foundation from which a greening project evolves. Hart (1997) has placed especial emphasis to the notion that students should be involved in the problem identification phase of greening projects. However, according to Dyment (2008), based on her investigations across the Toronto District School Board on school ground greening, it appears that while students provide a considerable amount of time and labor to the actual project, they are not overly involved in problem identification, visioning, or planning phases of greening. She argues that while it is laudable and important to include them in the designs, actual plantings, and maintenance, much is being lost when they are not involved in earlier phases.

An effective way to involve children, and the rest of the school community, since the earliest stages is by surveying opinions, as asking them for ideas includes them in the process and starts to generate a sense of ownership of the project (Coffey, 2006). Students should be invited to develop a vision for the future use and development of their school grounds. How do they currently use the school grounds? How would they like to use it in the future? What features should it have? We must start really listening to children because their needs and preferences

can only be determined by consulting with them. This is one reason why children must be involved right from the start of any school grounds improvement project. Coffey (2006) has stated that adults have great difficulty relinquishing control, acting as facilitators, and allowing projects to be driven by young people because they still believe that adults know best what children need, but if this were not the case, the typical barren schoolyard would be a very different place.

Parents

Once children are involved, parents can also indirectly be aware of the project by what their children tell them at home. In the schools analyzed, teachers and the principal generally set a parent's meeting at an early stage to explain them the project and invite them to collaborate. According to Evergreen (2002), parents, along with neighbors and other community members, can be essential agents in achieving transformation, particularly by offering their services as professionals or assisting with the various tasks of a greening process according to their skills. However, it is best to extend the invitation to participate to all parents only after the principal and a core group of teachers are committed (Evergreen, 2002).

The math teacher at Salvador Allende School explained that parents helped in almost every project since the beginning of the process. The parents council always existed but became more involved after the first greening project begun, because they were asked to form part of the environmental committee. Since then, they were part of decision-making and actively collaborated on greening projects such as the construction of "the pergola", tree planting and mural painting. In these schools, this relationship was shown to be particularly important for two main reasons; firstly, the parents' council is the only entity able to apply for public grants for greening projects, and secondly because they produce a cohesive effect for fundraising events among the rest of the school community. As a group, parents are a fundamental agent in supporting the greening process. According to the principal:

"We discuss with the parent's council all the projects we want to start because their help and engagement is fundamental. For example, one of the projects we have convene is that they choose one week a year, generally during the school's week anniversary, and do several maintenance activities, such as mural's painting, clean up, green areas maintenance, and many others. They do this because they know it will benefit their children"

According to Stowell (in Grant and Littlejohn, 2001), parents enthusiastically support projects that excite and stimulate their children and many find their own lives enriched by participation in the creation of an outdoor classroom.

Neighbors

In all the case studies, surrounding neighborhood members were also fundamental participants. Once teachers, children and parents become engaged, they can spread the word to the immediate neighborhood. According to the principal at Paul Harris, neighbors are invited to attend all of the school's events (fundraising events, conferences, cultural shows, etc.) where children explain to them mutual benefits that can potentially arise from this relationship. According to the principal:

"We work like this in every project, we invite parents and neighbors to work together because we have seen the potential of bringing people together. Without a doubt, our relationship with them strengthen the sense of belonging to the school, creating a supporting network and giving us important clues about where to direct new activities"

At Paul Harris School, students were engaged in actions that were directly intended to improve the local context and generate community awareness. For example, they painted the community center facades with environmental messages. They also started a recycling campaign where neighbors could deposit their plastic bottles on containers located on the school main entrance. At Ciudad de Lyon School, students collect food waste from the local street market for composting, and later donate or sell the compost back to local food traders.

As stated by the principals of both case study schools, this is the beginning of a relationship that can be enormously beneficial, particularly when neighbors start developing a sense of ownership for the projects and help the, to reduce vandalism and other violent actions. The principal at Salvador Allende School explained that the tree planting project on the green areas outside the school was vandalized several times, generating frustration among students, but when neighbors were invited to plant with them, these incidents diminished, mainly due to more eyes overseeing the intervened areas. According to Evergreen (2002), the more you encourage direct involvement of the community, the more you reduce vandalism. When people feel a sense of ownership for an initiative, they are likely to be protective of it rather than destructive. According to Coffey (2006), neighbors can watch out for and report undesirable uses and acts of after-hours vandalism. For this reason, it is imperative to involve as diverse cross-section of the community as possible and foster a sense of neighborhood ownership, particularly relevant in vulnerable communities, as the ones studied. Also, if the school is taken care of, it can be offered as a space for social interaction, programs and activities aiming to support community needs.

Broader community

It is essential to include members of the wider community as key players on the project team. Among some of these we can find natural resource professionals, local businesses and civic organizations. These people can offer technical support, in-kind contributions of materials, and even funding. Additionally, through their direct involvement in the project and interaction with students, these individuals serve as role models and mentors, opening the eyes of students and others in the school community to new career directions (Stowell, 2001).

The creation of partnerships is a necessary aspect within the discussion on a participatory approach. Including the broader community can be very productive. According to Evergreen (2002), community members are a source of volunteers, which is important as most greening project are usually completely volunteer-driven. It is also recommended to seek expert advice because they can help sidestep mistakes and setbacks, save time and money, increase access to resources and suppliers, and come up with solution that may have otherwise been missed (Evergreen, 2002). However, to formally hire professionals such as landscape architects, botanists or biologists, will most probably constitute a challenge for low-income schools already working with limited resources. This is why the creation of partnerships is so important, as schools can find potential collaborators willing to participate and donate their time and services in the achievement of the projects.

Table 4 summarizes key stakeholders and their roles within a school greening process.

AUTHORITIES				
Ministry of Education	Form the educational policy and fiscal context within which school administrators operate. They can show their commitment to school ground greening through policy directives and funding.			
Secretariat of Education	Their role is to create and oversee school policy.			
Municipal Department of Education	They represent the local authority for public schools within each district. Oversee all educational and operational services delivered locally. They can be effective supporters of greening projects, especially with respect to the integration of curricula and site planning and maintenance.			
SCHOOL COMMUNITY				
Principals	Ensure that teachers staff have the resources and support needed to maximize the educational potential of school grounds. They are responsible for setting goals for school performance and may be looking to meet these goals through school ground improvements.			
Teachers	Sit on greening committees and develop curriculum links. School landscapes can become incredibly valuable teaching resources for educators.			
Students	Can be involved in all aspects of greening projects, which develop a sense of active citizenship and stewardship and provide experiential learning opportunities.			
Parents	Can offer their services as professionals or assist with the various tasks of the greening process according to their skills. Can also be creative resources in identifying alternative approaches to issues surrounding such things as budgeting, maintenance and design.			
Neighbors	Can offer their services as professionals or assist with the various tasks of the greening process according to their skills. They are extremely valuable to watch out for greening projects and report undesirable uses and acts of after-hours vandalism.			
BROADER COMMUNITY				
Outside agencies	Include non-profit and civic organizations, local businesses, and educational institutions among others. They can fill the voids in funding and information support. They can provide advice, publications, grants and lobbying efforts to ensure that interest in greening does not evaporate due to lack of coordinated effort.			
Design professionals	Can lend valuable credence to design and policy development. Architects, landscape architects and planners are trained in the functional design of space and the conversion of good ideas into realistic plans. In addition, naturalists and habitat biologists/ecologists understand the intricate relationships among the diverse elements of a natural landscape.			

Table 4. Stakeholders' roles and responsibilities. Source: Adapted from Evergreen 2002

B. Aligning Management

In the case study schools, it was observed that there were some actions conducive to align management or the internal functioning of the school. These actions were relevant to help the school acquire an environmental ethos and provide a solid foundation for further and meaningful change. This category also encompasses the specific actions that schools developed in the management of the school grounds to design and implement a greening project.

Following, figures 53, 54 and 55, show the actions filtered within this category. Then, the synthesis and analysis of these actions is explained.



Fig. 53. Actions that align management at Salvador Allende School



Fig. 54. Actions that align management at Ciudad de Lyon School



Rethink/create mission statement

This aspect turned out to have huge importance among the case studies because it reflects the school's values and vision. It is a strong resource to promote the underlying philosophy of the school and make the school community identify with it. Within the case studies, two of them explicitly stated an environmental commitment on their mission statements and explained that they had developed it with the participation of students and teachers.

Enroll in government-related environmental initiatives

Another important aspect in the management of these schools towards aligning environmental imperatives is the presence of governmental related initiatives. By promoting these initiatives, the government sends a clear message to schools that a green school ground and outdoor learning is important. The certification program resulted to be an effective instrument for these schools to accelerate a greening transformation. As concluded from the case studies, to work towards achieving the different certification levels was a huge motivation among the school community. Through such a process the schools were able to set specific goals and see their efforts recognized when accomplishing them. In the interviews, all the teachers and the principals manifested to be very proud of having achieved the highest level and be working to maintain it. In Chile, both the Ministry of Education and the Ministry of Environment have placed big efforts in the promotion of this program, which has fostered the participation of an increasing number of schools along the country and slowly started a school greening movement. Another environmental initiative promoted by the government and specifically directed to teachers in schools under certification, is the "Eco-educators network", where teachers can meet and share their environmental experiences with other teachers and related professionals. The main role of this association is to create competency among teachers on environmental education and aid them in their labor to connect greening design strategies to the curriculum.

Actions described here were conducive to create a renewed ethos and promote a strong environmental message among the school community. It was observed that these actions happened relatively early and then sustained throughout the whole process. This category also encompasses the specific actions that schools developed in the management of the school grounds in order to plan and implement a greening process. The following are relevant actions:

Creation of committees

The creation of committees is a crucial step within the greening process and can be seen as a milestone or outcome of an effective process of engagement. In the three case studies, the creation of committees happened early within the process. For example, at Salvador Allende School, after the science teacher had talked about his idea to the principal and the teachers' council, those teachers that were more engaged decided to form an environmental committee. This also happened early at Ciudad de Lyon School, where after a short period of research and initial awareness, the principal encouraged his teachers to create an environmental committee.

It was also observed in the case studies that teachers and students formed different committees. When the teachers' committee carries out a meeting to discuss environmental projects, they usually invite representatives from the parents' council to assure they take part in decisionmaking. The principal at Ciudad de Lyon School also mentioned that the intention of the school is to gradually incorporate formal participants to the committee, particularly neighbors. In the three case studies analyzed, children created a different committee, under the name of "Environmental shapers" or "Eco-team". At Ciudad de Lyon School, the principal mentioned that children select leaders to attend meetings, and later, these act as messengers to the rest of the students on each class. As explained in the case study description section, at Salvador Allende School, children collaborated with the science teacher in the creation of the school garden, volunteering after school hours every Friday. After this initial involvement, they were motivated to form their own committee. According to one of the teachers at Salvador Allende, the creation of the children's committee is a big step because it means that the most important actors are formally engaged. Children are able to attract other children, making the process grow. At the time of the interviews, Ciudad de Lyon School for example, indicated that more than 50 children were active part of the committee.

Either by having one committee composed by different stakeholders or having subcommittees and a steering group, the final goal is to guarantee everyone having a voice and able to contribute to planning and decision-making. According to Evergreen (2002), to ensure a solid foundation, committees should be as inclusive as possible, because the more people involved, the lighter the demands on everyone and the greater the probability the project will be a success. However, they also recommend having a core team, willing to oversee the different projects and assure continuity every step of the way.

Grant and Littlejohn (2001) have explained that the committee tasks include coordinating site planning, fundraising, publicity, and the development and maintenance of the projects. In order to work effectively it is necessary to have an inventory of the committees' skills, expertise, and resources that participants can contribute or obtain (Evergreen, 2002).

All outdoor classroom projects begin with a creative spark in the mind of an individual who knows the value of outdoor learning; but no individual should go it alone. Creating an outdoor classroom requires the vision, the dedication, and the hard work of many people, and taking the time to assemble a dedicated committee or project team is the first and most integral step in any successful project. It is time well spent and will result in a project to enjoyed, used, and "owned" by students, educators and the entire community (Stowell, 2001). In all three schools, the creation of committees happened early in the process, after some teachers and children have become involved. However, a committee that includes as diverse a cross-section of the community as possible can be seen as a milestone or outcome of a successful participatory process that was able to engage key actors on its way.

Elaborate a concept plan and vision

According to the analysis, two of the schools had an environmental plan in place. Salvador Allende School had a well-articulated plan with goals and tasks described for the duration of school year. At this school, these documents are set as policies that guide the greening process, including major benefits for students and relevant connections to the curriculum. As the principal explained, such documents are important as teachers can refer to them during the implementation of the projects. Paul Harris School also had a plan in place including greening projects that they wanted to pursue during the school year. In this plan, the committee organized activities by class, including estimated timeline and resources involved. The principal at this school and imagining ideas on how to solve these. At Ciudad de Lyon School, the principal informed not having an environmental plan in place, and developing greening actions spontaneously as needs or problems arose. However, he recognized that a guiding plan would be helpful in clearly stating and acknowledging the school's priorities.

Evergreen (2002) recommends as an initial step to establish a statement of purpose that will help in giving reasons for undertaking a project and provide a focus. This has also been referred to as concept plan or vision. To develop an effective concept plan and vision it is necessary to put in practice the principles of a participatory approach previously described. Coffey (2006) has explains that it is necessary to brainstorm with students, and survey teachers, parents and neighbors to gain their input. It is also necessary to survey the site and identify all the site uses and constraints to start to picture what the possibilities are and balance these with people's ideas. These are the essential tools needed for planning and the only way to achieve a concept vision that is pertinent and relevant to the school and its people's needs. The environmental committee or project team overseeing the process is usually in charge of gathering this information and materializing it in the form of a concept plan or vision. They should clearly develop goals and articulate the educational and environmental rationales for the project (Evergreen, 2002).

Research potential funding

To assess the economic feasibility of the projects is of primary concern. Having a clear idea of the available resources and potential funding alternatives for each project will help set attainable objectives. In the case studies, the most important source for funds were twofold. On one hand, the parents of the school were able apply for public funds through the parents' council, specifically destined to those schools enrolled in the certification program. Parents also had a fundamental role in the organization and promotion of fundraising events. On the other hand, also through the certification program, schools are able to make important partnerships with other governmental agencies that help in providing supplementary funding for greening initiatives. However, and as the principals in these schools suggested, these funds are usually not sufficient to complete an entire project, and equally important, maintaining it over time, given that funds are specifically provided to start the projects. Again here, a participatory focus leaded by the committees, is fundamental in promoting active collaboration and donations of time and skills from the school community in these contexts.

At Salvador Allende School, the principal explained that among all the ideas they had for greening, they wanted to prioritize those projects that showed to be more frequently used by students, such as the pergola project, and also those areas that had a greater learning potential, such as the school garden. For example, the court plaza, even though it was one of the most

deteriorated areas, was not considered among the most urgent projects. As explained by the principal:

"Most of the projects have been done through "self-management", meaning that we gather funds ourselves for each of the projects we want to start. It conveys a big work, for what making good use of what was gathered is extremely important. We organize all of our fundraising events with the parent's council. Also, the municipality has helped us with several projects, mainly providing technical support"

According to the math teacher, the municipality is able to contribute labor and a limited amount of materials, but mainly it provides advice on to where to direct funding and grant applications. The principal also explains that the municipality can provide curricular support by distributing relevant instructional materials developed by the ministry and offering opportunities for teacher's training. In his interview, the math teacher explained that the role of the municipality as a facilitator between the school and other institutions is fundamental. He recalled a specific project:

"Through the environmental education department of the municipality we were able to reach the University of Chile, who assigned a group of undergraduate students to provide us with techical support to implement our first sonal panel for water heating"

According to Evergreen (2002) some potential sources of funding are businesses that have an interest in supporting community-based or environmental projects, government grants, private donations, and other institutions that may be willing to donate their time and expertise, such as universities and colleges, service clubs, and community and private foundations. Fundraising strategies are important as they can empower students and give a sense of reality and immediacy to the projects (Moore and Wong, 1997).

Detailed design plan

Information on the detailed design of the projects was not provided by the case study schools. At Salvador Allende School, the principal mentioned having received technical support from municipal representatives in the construction of one of the specific projects, the pergola. He also mentioned the importance of their alliance with the University of Chile in accomplishing some of the more complex projects such as the installation of a solar panel and the grey-water recycling system. However, it is described here as the logical step to follow. General aspects that schools should consider are:

• Doing a school ground inventory

This is vital for planning and involves mapping the physical features of the site such as size, orientation, location of built and natural features (such as sunlight, vegetation, landforms and drainage, wind, soil, etc.). In addition, it is necessary to know how people currently use the space and what they would like to be able to do there. According to Coffey (2006), surveying activities can be easily integrated into the curriculum where students can help and learn.

Consider existing policies

All greening projects are developed within the context of other existing policies, such as national or provincial legislation governing education and the environment, or municipal plans that deal with the protection and management of open space and green space. Through the educational and architecture departments, municipalities also provide codes and regulations regarding facilities management, play structures, grounds maintenance, and health and safety standards that should be considered when planning a green school ground.

• Consult with experts

Many school greening projects may require assistance from an expert in landscape design or architecture who understands the constraints and opportunities of a site. In low-income schools these kind of services are usually too expensive to be considered, aspect that highlight the importance of working closely with the local authority, who can assist with professionals in their departments and also stresses out the need to promote the project among the community to attract potential collaborators.

• Develop maintenance plans

According to Evergreen (2002), inadequate ongoing maintenance is the most common reason for the failure of greening projects. To address this it is necessary to establish early in the planning process the responsibilities of the greening committee in leading an implementing maintenance policies. It is also important to consider maintenance strategies in advance and set an estimated budget for their application. A well-planned and organized maintenance strategy will protect investment of energy systems, resources, money, and time. Importantly, what proved to be effective in the schools to sustain greening projects was making the adequate links to the curriculum to involve students in all maintenance activities.

• Evaluate

According to Evergreen (2002), most artificial landscapes, including greening projects, ultimately reach the end of their useful existence, and at this point it is necessary to breathe new life into it;

Has the project fulfilled its purpose? Is it necessary that this purpose adapts or changes to new circumstances and needs? What management changes can be made to ensure the ongoing success of the project? However, evaluation on an ongoing basis will help assess current condition and uses, and avoid possible neglected projects in the school. None of the case studies analyzed had evaluation policies or practices being applied.

Although it was observed within the case study schools that actions for the planning and implementation of a specific greening project seem to follow a logical order and might typically include those described here: forming committees, choosing and surveying the site, designing the project, making a project plan, gathering funds, implementing, maintaining, and updating the project, it has also been argued that these actions can overlap or even happen at out of order, given that each school's process is unique (Evergreen, 2002).

C. Integrating Curriculum

In the three case study schools, it was observed that there were some actions conducive to connect greening strategies to the school curriculum, aspect that in turn was relevant to achieve a successful transformation. Greening design strategies need to serve an educational purpose and not be conceived as mere design features. If this is the case, they will only serve as elements that will temporarily improve the physical condition of the school, but will most probably be neglected and ultimately produce a negative impact on the already vulnerable condition of these schools.

It was also observed within the models that actions filtered in this category happened once engagement among the school community was created and general management aspects such as the formation of committees were already in place. However, it was observed that these actions happened at an early stage, during the planning of the first greening projects and relevant connections to the curriculum envisioned by teachers.

Following, figures 56, 57 and 58, show the actions filtered within this category. Then, the synthesis and analysis of these actions is explained.



Fig. 56. Actions that integrate curriculum at Salvador Allende School



Fig. 57. Actions that integrate curriculum at Ciudad de Lyon School


Fig. 58. Actions that integrate curriculum at Paul Harris School

Connect to the curriculum

At Salvador Allende School, the principal and teachers realized at an early stage, that they needed to adjust every aspect on the curriculum to make sense of greening interventions and appropriate to the new environmental program of the school. The art teacher stated:

"Soon we understood that we needed to redesign curricular areas to introduce environmental contents and moreover, if we wanted to have an effective environmental curriculum, we needed to provide students with opportunities to make links and relationships between the different subjects"

Also, every municipal school in Chile is required to have a "Technical Educational Unit Manager" (TEU), who is a teacher in charge of the coordination, supervision and assessment of curricular activities and school programs. The environmental committee together with the TEU manager coordinates environmental objectives and makes the proper adaptations and links to the different subsectors in the curriculum. In his interview the history teacher explained:

"The environmental committee and the TEU manager agreed that this term, in the area of technological education (arts and crafts), emphasis would be on promoting waste reduction, for what students would work with reused materials they could bring from home and learn how to recycle discarded paper"

But for a school to be able to integrate environmental education within its curriculum, it is vital that teachers first acquire the necessary competencies to be able to incorporate these topics accordingly in their classes. In their interviews, teachers consistently referred to curricular changes as being one of the most important but challenging areas due to unfamiliarity and lack of guidance. But despite arguing there is a lot of work to do, teachers at Salvador Allende School have been able to incorporate environmental learning across most of the educational areas. As the history teacher has stated:

"As teachers we understand that environmental education has to be applied across all subjects and we need to be committed to incorporate it a 100% in our subjects. Environmental education is part of everyday life in our school; we work with the logic of saying yes to the children "you can do this", not with the logic of saying "no", for what we need to be prepared, even if we have not received formal training"

As the same teacher stated, the introduction of environmental education into the curriculum has posed several benefits, particularly relevant to low-income schools:

"As we incorporate environmental education across all subjects, we are able to substantially enhance school life, by promoting collective work among students in a respectful and harmonious environment"

The principal at Ciudad de Lyon School stated, "Today's curricular planning incorporates environmental topics across all subjects. Formal school hours are destined to "Environment" class on every level, from preschool to 8th grade" (Segovia, 2012).

For a school to achieve a successful transformation, greening design strategies need to have an educational purpose and be strongly integrated into the school curriculum. The school needs to have a cross-curricular approach to environmental education, where teachers are able to incorporate environmental education across every subject and discipline. If this happens the school will be able to drive and sustain a successful transformation. This system thinking approach to the curriculum is the most powerful means to develop holistic ecological literacy.

A key aspect of environmental education is experiential learning, and greening design strategies are a superior resource to deliver this kind of learning by allowing children to be directly involved on their creation and maintenance. Another important aspects is that greening strategies can be used as tools for outdoor learning where students can acquire the knowledge, skills, and perspectives that foster understanding of their fundamental connections to the world around them, and that will ultimately lead to environmental stewardship.

One of barriers encountered by these schools is that environmental education is still not regarded as an important area of development within educational policies as manifested in the fact that the national curriculum does not integrate environmental education as a subject or make any direct allusion to its application. To foster green school grounds and outdoor learning, it is necessary that authorities start advocating for it and demonstrating a strong commitment by rethinking educational policies. So far, most of the schools address environmental education in science class, but the larger goal is to integrate it transversally across all areas of study and encourage collaboration in the development of instructional resources and methods. There are several benefits that can be obtained from implementing environmental education, but one of the most significant aspects in disadvantaged contexts is that these types of initiatives can increase student engagement by fostering active participation in community projects that build connections between the school, its context and its people.

Develop teachers' competences

In all three case studies analyzed, teachers manifested that as a result of these new changes in the curriculum, their competences were also challenged. Teaching methods needed to be upgraded. Instructive resources for teachers were scarce by the time the school begun the greening process. Only recently, the ministry has provided booklets and guidelines for the pedagogical implementation of environmental education and delivered formal training programs. The history teacher described it as this:

"Most of our training has been self-taught. Formal training has been fairly low. So far, the main form of work is to put what we have learnt independently into our discussion sessions with other teachers to adapt the school curriculum. We are giving every class an environmental focus"

In his interview, the principal was also emphatic in stating they needed more support from the municipality:

"Teacher's training is an area we need to keep working on. We rely a lot self-instruction and self-training. The main reason for this is that the implementation of environmental curriculum has not made much progress at the government level, which has led teachers and schools to seek self-education on the topic and bring their learning back for planning new approaches on contents and methods. We definitely need more governmental support in this respect"

Despite governmental efforts such as the creation of the "Eco-Educators" network, teachers interviewed among the case studies stated that they still needed more support from authorities. One of the principals mentioned that while they were totally opened and willing to include environmental education in the school, they sometimes saw their efforts undermined when authorities do not seem to assign these matters a priority order among educational policies. According to Evergreen (2002), helping teachers become more comfortable and creative in an outdoor setting may be simply a matter of providing some training with outdoor educators or local specialists from conservation authorities, naturalists groups or other similar groups. It is urgent then that educational authorities find ways to address teachers' concerns by showing a stronger commitment to green school grounds and environmental education.

D. Creating Partnerships

It was observed in the schools analyzed that there were some actions conducive to create partnerships with the broader community, aspect that in turn, demonstrated to be fundamental in achieving a successful transformation. Engaging stakeholders beyond the school community can be a great asset for schools in vulnerable contexts.

It was observed within the models that actions filtered in this category happened later within the greening process, once the school community including administrators, teachers, students, parents and immediate neighbors were already engaged on the process. Thus, the creation of partnerships can be seen as an advanced phase within the participatory process, where the school community works to attract key players beyond its walls. In this relationship, principals and teachers at the three schools recognized a new role of the school as an agent of social and ecological improvement.

Following, figures 59, 60 and 61, show the actions filtered within this category. Then, the synthesis and analysis of these actions is explained.



Fig. 59. Actions that create partnerships at Salvador Allende School



Fig. 60. Actions that create partnerships at Ciudad de Lyon School



Fig. 61. Actions that create partnerships at Paul Harris School

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Reach out to the broader community

In the case studies schools, the creation of partnerships with external agents such as private companies or research groups was extremely beneficial regarding funding and technical support, and helped the schools move their projects forward in many cases. Reaching out beyond the school community for everything from funds to materials to specialized advice will help achieve goals while engaging others in the joy of helping to realize a good idea. For the schools analyzed, authorities played a crucial role by linking schools with the adequate collaborators in order to materialize change.

A central aspect in the path to become an environmental school is the fact that all three case studies were able to shape transformation by gradually attracting external agents, such as private companies, universities and other groups. As more people became engaged, the school became stronger and closer to achieving its environmental goals. Thus, the constitution of networks is essential in materializing change. Furthermore, there are benefits at both ends; the school needs these networks to achieve progress, but at the same time, a school making these connection with the local and wider community can enhance social cohesion and act as a catalyst to create well-being (Wheeler, 2010).

Disseminate the idea

In order to generate partnerships it is necessary to communicate widely. According to the principal at Salvador Allende School, a fundamental aspect in creating effective networks is to disseminate these ideas among as many agents as possible. He stated that as pioneers of school greening, Salvador Allende and Ciudad de Lyon School have serve as precedents for other schools and have been invited to talk about their experience to many other school stakeholders aspiring to start a similar process, including teachers from the Eco-educators network, other public schools in and outside the district, and many community representatives from social organizations, such as neighborhood council, sporting clubs and healthcare centers. During 2010 the school was selected as the venue to open the school year for green schools, as well as the award ceremony for the "Environmental Tales" contest, organized by the ministry of environment at a national level. According to the principal at Salvador Allende School, as they disseminate information about their projects and the ideas behind them, they become noted and recognized and thus making it easier to attract private companies and other actors for all kinds of support. Children are a fundamental agent in this task, they can do informational flyers, posters,

newsletters, organize environmental fairs, lectures and many other activities that will be helpful in seeking in-kind donations and volunteer assistance. Additionally, interaction with the larger community is valuable experience for students and will serve to strengthen their sense of ownership in the project as community involvement grows (Grant and Littlejohn, 2001, p16).

5.2 GREENING DESIGN OUTCOMES

When actions within the categories described above combine, they create the foundation for greening design outcomes to emerge. It has been highlighted that in order to sustain these achievements it is particularly important to include children and the school community within every stage of the greening process to create a sense of ownership and willingness to look after them.

Pivnik (2001) states that gardening for example, gives students a feeling of accomplishment. When they see the first shoots poke through the ground and the first buds appear and later when they share their harvest with family and friends, they have a feeling of exhilaration and pride. Experiencing their handiwork, decisions, and hard work contributes to a feeling of self-worth, the value of which cannot be underestimated in developing an environmental ethic in children. The principal at Ciudad de Lyon School manifested this as well, explaining that seeing the first carrots and tomatoes appear in the food garden was a huge motivation for children and parents to continue working and maintaining the garden. This principal also showed that in their case it was important to start with a small project such as the food garden that could allow them to see results in a short period of time and serve as a stimulus for subsequent initiatives.

Following, figures 62, 63 and 64, show the design outcomes achieved by the three schools.



Fig. 62. Greening design outcomes at Salvador Allende School



Fig. 63. Greening design outcomes at Ciudad de Lyon School



Fig. 64. Greening design outcomes at Paul Harris School

6. CREATING POSITIVE CHANGE: FRAMEWORK FOR PLANNING GREEN DESIGN OUTCOMES IN LOW-INCOME SCHOOLS IN CHILE

The previous analysis was done to create a framework for planning a greening process in lowincome schools in Chile that can guide school administrators and policymakers in their related efforts. In this goal, three case studies were analyzed to identify common aspects between them, relevant in achieving a successful transformation of the school grounds. Relevant actions across the three case studies could be grouped in four categories; building engagement, aligning management, integrating curriculum, and creating partnerships. The analysis also demonstrated that to start a greening process it is necessary to create engagement and awareness among the entire school community, including administrators, teachers, students, parents, neighbors, and also among the broader community of stakeholders. While there was usually one person in these schools acting as a leader and orchestrating the whole process, it was also evident that for this spark to be sustained, a wide variety of stakeholders needed to be involved for the project to succeed.

The analysis also suggests that to create and maintain effectively the greening design strategies, these need to be born with an educational purpose and maintained by making strong connections to the curriculum, aspects that in turn need to be incorporated since the early planning of the process. This is the primary way schools will assure their use and avoid a possible neglect. Importantly, in order to do this, teachers competences need to be enhanced so that they can confidently use of the school grounds for outdoor learning. Given this point it is necessary to highlight the role of educational authorities in developing and promoting appropriate policies for schools seeking support in their educational practices and methods.

Schools reaching out beyond the school community to create partnerships proved to be fundamental in achieving greening projects, particularly, more complex ones that require high technical and financial support. The creation of partnerships starts when the school adopts a participatory process and embrace policies that are as inclusive as possible.

Finally, those aspects pertaining to the management of the school also needed to be aligned to conduct a successful transformation. Importantly, there were some actions directed at instilling an underlying environmental ethos to the school, such as the development of a mission statement explicitly declaring an environmental concern and the school participation in government-related initiatives, such as the environmental certification program for schools and a teachers training

network. Recommendations on the specific steps for the greening process are encompassed under this category; creation of committees, assessment of the school grounds to define needs and priorities, study of potential funding sources for greening projects, development of a detailed design plan, implementation and maintenance of the project. Although it might appear that these steps follow a logical order, it is also necessary to consider that at times these may overlap, occur simultaneously or even happen out of order. This is because these stages are not necessarily discrete and each school's process is unique. Moreover, it is important to stress out the role of authorities in the need to provide appropriate policies for schools seeking to conduct greening interventions in their school grounds.

When actions combine to achieve these major goals, they are simultaneously laying the ground to accomplish and sustain greening design outcomes. The analysis highlighted the importance of including children and the school community within every stage of the greening process, and particularly during the planning phase that will result in the development of a sense of ownership for the projects. When tangible outcomes are seen, students develop a feeling of accomplishment and pride for what they have helped in creating. The same is true for teachers, the more involved they are in the planning, the more likely they are to use the school grounds as a teaching tool. It was observed that a crucial aspect in the maintenance of greening interventions is to permanently think of ways to connect them with the school curriculum and maximize their educational value.

One of the main barriers these schools encountered was the lack of supportive policies for school ground greening and environmental education. Such support would allow schools to assess the appropriateness of the greening strategies to serve in their specific needs and goals. For example, one of the school analyzed expressed that the green roof has been not adequately designed for small children and thus, was not serving any educational purpose. More preparation and training would allow teachers to identify and conduct efforts that are pertinent and contextually relevant, and address their real educational needs.

It was also observed that none of these schools were concerned with the evaluation stage of the projects, which has been argued to be important to avoid a potential future neglect. Besides an ongoing maintenance program, schools can implement evaluative practices at least once a year to assess current uses, purposes and possible adaptations that might be beneficial. This would be an effective strategy to avoid neglected projects and having to update or change them unpredictably.

The greening process at one of these schools was particularly fast. The principal stated that the construction of the school garden started only after two months of planning and after a period of two years they achieved the highest level possible in the certification program. One of the reasons for this is that this principal had a greening experience on a previous school and could lead the process in a more knowledgeable way. However, this is not usually the case. It is recommended that the planning process should take at least a year, and that schools need to see it as a vital part of the project and not a separate exercise. Coffey (2006) states that schools usually take from one to two years to plan a greening program because it takes time to gather all the relevant information that is required for proper planning and coordinate related activities, such as assigning responsibilities, acquiring funding, designing and developing relevant maintenance policies. Still, it is important to note here that most of the existing literature on greening schools focuses in the implementation of one specific project, and what these schools were trying to achieve was an overall transformation, shifting the underlying philosophy of the school into an environmental one. As such, some of the actions such as the mission statement, certification, teachers' training and curriculum adaptations, were targeted to build momentum and garner quick support from the school community. Nevertheless, it might be even more relevant in these cases to address good planning and find the meaningfulness of this stage.

These findings are synthetized in the proposed framework.

STAKEHOLDERS



Fig. 65. Framework for planning greening process in low-income schools in Chile

7. CONCLUSION

A direct relationship exists between the qualities of the physical space of the school and children's overall development and learning. The design of the physical environment can foster or hinder opportunities for learning. Particularly, outdoor school settings can offer almost limitless options for play, exploration and observation if crafted with nature and the design of diverse and stimuli-rich features that foster children's overall development. In contrast, limited exposure to nature may have negative consequences for children. The design of the physical environment transmits a powerful message to children about the importance we place on their care and education. If the message is conveyed that children are low priority, children may eventually reflect that message in lower self-esteem, lower achievement levels, or lower participation in school or community affairs (Maxwell, 2003; Maxwell & Chmielewski, 2008). Thus, the school and classroom physical environment is crucial, not only in communicating to students the school's values, but also the larger society's values.

Addressing these aspects is especially urgent in more vulnerable contexts, where the physical space is consistently overlooked due to a lack of resources, and where existing resources are used in favor of other educational needs. Here, the neglect of the physical space might be causing unsuspected damage, for which it is extremely necessary that architects and other design professionals advocate for improved conditions that allow low-income children to thrive and succeed. The goal of this thesis is to provide a framework for school administrators in support of the planning of greening design strategies in low-income schools in Chile. The results also complement environmental policies intended to greening school grounds, identifying relevant agents in this process. A case study analysis based on actual greening practices of low-income schools in Chile has not been undertaken before and, as such, the work constitutes an important contribution to inform such policies.

The purposeful introduction of natural elements into the school grounds is a cost-effective method to improve the physical environment of the school while fostering the development and learning outcomes for children. Among one of the most important outcomes of a greening intervention is that it allows children to become ecologically literate and acquire skills related to democracy, participation, and citizenship during the process of greening, becoming responsible and reflexive adults, concerned of their local and broader context. Moreover, the opportunities for children in disadvantaged contexts. Nature can moderate the impact of stressful life events on the

psychological well-being of children, increase levels of cognitive functioning, promote healthy development, restore mental fatigue and increase feelings of self-esteem and mood. Furthermore, the process of transforming school grounds with children allows for a sense of appropriation, reducing anti-social behavior such as violence, bullying, vandalism and littering. Involving teachers in the process is also extremely relevant. The more involved they are, the more ownership they feel, and thus, the more they will use the physical setting of the school as a teaching tool, making relevant connections to the curriculum. In the same way, participation is a means by which to empower the broader community to take action within the school, promoting collective work and community cohesion necessary to successfully sustain changes made to the school's physical environment.

The analysis suggests that leading a successful transformation requires four main goals: building engagement, integrating curriculum, creating partnerships, and aligning management. Two of the most relevant aspects to plan, use, and maintain greening design strategies effectively is that they are born through a participatory process involving children, teachers, parents, neighbors, administrators, and the broader community of stakeholders. Also, they need to be strongly connected to the curriculum and provide learning opportunities that are interdisciplinary. It is argued that in order to achieve a successful school grounds transformation, educational authorities needs to provide a clear and strong message by delivering supportive policies for all the stages of the greening process, that will in turn, aid in making these practices become mainstream.

The improvement of the physical environment of the schools delivers a message to children that they are been cared for and that there is a hidden curriculum embedded in every school building and school ground. Greening interventions provide educators with a valuable educational tool that can help them enhance the quality of the learning experience, a particularly urgent undertaking to serve children in more disadvantaged contexts.

REFERENCES

- Adams, E. (1993). School's Out!: New Initiatives for British School Grounds. *Children, Youth and Environments*, *10*(2), 180–191.
- Ahrentzen, S. G., Jue, G., Skorpanich, M., & Evans, G. W. (1982). School Environments and Stress. In *Environmental Stress*. Cambridge, MA: Cambridge University Press.
- Arbogast, K. L., Kane, B. C. P., Kirwan, J. L., & Hertel, B. R. (2009). Vegetation and outdoor recess time at elementary schools: What are the connections? *Journal of Environmental Psychology*, *29*(4), 450–456. doi:10.1016/j.jenvp.2009.03.002
- Barbour, A. C. (1999). The Impact of Playground Design on the Play Behaviors of Children with Different Levels of Physical Competence. *Early Childhood Research Quarterly*, *14*(1), 75–98.
- Berlyne, D. E. (1960). Conflict, arousal, and curiosity. New York: McGraw-Hill.
- Bixler, R. D., Floyd, M. F., & Hammitt, W. E. (2002). Environmental Socialization: Quantitative Tests of the Childhood Play Hypothesis. *Environment and Behavior*, *34*(6), 795–818. doi:10.1177/001391602237248
- Boldemann, C., Blennow, M., Dal, H., Mårtensson, F., Raustorp, A., Yuen, K., & Wester, U.
 (2006). Impact of preschool environment upon children's physical activity and sun exposure. *Preventive Medicine*, 42(4), 301–308. doi:10.1016/j.ypmed.2005.12.006
- Bronfenbrenner, U. (1974). Developmental Research, Public Policy, and the Ecology of Childhood. *Child Development*, *45*(1), 1. doi:10.2307/1127743
- Cheng, J. C.-H., & Monroe, M. C. (2012). Connection to Nature: Children's Affective Attitude Toward Nature. *Environment and Behavior*, *44*(1), 31–49. doi:10.1177/0013916510385082
- Cheskey, E. (2001). How Schoolyards Inlfuence Behavior: What Common Sense and Research Tell Us. In *Greening School Grounds: Creating Habitats for Learning* (pp. 5–8). Toronto, ON: New Society Publishers.

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- Clark, H. (2002). Building Education: The Role of the Physical Environment in Enhancing Teaching and Research. Issues in Practice. Retrieved from http://eprints.ioe.ac.uk/5487
- Coffey, A. (2006). A Guide to Transforming School Grounds. Ottawa, ON: Canadian Biodiversity Institute.
- Collins, B. L. (1975). Windows and People: A Literature Survey: Psychological Reaction to Environments With and Without Windows. Washington, DC: National Bureau of Standards Building Science Series N°70. Retrieved from http://babel.hathitrust.org/cgi/pt?id=mdp.39015086577528;view=1up;seq=1
- Davis, S. F., & Buskist, W. (2008). 21st Century Psychology: A Reference Handbook. California, United States: SAGE Publications, Inc. Retrieved from http://knowledge.sagepub.com/view/psychology/SAGE.xml
- DCSF. (2008). *Framework for Sustainable schools UK*. UK: DCSF Publications, retrieved from www.teachernet.gov.uk/publications.
- Demetriou, C. (n.d.). The Montessori approach and its architecture by Christina Demetriou I Sustainable Design Unit - Academia.edu. Retrieved September 23, 2014, from http://www.academia.edu/2018126/The_Montessori_approach_and_its_architecture_by_ Christina_Demetriou
- Dewey, J. (1938). Experience and Education. New York, NY: New York: Macmillan.
- Dewey, J. (1980). Art as Experience. New York: Berkley Publishing Group.
- Dowdell, K., Gray, T., & Malone, K. (2011). Nature and its Influence on Children's Outdoor Play. *Australian Journal of Outdoor Education*, *15*(2), 24–35.

Durán-Narucki, V. (2008). School building condition, school attendance, and academic achievement in New York City public schools: A mediation model. *Journal of Environmental Psychology*, *28*(3), 278–286. doi:10.1016/j.jenvp.2008.02.008

Dyment, J. (2004). "At That Age, You Just Accept What You Have... You Never Question Things": Student Participation in School Ground Greening. *Children Youth and Environments*, *14*(1), 130–152. Dyment, J. (2005). Green School Grounds as Sites for Outdoor Learning: Barriers and Opportunities. *International Research in Geographical and Environmental Education*, *14*(1), 28–45. doi:10.1080/09500790508668328

- Dyment, J. (2008). Student Participation in School Ground Greening Initiatives in Canada: Reflections on Research Design Decisions and Key Findings. In *Participation and Learning* (pp. 241–255). Springer. Retrieved from http://link.springer.com/chapter/10.1007/978-1-4020-6416-6_15
- Dyment, J. E., & Bell, A. C. (2007). Grounds for movement: green school grounds as sites for promoting physical activity. *Health Education Research*, *23*(6), 952–962. doi:10.1093/her/cym059
- Dyment, J. E., & Reid, A. (2005). Breaking new ground? Reflections on greening school grounds as sites of ecological, pedagogical and social transformation. *Canadian Journal of Environmental Education*, *10*. Retrieved from http://eprints.utas.edu.au/1658/
- Earthman, G., & Lemasters, L. (1996). Review of Research on the Relationship between School Buildings, Student Achievement, and Student Behavior. *Paper Presented at the Annual Meeting of the Council of Educational Facility Planners, International.* Retrieved from http://eric.ed.gov/?id=ED416666
- Evans, G. W. (2004). The Environment of Childhood Poverty. *American Psychologist*, *59*(2), 77– 92. doi:10.1037/0003-066X.59.2.77
- Evans, G. W. (2006). Child Development and the Physical Environment. *Annual Review of Psychology*, *57*(1), 423–451. doi:10.1146/annurev.psych.57.102904.190057
- Evans, G. W., Saegert, S., & Harris, R. (2001). Residential Density and Psychological Health among Children in Low-Income Families. *Environment and Behavior*, *33*(2), 165–180. doi:10.1177/00139160121972936
- Evergreen. (2002a). *School ground greening: a policy and planning guidebook*. Toronto: Evergreen.

- Evergreen. (2002b). All Hands in the Dirt: A Guide to Designing and Creating Natural School Grounds. Canada: Evergreen.
- Ewing, R. (2005). Can the physical environment determine physical activity levels? *Exercise and Sport Sciences Reviews*, *33*(2), 69–75.
- Faber Taylor, A., & Kuo, F. E. (2006). Is contact with nature important for healthy child development? State of the evidence. In *Children and Their Environments: Learning, Using and Designing Spaces* (pp. 124–140). Cambridge, UK: Cambridge University Press.
- Fjørtoft, I. (2001). The natural environment as a playground for children: The impact of outdoor play activities in pre-primary school children. *Early Childhood Education Journal*, *29*(2), 111–117.
- Fjørtoft, I., & Sageie, J. (2000). The natural environment as a playground for children: Landscape description and analyses of a natural playscape. *Landscape and Urban Planning*, 48(1), 83–97.
- Freeman, C., & Tranter, P. J. (2011). *Children and Their Urban Environments: Changing Worlds*. Washington, DC: Earthscan.
- García Huidobro, J. E., & Concha, C. (2009). Jornada escolar completa: la experiencia chilena. Retrieved from Http://basica. Sep. Gob.

Mx/tiempocompleto/memorias/reunionnac/conferencias/carlos_conc Ha_chile. Pdf. Retrieved from http://basica.sep.gob.mx/tiempocompleto/pdf/CarlosConcha Jornada.pdf

- Getzels, J. W. (1974). Images of the Classroom and Visions of the Learner. *The School Review*, *82*(4), 527–540. doi:10.2307/1084001
- Gifford, R. (1987). *Environmental Psychology: Principles and Practice*. Boston, MA: Allyn and Bacon, Inc.
- Han, K.-T. (2009). Influence of Limitedly Visible Leafy Indoor Plants on the Psychology, Behavior, and Health of Students at a Junior High School in Taiwan. *Environment and Behavior*, *41*(5), 658–692. doi:10.1177/0013916508314476

- Han, K.-T. (2010). An Exploration of Relationships Among the Responses to Natural Scenes:
 Scenic Beauty, Preference, and Restoration. *Environment and Behavior*, *42*(2), 243–270.
 doi:10.1177/0013916509333875
- Hart, C. H., & Sheehan, R. (1986). Preschoolers' Play Behavior in Outdoor Environments: Effects of Traditional and Contemporary Playgrounds. *American Educational Research Journal*, 23(4), 668–678. doi:10.3102/00028312023004668
- Hartig, T., Mang, M., & Evans, G. W. (1991). Restorative Effects of Natural Environment Experiences. *Environment and Behavior*, *23*(1), 3–26. doi:10.1177/0013916591231001
- Hart, R. (2002). Containing children: some lessons on planning for play from New York City. *Environment and Urbanization*, *14*(2), 135–148. doi:10.1177/095624780201400211
- Hart, R. A. (1997). *Children's participation: The theory and practice of involving young citizens in community development and environmental care*. Unicef, London, UK: Earthscan.
- Hathaway, W. E. (1995). Effects of school lighting on physical development and school performance. *The Journal of Educational Research*, *88*(4), 228–242.
- Hayward, G. D., Rothenberg, M., & Beasley, R. R. (1974). Children's Play and Urban Playground
 Environments: A Comparison of Traditional, Contemporary, and Adventure Playground
 Types. *Environment and Behavior*, *6*(2), 131–168. doi:10.1177/001391657400600201
- Hofferth, S. L., & Sandberg. (2000). Changes in American Children's Time, 1981–1997. In
 Children at the Millenium: Where Have We Come From, Where Are We Going?. Oxford,
 England: Elsevier Science.
- Kaplan, S. (1983). A Model of Person-Environment Compatibility. *Environment and Behavior*, *15*(3), 311–332. doi:10.1177/0013916583153003
- Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, *15*(3), 169–182.
- Kellert, S. R. (2005). *Building for Life: Designing and Understanding the Human-Nature Connection*. Washington, DC: Island Press.

- Kuo, F. E. (2001). Coping with Poverty: Impacts of Environment and Attention in the Inner City. *Environment and Behavior*, *33*(1), 5–34. doi:10.1177/00139160121972846
- Kuo, F. E., & Sullivan, W. C. (2001a). Aggression and Violence in the Inner City: Effects of Environment via Mental Fatigue. *Environment and Behavior*, *33*(4), 543–571.
 doi:10.1177/00139160121973124
- Kuo, F. E., & Sullivan, W. C. (2001b). Environment and Crime in the Inner City: Does Vegetation Reduce Crime? *Environment and Behavior*, *33*(3), 343–367.
 doi:10.1177/0013916501333002
- Lachowycz, K., & Jones, A. P. (2011). Greenspace and obesity: a systematic review of the evidence: Greenspace and obesity review. *Obesity Reviews*, *12*(5), e183–e189. doi:10.1111/j.1467-789X.2010.00827.x
- Largo-Wight, E. (2011). Cultivating healthy places and communities: evidenced-based nature contact recommendations. *International Journal of Environmental Health Research*, *21*(1), 41–61. doi:10.1080/09603123.2010.499452
- Lieberman, G. A., & Hoody, L. L. (1998). Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning. *Ponway, Ca: Science Wizards*.
- Louv, R. (2008). Last Child in the Woods: Saving our Children from Nature-deficit Disorder. Chapel Hill, NC: Algonquin Books of Chapel Hill.
- Lowenfeld, V. (1982). *Creative and mental growth* (7th ed. --.). New York: London: Macmillan; Collier Macmillan.
- Malone, K., & Tranter, P. (2003a). Children's Environmental Learning and the Use, Design and Management of Schoolgrounds. *Children Youth and Environments*, *13*(2), 87–137.
- Malone, K., & Tranter, P. J. (2003b). School Grounds as Sites for Learning: Making the most of environmental opportunities. *Environmental Education Research*, *9*(3), 283–303. doi:10.1080/13504620303459

Maxwell, L. E. (2003). Home and School Density Effects on Elementary School Children: The Role of Spatial Density. *Environment & Behavior*, *35*(4), 566–578.
 doi:10.1177/0013916503035004007

- Maxwell, L. E. (2007). Competency in Child Care Settings: The Role of the Physical Environment. *Environment and Behavior*, *39*(2), 229–245. doi:10.1177/0013916506289976
- Maxwell, L. E., & Chmielewski, E. J. (2008). Environmental personalization and elementary school children's self-esteem. *Journal of Environmental Psychology*, *28*(2), 143–153. doi:10.1016/j.jenvp.2007.10.009
- McGuffey, C. (1982). "Facilities." In *Improving educational standards and productivity* (pp. 237–288). Berkeley, CA: McCutchan Publishing Corp.
- MINEDUC, 2012, Research Centre, Planning and Budget Division, Ministry of Education of Chile, retrieved from http://centroestudios.mineduc.cl/index.php?t=96&i=2&cc=2044&tm=2 on January 2014.
- Moore, R. (1995). Children Gardening: First Steps Towards a Sustainable Future. *Children Youth* and Environments, 12(2), 222–232.
- Moore, R. C. (1996). Outdoor Settings for Playing and Learning: Designing School Grounds to Meet the Needs of the Whole Child and the Whole Curriculum. In *The Complete Playground Book* (pp. 97–121). Syracuse, NY: Syracuse University Press.
- Moore, R. C., & Wong, H. H. (1997). *The Life History of an Environmental Schoolyard: Creating Environments for Rediscovering Nature's Way of Teaching*. Berkeley, CA: MIG Communications.
- n.a. (n.d.). Progressive Education Philosophical Foundations, Pedagogical Progressivism,
 Administrative Progressivism, Life-Adjustment Progressivism. Retrieved September 23,
 2014, from http://education.stateuniversity.com/pages/2336/Progressive-Education.html
- Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2009). The Nature Relatedness Scale: Linking Individuals' Connection With Nature to Environmental Concern and Behavior. *Environment and Behavior*, 41(5), 715–740. doi:10.1177/0013916508318748

- Oborne, D. J., & Gruneberg, M. (1983). *The Physical Environment at Work*. New York, NY: J. Willey.
- OECD. (2004). Reviews of National Policies for Education: Chile.
- Orr, D. W. (1992). *Ecological Literacy: Education and the Transition to a Postmodern World*. Albany: State University of New York Press.
- Orr, D. W. (1993). Architecture as Pedagogy. Society for Conservation Biology, 7(2), 226–228.
- Ozer, E. J. (2007). The Effects of School Gardens on Students and Schools: Conceptualization and Considerations for Maximizing Healthy Development. *Health Education & Behavior*, *34*(6), 846–863. doi:10.1177/1090198106289002
- Peters, S. (1971). Open Education the American British Infant Schools. *Gifted Child Quarterly*, *15*(3), 229–232. doi:10.1177/001698627101500312
- Pivnick, J. (2001). Sowing a School Garden: Reaping an Environmental Ethic. In *Greening School Grounds: Creating Habitats for Learning* (pp. 12–14). Toronto, ON: New Society Publishers.
- Pretty, J., Peacock, J., Sellens, M., & Griffin, M. (2005). The mental and physical health outcomes of green exercise. *International Journal of Environmental Health Research*, *15*(5), 319– 337. doi:10.1080/09603120500155963
- Provenzo, E. F., & Renaud, J. (2009). *Encyclopedia of the Social and Cultural Foundations of Education*. SAGE.
- Pyle, R. M. (2002). Eden in a Vancant Lot: Special Places, Species, and Kids in the Neighborhood of Life. In *Children and Nature: psychological, sociocultural, and evolutionary investigations* (pp. 305–327). Cambrigde, MA: The MIT Press.
- Raczynski, D., & Muñoz, G. (2007). *Reforma educacional chilena: el difícil equilibrio entre la macro y la micropolítica*. CIEPLAN Santiago, Chile. Retrieved from http://educahoy.cl/wp/wp-content/uploads/2010/10/dagmar-reforma.pdf
- Rivkin, M. (1997). The schoolyard habitat movement: What it is and why children need it. *Early Childhood Education Journal*, *25*(1), 61–66.

- Rivlin, L. G., & Weinstein, C. S. (1984). Educational Issues, School Settings, and Environmental Psychology. *Journal of Environmental Psychology*, *4*, 347–364.
- Sanders, S. G., & Wren, J. P. (1976). The Open-Space School-How Effective? *The Elementary School Journal*, *77*(1), 57–62. doi:10.2307/1000438
- Sanoff, H. (2009). Schools Designed with Community Participation. In Schools for the Future: Design Proposals from Architectural Psychology (pp. 123–140). Cambrigde, MA: Hogrefe.
- Shamsuddin, S., Bahauddin, H., & Aziz, N. A. (2012). Relationship between the Outdoor Physical Environment and Student's Social Behaviour in Urban Secondary School. *Procedia -Social and Behavioral Sciences*, *50*, 148–160. doi:10.1016/j.sbspro.2012.08.023
- Social, B. (2006). La crisis educativa en Chile. *Propuesta Al Debate Ciudadano*. Retrieved from http://opech.cl/bibliografico/calidad_equidad/Documento_Bloque_Social_Noviembre.pdf
- Sotomayor, F. (n.d.). Revista EMB Construcción Infraestructura Educacional: Un aspecto clave para el desarrollo nacional. Retrieved September 23, 2014, from http://www.emb.cl/construccion/articulo.mvc?xid=324&edi=14&xit=infraestructuraeducacional-un-aspecto-clave-para-el-desarrollo-nacional
- Staempfli, M. B. (2008). Reintroducing Adventure Into Children's Outdoor Play Environments. *Environment and Behavior*, *41*(2), 268–280. doi:10.1177/0013916508315000
- Stedman, R. C. (2002). Toward a Social Psychology of Place: Predicting Behavior from Place-Based Cognitions, Attitude, and Identity. *Environment and Behavior*, *34*(5), 561–581. doi:10.1177/0013916502034005001
- Steg, L., van den Berg, A. E., & de Groot, J. I. M. (2013). Environmental Psychology: An Introduction. Chichester, U. K.: Wiley Blackwell / British Psychology Society. Retrieved from http://opus.bath.ac.uk/37619/
- Stewart, I. T., Purner, E. K., & Guzmán, P. D. (2013). Socioeconomic Disparities in the Provision of School Gardens in Santa Clara County, California. *Children, Youth and Environments*, 23(2), 127–153. doi:10.7721/chilyoutenvi.23.2.0127

- Stowell, S. (2001). Maximizing Participation: Go Team! In *Greening School Grounds: Creating Habitats for Learning* (pp. 16–18). Toronto, ON: New Society Publishers.
- Strife, S., & Downey, L. (2009). Childhood Development and Access to Nature: A New Direction for Environmental Inequality Research. *Organization & Environment*, *22*(1), 99–122. doi:10.1177/1086026609333340
- Strong-Wilson, T., & Ellis, J. (2007). Children and Place: Reggio Emilia's Environment As Third Teacher. *Theory Into Practice*, *46*(1), 40–47. doi:10.1207/s15430421tip4601_6
- Sturm, R. (2005). Childhood obesity—what we can learn from existing data on societal trends. *Prev Chronic Dis*, *2*(1), A12.
- Sugiyama, T., Okely, A. D., Masters, J. M., & Moore, G. T. (2012). Attributes of Child Care
 Centers and Outdoor Play Areas Associated With Preschoolers' Physical Activity and
 Sedentary Behavior. *Environment and Behavior*, 44(3), 334–349.
 doi:10.1177/0013916510393276
- Sutton, S. E. (1985). *Learning through the built environment: An ecological approach to child development.* New York: Irvington Publishers, Inc.
- Tai, L., Taylor Haque, M., McLellan, G., & Jordan Knight, E. (2006). Designing Outdoor Environments for Children: Landscaping Schoolyards, Gardens, and Playgrounds. McGraw-Hill.
- Taylor, A. F., Kuo, F. E., & Sullivan, W. C. (2001). Coping with add: The Surprising Connection to Green Play Settings. *Environment and Behavior*, *33*(1), 54–77. doi:10.1177/00139160121972864
- Taylor, A. F., Kuo, F. E., & Sullivan, W. C. (2002). Views of Nature and Self-Discipline: Evidence From Inner City Children. *Journal of Environmental Psychology*, *22*(1-2), 49–63. doi:10.1006/jevp.2001.0241
- Taylor, A. F., Wiley, A., Kuo, F. E., & Sullivan, W. C. (1998). Growing Up in the Inner City: Green Spaces as Places to Grow. *Environment and Behavior*, *30*(1), 3–27.
 doi:10.1177/0013916598301001

- Titman, W. (1994). *Special Places; Special People: The Hidden Curriculum of School Grounds.* London, UK: WWF UK.
- Valenzuela, J. P. (2008). Evolución de la Segregación Económica de los Estudiantes Chilenos y su Relación con el Financiamiento Compartido. Fondo de Investigacón Y Desarrollo En Educación, Departamento de Estudios Y Desarrollo, División de Planificación Y Presupuesto, Ministerio de Educación.
- Vygotskiĭ, L. S. (1986). *Thought and language* (Translation newly rev. and edited.). Cambridge, Mass: MIT Press.
- Walberg, H. J., & Thomas, S. C. (1972). Open Education: An Operational Definition and
 Validation in Great Britain and United States. *American Educational Research Journal*,
 9(2), 197–208. doi:10.3102/00028312009002197
- Walden, R. (2009). *Schools for the Future: Design Proposals from Architectural Psychology*. Cambrigde, MA: Hogrefe.
- Weinstein, C. S. (1979a). The Physical Environment of the School: A Review of the Research. *Review of Educational Research*, *49*(4), 577–610. doi:10.3102/00346543049004577
- Weinstein, C. S., & David, T. G. (1987). *Spaces for Children: The Built Environment and Child Development*. New York, NY: Plenum Press.
- Weinstein, C. S., & Pinciotti, P. (1988). Changing a Schoolyard: Intentions, Design Decisions, and Behavioral Outcomes. *Environment and Behavior*, *20*(3), 345–371.
 doi:10.1177/0013916588203005

Wells, N. M. (2000). At Home with Nature: Effects of "Greenness" on Children's Cognitive Functioning. *Environment and Behavior*, *32*(6), 775–795.
doi:10.1177/00139160021972793

- Wells, N. M., & Evans, G. W. (2003). Nearby Nature: A Buffer of Life Stress among Rural Children. *Environment & Behavior*, *35*(3), 311–330. doi:10.1177/0013916503035003001
- Wells, N. M., & Lekies, K. S. (2006). Nature and the life course: Pathways from childhood nature experiences to adult environmentalism. *Children Youth and Environments*, *16*(1), 1–24.

- Wener, R. E. (2012). *The Environmental Psychology of Prisons and Jails : Creating Humane Spaces in Secure Settings*. Cambridge: Cambridge University Press.
- Wheeler, A. (2012). Am I an Eco-Warrior Now? Place, Wellbeing and the Pedagogies of
 Connection. In *Wellbeing and Place* (Sarah Atkinson, Sara Fuller, Joe Painter., pp. 105–121). England: Ashgate.
- Whipple, S. S., Evans, G. W., Barry, R. L., & Maxwell, L. E. (2010). An ecological perspective on cumulative school and neighborhood risk factors related to achievement. *Journal of Applied Developmental Psychology*, *31*(6), 422–427. doi:10.1016/j.appdev.2010.07.002

APPENDIX A: LETTER OF CONTACT TO MUNICIPALITIES AND SCHOOLS

A1. E-mail to the Municipality of El Bosque

November 13th 2012

Dear Susana, Department of Health and Environmental Education, Municipality of "El Bosque",

I introduce myself, my name is María José Valdebenito, master's student in architecture from the University of British Columbia in Vancouver, Canada. I'm an architect from the University of Chile, graduated six years ago. I got your email contact through the information available on the website of the Municipality. Before coming to study in Canada I was working at the University of Chile in the research center "IDIEM", dependant of the Faculty of Engineering, where I had the opportunity to work on various projects related to the improvement of educational infrastructure in our country.

I am writing today because I am doing a research on the incorporation of environmental design strategies in disadvantaged schools in Chile. During my program I have been able to study several issues related to environmental design in schools in the developed world. My intention is to have an idea of what is being currently done in schools in developed countries, but most importantly, I need to understand what are the actual practices of schools in Chile, in order to have a clear vision of local values and needs, specially in low-income communities. My biggest goal is to provide practical guidance and support to these schools through the introduction of natural elements in the school physical context, helping to maximize the educational process of students and teachers.

That is why I write you today, hoping to visit some schools in your community. "El Bosque" district has a special appeal to me because of the active environmental plan administered by the Municipality with the community. My intention is to define and select some schools as case studies with your help if possible and then visit them to interview the principal and teachers about their environmental experiences, and also take some pictures of the green design strategies that are underway in these schools.

The result of my research will be a written thesis, which copy will be delivered in digital form to all schools that have cooperated with the investigation.

I hope above all that my project is of your interest and can count with your support to coordinate a visit to some of the schools in your district.

I remain attentive to your comments and I thank you in advance,

Best regards,

María José Valdebenito Architect, University of Chile LEED AP BD+C M.A.S.A. Candidate University of British Columbia Vancouver, Canada Cel: +1 7788928070

November 13th 2012

To whom it may concern, Department of Environmental Education, Municipalility of Nuñoa,

I introduce myself, my name is María José Valdebenito, master's student in architecture from the University of British Columbia in Vancouver, Canada. I'm an architect from the University of Chile, graduated six years ago. Before coming to study in Canada I was working at the University of Chile in "IDIEM" research center, dependant of the Faculty of Engineering, where I had the opportunity to work on various projects related to the improvement of educational infrastructure in our country.

I am writing to the municipality because my research is focused on the incorporation of environmental design strategies in disadvantaged schools in Chile. During my program I have been able to study several issues related to environmental design schools in the developed world, however, most important is to understand the actual practices that are being implemented in schools in Chile, in order to have a clear view of the values and local needs, especially in lowincome communities. My biggest goal is to provide practical guidance and support to these schools through the incorporation of natural elements in the school context, helping to maximize the educational process of students and teachers.

My intention is to visit some schools in your district, as schools in "Nuñoa" could constitute a very interesting case study for my research, particularly because I am aware that some schools in the district are already incorporating green design practices. My goal is to define some schools as case studies in the district and then visit them to interview the principals and teachers about their environmental experiences, and also take some pictures of the strategies that are underway in these schools.

The result of my research will be a written thesis, which copy will be delivered in digital form to all schools that have cooperated with the investigation.

I hope above all that my project is of your interest and can count with your support to coordinate a visit to some of the schools in your district.

I remain attentive to your comments and I thank you in advance,

Best regards,

María José Valdebenito Architect, University of Chile LEED AP BD+C M.A.S.A. Candidate University of British Columbia Vancouver, Canada Cel: +1 <u>7788928070</u> A3. Letter of contact to the School's Principal at Nuñoa District

November 15th 2012

Dear Principal, "School name", Nuñoa District,

I introduce myself to you, my name is María José Valdebenito, architect and student of a Master of Architecture at the University of British Columbia, in Vancouver, Canada. I'm an architect from the University of Chile, graduated six years ago. Before coming to study in Canada I was working at the University of Chile in "IDIEM" research center, dependant of the Faculty of Engineering, where I had the opportunity to work on various projects related to the improvement of educational infrastructure in our country.

I am writing to you today because I am doing a research on the incorporation of environmental design strategies in disadvantaged schools in Chile. During my program I have been able to study several issues related to environmental design schools in the developed world, however, most important is to understand the actual practices that are being implemented in schools in Chile, in order to have a clear view of the values and local needs, especially in low-income communities. My biggest goal is to provide practical guidance and support to these schools through the incorporation of natural elements in the school context, helping to maximize the educational process of students and teachers.

I am aware that your school is already implementing some green strategies on the school grounds according to what is available in the school's webpage. My research is focused on documenting the renovation that schools like yours have gone through, from being a traditional school to an environmental school. The main objective of my research is to develop a framework that can be replicated in other similar schools willing to implement these kind of strategies and eventually become an environmental school. In order to achieve this, I need to define and select some case studies from which to describe and analyze this process. I expect to make a site visit to the school, with the intention to take some photographs of the strategies deployed and conduct short interviews with the principal and 2-3 teachers, to record their experiences during this process of renovation. It is very important for my research also to include the perception of children, for which I expect to develop a simple drawing exercise with them, in order to analyze the relationship of children with their school environment and future aspirations for their school.

The result of my research will be a written thesis, a copy will be delivered in digital form to all schools that have cooperated with the investigation.

I hope this brief description of my project has been sufficiently clear and is of your interest. Hoping to have your support and collaboration,

I thank you in advance,

Sincerely,

María José Valdebenito Architect, University of Chile LEED AP BD+C M.A.S.A. Candidate University of British Columbia Vancouver, Canada Cel: +1 7788928070

APPENDIX B: INTERVIEWS

B1. Interview to the School's Principal

On a site visit to each of the schools, the researcher conducted a semi-structured interview with the principal of that school. Interviews were previously agreed to be audio recorded and took no longer than 30-35 minutes. Each of the school's principal explicitly gave their consent to use the information provided in the interviews at the researcher's discretion. They also previously agreed to publish their names and name of the school at the researcher's discretion. The interviews were done in Spanish, which is the native language of the participants.

The questions done to the principals were regarding the greening process of their school. The principals were asked to answer according to their own knowledge and experience. They were asked to recall some of the projects, activities and relevant aspects during this process, and particularly about their role on it.

Questions:

1. How did the greening process begin? Who expressed the first idea or the interest to start this transformation?

2. What was the first instrument this person used to communicate the initial idea? A presentation? A written document? Or just an idea that passed on by word of mouth?

3. What is your role in the greening process? For example, motivational, supportive, offering technical guidance, etc.? Do you see yourself as a leader within the process?

4. Can you recall the first greening project in the school? How did it start? Who collaborated? How did you get funding for the project? When did it start and how long did it take?

5. When did the Municipality in your district start to be aware of the renovation of the school? When did it provide more formal support? What type of support did you receive from them in a first instance? What is their main role during the projects?

6. Can you recall the main projects you have developed so far? For example, when did the school build the first outdoor classroom? And how did you get funding for these projects?

7. What are the main aspects you would say are instrumental in carrying out a greening process? For example, what would you call a milestone or a relevant outcome within the process?

8. What important changes, if any, have you done to the management of the school with a view to support the greening process?

9. What has been the more difficult project to implement? Why?

10. How do you engage the school community to participate in the projects? According to your perspective what makes them want to participate?

11. Does the school have a parent council? If so, how is it involved in the greening process?

12. What was the first project you included inmediate neighbors to the school? How did you include them?

13. How do you promote teachers' environmental training? What were the first strategies deployed to train teachers? When did teachers start to feel confident about their knowledge and able to incorporate environmental topics on their curricular activities?

14. Do you support on-going training for teachers? If so, how do you promote it?

15. Are you doing any changes to the school curriculum to integrate environmental education formally?

16. Within the duration of the process, have you developed greening policies for the school? If so, who is in charge of developing them? Have you received support from authorities for doing this? If so, which kind of support?

17. Have you received support from private agencies? If so, how was it obtained? What other partnerships have you made during the process and how did you reach them?

18. What would you say have been the greatest benefits resulting from this environmental transformation?

19. How long has the process taken so far?

20. What do you expect for the school in the future? What other projects? What are your ideas to further improve the environmental plan of the school?

21. How do you plan to maintain the greening design strategies? Do you have any maintenance policies in place?

22. Do you evaluate the projects? How do you decide if a project has fulfilled its purpose and need to change or adapt?
B2. Interview to teachers

On a site visit to each of the schools, the researcher conducted semi-structured interviews with 2-3 teachers. Voluntarily, the teachers offered to collaborate in the study, especially those that were active participant on the school's "Environmental Committee". Efforts were done to interview all the teachers that had offered to cooperate, resulting in minimum 2 and maximum 3 teachers per school.

Interviews were previously agreed to be audio recorded and took no longer than 25-30 minutes. Each of the teachers explicitly gave their consent to use the information provided in the interviews and publish their names at the researcher's discretion. The interviews were done in Spanish, which is the native language of the participants.

The questions done to the teachers were specifically regarding the greening process of the school, its origins and those aspects they could explain as being relevant to achieve a successful transformation. Teachers were asked to answer according to their own knowledge and experience. They were asked to recall some of the projects, activities and relevant aspects during this process, and particularly about their role in it.

Questions:

1. How did the greening process begin? Who expressed the first idea or the interest to start this transformation?

2. What was the first instrument this person used to communicate the initial idea? A presentation? A written document? Or just an idea that passed on by word of mouth?

3. If a document or other instrument existed, what were its characteristics? What did it contain?

4. According to your experience, how did you formally started to participate in this process? When and how was the rest of the teachers and school staff included?

5. Who created the mission statement of the school? Can you describe the process by which it came about?

6. Which was the first greening project done in the school? How did it start? Who collaborated? How did you get funding for the project? When did it start and how long did it take?

7. How did you engage students on the first greening project? What would you say is relevant to keep them motivated?

8. Under your perspective, would you say there is a change on children's attitudes and behavior since these projects have been introduced in the school?

9. Would you say these projects have positively affected the physical environment of the school? Do you use the school grounds as a teaching resource now?

10. On your perspective, what are the main barriers to implement a greening process?

11. How are parents involved within the greening process? Was it difficult to motivate them or it was just natural for them to start collaborating?

12. Have you received support from private agencies? If so, how was it obtained? What other partnerships have you made during the process and how did you reach them?

13. Does the school incorporate formal training for teachers on environmental education? Do you feel confident with your knowledge on the topic?

14. Is the school doing any changes to the school curriculum to integrate environmental education formally? How do you think this process can be improved?

15. What would be some future activities or projects that you would like to implement with the children?

16. How do you include children on the maintenance of the greening design strategies? Do you think maintenance procedures can be more strongly connected to the school curriculum?

17. What ideas can you think of to further improve the greening process of the school?

B3. Interview to the "Department of Environmental Education and Health" representatives at El Bosque municipality

The researcher conducted semi-structured interviews with professionals from the Municipality of "El Bosque", belonging to the "Department of Environmental Education and Health". As explained in Section 1, Municipalities are the institutions in charge of administering public schools in each district, reason for what their role as supporting agents is determinant. Thus, interviewing the professionals who work in the educational area in the Municipality is crucial. Professionals interviewed included assessors, coordinators and architects.

Interviews were previously agreed to be audio recorded and took no longer than 25-30 min. Each person interviewed gave his/her consent to use the information provided at the researcher's discretion. These interviews were done in Spanish, which is the native language of the participants.

The questions done to the professionals at the municipality were specifically regarding the greening process of the schools under their administration. Professionals were asked to answer according to their own knowledge and experience. They were asked to recall some of the projects, activities and relevant aspects during this process, and particularly about their specific role in it.

Questions:

1. At what stage does the municipality start to work with the schools in the district to implement greening proyects?

2. What is the concrete contribution of the municipality to support the development of the different greening projects in these schools?

3. What is the regulatory framework that supports these schools? Is there a greening policy in place from where schools can support their projects?

4. Is there any financial support granted by the municipality for the development and/or maintenance of the greening projects in these schools?

5. How does the municipality support ongoing training for teachers? What other type of support does the Municipality give to these schools? i.e. technical, management, human resources, etc.?

6. I understand that there is a "Red de Ecoeducadores" (Ecoeducators Network) at the municipal level, what is the process for a teacher to be part of this network? What are the benfits of being part of this network?

7. Is there any kind of evaluation procedures from the municipality to assess a school's progress in terms of a greening process? If so, how do you provide them feedback and further support?

8. Have you seen concrete changes in students and their communities? i.e. behavior, academic, etc.?

have you seen any changes on teachers? Would you say there is some kind of impact on the inmediate communities? If so, what particular aspects you have noticed?

9. How does the municipality support the inclusion of neighbors in these communities to be active partcipants on the environmental proyects of these schools?

10. What would you say are the main barriers for these schools in the implementation of a greening process? How can the municipality aid to solve them? How does the municipality plan to sustain green school grounds in the future?