THE DESIGN OF LEARNING ENVIRONMENTS TO PROMOTE HOLISTIC HEALTH & WELL-BEING OF CHILDREN

Thesis

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DEDICATION

I dedicate this thesis to my son 'Aarush'
for being my biggest motivation
throughout this enduring journey and
for being the sole reason behind the selection of this topic.

CERTIFICATE

The work included in the thesis entitled **"THE DESIGN OF LEARNING ENVIRONMENTS TO PROMOTE STUDENT HEALTH & WELL-BEING OF CHILDREN"** submitted to the Faculty of Physical Planning and Architecture, Guru Nanak Dev University, Amritsar, for the degree of Doctor of Philosophy, was carried out by **Parul** at the Department of Architecture, Guru Nanak Dev University, Amritsar, under my supervision. This is an original work and has not been submitted in part or full for any other degree/diploma at this or any other university/institute. This thesis is fit to be considered for evaluation for the award of the degree of Ph.D in Architecture.

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DECLARATION

The work embodied in the thesis entitled **"THE DESIGN OF LEARNING ENVIRONMENTS TO PROMOTE HOLISTIC HEALTH & WELL-BEING OF CHILDREN"** has been done by me and not submitted elsewhere for the award of any other degree/ diploma. All the ideas and references have been duly acknowledged.

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To the universe and my life journey that led me to a place where I found the courage and inspiration to begin this very beautiful chapter of my life that changed everything, for good! It has been a long journey, but God has been kind enough to extend his hand and be with me in the form of all those special people who showed up just at the right time when I needed them the most. My heart goes out to my parents for not only nurturing me with their love and care but also for being great role models. I express my heartfelt gratitude to my second set of parents (my in-laws) without whose unwavering support, this was not possible. Words are not enough to thank my companion for life, my husband Amit, who has always stood by my side and encouraged me to follow my heart's desire. I extend my gratitude to my entire family for always showering me with their love and bearing with me throughout this enduring journey.

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(Parul)

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ABSTRACT

The health and well-being of children is not a pursuit but a prerequisite to achieving higher goals of education and life in general but research in the field of school design rarely finds a mention of the health and well-being of children as a direct outcome of the physical school environment. According to Barton and Grant (2006), the natural and built environments are critical health determinants as well. Most of the time, the potential of a built school environment to improve the health of its users goes largely untapped and the impact of an ill-designed environment is usually understated. The World Health Organization (2017) lists the social, economic, and physical environment along with a person's characteristics and behaviours as the primary determinants of human health. In a world cramped by disease and disability, it becomes extremely important to consider health promotion in every human endeavour. The creation of health-promoting school environments can be a vital step toward building healthy and flourishing communities. The conventional approach to school design, as found in the extensive literature on the school architecture, primarily focuses on creating environments that aim at achieving academic excellence and in some cases physical fitness. The aesthetic quality of the environment is also considered in some cases. However, in the present scenario, it has become necessary to create school environments that promote overall health due to the following reasons: a) Increasing number of children suffering from NCDs (Non-communicable/Lifestyle Diseases) b) Increasing risk of infection with viruses like Covid-19. c) Increasing cases of student suicide, anxiety, and depression in school children. d) Failure of conventional measures based on academic performance as reliable indicators of student success.

Existing studies that explore the relationship between the environment and the holistic health of children, usually consider the social environment of school with little or no mention of the physical environment. This creates a gap in the knowledge and information that focuses on the impact of the physical school environment on the health and well-being of children. Moreover, the absence of clear guidelines for the spatial application of health-promoting strategies makes these considerations unpopular among architects. It, therefore, becomes important to translate health criteria into the architectural language to assess schools from the

perspective of their “health status” (how supportive is the built school environment to children’s health) and to propose a set of well-articulated guidelines for easy application by school architects and facility planners.

This study aims to contribute towards the design of learning environments that promote holistic health & well-being of children by developing a set of design guidelines and an assessment tool that can help school architects in designing and renovating healthy schools. The following objectives have helped in paving a path towards the abovementioned aim : a) To identify the determinants of holistic health in children through various studies in the fields of holistic health, environmental psychology, child psychology etc. b) To decipher the attributes of salutogenic (health-promoting) design that can contribute to building healthy schools for children by reviewing existing research. c) To propose a set of design guidelines for school architects to facilitate the process of healthy school design derived from a detailed literature review in the domains of holistic health, salutogenic design and the physical school environment. d) To formulate an assessment tool to indicate the health status of existing school buildings and demonstrate its application by assessing selected schools in Amritsar city, India.

The theoretical framework combines knowledge and information from various sources belonging to each of the disciplines involved. The inclusion criteria are based on the understanding that studies directly or indirectly consider the three major domains of research i.e. salutogenic design, physical school environment and holistic health. Since the initial studies informed that innate human needs are universal, studies from all parts of the world are included for review. The literature review is conducted in two parts: Part one concludes with the formulation of design criteria matrices for healthy school design based on research in holistic health, salutogenic design and physical school environment. Part two includes a detailed study of each design criteria to synthesize guidelines that relate to the holistic health needs of children with their spatial implications. Some new literature sources are added at this stage and some previous ones are revisited for proposing a comprehensive set of guidelines.

The listing of design criteria is done under the framework of salutogenic design. The theory of salutogenic design states that a design can be called salutogenic (health-promoting) if it enhances three core components of a Sense of

Coherence (SOC) i.e., comprehensibility, manageability, and meaningfulness). These three components are not mutually exclusive but highly interdependent and therefore there is an overlapping in design cues as well. Table 1 shows the design cues under all three components of SOC. These design cues are derived from the synthesis of an interdisciplinary literature review. A list of 27 design guidelines is then proposed to act as a ready reference to guide school architects and facility planners through the process of salutogenic design of learning environments. These guidelines are created by synthesizing the design cues with the identified holistic health needs of children. Each guideline is then expanded further, by referring to the advanced studies in the field of school design, to create an assessment tool called the Healthy School Assessment Tool (HSAT).

The assessment of the schools in Amritsar revealed that the highest overall score amongst the nine schools assessed in the city of Amritsar is far below the acceptable range. It, therefore, indicates that even the best schools in the city do not meet the holistic health needs of children sufficiently. Interviews and discussions with some of the leading architects of the city revealed that although health and well-being felt like an obvious design criteria, the absence of detailed guidelines and corresponding spatial considerations made it difficult to include them in the school design process. The study, therefore, fulfils this research gap between the theory of holistic health and the practical design of school environments. The scope of the study is limited to the proposal of design guidelines and the assessment tool and a deeper dive into the technical details of each one of these guidelines would be a logical doorway for further research.

CHAPTER 1

INTRODUCTION

1.1 Title of the Study

The Design of Learning Environments to Promote Holistic Health & Well-Being of Children

1.2 Background of the Study

Holistic health is not a pursuit but a prerequisite to achieving higher goals of education and life in general. Yet, it is not very common to find health on the design criteria list of school planners and architects. Research in the field of school design suggests that academic performance and physical activity of children are usually considered the primary goals that need to be facilitated by school design. However, the built environment is known to be much more than a mere combination of built-open spaces that accommodate certain functions. According to Barton and Grant (2006), the natural and built environments are critical health determinants. The potential of a built school environment to improve the health of its users goes largely untapped and the impact of an ill-designed environment is usually understated by those who shape our built environment. The World Health Organization (2017) lists the social, economic and physical environments along with a person's individual characteristics and behaviours as the primary determinants of human health. Hodgdon (2021) claims, "Your physical and social environment (where you live, work, and play) has a greater bearing on your health and well-being than your access to health care, your genetics, and your lifestyle and behaviours combined". Home, neighbourhood and school are the three primary built environments for children. School buildings are the places where most children spend a considerable part of their childhood; this creates an excellent opportunity for school planners and designers to create an environment that contributes to the holistic health of the children.

Human beings perceive the built environment through their five senses as well as the five elements of nature -- Earth, Water, Fire, Air and Ether. These five elements create the environment that affects the physical, psychological, spiritual and social well-

being of the occupants through their five senses. The health and well-being of people can, therefore, be enhanced by improving the features of the built environment. A holistic 'Mind-Body-Spirit' approach, that not only addresses physical function but also recognises emotion & perception, is required for enhancing the well-being of occupants. This approach acts as a preventive measure against the steeply rising NCDs (non-communicable diseases) that are directly affected by the lifestyle and stress experienced by people in their daily lives. NCDs like obesity, diabetes, depression etc. have now started affecting the health of children as well, thus leading to the poor overall health of the society. This steep increase in NCDs adds to the burden of our already crippled health care systems. These diseases are, however, easily preventable through certain lifestyle changes and also a stress-free disposition; both of which can be facilitated through the design of our primary built environments.

1.3 Statement of the Problem

India has witnessed a pronounced expansion of educational opportunities in the past few decades. The upsurge of technological innovations, altered family structures and an altered socio-cultural situation calls for a change in the education system as well. It is now a well-established fact that education must, by no means, revolve only around the academic excellence of pupils. Children also need to develop confidence, compassion, emotional intelligence, stress management skills, social skills, empathy etc. in order to thrive in their lives. This, however, seems to be a distant dream with the current approach towards education. According to a news report in the Economic Times (Jan 11, 2020), the yearly figure for suicide rates by students turned out to be the highest in a decade-over 10,000 in 2018. Twenty-eight students on average committed suicide every 24 hours during 2018 (NCRB data). This number will possibly rise even higher when children get back to school in the post-pandemic world owing to an array of complex reasons for the same. The following issues clearly indicate the urgent need for a paradigm shift in the field of school design:

i) Increasing number of children suffering from NCDs (Non-communicable/ Lifestyle Diseases)

ii) Increasing risk of infection with viruses like Covid-19.

iii) Increasing cases of student suicide, anxiety, and depression in school children.

iv) Failure of conventional measures based on academic performance as reliable indicators of student success.

Though it is not in the scope of this thesis to discuss all the issues related to the holistic health of school-going children, it is now well known that the ability to handle stress and develop resilience are the two most important (but least nurtured) qualities for children to maintain sound health. Fortunately, our primary built environments have the ability to make a considerable contribution towards enhancing these qualities. Therefore, it becomes pivotal to decode the attributes of built school environments that may enhance the health and well-being of children and lead to a healthier society. To create supportive physical environments, it is crucial to understand an individual's fundamental needs (Heerwagen et al., 1995).

1.4 Research Premise

The study begins by exploring a holistic approach to children's health and its relationship with the built school environment. This approach to health is viewed through the lens of salutogenesis (Antonovsky, 1979) which uses the sense of coherence (SOC) as a measure of a person's overall health. The basis of the salutogenic theory is that it is possible to reduce human suffering by shifting the focus from sources of illness to sources of wellness. According to Antonovsky (1996), health and well-being are related to a person's ability to cope with the stressors of human existence by seeing the world as making sense, cognitively, instrumentally and emotionally. The salutogenic theory states that having a sense of coherence (SOC) enables a person to perceive the world on a continuum, as comprehensible, manageable and meaningful (Franz, 2019). Dilani (2001) translated the salutogenic approach in the context of the built environment and opened new avenues for its application. Franz (2019) suggested that the salutogenic approach to school design could act as a possible solution for a healthy school environment. Yet by far, most of the work in the field of salutogenic design has been done in the field of healthcare facilities, with the works of Dilani (2006, 2008) and Golembiewski (2010, 2014, 2016, 2017) as the most cited ones. The application of salutogenic design has proved to be helpful in enhancing the overall health of the

occupants. In 1997, the World Health Organization identified the health "arena", including priority settings and frequently used spaces such as; workplaces, schools, hospitals, correctional institutions, commercial offices, public spaces within our towns and cities, along with the residential spaces. These areas should be at the centre of health promotion activities in the 21st century (Dilani, 2012). This research, therefore, attempts to develop a guided framework for the application of salutogenic design principles in case of school architecture.

1.5 Research Aim

This thesis therefore aims at contributing towards the design of learning environments that promote holistic health and well-being of children. In doing so, it intends to propose a set of salutogenic (health-promoting guidelines for the architectural design of new schools and also formulate an assessment tool for examining the health status of the existing K-12 school buildings from a holistic health perspective. The study, therefore, seeks to contribute towards:

- Identification of holistic health needs of children.
- Introducing "salutogenic Design" in the arena of school design
- Proposing a set of guidelines for a salutogenic school design that can act as a ready reference for school architects and facility planners.
- Formulating a tool for the pre-occupancy and post-occupancy health assessment of the physical school environment.

1.6 Research Objectives

Architecture is by no means a tool for merely enhancing the aesthetic quality or the structural integrity of the built environment; it is much more significant as it can directly influence the overall health and well-being of its users. The focus of the present study revolves around the contribution of the built school environment to improving the holistic health of children. The following questions need to be ruminated upon in order to identify the objectives of the study:

- What do children need in order to be healthy, holistically?
- What is the relevance of the built school environment as a determinant of the holistic health of children?
- What is salutogenic design and how does it contribute towards the creation of a healthier built environment?
- Which attributes of salutogenic design have the potential to improve the health and well-being of school children?
- What are the guidelines for school architects and planners from a salutogenic design perspective?

The above questions lead to the following **research objectives**:

1. To identify the determinants of holistic health in children through various studies in the fields of holistic health, child psychology and environmental psychology.
2. To assemble the attributes of salutogenic design, that can contribute to building healthy schools for children, by reviewing the existing research.
3. To create a set of salutogenic guidelines for healthy school architecture and design by synthesizing the results from interdisciplinary studies and applying them in the context of school design.
4. To formulate an assessment tool that can examine the health status of existing school buildings by studying the existing school assessment methods and rating scales.
5. To test the effectiveness of the assessment tool by conducting a demonstrative study in the chosen schools of Amritsar city.

1.7 Limitations of the Study

The researcher aims at developing a set of guidelines and an assessment tool for healthy school architecture and design. These resources (guidelines and the tool), however, do not intend to replace building bye-laws and technical standards for school

architecture and design. Since holistic health needs are innate and universal to all children, these guidelines are generalized for a broad application. They are intended to act inherently as design guidelines that are subject to contextual variations and not as strict construction guidelines.

This chapter has thrown light on the importance of the built school environment for the holistic health of school children. The contribution of built school environment towards the holistic health of children and the potential of salutogenic design in resolving the health issues that arise due to unhealthy design practices is still largely unexplored in the case of learning environments. This chapter lays the foundation for the exploration that is undertaken in the upcoming chapters. The next chapter will provide an insight into the relevant literature concerning with the various aspects of built school environment, holistic health and salutogenic design.

1.8 Chapter Scheme

The chapter scheme of the research thesis is given below.

CHAPTER I: INTRODUCTION

The first chapter presents an introduction to the problem identified, gives an overview of the role of primary built environments as the critical determinants of holistic health in children. It enlists the aims and develops the objectives of the study by analysing the research questions. It also mentions the scope and limitations of the study.

CHAPTER II: REVIEW OF LITERATURE

The second chapter deals with the relevant literature concerning the holistic health needs of children, built school environment and salutogenic design of school environments. It synthesizes the information to arrive at thirty-six design considerations/cues for built school environments.

CHAPTER III: RESEARCH METHODOLOGY

The third chapter provides detailed information about research methodology in the form of research design, details of steps in the research process and gaps in the research.

CHAPTER IV: HEALTHY SCHOOL ASSESSMENT TOOL (HSAT)

The fourth chapter illustrates the compilation, validation, organization and usage of the Healthy School Assessment Tool (HSAT) based on the thirty-six design considerations derived in the review of the literature (Chapter II).

CHAPTER V: DEMONSTRATIVE STUDY (AMRITSAR, INDIA)

The fifth chapter contains the data analysis and interpretation of the tables and graphs of data collected from the demonstrative study of the nine selected schools from Amritsar.

CHAPTER VI: **CONCLUSION**

The sixth chapter closes the research with overall findings, conclusions and recommendations for health promotion in the learning environments. This chapter also includes the scope for further research followed by bibliography and annexure.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction

'The true measure of any nation's standing is how well it attends to its children - their health and safety, their material security, their education and socialisation and their sense of being loved, valued, and included in the families and societies into which they were born' (UNICEF, 2007).

To achieve total physical, mental, and social well-being, an individual or community must be able to recognise and realise ambitions, satisfy needs, and modify or cope with the environment, according to the World Health Organization's Ottawa Charter for Health Promotions. (World Health Organization, 2016). The Incheon Declaration states that "it (quality education) develops the skills, values, and attitudes that enable citizens to lead healthy and fulfilled lives, make informed decisions, and respond to local and global challenges" in order to emphasise the link between health and education (UNESCO, 2016). Without a suitable environmental setup, it is impossible to achieve all of the health and education goals. Even as the 4th century B.C., Hippocrates recognised that the physical environment in which people live has an impact on their overall health. Because lifestyle-related disorders are on the rise, the environment in which we spend the majority of our time must be investigated as a precursor to implementing health-promoting design.

A healthy built environment is multifaceted; it encompasses more than adequate lighting and ventilation. Physical places have now been shown to have the ability to produce particular moods in its residents, according to research (Day, 1990). Place-induced moods have psychosomatic tendencies toward health and sickness, hormonal balance, and the vigour with which our bodies combat pathogens. PNI (psychoneuroimmunology) is a branch of psychology that discusses how locations and environments have the ability to nurture people (Day, 2014). Sensory aesthetics, according to Christopher, have a substantial impact on health and welfare (Day, 2007). 'We shape our structures; then they shape us,' Churchill (1943) said in a similar vein.

Children, like wet clay, are formed more swiftly by the environment in which they spend the majority of their formative years. The school environment is next only to home and neighbourhood when it comes to the built environment for children.

Health, according to the United Nations World Health Organization (1948), is "a state of complete physical, mental, and social well-being, rather than only the absence of sickness or infirmity." This holistic view of health considers the impact of social, economic, political, and environmental factors on one's health, as well as one's overall well-being. It's also important to remember that humans have the ability to influence and change the environment (Morandi et al., 2011). The concept of holistic health is universal. Health is referred to as 'swasthya' in Ayurveda (one of the world's oldest holistic treatment systems). It is a Sanskrit phrase that refers to a state of complete, balanced bodily, mental, and spiritual well-being (Sharma et al., 2007). As previously stated, Ayurveda's approach is in line with the WHO's concept of health. Antonovsky (1979) introduced a concept known as salutogenesis, which has a striking likeness and association with the above-mentioned approaches to health (Shivam S. Gupta and Satyam S. Gupta, 2019). Beyond cultural or ethnic roots, Ayurveda and salutogenesis are both intercultural and universally relevant (Morandi et al., 2011). These holistic health techniques attempt to prevent disease and promote wellness. WHO (1986) defines health promotion as "the process by which people gain control over their health determinants in order to enhance their health and lead a more active and productive life." In a globalised world marked by fast social change, the ability to manage change-related stress is critical for maintaining and improving one's health and quality of life.

Therefore, it becomes pivotal to discover the attributes of a built school environment that can help enhance the health and well-being of children and lead to a healthier society. In order to create supportive physical environments, it is crucial to understand an individual's fundamental needs (Heerwagen et al., 1995). This study begins by understanding the holistic health perspective and identification of the holistic health needs of children. It then focuses on identifying attributes of a health-promoting built school environment based on salutogenic design and the various perspectives in the field of built school environment (Dilani, 2008). This review of literature intends to arrive at a set of design considerations/cues that can act as a basis for the development

of salutogenic guidelines for school design and a tool for measuring the health status of existing schools.

2.2 Components of Literature Review

Theoretical framework for an interdisciplinary study like this must combine knowledge and information from various sources belonging to each of the disciplines involved. The inclusion criteria were based on the understanding that studies directly or indirectly considering the three major domains of research i.e. Holistic health, School environment (physical) and salutogenic design were considered for review. The intention to understand the holistic health needs of children and the attributes of physical environment that may help in fulfilling those needs and promote overall health and efficiency was given priority over other aspects. The initial studies informed that innate human needs are universal, so the studies from all parts of the world are considered for review.

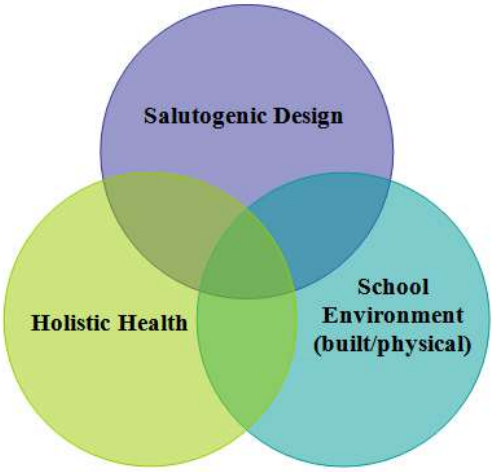


Figure 2.1 Key Literature Review domains

2.3 Holistic Health

2.3.1 Definition, Meaning and Attributes of Holistic Health

'It is easier to build strong children than it is to repair broken men,' said Frederick Douglass in 1885. Over 150 years later, building strong children remains as crucial and challenging as ever. Claiming a demographic share of approximately 40%, children (0-18 years) form a significant segment of India's population and, therefore, a

momentous determinant of its growth and development narratives (India Child Well-being Report 2019).

A nation can build strong children when it works towards ensuring their overall health and wellbeing. The Oxford Dictionary defines 'health' as 'the state of being free from illness and injury. This, however, defines what health is not. The English term 'health' derives from Old English 'health', which is related to 'whole' and 'a thing that is complete'. The WHO (1948) defined health as a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity. According to the Merriam-Webster dictionary, well-being is the state of being happy, healthy, or prosperous. Various terms related to health like wellness, well-being (Aristotle's hedonia and eudaimonia), and quality of life are used in different contexts but with a common aim. Two mainstream philosophies define health in their way, the first being the bio-statistical or the medical approach (Boorse, 1997). According to this approach, there is nothing evaluative or subjective about health and diseases. Health is the absence of disease and disease is a type of internal state which is an impairment of normal functional ability or a limitation on functional ability caused by environmental agents (Nordenfelt, 1987).

The second mainstream approach is the holistic approach that considers health and disease as two value-laden concepts. The holistic method refers to an overall approach to the health and wellbeing of the whole person. It does not focus on illness or specific parts of the body. It considers how individuals interact with their environment and emphasises the connection between mind, body, and spirit to achieve an utmost level of wellbeing. The holistic approach encourages people to accept responsibility for their health and well-being as opposed to the medical approach, which relies on the healthcare system to maintain the health and well-being of people (Sainju, 2018). According to Hembree & Sholder (2013), the physical body is a factor of holistic health defined by the balance and communication of physical activity, nutrition, genetic composition, and coordination. The mind is a factor of holistic health defined by the balance and communication of the ability to learn, retention of knowledge, and capability of abstract thought. The spirit is a factor of holistic health defined by the balance and communication between self-esteem, self-empowerment, and self-identity

concerning social communities. The term 'holistic' was coined by South African statesman Gen JC Smuts in 1926, as a philosophical term. He viewed the universe in terms of 'wholes' – that is, organisms and systems instead of molecules and atoms. He derived *holism* from the Greek word *holos*, meaning 'whole'.

Holistic Health, therefore, deals with the whole person and is a concept that goes beyond curing illness to one of achieving optimum wellness. It strives to achieve maximum well-being, where everything is functioning at the highest level possible. This broader (w)holistic approach to health, promotes wellness by integrating and balancing the various aspects which constitute the 'whole person. It's a continuous process and a way of life. Some definitions of health, wellness, and well-being related to the holistic approach are as follows:

- Health is a state of complete physical, mental and social well-being and not the absence of disease or infirmity (WHO, 1948)
- Wellness is an integrated method of functioning which is oriented toward maximising the potential of which an individual is capable (Dunn, 1961).
- The extent to which an individual or group can realise aspirations and satisfy needs and change or cope with the environment. Health is a resource for everyday life, not the aim of living; it is a positive concept, emphasising social and personal resources, as well as physical capacities (Health promotion: a discussion document, Copenhagen, WHO, 1984).
- Health is the capability of individuals, families, groups, and communities to cope in the face of significant adversity or risk (Vingilis & Sarkella, 1997).
- It is a way of life oriented toward optimal health and well-being in which the integration of an individual's mind, body and spirit allows them to live life fully within the human and natural community (Witmer & Sweeney, 1998).
- Well-being is a complex construct that concerns optimal experience and functioning (Ryan & Deci, 2001).

- Health is a condition where resources are developed in the relationship between humans and their biological, chemical, physical and social environment (Lawrence, 2002).
- Well-being is the state of successful performance throughout the life course integrating physical, cognitive and social-emotional functions that result in productive activities deemed significant by one's cultural community, fulfilling social relationships, and the ability to transcend moderate psychosocial and environmental problems. Well-being also has a subjective dimension in the sense of satisfaction associated with fulfilling one's potential (Bornstein, Davidson, Keyes, & Moore, 2003).

All the above definitions clearly state the following characteristics of holistic health:

- It is person-oriented rather than disease-oriented
- Its aim is full, vibrant health (positive wellness) not symptom amelioration
- It is three-level (physical, emotional, spiritual) not uni-level (physical only)
- It is a long-term, ongoing and continuous lifestyle
- It focuses on primary prevention instead of crisis intervention
- It aims towards achieving full human potential (self-actualisation)
- It focuses on building resilience and building better coping mechanism
- An individual's experiences and environment are the basis of holistic health

The India Child Wellbeing Report (2019) insists that the measure of child well-being needs to be multidimensional to be relevant or useful. It refers to Bradshaw's definition which defines wellbeing as, "the realisation of children's rights and the fulfilment of the opportunity for every child to be all she or he can be" (Bradshaw et al 2007). Another definition by Minkkinen (2013) calls child well-being a dynamic process, "wherein a person's physical, mental, social and material situation is more commonly positive than negative, and as an outcome of intrapersonal, interpersonal, societal and cultural processes".

The goal of holistic health, therefore, is to achieve a purposeful, vibrant, and healthy lifestyle by emphasising the connection between mind, body, and spirit. A healthy person is a person in balance, normally meaning that different parts and different functions of the human body and mind interlock harmoniously and keep each other in check (Nordenfelt, 1987). The idea of balance is strong in most non-western medical traditions. Ayurveda, an Indian holistic health system, places great emphasis on maintaining health through a balance of body, mind, and spirit by making appropriate lifestyle changes according to one's constitution (Lad, 2002). Ayurveda considers the surrounding environment and society as part of the broad concept of health. Many other ancient schools of thought have insisted upon the relevance of holistic health.

The concept of health as a balance between a person and the environment, along with the unity of 'soul' and 'body', was the basis of the perception of health in ancient Greece (Svalastog et al., 2017). The above discussion leads us to the following definition of health: the ability to maintain a state of equilibrium and balance between genetic factors and environmental conditions, mental-spiritual and bodily functions, along with the interaction between individual and community, leading to the attainment of full human potential (self-actualisation) and building of a sound coping mechanism (resilience) (Fig.2.2).

Figure 2.2: A model of holistic health with self-actualisation and resilience as the ultimate goals to be achieved through mind-body-spirit balance in the presence and under the influence of physical and social environmental conditions.

2.3.2 Identification of Holistic Health Needs: What do children need?

Before exploring the relationship between a built school environment and holistic health, it is vital to first identify the basic physical and psychological needs of children. Many architects, researchers, psychologists, educationists, and philosophers have put forth their point of view or presented an evidence-based study on the same subject. Two studies/ theories have been explored in detail: Maslow's hierarchy of needs (A theory of human motivation, 1943) and Self Determination Theory (Ryan & Deci, 1985). A few other works by the likes of Carol Ryff (1995), Martin Seligman (2010), and Jeni Hooper (2012) have also been referred to, to prepare an exhaustive list of the holistic health needs of children that can be fulfilled by the thoughtful design of school environment.

A. Maslow's Hierarchy of Needs

Abraham Maslow, an American psychologist best known for creating Maslow's hierarchy of needs in his 1943 paper "A Theory of Human Motivation" in the journal Psychological Review. The hierarchy of needs is an idea in psychology based on fulfilling innate human needs in priority, culminating in self-actualization. Maslow's theory is based on his research of 'exemplary people' (some of the most prominent figures throughout history) like Albert Einstein, Jane Addams, Eleanor Roosevelt, and Frederick Douglas. The reason for taking up this approach was to develop an account of human motivation based on the positive aspects of human psychology. Alongside the so-called exemplary people, Maslow also studied college students who were the healthiest 1% for their particular group. Maslow intended to concentrate on 'healthy' individuals to provide a more illustrative account of motivation that would apply to the general population, and not only those with some established health problem. Maslow's study is relevant in the context of this research because of its consideration of Self Actualisation as the highest goal which is also one of the primary goals of the holistic health approach defined earlier in this study. Maslow's hierarchy is normally represented as a pyramid with five levels that range from the most basic human needs at the bottom to the most complex and sophisticated at the pinnacle (Maslow, 1998) as shown in Figure 2.3.

Figure 2.3: Maslow's hierarchy of needs (Maslow,1998)

Maslow modified the hierarchy at a later stage to add two more levels dealing with cognitive issues (to know, to understand, and explore) and aesthetics, symmetry, order, beauty, sense of scale, color perception, overall sensory harmony, and intent). Maslow believed that to progress to the next level, the needs at the lower levels must be met. In the context of learning, his theory helps us understand that a learners' preoccupation with any of the lower four levels will always override concentration on the processes involved with learning (Mc Michael, 2004). It conveys that not only to reach full human potential (self-actualisation) but also to learn effectively (primary purpose of schooling), children's basic needs of health, safety, belongingness and esteem must be met. To identify the basic needs that can be met by the design of the school built environment to help children reach the highest level in this hierarchy, an understanding of each of the levels is crucial.

Table 2.1: Needs identified by Maslow *(*Zhang & Dong, 2008)

Needs identified by Maslow
Stage:1 – Biological and Physiological Needs. Water, Food, Air, Warmth, Shelter, Sleep
Stage:2 – Safety Needs. Freedom from Fear, Protection from Natural Elements, Law and Order, Security and Stability.
Stage:3 – Love and Belonging Needs. Love, Friendship, Affection, Trust and Acceptance, Intimacy, Receiving and Giving, Affiliating and being part of a Family or Friends or Work.
Stage:4-Esteem Needs. Self-Esteem, Independence, Mastery, Dominance, Achievement, Prestige, Status Self-Respect
Stage:5-Cognitive Needs. Exploration, Curiosity, Understanding and Knowledge and Predictability
Stage:6-Aesthetic Needs. Search for Beauty, Appreciation, etc
Stage:7-Self-Actualization Needs. Rich Experiences, Self-Fulfillment, Realizing Personal Potential and Seeking Personal Growth.
Stage:8-Transcendence Needs: Being helpful for others to achieve self-actualization

This expanded understanding of Maslow's hierarchy of needs holds the potential to highly impact the practice of design and architecture. School architects and facility planners have a direct opportunity to address the functional requirements of the users mentioned in the first five tiers of the framework. If learning spaces are created with this in mind, from the very beginning, it can assist the learners in reaching the higher levels in the hierarchy. This is important because many of these preoccupations will be met by entering the school facility/learning environment. The basic fulfilment of all the deficiency needs and the two lower-level growth needs sets the stage for children to be holistically healthy. This does not mean that a well-designed educational facility can

deal with all of the issues found in the hierarchy that may be a negative influence on a learner's life and ability to learn. However, well-designed facilities and environments can enhance and strongly influence the overall well-being in a positive manner. Maslow's theory, therefore, supports the idea that the physical design and planning of our learning environments is of high importance on a basic level (Mc Michael, 2004). It can be said that people involved in building school facilities shape the buildings that help to shape our society. Maslow wanted "a psychology that would speak to human potential and wholeness" (Ballard, 2006: 2).

B. Self-Determination Theory by Ryan & Deci

Self Determination Theory is a theory of human motivation given by Edward L. Deci and Richard Ryan in 1985 who believed that to reach one's full human potential, every human being's basic psychological needs must be fulfilled (Table 2.2). Maslow's hierarchy of needs also suggests that the needs that occupy a lower place in the hierarchy must be fulfilled before the fulfilment of needs placed on the upper levels of the hierarchy. Self-determination theory has its roots in the belief that individuals naturally orient themselves towards growth and self-organization provided their basic psychological needs are fulfilled. The basis of Self Determination Theory in the words of its curators Ryan & Deci is as follows: *"SDT rests on the notion that the individual is involved continuously in a dynamic interaction with the social world- at once striving for the need satisfaction and also responding to the conditions of the environment that either support or thwart needs. As a consequence of person-environment interplay, people become engaged, curious, connected and whole, or demotivated, ineffective and detached."* (Ryan & Deci, 2017).

Table 2.2: What children need to flourish (Ryan & Deci, 2017)

Basic Psychological Needs (Ryan & Deci, 2017)	
Autonomy	the need for freedom, self-endorsement, ownership, and self-regulation
Competence	the need to feel effective, for development of skills, understanding, and mastery
Relatedness	the need for connection and involvement

Basic Psychological Needs Theory (BPNT), which is a part of SDT, reflects upon how social environments can neglect, thwart or satisfy people's basic psychological needs. Basic psychological needs of Autonomy, Competence, and Relatedness are at the heart of Self Determination Theory and BPNT specifies more precisely how these needs are essential for health and wellbeing. BPNT also argues that the three basic psychological needs are not only essential, but also innate and universal, which means that they exist across individuals and cultures. All living beings are dependent on the environment for their survival, as the environment provides them with nutrients needed for survival. Similar to the physiological needs of thirst, hunger, and sleep which must be met by the environment for the survival of all organisms, they also have psychological needs which must be fulfilled to function in psychologically healthy ways. Many studies in this area have found a strong relationship between psychological need satisfaction and indicators of eudemonic wellbeing, that is, the extent to which a person experiences meaning, self-realisation, and optimal functioning. This resonates with the definition of holistic health derived earlier in this thesis.

Environments that support autonomy, foster the user's inner motivational resources and intrinsic preferences by offering choice and flexibility to make decisions. Such environments also provide useful information for the user to internalize the motivation for their behaviour. The need for competence is satisfied by contexts and relationships that provide the user with an optimal challenge along with structure and feedback that allows skills and abilities to develop. The need for relatedness is satisfied when relationships are reciprocal and also when they involve acceptance of the authentic self. It can therefore be established from the research in SDT that the environments supportive of the above psychological needs, help to develop the user's perceived sense of autonomy, competence, and relatedness, which then uplifts the overall holistic health and develops deeper engagement (Legault,2017). It can therefore be concluded that children need motivation in school to attain a state of optimum wellbeing and sustained motivation comes from within the individual (Ryan & Deci 2000), but it can be influenced by contextual factors. Through Self Determination Theory, Ryan & Deci provide us with a lens to investigate the importance of environments and whether or not they are autonomy-supportive, competency

supportive, and relationally supportive. They state that social and environmental contexts that support satisfaction of all three psychological needs tend to facilitate autonomous functioning, which leads to better performance and increased wellbeing, while social and environmental contexts that fail to support and/or actively thwart these basic psychological needs may lead to controlled motivation or amotivation, which in turn results in poorer performance and ill-being.

Considering the above discussion, the 'Holistic Health Needs' associated with overall mind-body-spirit balance are stated in the Table 2.3.

Table 2.3: What Children 'Need' to be Healthy? (Source: Researcher)

HOLISTIC HEALTH NEEDS OF CHILDREN
Habitable environment (Clean air, water, shelter, thermal comfort, natural light, etc.)
Safety & Security
Self-esteem/ Personal growth/ Self-acceptance
Autonomy/ psychological freedom
Positive relationships with people and places
Rich experiences leading to positive emotions/Joy/Empathy/Compassion/Enthusiasm
Competence/ Capability/ Accomplishment/ Mastery
Engagement/ Purpose in life

2.4 School Environment

'When you pay attention to the beginning of the story, you can change the whole story'.

- Raffi Cavoukian

The school environment is one of the primary influences for most of the school-going children, only next to home and neighbourhood environment because children spend nearly half of their waking hours in school. Health problems developed at a young age usually affect a child's social, behavioural, cognitive and physical processes and get compounded as the child grows. A sedentary lifestyle causes many health

problems, such as obesity, which are easily preventable in childhood. The way a child deals with internal health factors, external environmental factors, and issues of self-identity play an important role in the development of holistic health (Hembree & Sholder, 2013).

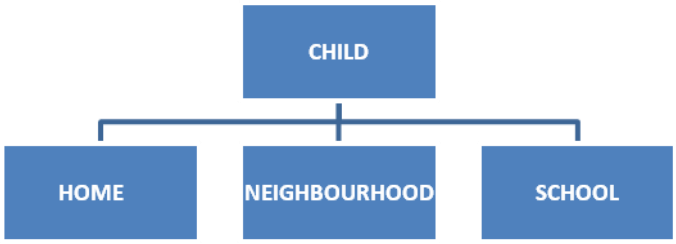


Figure 2.4: Primary environments for children

All the aspects of holistic health: mind, body, and spirit gather to form a child's identity. Social interactions shape a child's perception and understanding of incidences in their own life at home and school. Also, socio-economic issues affecting one's lifestyles, opportunities, and primarily built environment have a considerable impact on one's holistic health. It is, therefore, crucial to decipher the characteristics of the school environment (physical) that may assist children in reaching their full potential (self-actualisation) and effectively manage stress (resilience). The theory of salutogenesis addresses both the above factors and is the basis for further research.

2.4.1 Built Environment: Definition And Meaning

In the knowledge of Environmental psychology, whatever embraces mankind and his spiritual and physical existence is called 'Environment'. The Merriam Webster online dictionary defines the word environment as the circumstances, objects, or conditions by which one is surrounded or as the complex of physical, chemical, and biotic factors that act upon an organism or an ecological community and ultimately determine its form and survival. An ideal environment is a place where people "feel self-assured and competent, where they can familiarize themselves with the environment whilst also being engaged with it" (Groat,1995). The environment can be broadly classified into two types; the natural environment and the built environment. The natural environment includes all the living and non-living things that occur naturally on earth and the built environment is defined in Collins English Dictionary as

'the buildings and all other things constructed by human beings' which means that almost everything that we see around us in urban areas is a part of the built environment. Most importantly, the buildings that are designed and constructed to fulfil various human pursuits constitute a major part of the built environment.

The basic human need of shelter, security, and thermal comfort has led to such a huge expansion of the built environment that we see it all around us today. People residing in urban areas spend most of their lives in the built environment and it has now been established that the quality of the built environment where we live, work and recreate has a direct bearing on our lives. This fact is rightly explained in a statement by Winston Churchill many years ago that human beings first shape their environment and then get shaped by their environment. Although, the word environment refers to both the built environment and natural environment, in urban areas even the natural environment is modified to complement the built environment and therefore becomes a part of it rather than a separate entity.

Built Environment may be defined by four interrelated characteristics (Madhumita, 2016). First, it is extensive; it is everywhere; it provides the context for all human endeavours. Second, it is the creation of human minds and the result of human purposes; it is intended to serve human needs, wants, and values. Third, much of it is created to help us deal with, and to protect us from the overall environment. We can mediate or change this environment for our comfort and well-being. Fourth, an obvious but often forgotten characteristic is that every component of the built environment is defined and shaped by context; each and all of the individual elements contribute either positively or negatively to the overall quality of environments both built and natural, and to the relationship of human and environment.

2.4.2 Relevance of a School's Built Environment

"Whether people are healthy or not, is determined by their circumstances and environment. To a large extent, factors such as: where we live, the state of our environment, genetics, our income, and education level, and our relationships with friends and family all have considerable impacts on health" (WHO, 2017).

In the design and construction industry, there has been an increase in awareness amongst the professionals and the users about environmental impacts such as global warming and resource depletion. Although it is crucial to act sensitively to environmental concerns, in our enthusiasm to tackle one problem we have ignored another: the impacts of the built environment on the holistic health of people. There is no denying the fact that sustainable buildings promote the physical health and productivity of their users but this key performance indicator has been marginalized or has been seen in some cases as irrelevant until now (Grigoriou, 2014).

According to Butterworth(2000), the built environment is the setting and backdrop by which we live our lives. The built environment has a direct impact on senses, emotions, sense of community, and basic well-being. Parks, playgrounds, promenades, and other open areas are dependent on the surrounding built environment for their successful usage and maintenance. Although we now spend most of our lives within the buildings, there is always an urge to reach out for natural light and fresh air. While inside a building, the absence of natural light, ventilation, outside views not only impact us physically but also psychologically. According to the Healthy Community design (2010), the built environment comprises all physical parts where human beings live and work and has a direct influence even on their level of physical activity. It is therefore relevant to explore the relationship between the built environment and the holistic health of children.

The built environment may be understood as a material, spatial and cultural product of human labour that combines physical elements and energy in forms for living, working, and playing (Lawrence & Low, 1990). It may be defined as the human-made space in which people live, work and recreate on daily basis. The category of the built environment that is taken up for exploration in this study is the school environment with children as the primary user. Most of the existing research on built school environment either talks about the academic performance or student behaviour. This study assumes that both academic performance and behaviour are the external indicators of a child's holistic health and therefore if the root cause of these issues is catered to, most of the problems may be resolved.

Children are the most neglected users when it comes to the design of their built environment. This is so because they are expected to accommodate the environment designed by adults as per their sense of space. To maximise the potential usage of space, the user's perspective is neglected in most cases. The three primary built environments for children are home, neighbourhood, and school. A school is a place where children spend most of their waking hours during a day and a school-going child spends almost 14000 hours of their childhood in school. According to Tanner (2008), it is very unfortunate that most people believe that school buildings are just big boxes in which learning occurs and they are places to store students until they drop out of school or graduate. It is to be understood as - educational decision-makers, teachers, school board members, parents, and architects - that the design of these boxes, usually with a long and often dark, central corridor, has little to add to the process of learning and well-being of students.

2.4.3 School Environment In India: A Historic Overview

In ancient India, learning happened under a shady tree and the timings for the various activities were decided according to sunrise and sunset (for efficiency and thermal comfort). The climatic conditions in most parts of India have always allowed life to thrive outdoors, in the natural environment. A typical illustration of a gurukul (an ancient school in India) also depicts the guru(teacher) sitting on a raised platform under a tree and his disciples sitting on the ground below, facing the guru. The world's first university was built in Takshila in 700 BC and the University of Nalanda was established in the 4th century BC which is a great achievement and contribution of ancient India in the field of education. As more means of thermal comfort and artificial lighting came into being, most of our daily activities shifted indoors and today our lives are under the influence of our built environment more than ever before. The success of a built environment is directly impacted by the communication between the user and the environment. There has to be a certain rapport between the user and the building to attain overall health.

Early educators in India considered the environment to be a major influence on children. It was for the same reason that students had to live with their teacher and their peers where the teacher ensured a certain code of conduct and a certain quality of the environment. Everything wasn't taught by the teacher but the students were encouraged to learn from the surrounding environment and discover their strengths. During the early years of formal education in India, it was the responsibility of a religious institution to impart education and life skills to the children. As our societies became more liberal and secular, schools too transformed to be more inclusive institutions. This change in the education system also brought about a massive change in the environment of the schools. The system of education became teacher-oriented from the environment-oriented and the role of a teacher was transformed to an instructor, from a facilitator and a guide. With the British leaving a deep impact on the system of education and with a rise in tertiary activities as compared to India's agrarian economy, the sole purpose of education became to secure a degree than to develop life skills.

According to Swami Vivekanand, "Education is not the amount of information that we put into your brain and runs riot there, undigested, all your life. We must have life-building, man-making, character-making assimilation of ideas. If you have assimilated five ideas and made them your life and character, you have more education than any man who has got by heart a whole library" (Saravanakuma, 2007). The statement of Swami Vivekanand assumes much greater significance with the advent of the internet and ever-expanding digital connectivity. In this age of the internet and advanced communication networks, school education in India and the corresponding built environment in Indian schools are under immense pressure to cope with the changing scenario. The following literature is an attempt to explore the contributions of architects, philosophers, psychologists, and educators from various parts of the world who have contributed to the study of the relationship between children and their learning environment. In the Indian context; Mahatma Gandhi, Rabindranath Tagore, and J. Krishnamurthy have always been considered great thinkers and educators who have also considered the physical environment as a major component of their educational philosophy.

a) MAHATMA GANDHI

Mahatma Gandhi rejected the conventional system of education that aims at making people literate and focused only on memorization. His idea of education was all-round drawing out of the best in a child and man-body, mind and spirit. He insisted that the values cannot be taught but they are caught, children catch values from parents, teachers, and their surroundings. This, in a way, points out to the environment as being the third teacher. Mahatma Gandhi promoted an educational curriculum under the name 'Nai Talim'. Nai Talim is a principle that states that knowledge and work are not separate. Gandhian philosophy aimed at creating self-sufficient entrepreneurs rather than job seekers. In most parts of the world, the conventional system of education is being done away with as it has proved to be a failure in most cases. Like John Dewey, Gandhiji also wanted his school to be a 'doing' and 'thinking' school. He emphasised both theory and practice. But the latter was emphasised more.

Learning by experience was the primary motive behind this craft-centered education. He wanted that all instruction should be carried on through concrete life situations and about a productive and useful craft. Gandhiji's philosophy of education is known to be naturalistic in its setting; idealistic in its aims and pragmatic in its method and program of work (Rayees et al, 2021). This reflects the relevance of the setting -- the physical environment of a school-- in Mahatma Gandhi's educational philosophy. He believed that there is no true joy for the man whose life is cut off from the heavens above and the world of nature around. Gandhiji was very interested in the Montessori system of education and he taught the children in his Ashrams using a technique similar to the one Dr. Montessori developed. Some fundamental concepts that Montessori's Cosmic Education and Gandhi's philosophy have in common are Personal Freedom Through Accepting Responsibility, The Interdependence of Life, and Responsibility to Take Nonviolent Action Against Injustices (Bains,1949).

b) RABINDRA NATH TAGORE

Rabindranath Tagore believed that the highest education is that which doesn't merely give us information but makes our life in harmony with existence. Tagore wanted his students to feel free despite being in the formal learning environment of a

school because he had dropped out of school when he found himself unable to think and felt claustrophobic within the four walls of a classroom. He set up Santiniketan within lush greenery and aesthetically laid out the campus, which stands testimony to Tagore's belief that a close connection between man and nature should be the founding principle of education. Rabindranath believed that the educational system the British had enforced on India was meant only to train people to work as a clerk in their offices, and if possible, to inculcate in the so-called educated men a feeling of inferiority for their own culture and philosophy. Tagore, therefore, insisted on freeing the Indian education system of British control. He stated that a school should be home and a temple in one where teaching should be a part of a worshipful life. He believed that children have an active subconscious mind which like the tree has the power to gather food from the surrounding atmosphere (Tirath,2017).

c) J.KRISHNAMURTHY

School, according to Krishnamurthy, is a place where one learns about the totality, the wholeness of life (Lichtenberg, 2010). Though he insisted on academic excellence, he believed that there was much more to a school than just academics. He stated that a school is a place where pupils and teachers together explore along with the world of knowledge, their thinking, and behaviour. He emphasized the atmosphere in which the teaching-learning process takes place and he believed that a certain quality of the atmosphere is essential or teaching and learning. Nature was an integral part of Krishnamurthy's teachings and Krishnamurthy schools. Sense of belonging was central to the design of the school environment and the process of learning. Krishnamurthy's philosophy emphasizes the following aspects which tend to have direct physical and spatial implications:

- An intimate connection of man with nature- human beings need nature for goodness to flower.
- Space for self-introspection ; to reason for one's actions; to question and not simply accept what teachers/elders say and to realize that one is conditioned
- Teacher-student relationship: one of kinship, symbiotic and not hierarchical, 'the teacher is not a finished product who only has to give'

2.4.4 School Environment: Lessons From The World

"I do not teach anyone I only provide the environment in which they can learn"

- Albert Einstein

In the international context, people like Maria Montessori, John Dewey, Froebel, Rudolf Steiner, and many others demonstrated the relevance of built environment in their work towards children and education. **Maria Montessori** (1870-1952) advocated a system of education based on the foundation of a suitable environment. She insisted that children have the ability of self-exploration and intense learning through interaction with their environment. She also observed a strong tendency in children to order their environment (Gutek,2004). She also believed that children's minds are absorbent and that they pass through 'sensitive periods' of intense learning during which they change the physiology of their minds through interaction with their environment. She believed the environment to be the biggest facilitator for a child's self-learning process. Montessori stated that intellectual curiosity, excitement, and discovery require continual interaction between the child and its environment (Selda et al, 2012). She abolished the typical school benches and introduced movable furniture appropriate to the child scale. Maria Montessori developed a philosophy of education called cosmic education (Grazzini, 2010) that looked at the universe and all creation as one big family.

Montessori also discovered that children gain a sense of morality and purpose through learning about this interconnectedness. She talked about different planes of development in a human being's life. The second plane of development according to her is between the ages of 6–12 years old and is the time in which children attend elementary school. During this plane, according to Montessori, children begin to move from exploring concrete concepts to abstract ideas, and their focus shifts from individual formation to development as social beings which means they are reaching out to the world (Duffy,2002). This is also the time when children usually develop the higher brain function needed for reasoning and for engaging with ideas of morality and ethics (Lillard, 2013). All of these psychological characteristics of children in the

second plane of development make this period of their lives the foundation for their future.

American philosopher, **John Dewey** (1859-1952) considered two fundamental elements i.e. school and society as the two major topics needing attention. He conceived schools as miniature communities that mirrored the social relations and activities of the larger society which they are a part of (Dewey,1907). Yet, paradoxically, schools have been chambers of isolation – classrooms isolated from other classrooms, teachers isolated from other teachers, schools isolated from the outside world. Research has shown that positive and productive relationships within and outside an organization empower it to carry out its mission more effectively.

Froebel (1782-1852) coined the term 'Kindergarten' which means children's garden. He conceived school as a garden, the teacher as a gardener, and students as tender plants. He explains that just as a plant needs a favourable environment to grow, the child too needs an environment that fosters growth. He estimated that a child spends around 14000 hours in educational facilities from kindergarten to twelfth grade (Froebel, 1886). He believed in freedom with guidance, unity, connectedness, and community, engaging with nature and learning through self-activity and reflection. Laughlin(2015) stated that students who feel valued, connected, and cared for by people at school have a higher degree of wellbeing.

The founding father of the Waldorf school movement, **Rudolf Steiner** (1861-1925) recognized the association between space and human education. He paid special attention to the spatial dimension of the school building. His design philosophy was centred on colour, design, and a shift aloof from the right angle. He firmly believed that a child's mind, body, and spirit are deeply influenced by architectural forms. The typical watercolor-like scheme of Waldorf schools with its so-called ethereal, moral and spiritual effects was supposed to contribute to the overall development of students. Steiner imagined a new sort of school that would teach individuals to create a fair and tranquil society. The structure of Waldorf education follows a theory of childhood

development utilizing three distinct learning strategies for each of three distinct developmental stages (Bjørnholt,2014). These stages each last approximately seven years, as Steiner believed human beings develop in seven-year-long spiritual cycles. He also believed each stage was imbued with a different "sphere" - the Moon (0-7 years old), Mercury (7-14 years old), and Venus (14-21 years old). Steiner's seven-year stages are broadly similar to those later described by Jean Piaget.

Table 2.4: Four stages of cognitive development by Piaget

STAGE	AGE	GOAL
Sensorimotor	Birth to 18-24 months	Object permanence
Preoperational	2 to 7 years old	Symbolic thought
Concrete operational	Ages 7 to 11 years	Logical thought
Formal operational	Adolescence to adulthood	Scientific reasoning

Swiss Psychologist **Jean Piaget** (1896-1980), extensively worked on understanding the cognitive development of children. According to him, children are capable of learning from their interactions with the environment. He stated that learning comes after the development of cognitive functions. His theories reflect his respect for children's thinking. He insisted on exploration and discovery by the children to develop a sense of ownership and fulfilment that may further fuel their desire to learn (Piaget, 1969). The environment provides children with endless opportunities to learn. He insisted that if a child's interaction with their environment is restricted, their learning remains limited. He advocated learning from experience. Piaget's theory of cognitive development suggests that children pass through four stages of development as they grow up (Bukatku & Daehler,1995). There is a unique level of analysis, internal organization, and the understanding of the environmental information and events during each stage of cognitive development (Table 2.4).

Lazarus (2010) mentioned that at about seven years of age, children start using logical processes of reasoning on the basis of concrete evidence while at the formal operations stage they can reason in terms of theories and abstractions, as well as

concrete realities. It is in this stage that they develop problem-solving and reasoning skills that are powerful enough to last for the rest of their life.

Lev Vygotsky (1896-1934) in his social development theory argues that social interaction is a prerequisite to development. According to him, cognition is only an end product of socialization and social behaviour. He stated that what children can do with the assistance of others, can be more indicative of their mental development than what they can do alone. He believed in mixing various age groups where children can learn from each other. The more knowledgeable other (MKO) refers to anyone (particularly an older child) who has a better understanding or a higher ability level than the learner with respect to a particular task process or concept. He advocates the concept of the zone of proximal development (ZPD) which is the distance between a student‘s ability to perform a task under adult guidance and /or with peer collaboration and the student‘s ability to solve the problem independently. According to Vygotsky learning occurs in this zone. ZPD can be achieved through social interaction. To attain ZPD, areas facilitating interactive and cooperative facilities among students and teachers are required in addition to structured classrooms, for group interactions with teachers and peers planning for spaces in schools (Ivic ,1994).

Loris Malaguzzi (1920-1994), the founder of Reggio Emilia believed the physical environment to be of fundamental importance to the early childhood program. He referred to it as the ‘third teacher’, alongside adults and other students. The importance of the environment, according to him, lies in the belief that children can best create meaning and make sense of their world through environments that support “complex, varied, sustained, and changing relationships between people, the world of experience, ideas and the many ways of expressing ideas.” According to this view, the classroom environment is not only a space for learning, but a space for living in which students, teachers, families, and community members collaborate in the learning process (Malaguzzi, 1993).

Elements of the **Reggio Emilia** Approach include an aesthetically pleasing display of materials and furniture arrangement that encourages social learning and help to focus attention on collaboration between school and community. The approach

asserts the space and environmental elements of a classroom should be used as a means of communicating various messages to students. Children in Reggio Emilia are given the opportunity to express their knowledge and ideas in several forms of symbolic representation or languages (e.g., painting, drawing, sculpting, dramatic play, etc.). The importance of the physical environment is based on the belief children acquire the meaning of the world around them through complex and varied experiences with the materials and people within the environment (Strong-Wilson & Ellis, 2007).

Urie Bronfenbrenner (1917-2005) stressed the significance of considering the environment as much more than an inanimate object but rather acting in two opposite directions, where for every action of the child, there is a reaction by the environment and vice versa. This constant interplay allows development to occur. According to Darragh (2006), the following four categories must be reflected upon as they reveal that childhood environments should support children's learning by (a) providing information for the senses, (b) supporting the unique needs and preferences of children, (c) offering experiences that are content-rich and (d) giving feedback through bidirectional exchanges.

Carl Rogers (1902-1987) stated that all human beings have a natural tendency to learn and the role of the school is to facilitate such learning. This facilitation includes: setting a positive climate for learning, clarifying the purpose of the learners, organizing and making available learning resources, balancing intellectual and emotional components of learning, and sharing feelings and thoughts with learners but not dominating (Morgan,1977). Three out of five of the above aspects are clearly influenced by the built environment of the school which is a major component of school climate.

Dutch architect **Herman Hertzberger** insists that what children need is an environment that stimulates and incites learning by asking questions, a climate that provokes exchange and confrontation, intellectually, culturally, and politically. He also adds that in present times, the task of an architect who is entrusted with designing a school is a complex one because of plenty of changes that have taken place in recent years. Some of those changes are the arrival of the computer era, the emergence of

greater differences between pupils in terms of background, the arrival of pupils with diminished motivation and concentration due to a wide range of distractions like television and the internet that keep them occupied, complicated, and disordered home situations (Hertzberger, 2008). All these developments place a lot of responsibility on the schools to act as a second home to children and work on their wellbeing prior to learning because learning occurs when the mind and the body are relaxed and a sense of security prevails. **Alian De Botton** observes that the quality of our environment: the kinds of walls, chairs, buildings, and streets we are surrounded by, is one of the greatest causes of both happiness and misery (Botton,2005).

According to **Howard Gardner**, there are nine bits of intelligence in which children may be exceptionally gifted. He insists that each child has their own unique intelligence and the design of a classroom environment be equipped with the materials and instruction to best accommodate each child‘s intelligence and learning style (Gardener,1993).

According to **Mark Dudek,** the intention behind having an institute like a school is to nurture and care for education. He believes that the physical environment is bound to have an effect on the success of children not only academically but also socially. He terms school as a blueprint of the society in terms of investment, maintenance, and quality of built environment it offers for its future to the end-users. According to him, inhibiting the sense of freedom for reasons such as health and safety, fears of bullying, and difficulties of control are the major obstructions to a well-balanced school environment. He considers schools as communities where children learn as much from each other outside the classrooms as they do from their lessons (Dudek, 2000).

Henry Sanoff advocates the need for a variety of meeting places to promote interaction among children. According to him, such places need to be welcoming and must promote a feeling of belonging and a sense of ownership. He goes on to add that characteristics like shape, color, or arrangement help building users make mental images of the environment (Sanoff, 1994). Henry Sanoff devised a school assessment checklist consisting of the following nine factors: Building setting, Information

legibility, Comfort, Wayfinding, Communication, Social engagement, Versatility, Imageability, and Safety (Sanoff, 2001). Many other studies related to building conditions, school facilities, and student achievement also indicate that student achievement improves with improved building conditions.

Peter Bussmann points out that the problem lies in the fact that schools are designed for children by grown-ups whose priorities are very different from the users and sometimes even opposite. It is, therefore, crucial to understand how children perceive their spaces and what attracts or repels them. He insists that it is of utmost significance to acknowledge the various stages of development as established by Montessori, Piaget, Steiner, and others. According to him, children can relate more to a space when it is designed in compatibility with their perception and also where they are accompanied by their peer group (Walden,2015). Social interaction, therefore, is vital to the success of any institution.

Advancing a step further, **Christopher Day** questions the quantum of present crisis amongst adolescents being caused due to alienation and disenchantment and further adds that could a part of the crisis be resolved if the children had grown up in an environment that valued them and that they valued. He points towards the environment that matched the developing needs of the growing children. Apart from home and neighbourhood, school is the only place where children spend most times of their childhood. The built environment of the school, therefore, has a very deep impact on the health and wellbeing of the children even after they have finished school and stays with them for the rest of their lives (Day, 2007).

Spatial cues from the envisioned learning environment of some renowned educators, architects, and psychologists can greatly help in formulating the design considerations of a healthy school design. Table 2.5 mentions the prominent keywords from their education design philosophy:

Table 2.5 : Attributes of an Ideal School Environment

Educator/Architect/ Psychologist	**Spatial cues from their envisioned learning environment for children**
Mahatma Gandhi (Singh, 2019)	Naturalistic setting, flexible spaces, autonomy, sense of belonging, experiential learning, self-esteem, holistic approach
Rabindra Nath Tagore (Tirath, 2017)	Connect between man and nature, autonomy, harmony with environment, holistic approach
Krishnamurthi (Lichtenberg, 2010)	Connect with nature, space for self- introspection, sense of belonging
Montessori (Gutek, 2004)	Self-exploration, interaction with environment, flexible spaces, relevance of second plane of development (6–12 years)
John Dewey (1907)	School as a miniature community, social interaction
Froebel (Roszak, 2018)	Freedom with guidance, social interaction, connection with nature and space for self-activity and reflection
Rudolf Steiner (Bjørnholt, 2014)	Influence of aesthetics and architectural forms, developmental stages
Piaget (1969)	Developmental stages, interaction with environment, sense of ownership
Lev Vygotsky (1994)	Social interaction, mixing of age groups
Malaguzzi (Ellis, 2007)	Socialisation, interaction with environment, natural light, multiple modes of learning
Urie Bronfenbrenner (Darragh, 2006)	Stimulation of senses, flexibility, interaction with environment
Carl Rogers (Morgan, 1977)	Positive school climate, autonomy, holistic approach
Herman Hertzberger (2008)	Stimulating environment, social interaction, flexible spaces,
Howard Gardner (1993)	Self-esteem, flexibility to accommodate multiple modes of learning
Mark Dudek (2008)	Autonomy, social interaction, school as community
Henry Sanoff (2001)	Sense of belonging, aesthetics, community participation
Christopher Day (2007)	Self-esteem, stages of development, sense of belonging
Nair & Fielding (2009)	School as a small learning community
Walden(2015)	Social interaction, child's (user) perspective, stages of development

2.5 Salutogenic Design

2.5.1 Salutogenesis: Theory & Relation to Holistic Health

'To ask about health ease, instead of asking about the disease, is to search for weapons that may be far more potent in decreasing human suffering'.

- Antonovsky,1979

Salutogenesis is a medical approach focused on factors that support human health and well-being, rather than on factors that cause diseases (pathogenesis). To be more specific, 'salutogenesis' is a health-promoting model concerned with the relationship between health, stress, and coping. Aaron Antonovsky, a professor of medical sociology, coined the term in 1979. The word 'salutogenesis' literally means 'origin of health' and comes from the Latin word Salus (health) and the Greek word genesis (origin). According to Antonovsky (1979), health and wellbeing are related to our ability to cope with the stressors of human existence by seeing the world as making sense, cognitively, instrumentally, and emotionally. Following are some important definitions that can assist a better understanding of Aaron Antonovsky's perspective towards holistic health:

- **Stress:** 'Stress is the condition that results when person-environment transactions lead the individual to perceive a discrepancy -whether real- between the demands of a situation (stressor) and the resource of a person's biological, psychological, or social systems' (Turner-Cobb,2008).
- **Stressor:** 'A demand made by the internal or the external environment of an organism that upsets its homeostasis, restoration of which depends non-automatic and not readily available energy expanding action' (Antonovsky, 1979). The difference between the terms stress and stressors is stressors are agents with potential stress-inducing abilities and stress results from the potential stressor (Turner-Cobb, 2008).
- **Coping:** Coping is an attempt to deal with stress by trying to change the load, and to reduce the symptoms caused by the stressor by increasing resources bound to the

environment (Netterson). The tension level (stress) experienced by people depends upon how they cope with the stressors (Antonovsky,1979).

- **Generalised Resistance Resources (GRRs):** Generalised Resistant Resources (GRRs) are 'any characteristic of the person, the group, or the environment that can facilitate effective tension management' (Ziegler, 2009).
- **Sense of Coherence (SOC):** Sense of coherence (SOC) is the global orientation based on a person's confidence that stimuli are structured and predictable, the resources needed to meet these demands are available, and these demands are challenges, worthy of investment, and engagement (Antonovsky, 1979). It is the capability to perceive that one can manage in any situation independent of whatever else is happening in life (Mittelmark et al., 2017).

Antonovsky described health as a dynamic process and stated that everyone finds themselves on a continuum between 'maximum health' and 'maximum disease'(Table2.5). He intended to shift the focus away from the risk factors to a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that one's internal and external environments are predictable and there is a high probability that things will turn out well as can reasonably be expected (Krause, 2011).

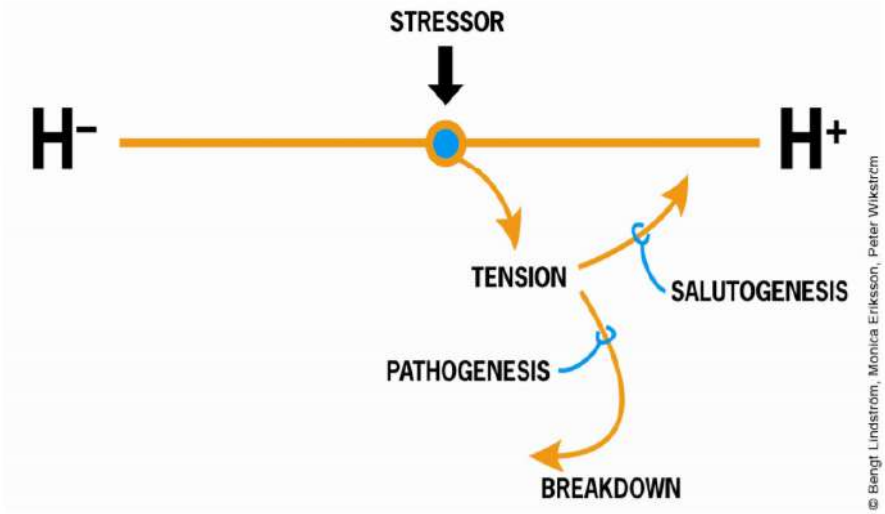


Figure 2.5: Antonovsky's idea of health continuum and the salutogenic direction.

In his theory, Antonovsky (1979) insisted that stressors are indispensable parts of our daily lives and it depends on our sense of coherence whether we allow these stressors to break us down or strengthen us. Antonovsky referred to SOC as a resource that enables people to manage tension, reflect on their external and internal resources, identify and mobilise them, promote effective coping by finding solutions, and resolve the tension in a health-promoting manner (Serbast Essa, 2020). Research has shown that it is possible to measure a person's sense of coherence and predict an individual's health (Suominen et al., 2001). A strong sense of coherence predicts good health and a low sense of coherence predicts poor health. In his study, Heiman (2004) showed that students with an elevated sense of coherence did not experience increased levels of stress. Antonovsky considered 'Generalised Resistance Resources' as the cornerstones of the development of a strong 'sense of coherence'. These resources are of different types: genetic and constitutional, psychosocial, cultural, and spiritual material (Lindström & Eriksson, 2005).

2.5.2 Sense of Coherence :

Antonovsky defined the core notion of SOC by the following three dimensions:

- **Comprehensibility**
- **Manageability**
- **Meaningfulness**

Comprehensibility: Comprehensibility is a belief that events in one's life can be understood including challenges (Jensen, 2017). The comprehensibility component contains items to the degree a person experiences internal and external stimuli as cognitive, comprehensible, orderly, cohesive, structured, and clear (Eriksson & Mittelmark, 2017). We may also see it as the ability to find order in chaotic situations. Only if one can comprehend a situation that one shall be more likely to manage the stress caused by it. We may therefore see comprehensibility as the ability to comprehend the situation/change/environment without an unhealthy increase in stress. A person with strong comprehensibility perceives the world as coherent.

Manageability: Manageability is a belief that there is ample availability of resources needed to take action and that things are manageable and under one's control (Jensen, 2017). In the words of Antonovsky (1987), manageability is the extent to which one perceives resources are at one's disposal which is adequate to meet the demands posed by the stimuli that bombard one and also they have the resources under one's control or resources controlled by legitimate others like spouses, friends, colleagues, God, etc. A high score on manageability shows that a person is managing adversities without feelings of being a victim or being treated unfairly (ibid).

Meaningfulness: Meaningfulness is a belief that things in life are interesting, motivating, and a source of satisfaction (Jensen, 2017). Meaningfulness is a desire to resolve difficulties and a willingness to invest energy to get through experiences of stress that have the potential to cause distress (Eriksson & Mittelmark, 2017). Meaningfulness is about to what degree life is emotionally understandable and about demands and challenges being appreciated, commitments and efforts handled directly without being bothersome.

Therefore, it can be concluded that persons with a strong sense of coherence meet challenges with a desire to be motivated to cope (meaningfulness), they believe that challenge is understandable (comprehensibility) and they believe that resources to meet challenges are available (manageability). The aim is the development of a sense of coherence is to have life experiences that lead to a strong SOC (Similia, 2015).

2.5.3 Salutogenesis in the Physical Environment

'Architecture can be psychologically manipulative. Salutogenic architecture is believed to accomplish this manipulation by providing a narrative context that affects a person's behaviour, neural and endocrine systems, and through its influence on the brain and the body' (Golembiervski, 2017 & Mazuch, 2017).

Alan Dilani conceived the idea of salutogenic design, to which he refers to as 'Psychosocially Supportive Design' with an intention to promote health. According to Dilani (2001), salutogenic design introduces wellness factors that can strengthen health.

The theory suggests that we not only design for stress reduction but focus on salutary rather than risk factors. Dilani (ibid) suggested ways in which the shift from a pathogenic approach to a salutogenic approach can be manifested in the built environment: According to him, the basic function of psychosocially supportive design is to start a mental process that may eliminate or, at least, reduce anxiety and bring about positive psychological changes. Dilani refers to the stress theory model (Figure 2.6) founded by Levi (1972) based on a system that points to a deeper understanding of the physical environment and different human components. According to Dilani (2008), the model describes how the physical environment is the foundation on which we build a societal organisation and, in the long run, promote health or disease.

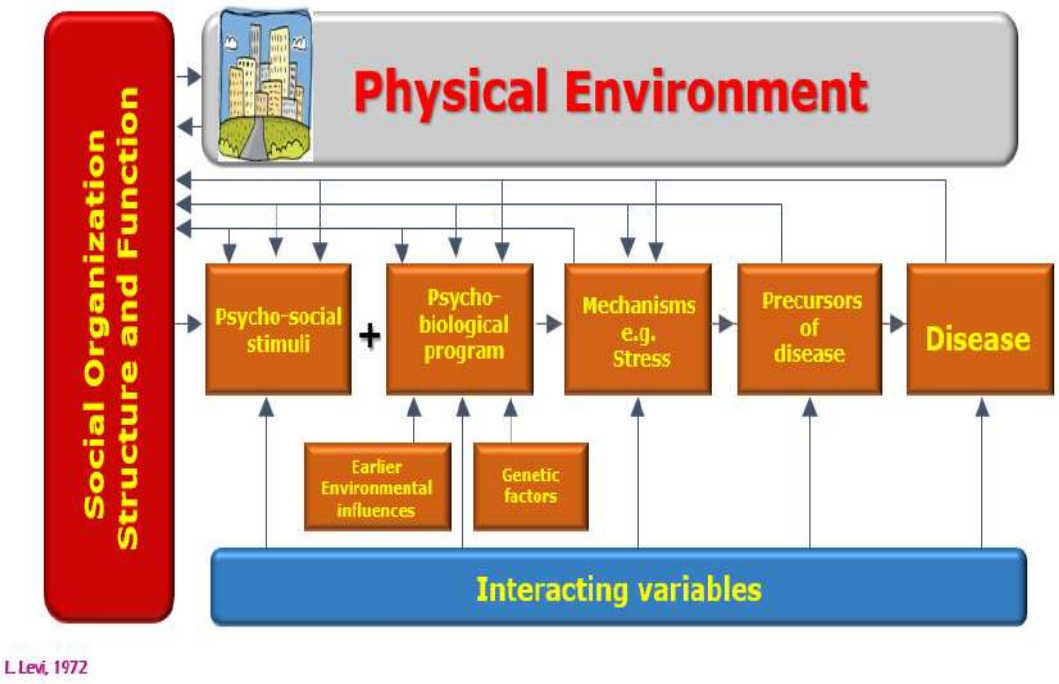


Figure 2.6: Stress theory developed by Lennart Levi, 1972

In 1997, the World Health Organization identified that any healthcare facility should include these frequently used priority spaces: the workplace, schools, hospitals, correctional institutions, commercial offices, public spaces within our towns and cities, and homes as the apex of health promotional activities in 21st century (Dilani, 2001). Adopting a salutogenic approach as a vital part of the building design process creates a

preventive care strategy that might shift the focus from the factors that cause illness to the factors that lead towards a healthier society.

Salutogenic design, in an educational context, aims at identifying the elements of physical school design that can contribute towards the development of a strong sense of coherence, leading to the improved holistic health of children. Dilani (2001) created a list of architectural characteristics that he argues can strengthen an individual's sense of coherence (Figure 2.7). He states, 'Physical elements in an organisation can contribute to stress, and therefore are essential design factors that can equally increase comfort as well'.

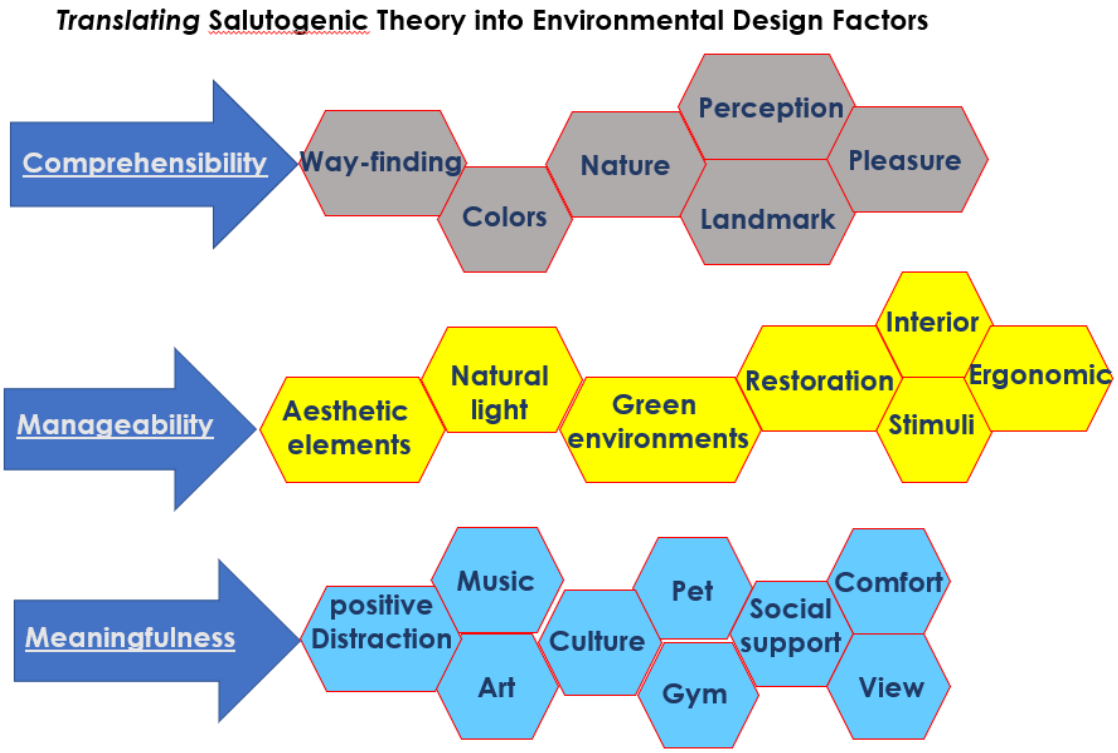


Figure 2.7: Design factors in relation to Sense of Coherence, developed by Dilani (2008)

Salutogenic design bridges the gap between architectural design, neuroscience, and psychology. According to Krause (2011), the two primary GRRs (Generalised Resistance Resources) that need to be activated to strengthen a child's sense of coherence in school are 'sense of self-worth' & 'sense of belonging'. Emotions and experiences are central to the building of a strong sense of coherence (Dilani, 2001).

The idea here is to create experiences in the built environment that may lead to positive emotions, further leading to a strong sense of coherence. Fredrickson (2001) states that positive emotions are much more than a few momentary experiences and can also contribute to holistic health. Sense of self-worth and sense of belonging may be broken down into multiple psychological experiences to connect them with their spatial counterparts in school design.

The psychological experiences of security, knowledge and freedom in a built environment can help in making an environment more comprehensible. Experiences of self-efficacy and balance can lead to stronger manageability and comprehending a sense of place and a sense of purpose can strengthen meaningfulness in school children. The following tables illustrate the psychological experiences that children must have in order to be healthy (Table 2.6) and the way these experiences can be realized for children by fulfilling their holistic health needs (Table 2.7).

Table 2.6: Simplifying the GRRs (Source: Researcher)

GRRs That Need to Be Activated by/for a High Sense of Coherence at School		
Sense of Self Worth	**Sense of Belonging**	
Sense of Security & Sense of Knowing	Sense of Self Efficacy	Sense of Place
Sense of Freedom	Sense of Balance	Sense of Purpose

Table 2.7: Sense of coherence and holistic health needs of children (Source: Researcher)

Comprehensibility (Sense of Security, Sense of Freedom, Sense of Knowing)	**Manageability (Sense of Self-Efficacy & Sense of Balance)**	**Meaningfulness (Sense of Place & Sense of Purpose)**
Safety/Security	Self-Esteem/Personal Growth/Self-Acceptance	Place attachment in school
Autonomy/ Psychological Freedom	Competence/Capability/ Accomplishment/ Mastery	Engagement/ Purpose in Life
	Habitable Environment (clean air, water, shelter, thermal comfort, natural light, etc.)	Positive relationships with people and places

2.5.4 Bringing it all together : Salutogenic Design of Schools

After combining and synthesizing the learnings from the three domains of literature review, the researcher has enlisted the various attributes of a healthy school environment in the Table 2.8

Table 2.8 : Bringing it all together (Source: Researcher)

<table>
<tr><th>Theoretical base</th><th>Salutogenic Approach</th><th>A healthy school design must aim at….</th></tr>
<tr><td>SENSE OF COHERENCE
Comprehensibility
Manageability
Meaningfulness</td><td>Ability to cope with stressors (Resilience)</td><td rowspan="4">Encouraging autonomy
Fostering self esteem
Ensuring physical comfort and safety
Building a sense of security
Promoting social interaction
Building a sense of place
Promoting engagement
Building competence
Connecting to nature
Sensory stimulation
Building resilience
Encouraging experiential learning
Facilitating self-introspection/restoration
Respecting developmental needs
Building ownership/ community values</td></tr>
<tr><td>MASLOW HIERARCHY OF NEEDS
Fulfillment of physiological needs, safety needs, love/belonging needs and self-esteem needs pave the way for self-actualization</td><td>Self Actualization</td></tr>
<tr><td>SELF DETERMINATION THEORY
In order to grow, flourish and reach upto their full potential, all individuals need:
1) Autonomy (the need to feel free and self-directed)
2) Competence (the need to feel effective)
3) Relatedness (the need to connect closely with others)</td><td>Motivation to reach full human potential</td></tr>
<tr><td>AYURVEDA
"a balance between body, mind, spirit, and social wellbeing."</td><td>Balance</td></tr>
</table>

The synthesis of literature review can help in deciphering the spatial considerations in school design capable of supporting experiences that may help

improve sense of coherence in children and hence their holistic health. Addressing the sense of coherence in school design, we can elaborate on the three attributes of salutogenic design as follows:

2.5.5 Comprehensible School Environment

According to Krause & Lorenz (2009), experiences of consistency are the basis for the development of comprehensibility. In positive cases, children have feelings of security and acceptance in social relations. Consistency in experiences comes when most events in daily lives are predictable. Though it's neither possible nor desirable to predict every experience as it may lead to monotony, human beings flourish when most of their experiences are consistent so that they can spare more time to pursue what they want to rather than adjust to unpredictable events/experiences. When translated to a built school environment, experiencing consistency would mean being able to comprehend the connection between the various spaces and having confidence that they all connect to form a unified whole, leading to a sense of security and coherence.

A secure environment must therefore possess the qualities of being decipherable (C. Day, 2007) and transparent (LOSD, 2009). These environments orientate and reassure children by using familiar elements and special features that may assist way-finding and legibility (Dilani, 2001). It requires an optimum organisation of space to control density and assure personal space for everyone. Comprehensible environments are authentic, genuine, and honest, and these qualities may be conveyed through the use of natural materials and construction methods, usually avoiding superfluous decoration and detailing (Franz, 2019). According to Ken Yeang (2015), 'Environmental Comprehensibility' requires environmental orderliness, predictability, and legibility. This may refer to the relevance of visual order in the built environment with legibility, intuitive way-finding, and the elimination of visual chaos. The following design guidelines can therefore enhance comprehensibility in a school environment:

(i) Give Reassurance & Build Orientation Through Legible and Predictable Design: Legibility is the degree to which a building facilitates the ability of users to find their way within it (Weisman, 1981). Legibility is crucial to comprehend an

environment effectively. Legibility in the school environment can be enhanced by creating unique identities for various locations, by using landmarks as visual cues, by creating well-structured paths, by limiting navigational choices, and by using clear sightlines to show what's ahead (Thapa, 2019). Predictability refers to the degree to which one can predict what can occur or what we expect to occur in an environment. We need predictability to ensure safety and security that can be enhanced through thoughtful design of spaces with natural surveillance, a welcoming secure entrance, transparency within spaces, use of familiar elements and sensory connections, and also through safe community involvement (LOSD, 2009).

(ii) Encourage Autonomy and Psychological Freedom in School Environment : Though it is not possible to grant complete freedom to school children, keeping in mind the concerns related to their safety. It is, however, possible to create an environment that makes them feel psychologically free. Architecture can foster autonomy and impact psychological freedom by measures like: use of scale: switches, water taps, door handles, etc (Walden, 2015)**,** ensuring personal space/controlling density/crowding/ territoriality (Walden, 2015)**,** sense of security and feeling of privacy (Sanoff & Walden, 2012) and authenticity (Franz, 2019).

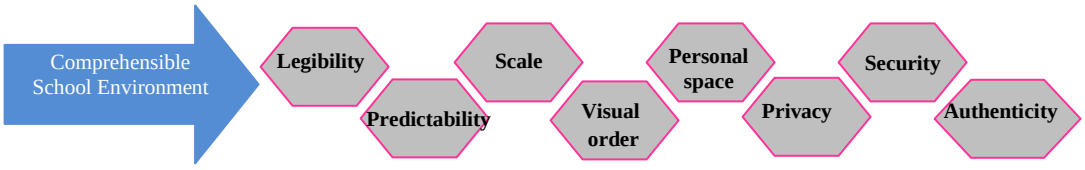


Figure 2.8: Design Cues for a Comprehensible School Design (Source:Researcher)

2.5.6 Manageable School Environment

Krause & Lorenz (2009) insist that experiences of self-efficacy are the basis for the development of manageability. This component grows if the requirements for children are available to their developmental level and if they experience the acceptance of their progress. According to Franz (2019), a manageable school environment aims to build competence by being well resourced, enhancing the ability to cope, develop further capabilities and undertake required/desired activities. These resources could also

be the environments that allow students to exercise control and support activities by being safe, comfortable, and accessible. The inclusive design also forms a part of a manageable environment where students with special needs are considered. Research on inclusive and universal design provides further support (Myerson & Lee, 2010 & Raheja, 2011).

It is also crucial for a manageable environment to be flexible and responsive to change and to encourage participatory planning. Dilani (2001) suggests that environmental components that foster manageability are aesthetics, natural light, green environments, restoration, stimuli, and ergonomics. Comprehensibility is a pre-condition for effective manageability. The following design guidelines can help develop a sense of self-efficacy and balance in school children:

(i) Ensure Comfort and Safety to Increase School Efficiency: Comfort here refers to 'a state or situation in which you are relaxed and do not have any physically unpleasant feelings caused by pain, heat, cold, etc' (M.W. Dictionary). 'Research suggests that students need to be comfortable (just like adults) to learn', says Nair (2014). We can achieve comfort through design via thermal comfort, acoustic comfort, visual comfort, physical (bodily) comfort, and olfactory comfort (Table 2.9). Also, compliance with the building safety codes is a prerequisite to a healthy school design.

Table 2.9 Comfort in the school environment (Source: Researcher)

Thermal Comfort	Natural ventilation, HVAC, air quality (Barrett et al., 2015)
Acoustic Comfort	Noise control, sound levels complementary to nature (Barrett, 2015)
Visual Comfort	Colors, natural & pleasant views, natural light, perceived scale, form, etc. (Barrett & Barrett, 2011)
Physical Comfort	Attention to ergonomics (Zhang & Barrett, 2009)
Olfactory Comfort	Smells to be avoided/invited (Barrett et al., 2015)

(ii) Create Opportunities for Attention Restoration and Stress Reduction in Schools: The relevance of salutogenic design from the point of view of school efficiency can be better understood if we are aware of the two types of attention systems. Kaplan and Kaplan (1989) developed the Attention Restorative Theory (ART), which states that activities needing direct attention may cause exhaustion after an intense period of concentration. A person may need to restore their attention after a period of continued concentration to be efficient. In a classroom where children are expected to concentrate on their lessons for hours together, it becomes crucial to restore attention after a certain period of direct concentration. It is now known that an exhausted person often commits human errors (Dilani, 2008). A child's ability to focus has a direct impact on their academic competence and ability to comprehend situations and stay inspired, this further leads to high self-esteem and better manageability. Studies by (Amicon et al. 2018) and (Determan et al. 2019) have provided the evidence that natural environment in schools can help students with better recovery of their attention resources, as well as in feeling more restored and less stressed and fatigued as claimed by Ulrich (1991) in Stress Reduction Theory (SRT). Empirical studies have informed that experiences of the natural environment provide greater emotional restoration, with lower instances of tension, anxiety, anger, fatigue, confusion, and total mood disturbance than urban environments with limited characteristics of nature (Barton & Pretty, 2010).

(iii) Design Flexible Spaces Capable of Quick Adaptation in Changing Scenarios of the Education System: To foster efficiency, spaces should be flexible to accommodate a variety of purposes, allowing day-to-day changes as well adaptability to future change (LOSD, 2009). Designing flexible environments could enable the adoption and adaptation of the emerging changes in education. Flexibility in space allows the usage of multiple modes of learning, as Howard Gardner suggests each child learns differently depending upon their unique intelligence. Therefore, flexible and adaptable building designs 'future proof' the spaces and allow for a variety of uses at different points in time (Cardellino, 2009).

(iv) Improve Accessibility and Inclusion by the Application of Universal Design Principles to Heighten Self-Esteem and Efficacy: 'Universal design is concerned with more than just removal of barriers, it seeks to eliminate discrimination by design and support full participation for all members of society' (Lusher & Mace, 1989). The goals of universal design given by Steinfeld and Maisel (2012), demonstrate its health-promoting intentions by ensuring an accessible, inclusive and usable environment for all the users that have a positive impact on self-esteem and self-efficacy in children.

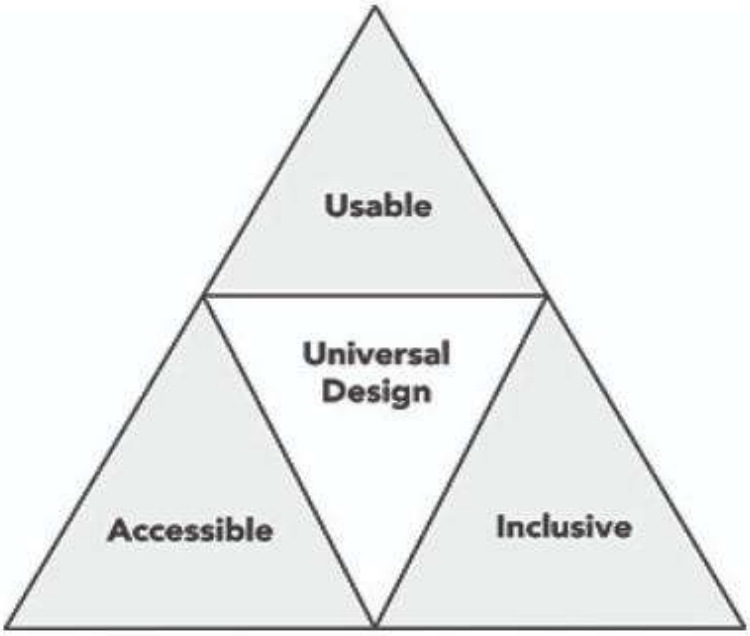


Figure 2.9: Equal Access: Universal Design of Student Services.
Source: Burgstahler, Sheryl. (2020)

(v) Encourage Participatory Planning to Build Environmental Stewardship : Childhood is the best time to inculcate environmental stewardship in children. A sustainable school environment can become a significant instrument and a potent third teacher (Wilson& Ellis, 2007) for environmental education and stewardship. Architects can either encourage participatory planning during the design and conception of the school or can leave room for intervention by children when they use the environment, which is not only a place where education is imparted but a place where learning happens (Tasci, 2015).

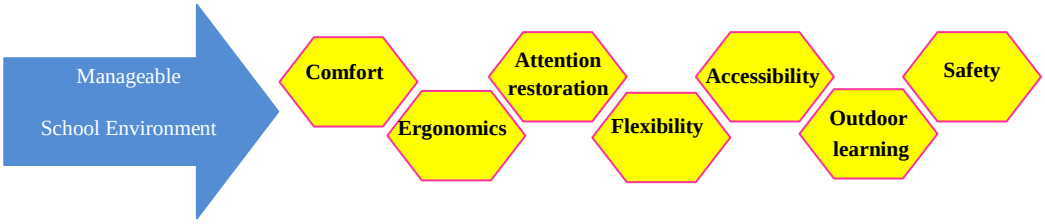


Figure 2.10: Design Cues for a Manageable School Design (Source : Researcher)

2.5.7 Meaningful School Environment

Krause (2011) observed that the motivational and emotional component increases when children can influence and take part in social decision-making processes (sense of purpose). Children need to feel that they belong to the school and school belongs to them. Based on research data from neurobiology and resilience studies, experiencing a minimal amount of empathic resonance is a fundamental biological need without which the human being could not survive (ibid.). If children feel accepted and acknowledged, they feel recognised and get feedback, which strengthens their self-worth. According to Franz (2019), an environment that motivates children's desire for a sense of coherence is perceived to be meaningful. Such environments are 'inspiring, engaging, restoring, challenging and aesthetically rich' (ibid.). Natural and built environments that engage the senses through material qualities of 'colour, texture and pattern' and atmospheric qualities of 'light, temperature and sound' are important in this context. Alongside the natural elements, several other additions can make an environment meaningful, for example, music, art, culture, gym, spaces for social support, opportunity to interact with other species, i.e., pets and other positive distractions (Dilani, 2008). A meaningful environment must therefore be able to evoke feelings of belongingness (self-worth) and engage people positively so that they experience a sense of purpose. We can inculcate these two qualities in the school environment in the following ways:

(i) Create Opportunities for Social Interaction Amidst a Natural Environment : The social structure and its physical environment determine to a large extent the kinds

of experiences children have and what they learn about the world. Every aspect of child development involves socialisation (Day, 2007). Socialisation facilitates identification with the school building and makes acceptance possible. Its users must feel connected to the school, feel at ease in it, and consider it a kind of home. A sense of place makes people connect with their surroundings and help them establish knowledge of and appreciation for the location. Lefebvre's work is significant because it challenges the unidirectional theory between physical space and social relations. In this work, he claims that space is socially produced, engineered, and constructed and that social relations are always made up relative to space. McGregor (2004) refers to schools as being a 'physical container for social life' in that they function as an intense place involving social interaction. A natural environment with 'biophilic' considerations is highly effective in enhancing the feelings of belonging and hence a sense of place. Some key elements of biophilic design, according to Salingaros (2017), are light, spatial permeability, sensory engagement, liminal spaces, organic shapes and forms, natural processes, and patterns such as fractal geometry.

(ii) Create Sensory-Rich and Actively Engaging Environment to Foster a Sense of Purpose: 'Experience of architecture is multi-sensory; qualities of matter, space, and scale are measured equally by the eye, ear, nose, skin, tongue, skeleton, and muscle. Architecture strengthens one's sense of being in the world, essentially giving rise to a strengthened experience of self' (Pallasmaa, 1996). Day (2007) states that stimulus is essential to a healthy life. According to him, for peaceful but invigorated balance, human beings need both sameness/predictability and contrast/stimulus. Perceived risk and stimulus of new challenges are what children need to stay motivated. These are essential ingredients for developing self-esteem and fostering a sense of purpose. Day (2007) insists that children cannot develop resilience without facing their fears. Risk-taking, therefore, becomes essential to develop an acute sense of coherence. Children love adventure, but their safety is a major concern. It is therefore important to maximise challenge while minimising injury risk. The designer must provide these whilst keeping actual risk. This is believed to be achieved through the design of environments that

accommodate a wide range of sensory experiences and activities and that include many learning: intellectual, physical, practical, social, emotional, spiritual, and cultural (Building Futures, 2004).

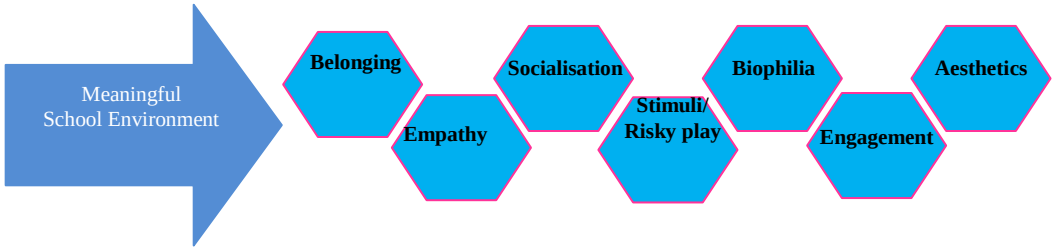


Figure 2.11: Design Cues for a Meaningful School Design (Source: Researcher)

2.6 The Nine spatial considerations for salutogenic (healthy) school design:

Dilani (2008) suggests that emotions and experiences are central parts of the health process and can be strengthened by exposure to positive stimuli from surrounding environments where we live, work, and play. In case of children, these primary environments would be home, neighbourhood and school. According to Dilani (2008), "The places where we spend most of our lives and the way we interact with the built environment, along with exposure to the stimuli from the built environment, strongly influence our moods and thereby health processes, emotions, and experiences, our state-of-mind and behavior". The holistic viewpoint emphasizes multiple dimensions of health, including the physical, psychological, emotional, spiritual, and social as discussed earlier in this study. All these dimensions are, in some way or the other, affected by the emotions we encounter and the experiences that we have on day-to-day basis. The above discussion can therefore be summarized by listing the experiences that children must have in order to reach a state of self-actualization (highest level of holistic health) against their respective spatial considerations. These spatial considerations are capable of enhancing the sense of coherence in children by paving way for them to create positive emotions.

Table 2.10: Spatial considerations to enhance SOC in school environment (Source: Researcher)

Experiences that can lead to positive emotions	**Spatial considerations in school design capable of supporting experiences that may help improve SOC**	**Positive emotions leading to improved SOC**
Sense of security, knowing and freedom	i) Give reassurance and build orientation through legible and predictable design ii) Encourage autonomy and psychological freedom in the school environment	Security/Joy Confidence
Sense of self-efficacy and balance	iii) Ensure comfort and safety to increase efficiency in school iv) Create opportunities for attention restoration and stress reduction in school v) Design flexible spaces capable of quick adaptation in changing scenario of the education system vi) Improve accessibility and inclusion by the application of universal design principles to heighten self-esteem and efficacy vii) Encourage participatory planning to build environmental stewardship	Mastery Relaxation/Peace Enthusiasm Acceptance Capability/ Competence
Sense of place and purpose	viii) Create opportunities for social interaction amidst natural environment ix) Create sensorially rich and actively engaging/ challenging environments to foster a sense of purpose	Belonging Curiosity/Awe

Table 2.10 illustrates how positive experiences in school when reinforced with suitable environmental conditions can help children create positive emotions that may further result in an improved sense of coherence. We can further convert the nine spatial considerations derived by critically reviewing the literature related to holistic health and built school environment into a practically applicable design criteria matrix, including design criteria to form the basis for a healthy school design. This exhaustive matrix enlists thirty-six design criteria for improving holistic health in a school environment. Although this matrix can be used as a ready reference for examining the health status of existing schools and a basis for new schools, the components of the matrix could be made more specific to suit the various contexts of its application. Table 2.9, 2.10, 2.11 illustrate the Conclusive Matrix of Design and Health (Ken Yeang & Alan Dilani) with psychosocial design factors (that prevent stress) on the horizontal axis and health-promoting factors (SOC) on the vertical axis within the context of the salutogenic learning environment.

Table 2.11: Design criteria with a view to strengthen comprehensibility in children.

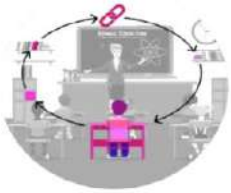
SOC Prevent stress — COMPONENTS OF HEALTH PROMOTION	PSYCHOSOCIAL DESIGN FACTORS		
	LIFESTYLE	**EMOTION**	**EXPERIENCE**
COMPREHENSBILITY "World is understandable"	Improve **LEGIBILITY** by creating unique identity of each block. 	Build **CONFIDENCE** through natural surveillance (esp corridors& toilets) to counter bullying. 	**WELCOMING** entrance, inviting, friendly and not institutional-looking or forbidding 
	WAY FINDING through clear sightlines and use of landmarks.. 	**SECURITY** through transparency. ex. Landscaping and trees must be carefully chosen to not block sightlines. 	**VISUAL ORDER** through limited and clear navigational choices. 
	PRIVACY through provision of retreat areas in classroom or in corridors to observe others and be alone as well. 	**AUTHENTICITY & HONESTY** conveyed through use of natural materials and construction. 	Create **HOMELIKE** environment by using familiar elements. 
	Safe Community involvement through **ACCESS CONTROL**. 	Foster **AUTONOMY** by designing places with respect for scale and developmental needs. 	**TERRITORIALITY** to value personal space ex. Home base for every student (LOSD). 

Table 2.12: Design criteria with a view to strengthen manageability in children.

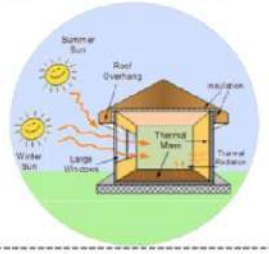
SOC Prevent stress — COMPONENTS OF HEALTH PROMOTION	PSYCHOSOCIAL DESIGN FACTORS		
MANAGEABILITY "Resources to meet needs"	**LIFESTYLE**	**EMOTION**	**EXPERIENCE**
	ERGONOMIC DESIGN for posture correction and efficiency in class room 	**REDUCE** learners' **STRESS** by the use of colours to facilitate vision and create a pleasant atmosphere and mood 	Create **BUFFER ZONES** from outside traffic and large school playgrounds to reduce noise disturbance 
	SUSTAINABLE / energy Efficient /**VERNACULAR** architecture to foster sustainable lifestyle. 	Ensure **COMFORT** in the Interior environment so children can concentrate on the task at hand ex thermal and acoustic 	Opportunities of **ACCESSING GREEN ENVIRONMENTS** in break periods in order to rejuvenate. 
	Improve accessibility and safety through the use of **UNIVERSAL DESIGN** principles 	**VISUAL STIMULI** by student work display fuelling better performance 	Participatory planning to boost **SELF EFFICACY** and competency. 
	BUILD COMPETENCE through flexible spaces suited for multiple modes of learning 	Allow **NATURAL LIGHT** into the classroom to uplift the mood and improve efficiency 	**ATTENTION RESTORATION** through outside / green views to allow minds and eyes to take a break. 

Table 2.13: Design criteria with a view to strengthen meaningfulness in children.

SOC Prevent stress / COMPONENTS OF HEALTH PROMOTION	PSYCHOSOCIAL DESIGN FACTORS		
	LIFESTYLE	**EMOTION**	**EXPERIENCE**
MEANINGFULNESS "Life makes sense"	Let **CULTURE REFLECT** by Using local materials and signature elements 	**LEARNING COMPASSION** by spending time with pets in the school garden. 	**AGENTIC LEARNING** environment to fuel belongingness 
	Inspiration through **ENGAGING** and well designed **LIBRARIES**, performing /visual art areas 	Developing **EMPATHY** for other children through informal interactions 	**STIMULATING ENVIRONMENTS** appealing to all senses ex. falling water sound 
	Intimate scale green spaces for positive **PEER INTERACTION** 	**AESTHETIC RICHNESS** through materials and furnishings in order to refresh and reflect 	**BIOPHILLIC DESIGN** to experience proximity to nature 
	GYM and playground for **PHYSICAL FITNESS** and mental strength 	**SENSE OF PLACE** through display of student artwork in corridors and waiting areas 	**RISK TAKING OPPORTUNITIES** (perceived) to experience sense of adventure 

2.7 Conclusion

The above discussion leads to the conclusion that the experiences of children in a salutogenic school environment can affect their ability to create positive emotions that may lead to an increased sense of coherence and hence improved holistic health. The nine vital considerations under the umbrella of salutogenic design can lead to effective and elaborate design criteria for schools from the point of view of health promotion. Applying the Matrix of Design and Health (Yeang & Dilani,2022) to the salutogenic school environment (Table 2.11, 2.12 &2.13), we get a comprehensive list of design criteria that affect the holistic health of children. These design considerations are detailed further by referring to the advanced studies in the field school design to arrive at a set of guidelines for salutogenic design of learning environments. Further research could quantify the impact of these design considerations by conducting Post Occupancy Evaluations (POE) of existing school facilities in the context where the newer proposed interventions aim to resolve the site/community/city-specific issues related to holistic health in children. The various methods of POE in schools like Sanoff's (2001) School building assessment methods; Tanner's 'Effect of school design on student outcomes' (2008); Cohen, Gilbert, Bodass and Leaman's 'Assessment of building performance in use: PROBE process' (2001); The classroom rating scale in Lorraine Maxwell, "Competency in Child Care Settings: The Role of the Physical Environment," (2006); and the EFEI (Educational Facilities Effectiveness Instrument), by Fielding Nair International will be referred to create a suitable assessment method for measuring the impact of built school environment on the holistic health of children.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

Research methodology is a process that is employed to find answers to the research questions systematically. It is, therefore, crucial to revisit the aim of the study before advancing towards the formulation of a suitable research methodology. This thesis aims to develop a set of salutogenic (health-promoting) guidelines for the design of new schools and an assessment tool for examining the health status of existing K-12 school buildings from a holistic health perspective. It also tends to demonstrate the application of the assessment tool by examining the health status of a few chosen schools in Amritsar city. The previous chapters have contributed to building a theoretical framework through an in-depth literature review concluded by deriving 36 design criteria to help school architects and designers prioritise health at the very conception of school design.

The school environment is known to affect the lives of students and teachers in more than one way. Student health and their educational performance are enhanced when the school environment works well for them. While the school environment is intended to support students' individual needs, it is necessary to understand their diverse needs and how the physical environment satisfies them (Sanoff, 2001). To evaluate to what extent the physical school environment fulfils the holistic health needs of children, a systematic assessment of environmental performance is indispensable. The assessment process is a means of providing satisfactory environments for the people who own, manage, and occupy them (Sanoff, 2001).

The guidelines and the tool intended to be developed through this study will contribute towards the health promotion of school children in the following ways:

1. As a reference guide to simplify the consideration of holistic health needs in the spatial design of learning environments.
2. As a checklist for Pre-Occupancy Checklist of the newly constructed schools

3. As a Post Occupancy Evaluation Tool for determining the health status of existing schools

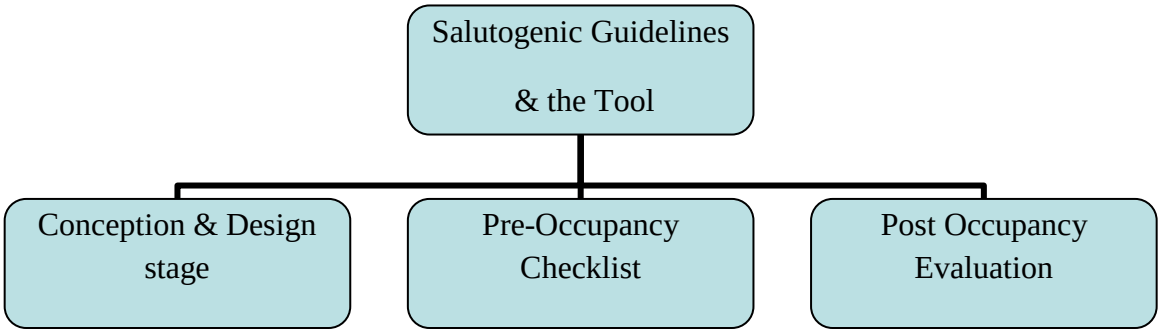


Figure 3.1: Possible application of the guideline & the tool

Sanoff (2001) defined the Post-Occupancy Evaluation (POE) of schools as an assessment process that can be applied to any type or size of the school environment, and it is a short-term process that seeks to identify its major successes and failures. Research methods and analytical techniques are generally determined by the outcomes that are expected from the POE. In this study, observation of the building or environment under working conditions for several hours was used to fill values in the assessment checklist by the researcher. Collection and analysis of data are the primary tasks in conducting a POE that precedes the interpretation of the results into useful findings. POE findings are intended to describe, interpret, and explain the performance of school buildings. It is only after an extensive discussion of the findings that a recommendation for future action comes into being. One important factor that determines the success of a POE is the skill with which a researcher selects and uses a suitable method for gathering information. According to Friedman (1978), methods used in data collection can be classified into three categories: direct observation, interview and simulation. The direct observation method was used to collect information for this study. In this method, data are collected by direct contact with real-life situations and by behaviours that occur naturally in the chosen environment. The observer unobtrusively records ongoing events and activities in a given setting. The assessment checklist was designed to be primarily used by architects and other professionals trained in the area of school design and holistic health. The healthy school assessment tool is not intended to be used as a strict evaluation instrument and none of

its findings are to be used against schools surveyed. Sanoff (2001) insists that the information and insights gained by individuals and groups through the use of assessment tools must intend to serve as a foundation for informed dialogue and consensus-building with those involved in, shaping K-12 school environments. School assessment tools must become an aid in the design decision-making process for the renovation, expansion or construction of new facilities.

According to Oladiran (2013), post-occupancy evaluation is the process of evaluating a building systematically after it has been occupied (Lee and Oh, 2007; Hewitt et. al, 2006; FFC, 2001). The field of POE or building performance evaluation is highly explored in commercial/office buildings (Clements-Croome, 2000; Walden, 2005). However, methods of post-occupancy evaluation in the case of learning environments are still unpopular and evolving. POE research in the learning environment focuses on how the building impacts learners' academic performance, comfort and health (Mendell and Heath, 2005; Scheider, 2002; Woolner, Hall, Higgins, McCaughey, Wall, 2007). Observation and survey methods are mainly used and different audiences involved in the assessment school environment are mainly designers, teachers, school administrators (Tanner, 2009; Sanoff, 2002; Earthman & Lemasters, 2009; Uline & Tschannen-Moran, 2008). Most of these researchers seek to quantify the effect that facilities have on effective learning and teaching (Baker, 2011), the effect of the physical school environment on the overall health of users remains largely unexplored. Therefore, this chapter focuses on creating a methodology for post-occupancy and pre-occupancy evaluation of primary schools from a holistic health perspective.

POE can have a significant impact on creating change in terms of improving the use of any building in two ways:

(1) By providing lessons and feedback for the architect and the construction industry (Enright, 2002)

(2) By empowering end-users as post-occupancy evaluation shows to what extent the building design meets the needs of its clients (Enright, 2002).

The following tested school building assessment methods have been the major references during the compilation of the assessment tool created for this study:

- Sanoff's methods (2001) in *School building assessment methods*
- Tanner's methods in the article *'Effect of school design on student outcomes'(2008)*

The reason behind the selection of these two methods is their inclination towards occupant's comfort and well-being, which resonates with the objectives of the current study that focuses the on holistic health of children. Another work that has greatly contributed towards the selection of design criteria for healthy school design is the book titled 'Language of School Design' (Nair, Fielding & Lackeney 2009). The patterns illustrated in this book directly resonate with the goal of holistic health promotion of children. Score rules and three-point rating scale have been adapted from:

1. The classroom rating scale in Lorraine Maxwell's "Competency in Child Care Settings: The Role of the Physical Environment" (2007)
2. The EFEI (Educational Facilities Effectiveness Instrument), by FNI. © Fielding Nair International (2005)
3. The EDA SPACE app by Education Design International (2020)

POE can be conducted at three levels: Indicative, Investigative and Diagnostic (Palm, 2007). The school building assessment tool created in this study is suitable for conducting an Indicative POE. As the name suggests, an Indicative POE is meant to indicate the success or failure of the overall building performance, or the individual aspects mentioned in the assessment checklist. It is a convenient, time saving, and cost-effective way of conducting a POE. Investigative and Diagnostic evaluations can be undertaken once the problem areas are identified (Eke, Clinton and Wellington, 2013). Indicative POE conducted through HSAT (Healthy School Assessment Tool) can specify the major strengths and weaknesses of a school building and therefore help school administration and the school architects in overcoming those weaknesses through suitable interventions. It can also direct the judicious use of resources in renovation and refurbishment projects along with presenting useful lessons for new the design of new school buildings.

3.2 Research Plan

The research plan on which this study was carried over is presented here. The research plan was drafted as follows:

Table 3.1: Draft Research Plan

A	Identification of the problem area
B	Setting of Objectives
C	Reviewing and examining relevant literature on holistic health, school design, environmental psychology and building assessment methods
D	Preparatory work for the creation of the assessment tool, creating design criteria matrices by identifying holistic health needs of children
E	Revisiting the literature for elaboration on design criteria to prepare the assessment tool
F	Formulation of the Healthy School Assessment Tool (HSAT)
G	Collection of primary data through HSAT and photo documentation
H	Analysis of the primary data to draw findings and conclusions from Post Occupancy Evaluation (POE)
I	Presentation of generalized guidelines for healthy school design as a resource for school architects and facility planners.

3.3 Research Design

This study employs a mixed methods approach as it allows the usage of both qualitative and quantitative techniques. According to Creswell (2003), there are three general strategies in a mixed-methods approach: sequential procedures, concurrent procedures, and transformative procedures. Sequential mixed methods seemed ideal for the current study. Sequential mixed methods procedures are those in which the researcher seeks to elaborate on or expand on the findings of one method with another method. The study begins with qualitative methods of data collection and analysis in the form of a detailed literature review leading to the derivation of a school assessment checklist that acts as an instrument for the collection of quantitative data.

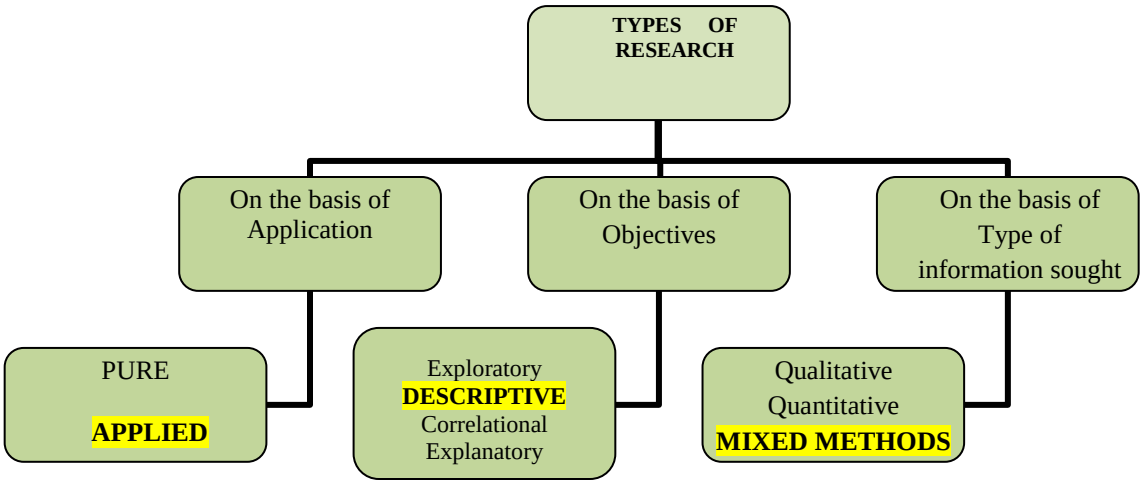


Figure 3.2: Types of research

Table 3.2: Research techniques used in the study

Research Design	**Research Methodology**	**Details**
Type of research	Applied research	The findings can be directly applied to improve the design of school buildings from holistic health perspective
Nature of the study	Mixed methods	Focuses on both qualitative and quantitative methods of research
Data Collection Approach	1) Primary data	Primary data is collected with the help of the assessment tool created for the study. The assessment tool is created by analysing data collected from secondary sources(literature review)
	2) Secondary data	
Data collection instruments	Observation method using an indicative Post Occupancy Evaluation (POE) tool and photo documentation of spaces	Checking the items on the assessment checklist through careful observation by the researcher
Sampling technique	Purposive sampling (non-probability sampling)	Selecting top 10 schools in Amritsar city (internet ranking websites and general mindset of parents)
Analysis of data	Descriptive analysis	
Thesis conclusion	Formulation of guidelines	

3.4 Steps in the Research Process

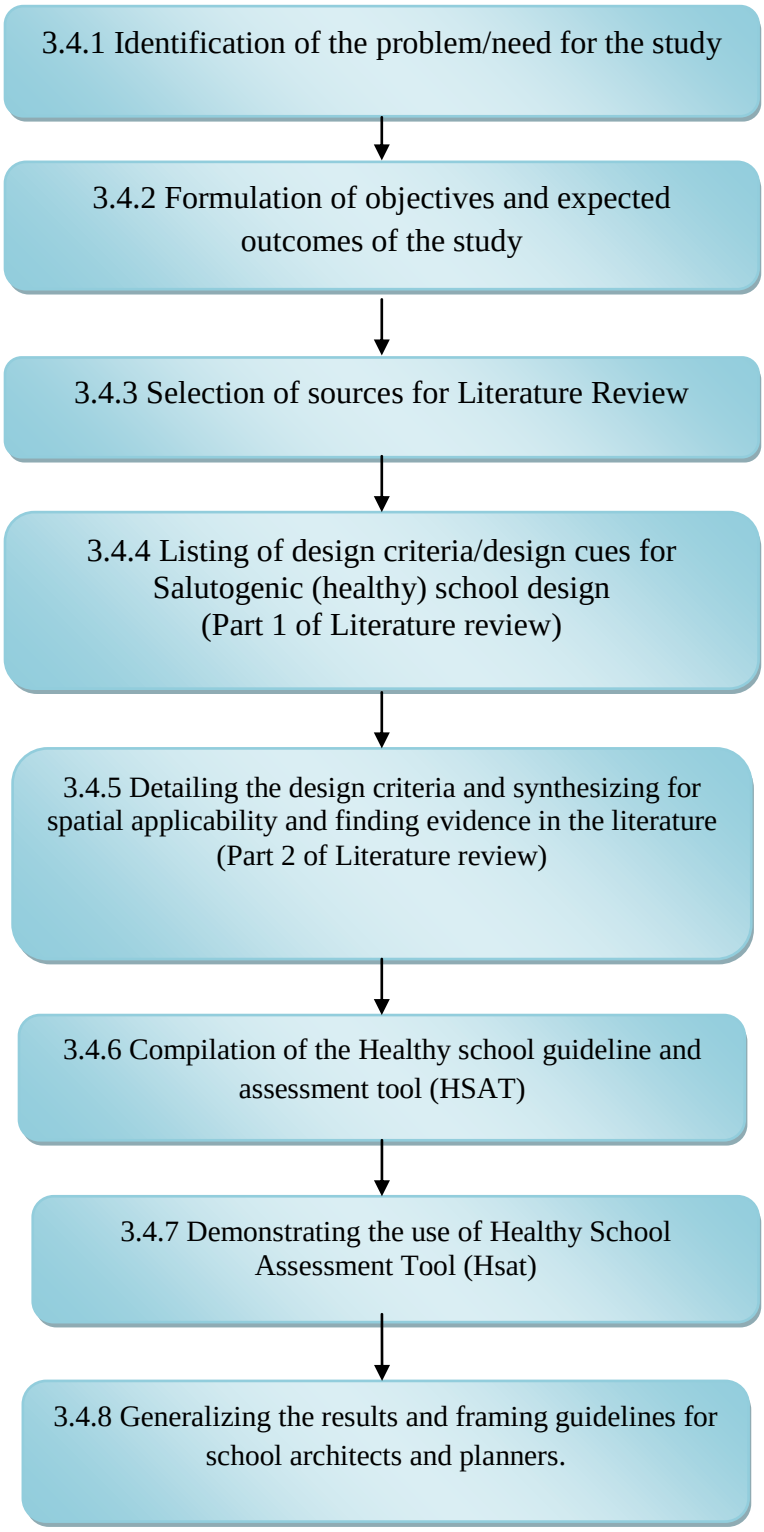


Figure 3.3: Steps in the research process

The detailed research plan can be elaborated under the following steps:

3.4.1 Identification of the problem/need for the study

The school setting is undoubtedly a crucial place for promoting health and well-being only next to the home and the neighbourhood where children spend most of their time. The school environment is also considered important because it provides a common platform to improve the health status of large groups of children at the same time and creates an opportunity for overall health promotion in society. Schools can be seen as playing a contributory role in improving the overall health and general well-being of the whole society (St. Leger, 2004), as they are considered relevant in the education sector. The Ottawa Charter (WHO, 1986) acknowledged the influence that surroundings can have on an individual's health, and also established a course for the settings approach in health promotion (Akinola and Yetunde, 2015). The success of a school does not, therefore, depend solely on the academic performance of pupils but also depends on making the whole school environment, including the physical, social and structural environments, healthy and conducive to learning (Simovska, 2004). A healthy school environment is not only associated with better social and emotional health of children and academic learning but is also associated with more healthful behaviours and better physical health (McNeely et al, 2002).Holistic health or overall health is not a pursuit but a prerequisite to achieving higher goals of education and life in general. Yet, it is not very common to find health on the design criteria list of school planners and architects. Research in the field of school design suggests that the academic performance of children is usually considered the primary goal to be facilitated by an aesthetically appealing school design. However, the built environment is known to be much more than a mere combination of built-open spaces that accommodate certain functions. The current approach in school design, therefore, needs to change with altering lifestyles and technological innovations. The difference between the current approach and needed approach in school design is elaborated in Table 3.3.

Table 3.3: Needed approach in school design

CURRENT APPROACH	NEEDED APPROACH
Childhood as a preparation for a successful future	Childhood is celebrated for its own sake and becomes the foundation for a healthy and well-balanced life
School as an academic institute promotes rote learning while ignoring the holistic development of children.	A school is a place where every child's talent and aptitude are nurtured in an environment that focuses on their holistic health
Built school environment facilitates mass production of content delivery.	The built School environment facilitates the development of life skills and competencies.
Schools are designed for standardisation and efficiency.	School facilities are designed to help deliver a personalised curriculum tailored to the needs of each child.
The school design process does not connect with learning and wellness research	School design is driven by and grounded in the research about holistic health and wellness.
The post-occupancy evaluation process for school facilities is cumbersome and rarely undertaken by architects	The post-occupancy evaluation is simplified for easy and effective application
School design standards are often rigid and focus more on engineering aspects and less on human needs.	Standardised designs are replaced by performance guidelines that provide creative freedom to the architects while focusing laser-like on the health and well-being of children.

According to Barton and Grant (2006), the natural and built environments are critical health determinants as well. The potential of a built school environment to improve the health of its users goes largely untapped and the impact of an ill-designed environment is usually understated. The World Health Organization (2017) lists the social, economic and physical environment along with a person's characteristics and behaviours as the primary determinants of human health. The Ottawa Charter for Health Promotion defines health promotion as "the process of enabling people to increase control over, and to improve, their health. The creation of supportive environments is one of the five key areas set up by the charter for health promotion. The significance of the physical environment as a determinant of holistic health (mind, body, spirit) has been clearly illustrated by Hancock (1985) in his mandala model of health.

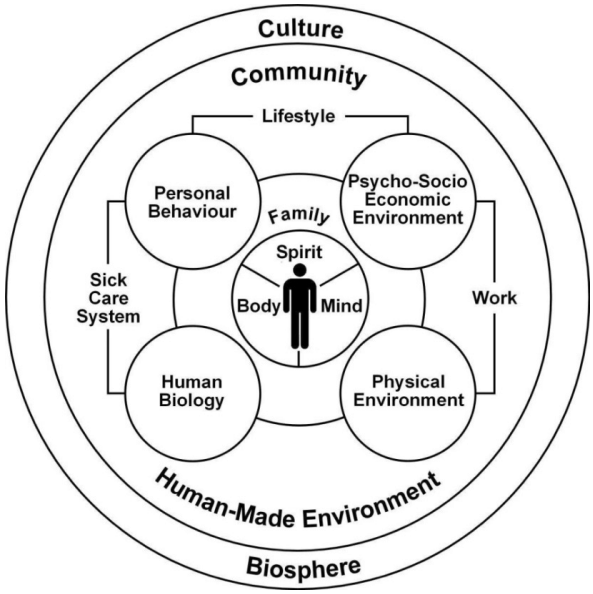


Figure 3.4: The mandala model of health depicts the various determinants of the health of an individual. It clearly depicts the relevance of the physical environment as a determinant of human health. (Source: Hancock, 1985)

In a world cramped by disease and disability, it becomes extremely important to consider health promotion in every human endeavor. The creation of health-promoting school environments can be a vital step toward building healthy and flourishing communities. The conventional approach to school design, as informed by the extensive literature on school architecture, primarily focuses on creating environments that aim at achieving academic excellence and in some cases physical fitness. The aesthetic quality of the environment is also considered in some cases. It is however necessary to consider the holistic health needs of occupants to create environments that promote overall health. Studies that relate environment to the holistic health needs of children in school, usually consider the social environment with little or no emphasis on the impact of the physical environment. This creates a gap in the knowledge and information that focuses on the impact of the physical school environment on the health and wellbeing of children. Moreover, the absence of a framework and clear guidelines for spatial application make health considerations unpopular among architects. It, therefore, becomes important to translate health criteria into the architectural language to assess schools for health status (how supportive is the built

school environment to children's health) and also to formulate well-articulated guidelines for easy application by school architects and facility planners.

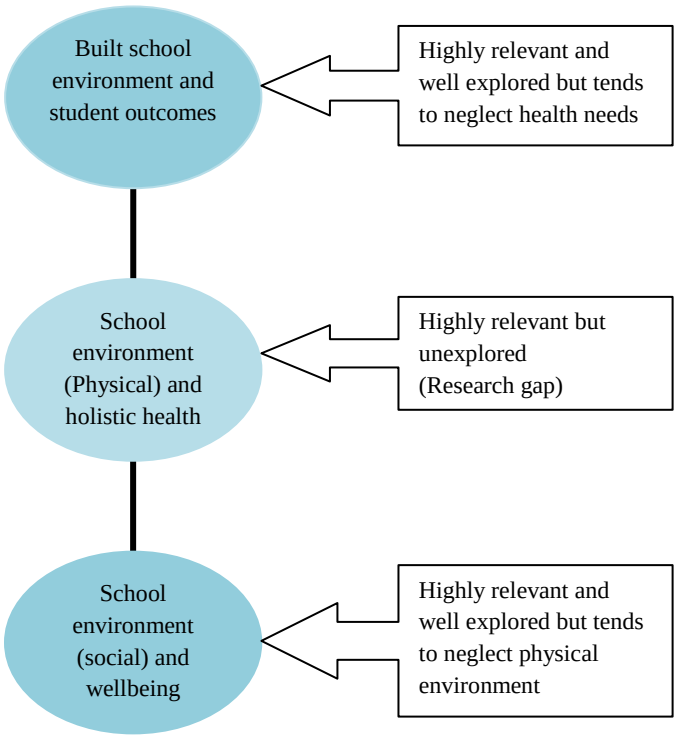


Figure 3.5: Research Gap

3.4.2 Formulation of research objectives and expected outcome of the study

As the need for the study has been identified, a framework is needed to execute the intentions expressed in the previous section. This study aims to develop a set of design guidelines and an assessment tool for Post Occupancy Evaluation (POE) of primary school buildings from a holistic health perspective. The study also intends to demonstrate the application of assessment tools by examining the health status of nine schools in Amritsar city (7 private + 2 government). To fulfil this aim, the researcher needs to understand the holistic health needs of children by reviewing various studies on holistic health and child psychology. The next step can be the identification of a design approach that considers most of the identified needs. The creation of guidelines and assessment checklist can follow after merging the learnings from previous steps with the existing literature in school design that resonates with the goals of the current study. The following objectives can therefore help in paving a path towards the desired goal:

Table 3.4: Research objectives

Research objectives
1. To identify the determinants of holistic health in children through various studies in the fields of holistic health, environmental psychology, child psychology etc.
2. To decipher the attributes of salutogenic (health-promoting) design that can contribute in building healthy schools for children by reviewing the existing research.
3. To propose a set of design guidelines for school architects to facilitate the process of healthy school design derived from a detailed literature review in the domains of Holistic Health, Salutogenic design and Physical School Environment
4. To formulate an assessment tool to indicate the health status of existing school buildings and demonstrate its application by assessing the selected schools of Amritsar city.

3.4.3 Selection of sources for Literature review

A theoretical framework for an interdisciplinary study like this must combine knowledge and information from various sources belonging to each of the disciplines involved. The inclusion criteria were based on the understanding that studies directly or indirectly consider the three major domains of research (Ref Fig 3.6) to understand the holistic health needs of children and the attributes of the physical environment that may help in fulfilling those needs. Since the initial studies informed that innate human needs are universal, studies from all parts of the world are included for review. The literature search was not bound to a particular study design and methodology as the review had to be conducted in two parts:

Part 1: First part concludes with the formulation of design criteria matrices for healthy school design based on research in holistic health, Salutogenic design and physical school environment.

Part 2: Second part included a detailed study of the thirty-six design criteria. Some new literature sources were added at this stage and some previous ones were re-visited for detailing specific design criteria.

Figure 3.6: Key Literature Review domains

Table 3.5: Literature review domains and keywords

Major themes	Keywords and search strategy
HOLISTIC HEALTH	'Health' is defined for this study by reviewing the literature related to the holistic meaning of health and various approaches to health that consider it to be a complete mind-body-spirit balance. Health-related theories from Ayurveda and Salutogenesis along with guidelines from World Health Organisation (WHO) have contributed to building a deeper understanding of holistic health and wellbeing. Keywords include a definition of health, holistic health, salutogenesis, health promotion, child well-being, physical well-being, psychological wellbeing, spiritual wellbeing, health needs of children, what children need etc preferably in the context of the school environment was reviewed to understand and needs and tendencies of children in the school environment.
PHYSICAL SCHOOL ENVIRONMENT	Literature corresponding to school architecture and design was searched in books, theses and research papers. Absence of any literature directly connecting school design and holistic health steered the research towards school design literature with keywords like child centricity, physical school environment, school design and student outcomes etc. that was reviewed along with some classic books on school architecture.
SALUTOGENIC DESIGN	The salutogenic design has been considered as a framework conducive to the fulfilment of holistic health needs in built school environment. literature in the field of salutogenic design was searched with keywords like salutogenic design. salutogenic architecture, salutogenic guidelines, salutogenic design of schools, salutogenesis, design and health etc.

3.4.4 Listing of design criteria/design cues for Salutogenic (healthy) school design

The design criteria for healthy schools were derived from the extensive review of literature from the interdisciplinary fields of holistic health, school design and psychology. The listing of design criteria was done under the framework of Salutogenic design. The theory of Salutogenic design states that a design can be called Salutogenic

(health-promoting) if it enhances the three core components of a Sense of Coherence (comprehensibility, manageability and meaningfulness). These three components are not mutually exclusive but highly interdependent and therefore there is an overlapping in design cues as well. Figure 3.7 shows the design cues under all three components of SOC. These design cues were derived from the interdisciplinary literature review and represented in the form of a visual matrix for better representation (Ref. Fig 3.7).

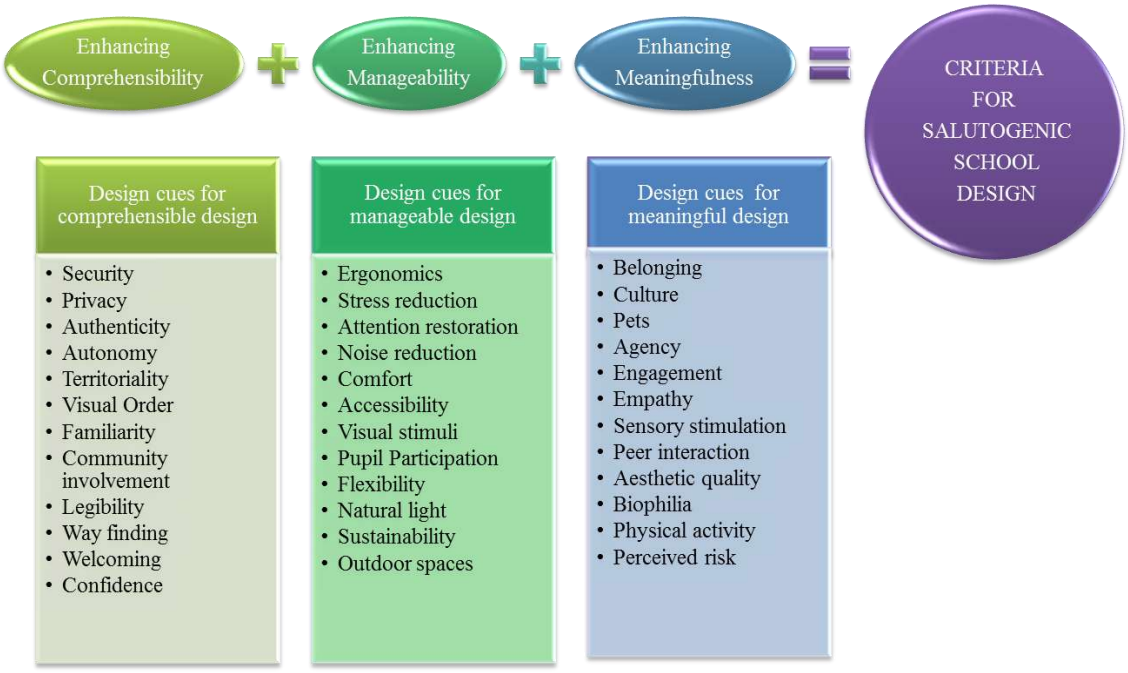


Figure 3.7: Design cues for enhancing the Sense of coherence (holistic health) in the physical school environment

3.4.5 Detailing the design criteria and synthesizing for spatial applicability

Each of the design criteria listed represented in the visual matrix created after reviewing the literature in part 1 was looked upon in literature with respect to school design and holistic health to determine their application as well as relevance in the process of a healthy school design. The detailing of each criterion revealed some overlapping and the possibility of combining two or more criteria under a common theme. Many of the items in the comprehensibility matrix were related to items in the manageability and meaningfulness matrix (and vice versa). This led to the synthesis of twenty-seven parameters for the Healthy School Assessment Tool (HSAT). Each one of

these twenty-seven parameters was then detailed for its practical implications and possibility to be assessed. This formed the basis of the assessment tool derived for Post Occupancy Evaluation of schools and the detailed discussion of each criterion also resulted in the formulation of a guideline for the architects and school facility planners.

3.4.6 Compilation of the design guidelines and the Healthy School Assessment Tool (HSAT)

A list of 27 design guidelines has been compiled to act as a ready reference for school architects and facility planners during the design process. This list is then detailed further and converted into an assessment tool called HSAT. The purpose of developing the Healthy School Assessment Tool (HSAT) is to take the first step towards creating a specifically focused tool for assessing the most relevant yet most neglected indicator of a well-designed school i.e., the health and well-being of children. A few studies from the past have discussed the relationship between school environment and child well-being but most of them only touched upon the social environment and physical health.

The absence of a holistic perspective has neglected the very important aspect of the impact of the physical school environment on the overall health and well-being of children. The assessment tool was compiled in the form of 27 subscales with a score of 0, 1, and 2 (A three-point rating scale) assigned to each of the assessable components. One of the objectives of this research was to provide an instrument that would satisfy the following purposes:

1. Provide a simplified yet comprehensive assessment tool that would facilitate the evaluation of the built school environment (from a holistic health perspective) in order to direct resources in the right direction during a school renovation project (a tool for post-occupancy evaluation, or POE).
2. Assist in fundamental research on the relation between the built school environment and the holistic health of children.
3. Provide systematic, evaluative information on the health status of the physical school environment for policymakers, managers, childhood educators, architects and parents.

4. Serve as a ready reference for the design of new school facilities.

The assessment tool is presented in the form of twenty-seven tables or subscales with each of them given a three-point rating. The average score in each of the 27 categories indicates the extent to which the school satisfies the given health consideration (0 is inadequate which means the criteria is not at all satisfied, 1 is adequate which means the performance is satisfactory but can be improved and 2 is excellent which means it is ideally satisfied). An option of N/A is also provided in case any of the criteria does not fit into the context of the school being examined. The Sum of all the average scores indicates the overall health status of the school where 86 % - 100 % means Excellent, 71 % - 85 % means Very Good, 51 % - 70 % means Acceptable, 31 % - 50 % means Unacceptable -- Needs Work and 0 % - 30 % means Poor -- Needs Substantial Changes. A sample of the subscale is shown in the Table 3.6.

What can be derived from HSAT:

- Overall health status of the school
- Issues that need attention
- Comparison between the health status of two or more schools
- Overall health status of schools in a city or country or under an organization

Table 3.6: Sample subscale for HSAT

4. Ergonomic considerations for posture correction	0	1	2	n/a
4.1 Variety of furniture that is flexible and easy to use.				
4.2 The furniture improves posture and is in good repair.				
4.3Workstations are designed to accommodate information technology.				
4.4 Floor seating and opportunity for reclining provided at a corner of the classroom.				
4.5 Popliteal heights, elbow angle, and other anthropometric considerations are taken care of.				
4.6 Footrest is provided for shorter children.				
4.7 Tables and built-in shelves have rounded edges.				
Average Score				

0 = Inadequate, 1 = Adequate, 2 = Excellent, n/a = Not applicable

Methods of statistical analysis:

1. Descriptive analysis (Median, Mean, Mode, Percentile) presented in the form of tables and pie charts.

3.4.7 Demonstrating the use of the Healthy School Assessment Tool (Hsat)

To demonstrate the use of the Healthy school assessment tool (HSAT), nine schools from the city of Amritsar were chosen through purposive sampling. Purposive sampling is the intentional selection of informants based on their ability to elucidate a specific theme, concept, or phenomenon (Robinson, 2014). As the Healthy school assessment Tool is meant to assess the health status of K-12 schools, the top twenty schools in the city were selected based on various ranking websites and the general perspective of city residents. The reason for this selection was to see if the traditional ranking parameters aligned with the holistic health parameters i.e. do the best schools prioritize health in their physical environment? Out of the twenty selected schools, nine schools were chosen as per their interest in participation (7 private schools + 2 government schools). All the selected schools are affiliated either with CBSE or to Punjab School Education Board (PSEB).

The Healthy school assessment tool is based on the innate and universal needs of children, it is, however, advisable to consider the contextual variations (if any). This step is indispensable owing to the diversity of contexts in which schools exist all over the world. The intention behind creating a simplified assessment tool is to popularise such assessments among school architects and policymakers to indicate the current state of affairs and rightly direct the future usage of valuable resources. One way in which this tool is different from the conventional POE tools is that it does not include the direct participation of the users. This makes the whole process less time consuming but it needs trained professionals to conduct the evaluation process. The detailed description of each criterion is however provided in Chapter 4 of the study for easy reference and better understanding. The following steps must therefore be followed during each assessment to ensure the contextuality of findings:

Table 3.7: Process of conducting a POE using Healthy school assessment tool (HSAT)

• Introduction to the city and the prevalent socio-economic and architectural context
• An overview of schools in the city
• Sample selection (according to the purpose)
• Conducting the assessment to determine health status of the built environment
• Drawing conclusions and comparisons (in case of multiple schools)
• Framing guidelines for the action required

3.4.8 Generalisation of the results and framing of guidelines

The study ends with the conclusions indicating the health status of the nine selected schools in Amritsar city. It intends to provide a fair idea of health considerations included in the design process by the school architects and facility planners. The conclusion also specifies the areas that need urgent attention so that specific measures can be taken and resources are judiciously utilized.

CHAPTER 4

DESIGN GUIDELINES AND THE ASSESSMENT TOOL

4.1 Derivation of Guidelines and Organization of the Assessment Tool

The design cues identified from review of the literature (Table 4.1) led the researcher towards the formulation of 27 design guidelines (Table 4.2) based on the relevant parameters. This process involved the understanding of the holistic health needs of children in the school environment and the identification of various design considerations that may help build a salutogenic (health-promoting) school environment. A salutogenic environment supports the capacity to cope – and even thrive, both of which hinge on an ability to dynamically adapt to life's changing situations.

Table 4.1: 36 Design criteria for Salutogenic School Environment

Security--Privacy--Authenticity—Autonomy—Confidence—Territoriality--VisualOrder-- Familiarity--Community involvement --Welcome feeling
Ergonomics--Stress reduction--Attention restoration--Comfort-Accessibility--Noise reduction--Visual stimuli--Student participation--Flexibility--Natural light--Sustainability--Outdoor spaces
Belonging—Culture--Agency--Engagement--Empathy--Sensory stimulation--Peer interaction--Aesthetic quality--Biophilia--Physical activity--Perceived risk

These guidelines may be classified as macro and micro considering that the impact of macro guidelines is more visible and direct and the impact of micro guidelines is more subtle and experiential. Each of these guidelines is then validated from the latest research in their respective areas that helped in the compilation of assessable components for that guideline. These guidelines with their assessable components were formulated into the Healthy School Assessment Tool (HSAT). The HSAT is therefore divided into 27 subscales with subscales 1-14 qualifying under the macro category and 15-27 qualifying under the micro category.

4.2 Design Guidelines for salutogenic learning environments

The 27 design guidelines for salutogenic learning environments are as follows:

I. Use of effective wayfinding strategies to improve legibility and build assurance

CHECKLIST
✓ A unique identity is created for each location
✓ Use of landmarks as visual cues
✓ Well-structured paths with goals
✓ Limited navigational choices
✓ Sightlines are used to show what's ahead
✓ Colour-coded indoor pathways to assist in keeping students oriented to the important locations within the learning environments
✓ The main building has an obvious point of reference among the school's buildings in which paths and buildings connect
✓ Distinction between various areas is made obvious using colors, textures, forms, ceiling heights etc.

Image IA:
Unique identity for each building

Image IB:

Colour-coded indoor pathways

II. Access control and Safe community involvement for enhanced learning and competence building

CHECKLIST
✓ Well placed windows to get clear view of the entrance
✓ Dedicated areas for community interaction near the entrance
✓ Signage and pavements to define accessible areas for visitors
✓ Clearly defined limits to ensure access control

Image IIA: Well placed windows to get clear view of the entrance

Image II B:

Dedicated areas for community interaction near the entrance

III. Respect for scale & development needs to improve self esteem/worth

CHECKLIST
✓ Variation in ceiling heights acc. to the intended use of space
✓ Spaces & Furniture considering child scale including toilet fixtures
✓ White board and other equipment respecting child scale
✓ Accessible material storage
✓ Door handles, switches etc at child's scale
✓ Variety of sizes of spaces

Image IIIA:

Door handles at child's scale

Image III B :

Fixtures respecting child's scale

IV . Ergonomic considerations to improve posture and increase efficiency

CHECKLIST
✓ Variety of furniture that is flexible and easy to use.
✓ The scale of furniture is age appropriate and is in good repair.
✓ Workstations are designed to accommodate information technology
✓ Floor seating and opportunity for reclining provided at a corner of the classroom
✓ Popliteal heights, elbow angle and other anthropometric considerations are taken care of.
✓ Feet can touch the floor while the person is sitting against the backrest . Foot rest is provided for shorter children.
✓ Tables and built in shelves have rounded edges

Image IV A

Floor seating and opportunity for reclining

Image IV B

Furniture designed to accommodate information technology

V . Careful use of color to avoid visual fatigue and enhance psychological comfort

CHECKLIST
✓ Variety of colors used while being careful about overstimulation
✓ Contrast between the board and the back wall just appropriate
✓ Color and lighting are considered together
✓ Colorful displays on the walls and doors
✓ Warmer tones are preferred for younger children and cooler tones for older children
✓ Physical activity areas like gyms, yoga halls etc. are painted in cooler colors
✓ Privacy niches and other areas for withdrawal to be painted in cooler colors
✓ Stage area in auditorium should be in contrast with surroundings and should preferably be painted in relaxing colors like beige, peach or pastel green

Image VA

Colorful displays on the walls and doors

Image VB

Variety of colors used while being careful about overstimulation

VI. Outdoor spaces to augment collateral learning, improve social interaction and feel connected

CHECKLIST

- ✓ Provision of an accessible green/open space immediately outside the classroom.
- ✓ An amphitheatre readily available for outdoor plays, performances, and presentations enhances the total learning environment
- ✓ Provision of temporary structures and benches to facilitate outdoor classroom
- ✓ Variety of open spaces to allow outdoor learning

Image VI A

Provision of benches to facilitate outdoor classroom even in a dense urban setting.

Image VI B

Variety of open spaces to allow outdoor learning

VII. Improve accessibility and build self esteem through universal design principles

CHECKLIST
✓ Simple, clear circulation with clearly defined paths, doorways, etc.
✓ Provision of handrails and use of material textures as tactile means of wayfinding.
✓ "Maze" entrances to washrooms improve access for all users and reduce hygiene issues associated with door knobs/levers.
✓ Circulation routes are of appropriate width (min. 1.5m wheelchair turning diameter), and kept clear of obstacles.
✓ Hardware and controls are located within reach of users and ensure ease of operation.
✓ Special consideration of acoustics for the visually impaired: buildings and rooms are designed to reduce echo, reverberation and extraneous background noise.
✓ Provision of appropriate lighting (natural and artificial) for circulation. Control glare and avoid extremes in light intensity between adjacent spaces.
✓ Use of large flat panel light switches which can be used with either hand, closed fist, elbow, etc. rather than small toggle switches.
✓ Rough or textured borders that contrast with smooth walking surfaces and indicate a change in grade or transition to soft landscaping, water, etc. are used.

Image VII A

Circulation routes are of appropriate width (min. 1.5m wheelchair turning diameter), and kept clear of obstacles.

Image VII B

"Maze" entrances to washrooms improve access for all users and reduce hygiene issues associated with door knobs/levers.

VIII. Managing density & crowding to improve self-worth and ensure social distance

CHECKLIST
✓ Ample space to move around in the classroom
✓ Gross Area provision per child is between 7- 10 sq.m.
✓ Children are divided into smaller groups/cohorts
✓ Uncluttered rooms as well as walls
✓ No. of students per class is between 17-25

Image VIII A

Ample space to move around in the classroom.

Image VIII B

Children are divided into smaller groups to maintain social distance

IX. Ample natural light for enhancing overall health and efficiency

CHECKLIST
✓ Diffused (glare free) daylight in every space where children spend long periods of time.
✓ Smaller windows at eye level are installed for views along with skylights or clerestory windows high in the wall deliver glare free light deep into the space.
✓ Unrestricted views (when glare is not a problem) provide a perspective to ease eye strain and bring the outside and inside worlds together.
✓ Daylight is supplemented with electric light. An acceptable design includes artificial light plus natural light from the outside, preferably on two sides of every room.
✓ Direct view of bright light sources like the sun, a bright sky, or an electric lamp that may create glare and visual discomfort are avoided.
✓ Diffused daylight enters from multiple directions and minimizes shadows, balances the light across the room.
✓ For each 100 square feet of classroom floor space, allow at least 25 to 50 square feet of window space.

Image IX

Diffused daylight in every space where children spend long periods of time.

X. Common spaces for peer/ teacher interaction to enhance a sense of community/belonging:

CHECKLIST
✓ Enough space/opportunities for 4 or more children, in more than 3 locations in visible/safe locations is ideal.
✓ Space for having a meal together with peers and teachers
✓ Presence of auditorium, amphitheatre etc in school

Image XA

Amphitheatre for performances that enhance social interaction

(Source: Language of School Design, Nair et al 2020)

Image XB

Spaces for informal interaction with teachers and peers

XI. Enhancing engagement through a variety of spaces that initiate a state of flow

CHECKLIST
✓ Engaging library with vibrant furniture, furnishings, colors etc
✓ Reading areas are well lit with spaces for group work
✓ Acoustically well designed and well-lit music and dance areas

Image XI A

Engaging library with vibrant furniture, furnishings, colors etc

Image XI B

Reading areas are well lit with spaces for group work

XII. Flexible spaces to facilitate multiple modalities of learning that build competence and self-worth:

CHECKLIST
✓ Space can be made larger/smaller or of a varying shape with a few changes in furniture arrangement
✓ The spatial layout allows the use of multiple modalities of learning
✓ Movable and flexible partitions that can be operated easily
✓ Possibility for expansion/change
✓ Adjustable furniture to support both technology use and writing/drawing etc by hand
✓ Curtains /blinds etc. to allow the usage of projector, smart board etc.

Image XII A

Adjustable furniture to support both technology use and writing/drawing by hand

Image XII B

The spatial layout allows the use of multiple modalities of learning

XIII. Effective noise reduction to combat stress and improve efficiency

CHECKLIST
✓ Site located in a peaceful area with low noise and air pollution
✓ Barriers and buffers to counter traffic noise
✓ Landscaping used as a dampener
✓ Hard materials that cause echo are avoided
✓ Appropriate sound absorbing materials are used

Image XIII A

Appropriate sound absorbing materials are used

Image XIII B

Landscaping used as a dampener

XIV. Natural ventilation and thermal comfort to improve efficiency and overall health

CHECKLIST
✓ Passive techniques for thermal insulation in extreme climates
✓ Provision for windows at various levels to be used during varied weather conditions
✓ Less noisy mechanical systems if any.
✓ Mechanical systems with a capacity to draw significant amount of outside air into the building
✓ Use of natural airflow patterns to circulate fresh air
✓ Higher ceiling heights wherever possible

Image XIV A

Passive techniques for thermal insulation in extreme climates

Image XIV B

Use of natural airflow patterns to circulate fresh air

XV. Welcoming entry and signature elements to help children comprehend the environment better and feel connected.

CHECKLIST
✓ An inviting and highly visible entrance with well-defined architectural features, signs, lighting, artwork, landscaping and other landmarks such as flags.
✓ Scale of the entrance not intimidating for the child.
✓ Motivational signs that send positive messages and invite children to school
✓ Landscaping features or small play areas visible from the entrance.
✓ Covered entrance that provides shelter from bad weather and facilitates transition
✓ Safe drop off/pick up, separate access for students and visitors
✓ Signature elements relating to local culture and architecture incorporated into the built environment, preferably visible from the entrance

Image XV A

An inviting and highly visible entrance

Image XV B

Signature elements relating to local culture and architecture

XVI. Ensure safety and security through natural surveillance and other design interventions

CHECKLIST
✓ Centrally located administrative offices to enhance student safety
✓ Parking areas are delineated for staff and visitors
✓ Entrances and exits are easily and effectively monitored
✓ All student/pedestrian pathways are passively monitored
✓ No hiding spaces in the ground, parking etc. created by landscaping , fencing etc.
✓ Separate age-level playgrounds for various age cohorts with developmentally appropriate and safe playground equipment
✓ Extensive use of windows and glazed doors to enhance natural surveillance of entrances, pathways etc.
✓ No unattractive barriers such as barbed wire on the school grounds
✓ Toilets preferably attached to classrooms, if not then they have auditory connections with adjoining areas
✓ Security system (unimposing alarms, lights, locks) provides elevated levels of security.
✓ The site and learning environments are free of excessive non-pedestrian traffic, hazards & noise.
✓ The school has physical or symbolic barriers along the property boundary present in an attractive appearance.
✓ There are no high voltage power lines in the close proximity of the school.

Image XVI

Careful placement of doors and windows to allow natural surveillance of outdoor areas

XVII. Use of sensory aesthetics and active design elements for optimum stimulation (physical & psychological)

CHECKLIST
✓ Attractive and plenty of well-maintained landscape areas
✓ Highly articulated fenestrations for framing of views
✓ Visually pleasing staircases and other movement pathways to encourage walking .Also, Age appropriate design of walking routes
✓ Avoidance of long narrow corridors and use of nature connected pathways instead
✓ Provision of dedicated indoor spaces for physical activities like yoga, dance, fitness training etc.
✓ Provision of sensory gardens with various activity spaces to suit the needs of children with varied temperaments.

Image XVII A

Stimulating physical activity areas

Image XVII B

Sensory garden

XVIII. Spaces for self reflection(privacy) and small group activities to enhance autonomy, competence and relatedness

CHECKLIST
✓ Social spaces where a small group of children may go to be alone (i.e. reading areas, quiet places, reflection areas, listening areas, etc.)
✓ Space and furniture in classroom and other learning areas provide 2-3 spaces for children to feel a sense of privacy and to control their interaction with others. (i.e. semi-enclosed spaces, nooks, dedicated furnishings, window seat for 1-2 etc.).
✓ Inviting yet supervisable cave spaces where students can take a deep breath, albeit momentarily, from their hectic lives.
✓ Classrooms have clear breakout zones or breakout rooms attached to them. Breakout zones within corridors and separate from the classroom are avoided.

Image XVIII A

Spaces allowing privacy

Image XVIII B

Inviting yet supervisable cave spaces

XIX. Authenticity and psychological comfort through the use of appropriate materials & textures

CHECKLIST
✓ Use of natural materials and visible details
✓ Multi-sensory materials are used that impart qualities like smoothness, roughness, brightness, opacity, transparency etc. to the surfaces.
✓ Use of materials that exude warmth
✓ Use of the glass to connect inside to outside yet making children feel secure
✓ Soft and comforting elements like pillows, plants, soft furnishings etc. add warmth and security of being home
✓ Use of curvilinear shapes wherever possible

Image XIX A

Use of natural materials and visible details

Image XIX A

Use of multi-sensory materials like sand

XX. Home like environments with familiar elements to enhance the feeling of security and psychological freedom:

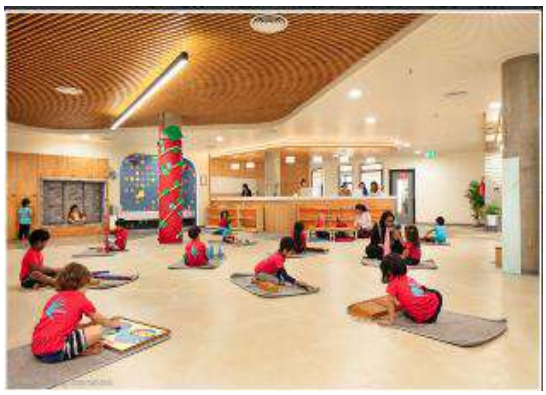
CHECKLIST
✓ Soft furniture, such as a couch or large armchair
✓ Nontoxic plants
✓ Natural or soft lighting, using window or lamps
✓ Throw pillows, cushions
✓ Other decorative touches, such as area rugs or repurposed furniture
✓ Family photos from the children and staff
✓ Inexpensive frames to hang children's artwork on the walls
✓ Neutral/Pastel paint colors with less stimulating displays (not visually overwhelming)

Image XX A

Soft seating with throw pillows and cushions

Image XX B

Neutral/Pastel paint colors with less stimulating displays



XXI. Encourage ownership/territoriality to build autonomous and agentic learners

CHECKLIST
✓ Personal workspace with lockers for each student
✓ Spaces for personal artefacts
✓ Personal storage for books, stationary etc.
✓ Adjustable/appropriate desks and chairs for varying ages and sizes
✓ Distinctive design elements
✓ Display spaces for student works

Image XXI A

Display spaces for student works

Image XXI B

Personal storage for books, stationary

XXII. Green/sustainable architecture to promote agentic learning and environmental stewardship:

CHECKLIST
✓ Spaces to learn from natural processes like sun orientation, wind flow patterns etc.
✓ Visible energy conservation/sustainable measures like rain water harvesting, solar panels etc.

Image XXII A

Outdoor shed with visible photovoltaic arrays on the top

Image XXII B

Storytelling area where children can track the sun's path during the day

XXIII. Biophillic design to counter nature deficit and effective attention restoration

CHECKLIST
✓ Ample availability of green and natural spaces in the school campus
✓ Views of nature from inside of the classroom
✓ Possibility of going out in the natural environment during break periods
✓ Use of biomorphic patterns in the interior environment
✓ Views of parking lots, roads etc are be avoided
✓ Restorative spaces with items such as soft furnishings, plants, animals, window seat or aquarium etc. are generously available.

Image XXIII A

Ample availability of green and natural spaces in the school campus

Image XXIII B

Restorative spaces near a window

XXIV. Spaces for pets in school for inculcating sense of responsibility and building empathy

CHECKLIST
✓ Outdoor spaces conducive for pets along with safety concerns of children
✓ Farm area for children to tend to

Image XXIV

Outdoor spaces conducive for pets

XXV. Student participation in planning and design of new facilities as well as maintenance/renovation projects

CHECKLIST
✓ Students maintain their own green patch
✓ Students volunteer in renovations and refurbishments in school
✓ Student participation to be considered during design and planning process

Image XXV A

Students maintaining their own green patch

Image XXV B

Making students a part of design and planning process

XXVI. Stimulating playgrounds to build risk competence and experience sense of adventure

CHECKLIST
✓ Opportunities for tree climbing and innovative play with movable parts
✓ Ample space for running, jumping and other age appropriate activities
✓ Presence of safety nets and other safety measures to avoid injury
✓ Proximity of school infirmary

Image XXVI A

Ample space for running, jumping etc.

Image XXVI B

Opportunities of innovative play even in small school sites in dense urban areas

XXVII. Enhancing overall sense of coherence by splitting bigger schools into Smaller learning communities:

CHECKLIST
✓ The school is split into small learning communities through blocks or levels
✓ Each learning community has its own open spaces and other indoor areas for socialization
✓ Each community has sufficient transparency to allow constant passive supervision

Image XXVII: Each community has its own areas for socialization

4.3 Validation from empirical research

The following section of the advanced literature review is intended to validate the connection between the derived guidelines and the latest research in their respective fields.

I. Use of effective wayfinding strategies to improve legibility and build assurance

Legibility is the key to building a cognitive map, or an internal representation of an environment that individuals use as a reference when navigating a space. It is the degree to which a building facilitates the ability of users to find their way within it (Weisman, 1981). However, a confusing environment is also expected to impact stress levels, as wayfinding issues may result in stress, frustration, and time loss (Arthur & Passini, 1992). Kanakri et al (2016) conducted an empirical study on wayfinding systems in educational environments, the study found that increased difficulty in wayfinding led to an increase in the subjective experience of stress in children. The study also mentions that anxiety affects the perceptive and cognitive abilities of children that are linked to disorientation. It further concludes that effective wayfinding systems reduce stress by creating environmental legibility. This argument is also supported by Oyelola (2014) who insists that effective wayfinding systems should reduce stress by creating environmental legibility.

Legibility in school, therefore, affects the ability of a child to comprehend how multiple elements form a part of a larger built environment. The distinction between various areas can be made obvious by the use of colours, textures, forms, ceiling heights etc. The interior circulation routes must be marked and easily understood. Children must find it easy to locate themselves and navigate through an environment that provides them with cues for creating a cognitive map. All the circulation routes within the building must be easily understood by newcomers. There must be well-defined pathways among buildings within the campus. Khan, Smita (2015) concluded in her post-occupancy evaluation of school environs that understanding the built surroundings reduces environmental confusion & can encourage confident learning experiences. Spatial cognizability & legibility also add to a sense of comfort in the young users.

Tanner (2009) provides the following markers for enhancing legibility in school environments: a) Indoor pathways may be colour coded to assist in keeping students oriented to the front, back, and other important locations within the learning environment. b) Clear pathways to activity areas and classrooms improve utilization of learning areas. c) The main building can have an obvious point of reference among the school's buildings in which paths and buildings connect within and among learning environments without getting disoriented. d) In circulation spaces, attention should be paid to avoiding complex structures that cause crowding and forces students to become disoriented.

II. Access control and Safe community involvement for enhanced learning and competence building

Slee & Skrzypiec (2016) suggest that collaborative school-community partnerships are pivotal in addressing issues related to wellbeing, bullying and resilience. Community involvement, though crucial for the holistic health of children, may pose serious threats to their security if goes unchecked. Feelings of safety and security are the primal conditions that enhance comprehensibility. Creating areas for safe community involvement near the entrance and controlling access to the private student areas becomes an important safety measure in the design of learning environments. Well placed windows can improve security by providing sightlines that help to monitor outside activities and identify visitors before they enter the school building (Erwine, 2006). Appropriate use of signage, pavement treatments, and landscaping can direct visitors and delineate their limits. A welcoming public entry, informal seating, private meeting rooms and an information centre for parents to learn about the school, its activities, and to share knowledge and information can also be provided (Nair&Fielding, 2020). Olawuni (2012) recommends in his 'Architectural Design Guidelines for Schools' that secure, controllable access to after-hours spaces to be used by the community must be provided. He suggests that access management for the same may include the usage of signs, well-marked entrances and exits, and landscaping to improve or limit access to certain areas.

III. Respect for scale and development needs to improve self esteem/worth

The learning environment and everything that is a part of it need to be at an age-appropriate scale for young children. Designing as per the developmental needs of children allows them to exercise autonomy and feel more confident. The scale and proportion of buildings and spaces affect both the physical and psychological comfort of the occupants. Rooms of different proportions can produce different effects; for example, low ceilings produce feelings of intimacy (Bennett et al. 2006). 'Soft classrooms' with semi-circular benches covered with pillows, adjustable lighting, a small rug and a few pieces of movable furniture are recommended for young children. Student participation noticeably improves in a soft classroom (Sommer & Olsen, 1980). Active participation leads to a rise in confidence and hence stronger comprehensibility. Spaces and furnishings which have scales that fit a child's size help children to feel a sense of ownership and belonging. A small school or class size can help children feel that their efforts are significant instead of feeling like a little cog in a large wheel. Weinstein (1987) recommends that spaces should be scaled to a child's size and that material storage should be accessible to children. This can enhance self-esteem and a sense of ownership in the school environment.

IV. Ergonomic considerations to improve posture and increase efficiency

Ergonomics is a science of taking human characteristics into account when we design and use things. Children spend most of their school time in a sitting position. Maintaining the same posture for a long is hard for the human body. Static postures create compression force on the lumbar spine. Good ergonomic design can protect the health and well-being of children and teachers (Bennett et al. 2006). Variety and appropriate scale of furniture is important for correct posture and academic efficacy in young children. Desks and chairs should be comfortable, interesting and ergonomic to the pupils' ages and sizes (Barrett, 2015). There must be a variety of furniture that is flexible and easy to use. Adjustable furniture may be an excellent ergonomic option that provides long term benefits (Linton et al.1994). Yanagisawa (2009) suggests that school furniture and workstations must be designed to accommodate information technology. Tables and built-in shelves must have rounded edges (Bennett et al. 2006). Enhanced

comfort levels through ergonomic considerations not only improve efficiency, but also add to a sense of place and belonging, thereby contributing to both manageability and meaningfulness.

V . Careful use of color to avoid visual fatigue and enhance psychological comfort

Colour is a medium of visual stimulation that can greatly impact children's interaction with their environment. However, while popular wisdom holds that infants and small children thrive on a high level of stimulation, research shows that the immature brain is easily over-stimulated and overwhelmed. When a child is overwhelmed, he tends to shut out his environment instead of absorbing it and learning from it. Learning environments must be carefully designed to allow for stimulation, but not over-stimulation (Gallagher, 1999). People and animals are stimulated by brightness and by warm colours that also stimulate creativity in students An increase in muscular tension, respiration rate, heart action, blood pressure, and brain activity occur under these conditions (Smith, 1980).

Dim light and cool colours have the opposite effect as they encourage withdrawal from external stimuli and decreases muscular tension, respiration rate, heart action, and blood pressure (Yarborough, 2001). Kuller's study shows that subjects placed in a colourful room for three hours demonstrated higher arousal (an alpha component of the EEG), lower pulse rate which is thought to be a result of higher attention levels, and higher levels of emotionality (Kuller, 1982). He concluded that overstimulation can cause changes in the rate of breathing, pulse rate, and blood pressure; an increase in muscle tension; and psychiatric reactions of various types (as cited in Mahnke, 1996). He also insisted that people subjected to under-stimulation show symptoms of anxiety, restlessness, excessive emotional responses and difficulty in concentration.

Nair & Fielding (2020) suggest that primary colours can be harsh and must be used sparingly. According to their experience with colour, they insist that children are wonderfully sensitive and responsive to nuances in both lighting and colour. Also, children are particularly attuned to the colours of nature and human skin tones and these

colours are completely out of the primary range but that does not mean that neutral colours are best for children. Research shows that learning benefits from a stimulus-rich environment, which is not supported by a palette that is dominated by grey, beige, white or off white; this applies to both building interiors and exteriors. There is rarely a good reason to take a neutral approach to educational architecture (Nair & Fielding, 2020).

Careful use of colour can help to create an environment that is stimulating yet leads to a sense of overall calm. Colours around the visual media like blackboard/ whiteboard/smartboard etc. may directly affect stress levels in students. The contrast between the background wall and the board must therefore be appropriate to not strain the eyes of children. According to Tanner (2015), colour and lighting must always be considered together because all suggested colour schemes assume adequate lighting. He recommends ceilings to be white or off-white and his studies conclude that young children prefer red, blue, green, violet, orange, and yellow without too many high contrasts that may produce fatigue.

Tanner (2015) goes on to suggest that upper elementary classrooms must be painted with cooler hues of blue and green. Considering visual stimulation as a motivational factor he recommends that classrooms for younger children must have colourful displays on walls and doors (e.g. light switches, wall outlets, louvres etc.) that are usually unnoticed by adults. In areas like an auditorium where the centre of attention is the stage, the stage area should be in contrast to the surrounding sidewalls, which should be a relaxing colour like beige, peach or pastel green (Tanner, 2015). The gymnasium is a room that produces more body heat; therefore, it should be painted in a cool receding colour with little colour contrast.

Steiner suggested that students experience a sequence of colours during their stay in school (Day, 2007). The psychological effect of colour was explored by Burruss (2001) who found colour has a direct impact on mood, judgment, and behaviour, therefore it should be an important consideration in a learning environment. It can therefore be concluded from the above argument that all colours have a place in children's environment when used thoughtfully. An ideal application considers the cultural and climatic context, available resources and lighting. Utilizing more saturated

accent colours in selected areas is more important for providing a varied, stimulating learning environment Nair & Fielding (2020).

VI. Outdoor spaces to augment collateral learning, improve social interaction and feel connected

Outdoor rooms for learning include any safe place that is not inside a building. This involves a place to watch clouds change shape and vapour trails develop after a jet plane has flown through the atmosphere. An outdoor room allows students to connect to natural surroundings. A small portion of the need for outdoor learning space may be linked to some understanding of getting away from high-density places in schools. This enhances the feelings of safety and security, builds competence and sets the stage for self-actualization (Tanner, 2015). Enforcing social distancing (like in Covid-19 times), particularly for the younger grades, is indeed a difficult task for teachers. Outdoor learning also provides more opportunities to maintain social distance. . The four elements of student-centred learning that are facilitated by outdoor spaces according to Nair (2020) include:

a) Personalization: It is easier to personalize learning in an environment where students don't have to all be doing the same thing at the same time and it is much easier outside than in a classroom;

b) Individual Mastery: As compared to classrooms, the outdoors provides a richer palette of learning modalities to facilitate students to demonstrate their in-depth grasp of a subject or topic;

c) Student Ownership and Agency: Outdoor areas give students opportunity to spread out and do different things. Outdoor learning spaces can inspire students to customize their learning. Outdoor learning can be facilitated in schools by use of shady trees, awnings, tents, sheds, traditional greenhouses, geodesic domes, inflatable structures etc. “An outdoor space becomes a special outdoor room when it is well enclosed with walls of the building, walls of foliage, columns, trellis, and sky; and when the outdoor room, together with indoor space, forms a virtually continuous living area” (Alexander et. al., 1977, p. 766). This

reasoning may also extend to an outdoor classroom adjacent to an indoor classroom.

VII. Improve accessibility and build self esteem through universal design principles

Frank Bowe (2000), in his book, Universal Design in Education, defines universal design as it applies to the educational setting as "the preparation of curriculum, materials and environments so that they may be used appropriately and with ease, by a wide variety of people." Another definition by The Centre for Universal Design (NC University) refers to it as, "The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design". As with most other public institutions, a school should endeavour to accommodate all users, including those with physical, cognitive, auditory or visual limitations. Originating from Barrier-Free and accessibility principles, Universal Design aims to improve the built environment through the creation of facilities, products and spaces which are inherently accessible, functional, attractive and equitable to all. For example, wheelchair ramps have often been designed as discrete elements, intended for providing access to those with mobility issues. Often retrofitted to buildings, these components are typically added where space permits, not necessarily at the main entrance.

Despite serving the purpose of providing accessibility, dedicated and isolated ramps may stigmatize users, be used infrequently, and negatively impact the visual quality of the building and site. A Universal Design approach would be to integrate site grading, landscaping, and building configuration to provide a gentle slope to the building which eliminates the need for ramps and stairs and creates one common, dignified, and attractive entry point. While the constraints of a project will inevitably limit the practical application of the seven Universal Design Principles (The Center for Universal Design, 1997) to every conceivable situation, the designer should understand and apply Universal Design wherever possible. The following checklist is adapted from Edmonton Design Committee principles (EDC,2007).

VIII. Managing density & crowding to improve self-worth and ensure social distance

Higher density schools may lead to cognitive fatigue, the perception of being crowded evokes an emotional response that may lead to stress and poor mental health. The feeling of crowdedness may also prompt behavioural responses such as aggressive, disruptive behaviour in children and social withdrawal (Gifford, 2002 & Saegert, 1982). These psychological and behavioural reactions not only affect school performance but are also associated with poor health including high blood pressure and heart disease in both children and adults (Evans et al. 1998). According to Maxwell (2009), the greatest improvements in academic performance occur when classes accommodate 13-17 students. However, improvements in student attitude and behaviour may also be achieved with slightly larger groups. The effects of high density were summarized by Wohlwill and Van Vliet (1985). "It appears as though the consequences of high-density conditions that involve either too many children or too little space are: excess levels of stimulation; stress and arousal; a drain on resources available; considerable interference; reductions in desired privacy levels; and loss of control (Tanner, 2015).

Overcrowded places and spaces including a barrage of sights, sounds, touches, and smells that disrupt necessary social functions in schools and public meetings are psychologically threatening (Hall, 1966; Steele, 1973). The freer people are to move around, the more likely they are to come in contact with one another and experience new knowledge, especially if they are not next to each other in specific, assigned seats (Steel, 1973). Freedom of movement and ample circulation patterns enhance psychic security. Maxwell(2009) recommends measures like creating personal space, subdividing classrooms into smaller work areas, avoiding clutter both in rooms and on walls, reducing noise levels, providing opportunities for restoration etc. to counter the sense of crowding. According to Lackney(2000), more and higher quality student-teacher interactions are possible in a smaller class, and that spatial density and crowding are also reduced. In a young children's study, it was found that increased density can induce stress in children thereby increasing aggressive behaviour and distraction in younger children.

IX. Ample natural light for enhancing overall health and efficiency

Lighting in an interior space is as important to set the mood as much as it is needed to perform tasks. Daylight is an essential component of good health. Lighting has various effects, ranging from improving maths scores on standardized tests to curing seasonal depression (Erwine, 2006). Daylight can help in reducing mental fatigue because it presents an ever-changing light source that reduces monotony. Light and views can affect a wide range of health issues including the production of vitamin D, regulation of our internal body clocks, relaxation, stress, moods and reduction of headaches (Benya et al. 2003; Guzowski 2000). Natural daylighting must be assured in all the student areas in a learning environment. It is a good idea to use varied varieties of artificial lighting and also the opportunity to vary lighting as per the need. Research has suggested that classrooms that have light from windows, skylights, borrowed light, reflected light, and artificial sources preferably on two sides of every room are ideal for student learning and comfort (Tanner, 2009).

Natural light is also classified as one of the basic needs in Maslow's hierarchy and contributes to controlling bodily functions; also lights of different colours affect blood pressure, pulse rates, respiration rates, brain activity, and circadian rhythm (Wurtman, 1975). Full-spectrum light is necessary to influence the pineal gland's synthesis of melatonin, which in turn helps determine the body's output of the neurotransmitter serotonin, which is critical to a child's health and development (Ott, 1973). Poorly lit and windowless classrooms can cause students to experience a daily form of jet lag; furthermore, forms of florescent lighting may affect some students and teachers negatively by causing mild seizures (Tanner and Lackney, 2006). Tinker (1939) recommended that a minimum of 10 to 15-foot candles(110-160 lux) of intensity be available at the desktop level when reading to allow for a margin of safety. Kuller and Lindsten (1992) warned that windowless classrooms should be avoided for permanent use. According to Tanner (1999), a learning space having a view (window) overlooking life contributed positively to student learning, especially if the light came into the space from at least two sides. Alexander et al. (1977) wrote "Rooms without a view are prisons for the people who have to stay there." Studies show that windows are more critical to emotional and physical health (Kuller, 2006).

X. Common spaces for peer/ teacher interaction to enhance a sense of community/belonging:

The way a space is laid out and organized can encourage more social interaction amongst children. Incidental learning is as important as target-oriented learning and therefore areas, where children spend their free time, must offer ample opportunities for social interaction. The social realm must allow room for eating, drinking, playing and reflection (Sanoff, 2001). Public areas are needed in learning environments to regulate the rhythm of social relationships (Ayers, 1999). Students need opportunities to develop social skills to better understand others and how to communicate with them. Public areas are the spaces that foster a sense of community (unity and belonging).

These areas are inviting and comfortable settings that include ample lighting, for example, auditorium, amphitheatre, media centre, commons (spaces for casual student meeting), and dining room/cafeteria (Tanner, 2015). These spaces have the potential to enhance a sense of belonging which is a significant component of Maslow's hierarchy of needs. Social spaces not only enhance the sense of community/ belonging but also tend to augment collateral learning. "Perhaps the greatest of all pedagogical fallacies is the notion that a person learns only the particular thing he is studying at the time. Collateral learning in the way of formation of enduring attitudes, of likes and dislikes, maybe and often is much more important than the spelling lesson or lesson in geography or history that is learned. These attitudes are fundamentally what count in the future. The most important attitude that can be formed is that of desire to go on learning." (Dewey, 1938).

XI. Enhancing engagement through a variety of spaces that initiate a state of flow

The overall ambience of spaces like libraries and areas for performing arts (music, dance etc.) must be inviting and engaging to allow children to unwind and enter a state of flow. Libraries with soft colourful seating and accessible, well-lit bookshelves as well as reading areas fit into this category. Acoustically well designed performing art areas with adequate lighting and natural views can also enhance the engagement and joy of performing. Special attention must be given to making the spaces look warm and inviting through the use of scale, colour, furniture etc (Barrett et al, 2019). Spaces for

agentic learning are agile and dynamic spaces that allow for a variety of activities Activity areas within the primary learning space allows for a variety of activities and includes a space for experimentation or messy work with adjacent clean up facilities. Students have access to electronic and printed resources and project materials as well as prep and storage areas adjacent to work areas (Barrett et al, 2019). There is ample space for all students and teachers to move around the spaces without congestion or awkward circulation.

XII. Flexible spaces to facilitate multiple modalities of learning that build competence and self worth:

The flexibility of school buildings has also become part of the picture with the recognition that a building should be able to respond to the needs of users as they change over time. This capacity to accommodate change can be examined over three different time horizons, the long term, the medium term and the short term, in the following ways: a) Adaptability b) Adjustability, and c) Agility. Out of these, agility can be easily assessed in a Post Occupancy Evaluation (POE) which refers to short-term flexibility where the settings, furniture and IT equipment can be rearranged quickly and easily. This relates to changing the use of the space and is the kind of change that individual users might be able to make themselves. An active learning space can respond to the needs of students and teachers quickly and, in particular, one where the furniture and technology such as projectors and display screens can be easily rearranged.

This flexibility is the extent to which users can use the spaces because they have a choice of whether to rearrange the settings and can do so easily and quickly i.e. build/create spaces, move furnishings, change a presentation area to an informal break out space, movable partitions etc. (Duthilleul, 2018). There must be a variety of materials, furniture and equipment to allow students to change the way the space looks and how it is used. Any space designed for technology use must be flexible. Elizabeth Prescott and Lee Walling recommend that in addition to permanent furnishings and equipment, there should be mobile pieces that can change the nature of an area and help students learn new associations and connections between areas (Hunter, 2005). Lighting

also needs to be flexible so it can be varied according to the activity. Spaces that are flexible and can be controlled by the students gives them an increased sense of ownership.

Mobile furnishings and partitions can be used to create an environment that can be easily updated. This is an important factor in the design of learning spaces. According to Nair, Fielding &Lackeney (2009), the '20' Learning Modalities that the physical school must support are independent study, peer tutoring, team collaboration, one-on-one learning with a teacher, lecture format, project-based learning, technology with mobile computers, distance learning, internet-based research, student presentation, performance-based learning, seminar-style instruction, inter-disciplinary learning, naturalist learning, social/emotional/spiritual learning, art-based learning, storytelling, design-based learning, team teaching/learning and play-based learning.

XIII. Effective noise reduction to combat stress and improve efficiency

Children's health may be compromised by everyday levels of environmental noise in the community such as road or train traffic. Health issues related to classroom noise also include stress and increased blood pressure and heart rate in children, these are the conditions that may persist into adulthood (Erwine, 2006). Noise is "audible acoustical energy (sound) that is unwanted because it has adverse auditory and non-auditory physiological or psychological effects on people"(Kryter, 1994). The impacts of excessive noise vary according to the age of students because the ability to focus on speech sounds is a developmental skill that does not mature until about the ages of 13 to 15. It is observed that younger children require quieter and less reverberant conditions than do adults who hear equally well (Picard & Bradley, 2001). Chronic noise exposure impairs cognitive functioning, with a number of studies finding noise-related reading problems, deficiencies in pre-reading skills, and more general cognitive deficits. The school must preferably be located in a peaceful area and the learning environments must be free of excessive noise and air pollution. There should be a possibility of natural or built barriers (buffer zones) that may protect these areas if the need arises in future. The school should be sited away from busy roads. At the same time, it ideally needs to keep a reasonable distance from adjacent users in the neighbourhood. Planning measures can

integrate site features, such as slopes or embankments, as barriers to considerably diminish the intrusion of noise. If these are covered with plants, then the noise can be further reduced. Sensitive spaces, such as classrooms can be orientated away from external noise sources and carefully separated from the intruding noise from other uses. The toilets, storerooms and corridor can act as a buffer zone (Barrett, 2015). Good acoustics positively affects the productivity of teachers, the learning abilities of students and the general health of students and teachers. Noise produces fatigue. Fatigue further leads to inattention. Two major aspects of acoustics can have an impact. First, background noise can make it more difficult for students to hear teachers, and for teachers to speak without raising their voices and suffering fatigue as a result. It is widely understood that most people cannot comprehend a sound if it is not 15 decibels louder than the background noise level. Second, rooms that create more echoes due to hard materials can impair what acousticians call speech intelligibility (Baker, 2012).

XIV. Natural ventilation and thermal comfort to improve efficiency and overall health

Thermal and acoustic discomforts are the common causes of fatigue and distraction amongst school children. The thermal environment affects the mucous membranes and the skin, causing direct effects via neural sensors of the tissues. The central nervous system is also indirectly affected by neurosensory stimuli and changes in blood circulation. Thermal comfort depends on temperature, relative humidity and air velocity. The occurrence of sick building syndrome symptoms is related to temperature (Jaakkola et al. 1989, Menzies et al 1993) and relative humidity (Reinikainen et al. 1991). Humans present the chief source of bacteria and viruses in indoor air, and the high density of children in schools ensures abundant sources of infectious agents. This consideration becomes even more important after the advent of Covid 19. Bacteria and viruses procreate in specific thermal conditions. Airborne transmission may be enhanced by dry air (Erwine, 2006). A plethora of studies regarding thermal comfort in the classroom implies that it is vital to student performance and well being. The SDPL (Tanner, 2015) studies conclude that the comfort index strongly influences the physiological state of the student and the teacher. When a classroom is too warm, it induces drowsiness and fatigue, increases respiration, and creates conditions favourable

to disease (Sanoff & Walden, 2012). When the human body is fighting to stay alert and is uncomfortable, it is not concentrating on the task at hand. The interior environment in a school must be comfortable with appropriate thermal conditions, natural glare-free light and ventilation along with low noise mechanical systems and appropriate acoustical treatments wherever required. School building design needs to maximize access to natural ventilation.

Natural ventilation can eliminate some of the serious problems associated with spending excessive amounts of time in conditioned spaces (Nair & Fielding, 2005). Naturally ventilated buildings reduce the number of toxins in the air that are released by a variety of building products. There are two ways to ensure that buildings have adequate natural ventilation. The first way is to use mechanical systems that have the capacity to draw in a significant amount of outside air into the building and the second method is to use natural air-flow patterns to circulate fresh air within the building. This system usually supplements mechanical systems that are in place but, on nice days, natural ventilation can take most of the load off the mechanical system and save energy costs. Beyond the measurable benefits, there is a lot of value in giving occupants of the building the ability to open windows and let in natural air. It provides a sense of connectedness to the outdoors that even the best mechanically ventilated building cannot provide (Nair & Fielding, 2005). Big window opening sizes, at different levels (and orientations), can increase the air exchange rate and also provide ventilation options for varying conditions. The controls should be easy to access and use. Where possible, increasing the ceiling height can improve the air quality of the classroom as it can absorb more stale air in the short term, but effective ventilation is still needed. Mechanical ventilation to introduce fresh air may sometimes become necessary when window openings are not available due to noise or security reasons (Barrett, 2015).

XV. Welcoming entry and signature elements to help children comprehend the environment better and feel connected:

The school entrance must be a friendly space connecting the outside world to the inside world. This transitional space should be inviting and highly visible to students and visitors. It should evoke a 'welcoming' feeling. A child should feel pulled toward

the school, in the same way, that they react when a mother's face welcomes them with a wide smile and kind eyes (Mayer, 2007). The scale of the entrance must not be intimidating for the child and there may be some interesting landscaping features or small play areas visible from the entrance that invite the attention of the child and relieve their anxiety. This welcoming aspect must be balanced by the need to secure the entry and separate its publicly accessible spaces from the student areas (Nair & Fielding, 2005). Whether it has a fabric canopy or a more elaborate cantilevered roof, a covered entry space must be provided. It is also a place where they might be dropped off or picked up from a car or bus and wait out during bad weather conditions. Architecturally, a covered entry provides more opportunities for creating a ceremonial quality for the school as a whole. Young children make the transition into school mode more successfully if the entrance is inviting and friendly, it is a place where children can say goodbye to their parents and adjust to more independent status. These areas not only add to the welcome feeling of the school entry but also enhance the security of the school.

The entrance can be made more inviting by placing a signature element near it. All schools have something about them that is special and unique, however, and the architecture should preferably showcase this. In some cases, the architecture of the school can itself become its signature element. The sculptural quality of the architecture can set the school building apart from all the other buildings in the community and gives the school a unique identity or "signature" (Nair & Fielding, 2005). A school's signature element could also be a fountain, a garden, a display wall, a special place for student-built projects, or some piece of history representative of the site where the school is located (local context).

The use of signature elements that reflect the local culture makes it easier for children to relate to the school and take pride in it. It promotes a sense of belonging among children and also imparts the message that unique identity is a matter of pride for buildings as well as for people. Signature elements reflecting culture must be visible not only at the entrance but also in the layout of spaces and activities.

XVI. Ensure safety and security through natural surveillance and other design interventions

Segregation of pedestrian and vehicular traffic at the entrance ensures safety and thoughtful landscaping not obscuring sightlines ensures security. Dedicated pedestrian pathways must begin right at the entrance and landscaping must be carefully organized to maintain clear sightlines (Tanner, 1999). Students must be picked and dropped at authorized locations that are clearly marked by signage, pavement and curb treatments. Administrative areas and faculty rooms must be strategically located to ensure natural surveillance of entrances, corridors, courtyards etc. Placement and layout of toilets must discourage bullying and ensure auditory connection with adjoining areas. Also, toilets attached to classrooms help reduce fear among children and can be effective against bullying (Nair &Fielding, 2005). Separate blocks/floors and play areas may be provided for varying age groups to ensure safety and security of younger children. Separation of old and young children provide a sense of security and safety among young children. Over imposing security devices and unattractive measures like barbed wires must be avoided.

XVII. Use of sensory aesthetics and active design elements for optimum stimulation (physical & psychological)

Sensory stimulation helps children engage with their surroundings and explore them better. This exploratory experience employs different areas of the brain and helps children absorb and retain information better, and improves balance, movement and spatial orientation. Outdoor play areas and common areas must provide plenty of opportunities for sensory stimulation for children. Visual, aural, haptic and olfactory stimulants make the environment come alive provided over-stimulation is taken care of. Unusual or aesthetically pleasing spaces tend to stimulate creativity in children. Ideal school environments should provide legibility, mystery, and refuge by utilizing curvilinear forms and edges, gradations of shape, colour and texture, natural elements etc. in the design. Outdoor areas should have mowed grass and scattered large shade trees. Placement of windows should also be based on the view being framed (Hunter, 2005). Barrett et al (2016) suggest that overall visual complexity including room layout and displays should be balanced; not too high nor too sterile. The aesthetic of an

environment that is occupied habitually by the same people is important to the emotions of the people who are there (Hunter, 2005). The visual stimulus can also encourage physical activity that makes children active and energetic at school. A central open staircase or a hybrid staircase must be provided with sitting areas in between that can act as a key design element of the school and also attract children to remain active. Pathways must incorporate daylighting, good interior design and supportive infrastructure (easy access to washrooms, water fountains, seating, etc.) along walking routes. Long, narrow corridors quickly consume area and circulation time without adding any positive or constructive experience or alternate use. Physical education/activity spaces must be designed to accommodate a range of uses (e.g. yoga, weight room, dance, etc.). Adequate space to run and play is critically important for physical fitness. There must be a dedicated indoor area available for all children to use daily and a dedicated outdoor play area for physical activities to take place.

XVIII. Spaces for self-reflection (privacy) and small group activities to enhance autonomy, competence and relatedness

Privacy is not necessarily the state of being alone; it is the perceived ability to control interactions with others. Privacy is often achieved by getting away from other people, but it is also attained by controlling the number of other people with whom one has to interact (Maxwell, 2006). Children need to have 'alone time to refresh and rejuvenate as much as adults do. Gifford(2007) suggests that every student needs a certain amount of privacy which varies from individual to individual. Proshansky and Wolfe (1974) established that privacy contributes to a child's growth and development. Curtis and Smith (1974) created places for children to hide away, only to discover that children did not use them because they could not see what was happening around them. They solved this problem by adding clear acrylic panels to the private spaces. This allowed the children to see what was going on around them while maintaining their sense of physical privacy (Tanner, 2015). This means that spaces that seem private to children should be under the passive surveillance of adults.

According to calculations done by SDPL researchers (Tanner, 2015), the design family of quiet places and spaces for reflection have a statistically significant influence on student outcomes. Students need inside and outside solitary places, easily supervised, to pause and refresh themselves in a quiet setting. Opportunities for self-reflection help children comprehend the situations and the environment better. Social spaces, inside and outside the school facility, where a small group of children may go to be alone (i.e. reading areas, quiet places, reflection areas, listening areas, etc.) can also enhance a sense of place, belonging, and community. Private spaces for students, both inside and outside the building in the form of reading areas, quiet places, reflection areas, listening areas, eating areas etc can also be provided.

One of the primary reasons that a variety of spaces is needed in a school is because the school must teach a wide variety of students. Some individuals are 'drawn to the life of the mind' and require little external stimuli and do best in quiet and simple environments where they are protected from sensory overload (Hunter, 2005) and there are others who require a high level of external stimulation. Research by Olds (1979) indicates precisely that: a variety of spaces, large and small, noisy and quiet, bright and dim, allows for all the different personalities to achieve a sense of belonging. Studies by Weinstein (1987) reveal that private spaces give children a place to escape from the crowd. Osmon (1971) showed that over-stimulated, upset or tired children need a place for retreat, quiet thought and quiet individual activities.

Ahrentzen (1984) showed that when students want to be alone, they prefer to be in secluded study areas or corners. Students are rarely allowed time to be by themselves in school or outside school. This is a serious learning problem because it is in solitude that students assimilate, synthesize and internalize learning so that it becomes knowledge and (sometimes) wisdom. That is the reason why schools have to make every effort to create inviting but supervisable cave spaces where students can check out and take a deep breath, albeit momentarily, from their hectic lives (Nair & Fielding, 2005).

XIX. Authenticity and psychological comfort through the use of appropriate materials & textures

Authenticity and honesty may be conveyed through the use of natural materials and visible details. Extensive use of synthetic cladding materials and superfluous decorations not only look artificial but are usually unhealthy as well. Elements that give an environment its particular ambience affect us psychologically and emotionally and also impact our well being. A rich variety of materials, textures and colours must be used without being overwhelming. The space must provide opportunities for children to handle different sensory materials such as water and sand (Nair & Fielding, 2005). Materials can be used to trigger sight, smell and touch. Therefore, it is useful to integrate them into a place of learning.

The selection of materials can create a multi-sensory experience through smooth, rough, bright, opaque transparent or translucent. It is important to integrate a nice pallet of materials that inspire a warm experience. It is also important to design for the future; schools have a long lifespan and the materials should equally do so and should be detailed to enhance this. Materials should make an environment inviting and comforting while enhancing light and creating a sensory experience. It should also successfully integrate a safe experience for the children and a space for them to learn through exploration. Materiality refers to the strategic selection and application of materials in the built environment. Perceived primarily through sight and touch, materials contribute to the experience, function and memory of a space.

Other sensory or psychological responses may also be triggered, such as the smell of cedarwood, or the perception of certain materials as being warm/cold, soft/hard, etc. Material choices have the power to affect mood, performance and behaviour. Consider how a space will be used when selecting finishes, textures and colours. Avoid overuse of cold, hard materials such as concrete blocks, and prefer natural materials such as wood to add warmth and inspire users. Expression of interior or exterior structural systems can add a dramatic effect to space and inform architectural detailing. Exposure and presentation of a building's systems (e.g. mechanical, electrical, etc.) provide learning opportunities and visual interest. Architectural design guidelines

for schools in the city of Alberta (2012) recommend the usage of varied materials, textures and massing that provide visual interest and engage the users. Designers must create a coherent vocabulary of details; utilize materials to unify the building as a thoughtfully articulated composition rather than an assemblage of disparate parts. Design must be strengthened by incorporating local or regional materials, craftsmanship and construction methods to express the unique cultural/contextual identity. According to Day (1999), materials speak strongly. High technology buildings and industrial materials incur huge environmental costs- both in the manufacture and thermal performance. Cold and hard materials, such as steel or large sheets of glass, make buildings feel unfriendly if used excessively (Day, 2007).

Moreover, regardless of how attractive such buildings may be, they aren't easy to adapt. Wood is touch-friendly, warm and alteration tolerant. It permits a wide mood range, from a cosy enclosure to extensively glazed openness. Although masonry is cold and hard, it's visually and texturally warm, and not too difficult to alter. Olds (1989) also calls for some elements in the environment to be soft and comforting. This adds warmth, welcome and interest. Pillows, plants and soft furnishings such as an upholstered couch or chairs can provide more home-like places for a child to read or dream. Children have a preference for curvilinear forms and edges, gradations of shape and colour, blended textures and natural elements (Hunter, 2005). Weinstein (1987) recommends warm colours, bright accents, textures, plants, animals, and interesting materials to draw a child into the space and create a feeling of warmth and welcome.

XX. Home like environments with familiar elements to enhance the feeling of security and psychological freedom:

The transition from the home setting to an institutional setting like a school can be stressful for younger children. It is therefore recommended to use physical and social home-like characteristics in school design that may reduce anxiety on the part of both parent and child and can help children feel more comfortable (Lackney, 2000). This may be achieved by using curtains, picture frames, plants, artwork etc. in the children's area at their eye level. Along with calming natural colour tones, elements such as soft seating areas, low ceiling heights, rugs, and soft lighting can make the school as comfortable and nurturing as home. According to Tanner (2015), a sense of belonging

is greatly enhanced when the school is in harmony with the community architecture. A home-like environment, in addition to places for privacy and quiet areas, offers children the opportunity to seek calm when they need it. Maslow's esteem needs, belonging and love needs, safety and security needs, and physiological needs may be summed up in architectural terms as "a sense of place" (Tanner, 2015).

XXI. Encourage ownership/territoriality to build autonomous and agentic learners

Physiology and psychology research indicates that the personalization of space is an important factor in the formation of an individual's identity and sense of self-worth (Barrett, 2015). It is argued that intimate and personalised spaces are better for absorbing, memorizing and recalling information (McMillan 1997). When children feel ownership of the classroom, it appears the stage is set for cultivating feelings of responsibility (DeVries and Zan 1994). Classrooms that feature the products of students' intellectual engagements, projects, displays, and construction are also found to promote greater participation and involvement in the learning process (Ulrich 2004). Young people need to feel that they have some autonomy and agency at the formative age when they are learning to become independent of complete adult control. There may be a minimum of 2-3 areas that each student can call their own. (i.e. lockers, seats at the table, mats etc.). According to Nair & Fielding (2005), providing a 'Home base' for an individual student with a desk and lockable drawers is a profound way of encouraging ownership. The goal is to promote a sense of security through an equal opportunity for each child and also to promote their psychological, social and moral development by encouraging autonomy. Halstaed (1992) envisioned the classrooms to be like studios where students should have their workspace. Children need places and spaces for personal artefacts – places that make them feel that they are needed and belong in the school environment (Tanner, 2015).

XXII. Green/sustainable architecture to promote agentic learning and environmental stewardship:

The use of passive techniques for thermal comfort not only benefits the environment but also impart lessons in a sustainable lifestyle that can inspire children to

carry it further into their lives. Local materials, passive techniques and energy-efficient architecture must be an inherent part of the overall design and can be spotted in most spaces. Within children's participation and power-sharing with adults, the direction of learning is set by children and builds their capacity for deep and transformational learning. If participation is centred around a project that is real (i.e. authentic) and personally relevant (i.e. local), such as transforming their school grounds, children are taking a role as active citizens, something Chawla and Cushing (2007) identify as essential for the development of pro-environmental attitudes and behaviour. Unfortunately, in many schools, children are not given this agency and are expected instead to follow adult directions. To develop into 'resilient learners' (Sterling, 2010) who can adapt as required by circumstances, children must engage politically (Chawla and Cushing, 2007). Green buildings serve as teaching tools that provide real-life examples of concepts being learned in the classroom. Teachers at green schools can use their buildings as the basis for project-based, experiential learning. Green schools provide a clear opportunity to connect students with curricula in environmental and science, technology, engineering and mathematics (STEM) education, and they can serve as tools for interactive lessons across all subjects. Every student can benefit from the opportunity for hands-on learning that demonstrates the interconnectedness of people, the built environment and natural systems.

XXIII. Biophillic design to counter nature deficit and effective attention restoration

To combat cognitive fatigue, children need opportunities to engage in non-focused activities such as watching birds at a feeder, leaves rustling in the wind or observing fish in an aquarium (Erwine, 2006). Windows maintain a visual connection with the natural world. Human well-being is enhanced through the implementation of biophilic design as it connects people and nature in the modern built environment. Biophilic design not only reduces the harm that stems from the built environment but also makes it more pleasing, enjoyable and healthy. The school must be in "harmony with nature". It must blend with the surroundings and bring nature into learning environments. Along with constant interaction with outdoor green areas, schools must also apply biophilic design principles to the interior environment. Kellert (2008) stated

that biophilic design is "an innovative approach that emphasises the necessity of maintaining, enhancing, and restoring the beneficial experience of nature in the built environment". The SDPL studies recommend unrestricted views available within the classroom and living views including some aesthetic indoor spaces and outdoor spaces such as gardens, wildlife, fountains, mountains, and the sky. Functional views must allow students to easily see at least 50 feet outside the classroom (Nair and Fielding, 2005) to restore their attention. Restorative environments can be defined as environments that both permit and promote restoration (Hartig, 2004).

Restoration refers to the psychological and physiological recovery processes elicited by specific environments and environmental configurations (Joye and Van den Berg, 2011); this recovery process consists of the renewal or recovery of adaptive resources that were depleted in the process of meeting the demands of everyday life (Hartig, 2004). Two main theories—the Attention Restoration Theory (ART) (Kaplan and Kaplan, 1989; Kaplan, 1995) and the Stress Reduction Theory (Ulrich, 1983) describe the processes underlying the renewal of psychological resources (e.g., the capacity of directing and sustaining attention, inhibiting impulses, and maintaining concentration) through environmental characteristics. The effects of biophilic experiences are not just stress-reducing or cognitive impacts but frequently a combination of both. Real and simulated views of nature are not the only way to create a biophilic experience. Nature can also be represented in patterns, finishes and objects that have biomorphic forms and fractals. Viewing biomorphic forms in art and architecture elicits a good visual preference response and lower stress (Joye, 2007). It may be that human brains associate biomorphic forms and patterns with living things (Vessel 2012), and these forms tend to conform to the collinear characteristics that ease visual processing (Albright, 2015; Gombrich, 1984). Experiences of such forms in the built environment that have characteristics close to nature, lead to measurable stress reduction responses -- heart rate, blood pressure and galvanic skin responses.

Children also restore their cognitive performance and perceive psychological restoration based on where they spent their recess time—that is, having the break in a natural or a built environment. The ideal school environments seem to be those with attractive outdoor spaces, where children can be active both inside and outside of the

classroom (Gifford, 2007). Evidence-based design guidelines from research in environmental and architectural psychology should lead to interventions, taking into account children's needs and contributions in this process (Sanoff and Walden, 2012). Research has now proved children in schools show better recovery of their attention abilities and perceive time spent in a natural environment as more restorative than in a built one. Literature shows that greener schools help children to concentrate (Bagot et al., 2015; Van den Berg et al., 2016) and enhance their attentive abilities (Grahn et al., 1997). It is also recommended that views of parking lots, walls, and roads must be avoided. These spaces should be accessible where children can go on their own. In the indoor environment, privacy niches also act as restorative spaces and could contain items such as soft furnishings, plants, animals, window seats or aquariums that are not awkward to access or view. Ideally, there must be three or more restorative spaces/opportunities in the principal learning area (Nair, 2020).

An experiment in which participants spent five minutes seated in a windowless classroom and five minutes seated in a space with plants, a metal screen with biomorphic patterns and a view of the river outside found significantly different outcomes. The biophilic setting led to lower blood pressure, lower galvanic skin conductance, and a 14% improvement in short-term memory performance (Yin et al., 2018). It is well known by doctors that eyestrain and visual acuity problems can develop if students have only short distance views available to them. To keep the eyes healthy, long-distance views are needed, indicating that views of the outdoors should be present and unobstructed. Nair (2020) states the following benefits of green environments for children:

1. Children with symptoms of ADHD are better able to concentrate after contact with nature. Views from inside the classroom overlooking life augment a student's emotional and physical health.
2. Play in a diverse natural environment reduces or eliminates bullying.
3. Nature helps children develop powers of observation and creativity and instils a sense of peace and being at one with the world.

4. Early experiences with the natural world have been positively linked with the development of imagination and a sense of wonder.

5. Wonder is an important motivator for lifelong learning.

6. Children who play in nature have more positive feelings about each other.

7. A decrease in children's time spent outdoors is contributing to an increase in myopia in developed countries.

8. Outdoor environments are important to children's development of independence and autonomy**.**

XXIV Spaces for pets in school for inculcating sense of responsibility and building empathy

Empathy is an important emotional resource linked to many positive psychological traits. Empathetic children also tend to be more resilient; they are better able to handle stress and "bounce back" from difficulties. If children have more opportunities to interact with animals in their daily life, naturally they become more empathetic. The school may have a farm area that houses many animals that children can tend to on regular basis (Nair, 2020). Research has shown that pets can increase empathy, resilience and responsibility in children, teach children how to nurture, care and have respect for all life (Purewal et al. 2017), improve academic achievement by helping children to concentrate and feel calm at school, decrease isolation and depression and also lower anxiety and decrease agitation.

XXV. Student participation in planning and design of new facilities as well as maintenance/renovation projects

Student participation can be invited during the planning and design phase as well as during the use/after occupancy. Students can make contributions in many areas with their creativity and ability to work. Wake and Eames' (2013) findings determined there were significant learning gains when students worked alongside architectural and building industry practitioners in grappling with design issues within regulatory frameworks. Students can learn about risk assessment reports, waste management, the performance of materials and design techniques as well as developing soft skills such as

collaboration, confidence in public presentations and problem-solving. The children might be asked to plan and maintain a school garden (Walden, 2009).

The entrance area can be decorated with pictures or other items made by students in their art classes. They can also decorate their hallways with pictures, decorate their classrooms with pictures and plants. Furthermore, the visual and physical basis of the methods focuses on young children's strengths – their local knowledge, their attention to detail, and their visual as well as verbal communication skills. Improvements can be made to the spaces and day-to-day running of school buildings as they come up with really perceptive ideas, which can genuinely improve their space (Barrett et al, 2019). Participation in school planning and design can help children in the following ways; enhanced ownership, fostering a culture of trust and collaboration that encourages everybody to be enthusiastic about every aspect of the school, reducing vandalism and anti-social behaviour, enhanced design literacy, building competence and raising learners' self-esteem.

XXVI. Stimulating playgrounds to build risk competence and experience sense of adventure

According to Christopher, children need perceived risk and stimulus of new challenges to develop self-reliance and self-esteem. Adventurous activities also help pupils to overcome fear, anxiety and physical stress. It’s the task of the designer to provide these whilst keeping actual risk (Day, 2007). There should be some opportunities available on daily basis within the school environment to present pupils with intellectual and physical challenges which encourage them to work in a team, building trust and problem-solving skills. Play is a significant factor in childhood because it teaches important creative and social skills (Steiner, 2003). Play behaviour in people reflects the drive to gain control and mastery (Ellis, 1974). Growth is a process of taking successive risks to expand capabilities. “When the challenge exceeds known limits, the response brings increased capacity.”(Houston, 1968). Leisure also has an important impact on mental health. It raises self-esteem, establishes identity, facilitates self-actualization, and enhances life satisfaction (Maslow, 1998).

Playgrounds are not only vital to leisure and physical training but can also be educational. A variety of landscaping, textures, shapes, and spaces alongwith various natural aromas from can stimulate as well as relax the senses. Playgrounds can include activity areas, interest centers, areas for large groups, small groups, and individual interests. The playground should be easily accessible from the classrooms and can contain areas such as: garden area, free play, play structures, climbing structures, outdoor classroom area, and hard play surfaces. Playgrounds need to include areas for children of differing ages and 6 sizes (Hunter, 2005). Nair (2020) insists that play is important because it's how we've evolved to learn. It is also increasingly important because of rising rates of obesity among children. A 2012 survey of children by the Heart Foundation of Australia found that the kinds of play features children want are not overly manicured, instead they're a little scruffy. "Hills to roll, run and slide down, boulders and tunnels to scramble around, branches and leaves with which to build tree houses and cubbies, water features and community art. "Children want to be able to build and construct things, so we need to provide moveable parts" (Perkins, 2012). It is now well accepted that risky play is necessary for a child in order to develop risk-taking skills and learn how to cope with risky situations (Brussoni, Olsen, Pike, & Sleet, 2012). This way, a child can obtain risk competence. Significant elements of risky play in children are: attempting something never done before; feeling on the borderline of 'out of control' often because of height or speed and overcoming fear (Stephenson, 2003). Depriving children from age-adequate risk play will hinder normal child development (Alexander, Frohlich, & Fusco, 2012) and is being associated with the development of fear, discomfort and dislike of the environment (Sandseter & Kennair, 2011).Furthermore, concerns about safety have caused an increasing restriction in risky-play opportunities (Ball, 2002; Stephenson, 2003), but failed to prevent accidents. Moreover, the warning has been raised that overprotection of this young generation is a much bigger risk because it impacts negatively on their health and their ability to cope with the unpredictability of daily functioning (Gill, 2007; Little & Wyver, 2008). New initiatives and movements take these concerns seriously by redesigning playgrounds into exciting and challenging experiment environments (Bundy et al., 2009) and by focusing on the utilization of affordances in an outdoor environment (Kernan, 2014; Helen Little et al., 2011).

XXVII. Enhancing overall sense of coherence by splitting bigger schools into Smaller learning communities:

Education research indicates that participation in school activities, student satisfaction, social connectedness and achievements are greater in smaller schools relative to large schools (Barker & Gump 1964, Sanoff 2009). Research demonstrates that students in smaller schools are more inclined to be engaged in school activities, despite the fact that larger schools offer more opportunities for the same (Barker & Gump 1964). Research also shows that students learn better in smaller schools where they feel more significant and have a greater sense of ownership (OECD, 2000). Students in smaller schools are more likely to participate in class exercises as well as in extracurricular activities. In a smaller school, every student can make a difference. It is also possible to create schools within schools that are sometimes referred to as small learning communities.

Small learning communities are known to enhance the sense of belonging, better interaction, group learning, performance and overall well being. This may be done in the form of blocks or floors that function independently for better learning and the overall well-being of children. Common green areas and other social spaces for each community to interact and work in groups are usually provided. This consideration can be very helpful and effective in the post covid scenario as it'll be much easier to adhere to covid appropriate behaviour in a small learning community. According to Wasley et al (2000), the advantages of smaller schools seem to outweigh those of bigger schools. Isolation, which reveals itself through alienation, vandalism, theft and violence, can be avoided in smaller schools (Bornewasser & Loschpet, 1984) as they thrive on close peer interactions as well as bonding with teachers. A small learning community as described by Nair & Fielding (2009) in their seminal work "Language of School Design" has the following significant physical features: Learning studios, small group rooms, a multi-purpose lab, a commons space that also doubles as a café, cubbies for student belongings, a staff work area, lots of storage, a kitchenette, a resource room, staff and student toilets, a dedicated entry and ample outdoor connections. The idea is that each SLC should be able to cater to multiple modalities of learning. Each community has between 80 and 150 students. Capping the number at 150 allows for every person in the

SLC to know everyone else, a count over 150 brings in a sense of isolation and anonymity increases exponentially.

In a similar vein, the concept of the instructional neighbourhood was described by SDPL (Tanner, 2015) as a place where teachers and students constitute a small community or a "family" in a "house." The design may include suites, each with classrooms, lounge space for adults, office space for teachers, lockers, private bathrooms, window seats, terraces, outdoor classrooms, hallway display cases, and small seminar rooms (Genevro, 1992). The instructional neighbourhood, ideally, includes places for indoor and outdoor play, since it is through play that children acquire social, cognitive, and physical skills (Gaunt, 1980).

4.4 Choosing a reliable scale

A reliable scale is one where assessments using the scale do not vary significantly between different users of the scale known as Inter-rater reliability. The idea is to design a tool that can be used by many different types of people, it is, therefore, important to minimize the extent of subjectivity in the results. Although it is intended that surveyors will be trained by an expert prior to taking up the survey, the possibility of error must however be minimized. To assess a K-12 school using HSAT, an assessor would indicate how well the school satisfies the criterion items in each subscale. The response format for each item was first taken as a 5-point linear numeric scale ranging from "Very poor" (score of 1) to "Excellent" (5).See sample subscale in Table 4.2

Table 4.2: A sample subscale for a 5 point linear numeric scale where 1 = very poor, 2= poor, 3= satisfactory, 4= good, 5= excellent.

21. Homelike environments with familiar elements	**1**	**2**	**3**	**4**	**5**
Soft furniture, such as a couch or large armchair					
Nontoxic indoor plants are used					
Soft and comforting elements like pillows, plants, soft furnishings, etc. add warmth and security of being home					
Other decorative touches, such as area rugs or repurposed furniture					
Provision to hang children's artwork and their pictures on the walls					
Neutral/Pastel paint colours with less stimulating displays (not visually overwhelming)					
Average score					

The average score of all the subscales was then added to get an overall health score of the school. The selection of a five-point numeric scale was done based on the research that a five-point scale offers more precision in survey results. This initial tool was then tested in a pilot study where the researcher appointed two intern architects to survey the two schools. The surveyors were given a briefing on the reasoning behind each subscale and were accompanied by the researcher on their visits to both schools. The results of the pilot study were disappointing as there came out a significant difference between the score given by each surveyor which meant that the scale was not reliable enough for usage. The author then decided to try a three-point scale with convincing evidence as it was employed by various agencies engaged in the design of learning environments. The scale was then revised to be a three-point numeric scale ranging from 0=Inadequate, 1= Adequate and 2= Excellent. Along with that an option N/A (not applicable) is added to cover up the discrepancies that come due to varied contexts. Score rules and a three-point rating scale were adapted from The classroom rating scale in Lorraine Maxwell, "Competency in Child Care Settings: The Role of the Physical Environment," (2006); the EFEI (Educational Facilities Effectiveness Instrument), by Fielding Nair International and the EDA SPACE app by Education Design International. The total score of all the subscales was then added to get an overall health score of the school. The total score was then converted into a percentage , refer Table 4.3 for the score rules.

Table 4.3: Score rules adapted for the study

SCORE RULES	
86 % - 100 %	**Excellent**
71 % - 85 %	**Very Good**
51 % - 70 %	**Acceptable**
31 % - 50 %	**Unacceptable -- Needs Work**
0 % - 30 %	**Poor -- Needs Substantial Changes**

This new scale was then tested by two surveyors in the same school and this time there was very less variations between the results. The scale was then finalised and used for the rest of the schools in the study, refer Table 4.4 for the revised sample

subscale. It was named as Healthy School Assessment Tool (HSAT) as it is devised to determine the health status of schools under consideration.

Table 4.4: The revised subscale with three-point numeric rating

21. Homelike environments with familiar elements	**0**	**1**	**2**	**N/A**
21.1 Soft furniture, such as a couch or large armchair				
21.2 Nontoxic indoor plants are used				
21.3 Soft and comforting elements like pillows, plants, soft furnishings add warmth and security of being home				
21.4 Other decorative touches, such as area rugs or repurposed furniture				
21.5 Provision to hang children's artwork and their pictures on the walls				
Average score				

0 = Inadequate, 1 = Adequate, 2 = Excellent

4.5 Organization of the scale

The scale is organized into twenty-seven subscales based on twenty-seven design guidelines. Each subscale can act as an independent assessment tool as well. The items included in each scale have been duly numbered for quick reference. Table 4.5 shows one such subscale.

4.6 Healthy School Assessment Tool (HSAT)

SECTION I: SCHOOL DETAILS

Name of the school:	
Location/Address:	
Site area:	
Built-up area:	
No of student	
No of teachers	
Average class size	
Average no. of students/class	
Other details	
School code	

Code assigned

SECTION II: THE TOOL

SUBSCALE 1

1. Legibility and way finding	0	1	2	N/A
1.1 A unique identity is created for each location				
1.2 Use of landmarks as visual cues				
1.3 Well-structured paths with goals				
1.4 Limited navigational choices				
1.5 Sightlines are used to show what is ahead				
1.6 Covered pathways among buildings within the campus				
1.7 Colour coded indoor pathways				
1.8 Clear and well-lit pathways to activity areas				
1.9 The main building has an obvious point of reference among the school's buildings in which paths and buildings connect				
1.10 Distinction between various areas is made obvious using colours, textures, forms, ceiling heights, etc.				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 2

2. Community involvement and access control	0	1	2	N/A
2.1 Well placed windows to get a clear view of the entrance				
2.2 Dedicated areas for community interaction near the entrance				
2.3 Signage and pavements to define accessible areas for visitors				
2.4 Clearly defined limits to ensure access control				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 3

3. Child scale and developmental needs	0	1	2	N/A
3.1 Variation in ceiling heights acc. to the intended use of space				
3.2 Spaces and furniture considering child scale				
3.3 Whiteboard and other equipment respecting child scale				
3.4 Soft classrooms with curvilinear shapes, pillows, rugs, etc.				
3.5 Accessible material storage				
3.6 Door handles, switches, etc. at child's scale				
3.7 Variety of sizes of spaces				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 4

4. Ergonomic considerations for posture correction	0	1	2	N/A
4.1 Variety of furniture that is flexible and easy to use.				
4.2 The furniture improves posture and is in good repair.				
4.3Workstations are designed to accommodate information technology.				
4.4 Floor seating and opportunity for reclining provided at a corner of the classroom.				
4.5 Popliteal heights, elbow angle, and other anthropometric considerations are taken care of.				
4.6 Footrest is provided for shorter children.				
4.7 Tables and built-in shelves have rounded edges.				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 5

5. Careful use of colour	0	1	2	N/A
5.1 Variety of colours used while being careful about overstimulation				
5.2 Contrast between the board and the back wall just appropriate				
5.3 Colour and lighting are considered together				
5.4 Colourful displays on the walls and doors				
5.5 Warmer tones are preferred for younger children and cooler tones for older children				
5.6 Physical activity areas like gyms, yoga halls, etc. are painted in cooler colours				
5.7 Privacy niches and other areas for withdrawal are painted in cooler colours				
5.8 Stage area in auditorium is in contrast with surroundings and is painted in relaxing colours like beige, peach, or pastel green				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 6

6. Outdoor learning spaces	0	1	2	N/A
6.1 Provision of an accessible green/open space immediately outside the classroom				
6.2 An amphitheater readily available for outdoor plays, performances, and presentations.				
6.3 Provision of temporary structures and benches to facilitate outdoor classroom				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 7

7. Density and crowding	0	1	2	N/A
7.1 Ample space to move around in the classroom				
7.2 Gross Area provision per child is between 7- 10 sq.m.				
7.3 Children divided into smaller groups/cohorts				
7.4 Uncluttered rooms as well as walls				
7.5 No. of students per class is between 17-25				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 8

8. Accessibility and universal design	0	1	2	N/A
8.1 Simple, clear circulation with clearly defined paths, doorways, etc.				
8.2 Provision of handrails as necessary and material textures considered as tactile means of way finding.				
8.3 Power doors to improve accessibility for all users.				
8.4 Provision of ramps/lifts for barrier free access				
8.5 "Maze" entrances to washrooms improve access for all users and reduce hygiene issues associated with doorknobs/levers.				
8.6 Circulation routes are of appropriate width (min. 1.5m wheelchair turning diameter) and are kept clear of obstacles.				
8.7 Hardware and controls are located within reach of users and ensure ease of operation.				
8.8 Special consideration of acoustics for the visually impaired: buildings and rooms are designed to reduce echo, reverberation, and extraneous background noise.				
8.9 Provision of appropriate lighting (natural and artificial) for circulation. Glare is avoided though.				
8.10 Large flat panel light switches, which can be used with either hand, closed fist, elbow, etc. are provided.				

8.11 Rough or textured borders, which contrast with smooth walking surfaces and indicate a change in grade or material, are used.				
8.12 Door lever does not require grip strength and can be operated by a closed fist or elbow.				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 9

9. Natural light for overall health and efficiency	0	1	2	N/A
9.1 Diffused (glare-free), usable daylight in every space where children spend long periods of time.				
9.2 Smaller windows at eye level are installed for views along with skylights or clerestory windows high in the wall deliver glare-free light deep into the space.				
9.3 Unrestricted views (when glare is not a problem) provide a perspective to ease eyestrain and bring the outside and inside worlds together.				
9.4 Daylight is supplemented with electric light. An acceptable design includes artificial light plus natural light from the outside.				
9.5 Direct view of bright light sources like the sun, a bright sky, or an electric lamp that may create glare and visual discomfort is avoided.				
9.6 Diffused daylight enters from multiple directions and minimizes shadows, balancing the light across the room.				
9.7 For every 10 square meter of classroom floor space, at least 2.5 square meter of window space is provided.				
9.8 Windows have some form of glare control but are in use (when glare is not a problem), and are without painted obstructions.				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 10

10. Flexible spaces to facilitate multiple modalities of learning	0	1	2	N/A
10.1 Space can be made larger/ smaller or of a varying shape with a few changes in furniture arrangement				
10.2 The spatial layout allows the use of multiple learning modalities				
10.3 Movable and flexible partitions that can be operated easily				
10.4 Possibility for expansion/change is present				
10.5 Adjustable furniture to support both technology use and writing/drawing, etc. by hand				
10.6 Curtains etc. to allow the usage of projector, smart board, etc.				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 11

11. Variety of engaging spaces that initiate a state of flow	0	1	2	N/A
11.1 Engaging library with vibrant furniture, furnishings, colours, etc.				
11.2 Reading areas are well-lit with spaces for group work				
11.3 Acoustically well designed and well-lit music and dance areas				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 12

12.Common spaces for peer/teacher interaction	0	1	2	N/A
12.1 Enough space/opportunities for 4 or more children, in more than 3 locations in visible/safe locations is provided				
12.2 Space for having a meal together with peers and teachers				
12.3 Presence of auditorium, amphitheater, etc. in school				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 13

13. Natural ventilation and thermal comfort	0	1	2	N/A
13.1 Passive techniques for thermal insulation in extreme climates				
13.2 Provision for windows at various levels to be used during varied weather conditions				
13.3 Less noisy mechanical systems, if any				
13.4 Mechanical systems with a capacity to draw significant amount of outside air into the building				
13.5 Use of natural airflow patterns to circulate fresh air				
13.6 Higher ceiling heights wherever possible				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 14

14. Effective noise reduction	0	1	2	N/A
14.1 Site located in a peaceful area with low noise and air pollution				
14.2 Barriers and buffers are provided to counter traffic noise				
14.3 Landscaping is used as a dampener				
14.4 Toilets, storerooms, etc. are used as buffer zones				
14.5 Hard materials that cause echo are avoided				
14.6 Appropriate sound absorbing materials are used				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 15

15. Welcoming entry and signature elements emphasizing the cultural context	0	1	2	N/A
15.1 An inviting and highly visible entrance with well-defined architectural features, signs, lighting, artwork, landscaping, and other landmarks such as flags				
15.2 Scale of the entrance is not intimidating for the child				
15.3 Motivational signs that send positive messages and invite children to school are used				
15.4 Landscaping features or small play areas are visible from the entrance				
15.5 Covered entrance that provides shelter from bad weather and facilitates transition				
15.6 Safe drop off/pick up				
15.7 Separate access for students and visitors				
15.8 Signature elements emphasizing the local/cultural context				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 16

16. Safety and security through natural surveillance	0	1	2	N/A
16.1 Centrally located administrative offices to enhance student safety				
16.2 Parking areas are delineated for staff and visitors				
16.3 Entrances and exits are easily and effectively monitored				
16.4 All student/pedestrian pathways are passively monitored				
16.5 No hiding spaces created by landscaping, fencing, etc.				
16.6 Separate age-level playgrounds for various age cohorts with developmentally appropriate and safe playground equipment				
16.7 Extensive use of windows and glazed doors to enhance natural surveillance of entrances, pathways, etc.				
16.8 No unattractive barriers such as barbed wire on the school grounds				
16.9 Toilets are attached to classrooms, if not then they have auditory connections with adjoining areas				
16.10 Security devices are unimposing				
16.11 Security system (alarms, lights, locks) provides elevated levels of security				
16.12 The site and learning environments are free of excessive non pedestrian traffic, hazards, and noise				
16.13 There are no high voltage power lines in the close proximity of the school				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 17

17. Ownership/territoriality through personalisation of spaces	0	1	2	N/A
17.1 Personal workspace with lockers for each student				
17.2 Spaces for personal artifacts				
17.3 Personal storage for books, stationary, etc.				
17.4 Distinctive design elements and display spaces for student works				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 18

18. Sensory aesthetics and active design elements	0	1	2	N/A
18.1 Attractive and plenty of well-maintained landscape areas				
18.2 Highly articulated fenestrations for framing of views				
18.3 Visually pleasing staircases and other movement pathways to encourage walking				
18.4 Age-appropriate design of walking routes				
18.5 Avoidance of long narrow corridors and use of nature connected pathways instead				
18.6 Provision of dedicated indoor spaces for physical activities				
18.7 Provision of sensory gardens with various activity spaces to suit the needs of children with varied temperaments				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 19

19. Self-reflection (privacy) and small group activities	0	1	2	N/A
19.1 Social spaces where a small group of children may go to be alone (i.e., reading areas, quiet places, reflection areas, listening areas, etc.)				
19.2 Space and furniture in classroom and other learning areas that provide 2–3 spaces for children to feel a sense of privacy and to control their interaction with others.				
19.3 Inviting yet supervised cave spaces where students can take a deep breath, albeit momentarily, from their hectic lives.				
19.4 Classrooms have clear breakout zones or breakout rooms attached to them. Breakout zones within corridors and separate from the classroom are avoided.				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 20

20. Use of appropriate materials and textures	0	1	2	N/A
20.1 Use of natural materials and visible details				
20.2 Multisensory materials are used that impart qualities like smoothness, roughness, brightness, opacity, transparency, etc. to the surfaces				
20.3 Use of materials that exude warmth				
20.4 Use of glass to connect inside to outside yet making children feel secure				
20.5 Overuse of cold and hard materials is avoided				
20.6 Use of curvilinear shapes wherever possible				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 21

21. Homelike environments with familiar elements	0	1	2	N/A
21.1 Soft furniture, such as a couch or large armchair				
21.2 Nontoxic indoor plants are used				
21.3 Soft and comforting elements like pillows, plants, soft furnishings to add warmth and security of being home				
21.4 Other decorative touches, such as area rugs or repurposed furniture				
21.5 Provision to hang children's artwork and their pictures on the walls				
21.6 Pastel paint colours with less stimulating displays (not visually overwhelming)				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 22

22. Agentic learning and green/sustainable architecture	0	1	2	N/A
22.1 Spaces to learn from natural processes like sun orientation, wind flow patterns, etc.				
22.2 Visible energy conservation/sustainable measures like rainwater harvesting, solar panels, etc.				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 23

23. Biophilic design to counter nature-deficit & attention restoration	0	1	2	N/A
23.1 Ample availability of green and natural spaces in the school campus				
23.2 Views of nature from inside of the classroom				
23.3 Possibility of going out in the natural environment during breaks				
23.4 Use of biomorphic patterns in the interior environment				
23.5 Views of parking lots, roads, etc. are avoided				
23.6 Restorative spaces with items such as soft furnishings, plants, animals, window seat or aquarium are generously available				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 24

24. School pets and empathy	0	1	2	N/A
24.1 Outdoor spaces conducive for pets along with safety measures				
24.2 Presence of farm area for children to tend to				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 25

25. Student participation in planning and design	0	1	2	N/A
25.1 Students maintain their own green patch				
25.2 Students volunteer for renovations and refurbishments in school				
25.3 Student participation was considered during design and planning process				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 26

26. Stimulating playgrounds and sense of adventure	0	1	2	N/A
26.1 Opportunities for tree climbing and innovative play with movable parts				
26.2Ample space for running, jumping and other age-appropriate activities				
26.3 Presence of safety nets and other safety measures to avoid injury				
26.4 Proximity of school infirmary from play areas				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

SUBSCALE 27

27. School configuration and smaller learning communities	0	1	2	N/A
27.1 The school is split into small learning communities through blocks or levels				
27.2 Each learning community has its own open spaces and other indoor areas for socialisation				
27.3 Each community has sufficient transparency to allow constant passive supervision				
Score				
Average Score (out of 10)				

0 = Inadequate, 1 = Adequate, 2 = Excellent

Total score (out of 270)	
Percentage score	

SCORE RULES*

86 % - 100 %

Excellent

71 % - 85 %

Very Good

51 % - 70 %

Acceptable

31 % - 50 %

Unacceptable -- Needs Work

0 % - 30 %

Poor -- Needs Substantial Changes

**Score rules and three-point rating scale adapted from:* The classroom rating scale in Lorraine Maxwell, "Competency in Child Care Settings: The Role of the Physical Environment," *Environment and Behavior* 20, no. 10 (2006); the EFEI (Educational Facilities Effectiveness Instrument), by FNI. © Fielding Nair International and the EDA SPACE app by Education Design International

4.7 Discussion

The Healthy School Assessment Tool (HSAT) can provide useful information regarding the physical environment of the school in the form of:

a) Overall health status of school

b) Issues that need attention

c) Comparison between health status of two or more schools

d) Overall health status of schools in a city or country or under an organization**.**

The results of the assessment may be represented in the form of pie charts and percentages. Other descriptive statistics like mean, median, mode and percentage may also be derived and represented in the form of tables, bar graphs etc. depending upon the purpose of the study for which the tool shall be used.

Overall health status of a school can be determined from the position of the overall percentage score of the school in the range given in the score rules. For example, a score of 55% lies in the 51-70% range that depicts a satisfactory health status. This overall percentage score can be calculated by adding up the average score of all the subscales, dividing it by the total score and then converting it into a percentage (Table 4.5). In the same table are depicted the average scores of each parameter. The scores below the satisfactory range depict the areas in the design that need attention and consideration. This is particularly relevant to ensure judicious use of resources in renovation projects that have a limited budget. Comparison between the health status of various schools can depicted by plotting average health scores of all the schools under consideration, against each other (Table 4.6). Overall health status of a group of schools in order highlight the areas that need attention and be consciously incorporated in the design of upcoming schools as well as in the renovation projects (Table 4.7). Apart from these tables, the results can be graphically represented in the form of graphs, histograms and pie charts as demonstrated in chapter five of this study.

Table 4.5 : Overall health status of a school and areas that need attention

S no.	Parameters Of Healthy School Assessment Tool(Hsat)	Avg. health score of each parameter	S no.	Parameters Of Healthy School Assessment Tool(Hsat)	Avg. health score of each parameter
1	Playgrounds		15	Child scale	
2	Safe community involvement		16	Homelike environment	
3	Noise reduction		17	Outdoor learning	
4	Safety and security		18	Ergonomic	
5	Density and crowding		19	Sensory aesthetics	
6	Welcoming entry		20	Accessibility	
7	Natural light		21	Agentic learning	
8	Variety of spaces		22	Biophilic design	
9	Careful use of colour		23	Materials and textures	
10	Ownership		24	School configuration & SLC	
11	Flexible spaces		25	School pets	
12	Common spaces		26	Self-reflection	
13	Natural ventilation		27	Student participation	
14	Legibility/way finding			**Overall health score of the school**	

Table 4.6: Comparison between health status of various schools

School name/code	Overall health score	Comments
S1		
S2		
S3		
S4		
S5		
S6		
S7		
S8		
S9		
S10		
Average score		

Table 4.7 : Overall health status of a group of schools with average score of each parameter, highlighting the areas that need attention.

S no.	HSAT PARAMETERS	AVERAGE SCORE OF EACH SCHOOL										AVG. SCORE OF EACH PARAMETER
		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	
1	Legibility/wayfinding											
2	Access control											
3	Child scale											
4	Ergonomic											
5	Use of colour											
6	Outdoor learning											
7	Density & crowding											
8	Accessibility											
9	Natural light											
10	Flexible spaces											
11	Variety of spaces											
12	Common spaces											
13	Natural ventilation											
14	Noise reduction											
15	Welcoming entry											
16	Safety & security											
17	Ownership											
18	Sensory aesthetics											
19	Self-reflection											
20	Materials & textures											
21	Homelike environment											
22	Agentic learning											
23	Biophilic design											
24	School pets											
25	Student participation											
26	Playgrounds											
27	School configuration & SLC											

CHAPTER 5

CASE STUDY – AMRITSAR

5.1 Introduction

Amritsar (Area: 139 Sq. Km.) is a city in the northwestern Indian state of Punjab, 28 kilometres from the international border with Pakistan. At the centre of its walled old town, is the gilded Golden Temple (Harmandir Sahib), the holiest shrine of the Sikh religion. The location coordinates are 31° 07' to 32° 03' North latitude and 74°29' to 78° 23' East longitude. It is 228 km west of the state capital of Chandigarh, 82 km from Jalandhar and well connected with other parts of the country by air, road and railway. With a population of around 1.4 million, it is the second-largest city in the state of Punjab.

5.2 School Education In India– The current scenario

School education in India is waiting to undergo a massive paradigm shift as the current model no longer seems to fulfil the purpose for which it exists. The current needs have outgrown the conventional school model which is more than a hundred years old. The Indian education system is largely dominated by two categories of schools, government schools and private schools respectively. Most of the private schools in India are affiliated with CBSE, ICSE or IB boards whereas all government schools are affiliated with state boards. Two aspects of school education that determine the quality of the school environment in India to date are education frameworks that mandate academic performance and the infrastructural controls given in the various policy documents.

5.2.1 National Education Policy (2020)

According to NEP 2020, the fundamental principles that will guide both the education system at large, as well as the individual institutions within it are:

1. Recognizing, identifying, and fostering the unique capabilities of each student, by sensitizing teachers as well as parents to promote each student's holistic development in both academic and non-academic spheres;

2. Flexibility, so that learners can choose their learning trajectories and programmes, and thereby choose their paths in life according to their talents and interests;

3. Multi-disciplinarity and a holistic education across the sciences, social sciences, arts, humanities, and sports for a multidisciplinary world to ensure the unity and integrity of all knowledge;

4. Emphasis on conceptual understanding rather than rote learning and learning-for-exams;

5. Creativity and critical thinking to encourage logical decision-making and innovation;

6. Ethics and human & Constitutional values like empathy, respect for others, cleanliness, courtesy, democratic spirit, the spirit of service, respect for public property, scientific temper, liberty, responsibility, pluralism, equality, and justice;

7. Life skills such as communication, cooperation, teamwork, and resilience;

8. Extensive use of technology in teaching and learning, removing language barriers, increasing access for Divyang students, and educational planning and management;

9. Respect for diversity and respect for the local context in all curriculum, pedagogy, and policy, always keeping in mind that education is a concurrent subject;

10. Full equity and inclusion as the cornerstone of all educational decisions to ensure that all students can thrive in the education system;

11. A 'light but tight' regulatory framework to ensure integrity, transparency, and resource efficiency of the educational system through audit and public disclosure while encouraging innovation and out-of-the-box ideas through autonomy, good governance, and empowerment;

12. Outstanding research as a co-requisite for outstanding education and development;

13. Substantial investment in a strong, vibrant public education system as well as the encouragement and facilitation of true philanthropic private and community participation.

These fundamental principles of NEP 2020 clearly point out the need for a massive transformation in the field of school education in India. The change in curriculum and the social environment, however, cannot be achieved without a user sensitive physical environment that supports the holistic development of children.

5.2.2 National Curriculum Framework (2005)

Khan, Smita (2015) analysed the three-pronged characteristics of the NCF 2005 that include an emphasis on relevance, flexibility and quality (Ref. Table 5.1). These three constituents need a complete paradigm shift to manifest. The emphasis given on holistic 'quality of life' as a vital component of the educational process makes it extremely relevant to the current study. NCF 2005 mentions, "Children will learn only in an atmosphere where they feel they are valued. Our schools still do not convey this to all children. The association of learning with fear, discipline and stress, rather than enjoyment and satisfaction, is detrimental to learning. Our children need to feel that each one of them, their homes, communities, languages and cultures, are valuable as resources for experience to be analysed and enquired into at school; that their diverse capabilities are accepted; that all of them have the ability and the right to learn and to access knowledge and skills; and that adult society regards them as capable of the best. We are becoming more aware of the importance of these needs as our schools expand and increasingly include children from all sections of society". Smita Khan however points out the following aspects that remain unaddressed in the curriculum. According to her,

(a) The school system is characterised by an inflexibility that makes it resistant to change;

(b) Learning has become an isolated activity, which does not encourage children to link knowledge with their lives in any organic or vital way;

(c) Schools promote a regime of thought that discourages creative thinking and insights;

(d) What is presented and transmitted in the name of learning in schools bypasses vital dimensions of the human capacity to create new knowledge;

(e) The "future" of the child has taken centre stage to the near exclusion of the child's "present", which is detrimental to the well-being of the child as well as the society and the nation.

5.3 Schools in Amritsar

Architectural considerations for school buildings in Amritsar must consider the composite climate with varying weather conditions throughout the year. The general considerations however include passive techniques of thermal insulation, enhancing natural light and ventilation with avoidance of excessive heat and glare. The majority of schools in Amritsar fall under two categories; government schools and private schools. The usual trend in Amritsar city is to prefer private schools over government schools when affordability is not an issue. Poor infrastructure and lack of opportunities along with a poor social environment make government schools so unpopular amongst the residents.

5.4 Demonstration of the Healthy School Assessment Tool (HSAT)

To demonstrate the use of the Healthy School Assessment Tool (HSAT), nine schools from the city of Amritsar were chosen through purposive sampling. Purposive sampling is the intentional selection of informants based on their ability to elucidate a specific theme, concept, or phenomenon (Robinson, 2014). As the Healthy school assessment Tool is meant to assess the health status of K-12 schools, the top twenty schools in the city were selected based on various ranking websites and the general perspective of city residents. The reason for this selection was to see if the traditional ranking parameters aligned with the holistic health parameters i.e. are the best schools also the healthy schools. Out of the twenty selected schools, nine schools were chosen as per their interest in participation (7 private schools + 2 government schools). List of schools given in the Annexure 1. All the selected schools are affiliated either with CBSE or to the Punjab School Education Board (PSEB).

Each of the nine schools was assigned a code from S1 to S9. The researcher spent a day or two at each school observing all the components included in the Healthy School Assessment Tool (HSAT). The recorded proformas were then graded and

analysed to get the average score of each of the subscales and also the overall score of individual schools that will be an indicator of the health status of the school being assessed. The score of each subscale may be graphically represented as a percentage on a pie chart. The recorded proforma of one of the schools has been given in Section 5.4.1 for better understanding.

5.4.1 HEALTH ASSESSMENT OF SCHOOLS IN AMRITSAR

Assessment of Doon International School. Amritsar (Code : S1)

1. Legibility and way finding	0	1	2	n/a
1.1 A unique identity is created for each location	0			
1.2 Use of landmarks as visual cues	0			
1.3 Well-structured paths with goals		1		
1.4 Limited navigational choices		1		
1.5 Sightlines are used to show what is ahead		1		
1.6 Covered pathways among buildings within the campus				x
1.7 Colour coded indoor pathways	0			
1.8 Clear and well-lit pathways to activity areas		1		
1.9 The main building has an obvious point of reference among the school's buildings in which paths and buildings connect				x
1.10 Distinction between various areas is made obvious using colours, textures, forms, ceiling heights, etc.	0			
Score	4/16			
Average score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

2. Community involvement and access control	0	1	2	n/a
2.1 Well placed windows to get a clear view of the entrance		1		
2.2 Dedicated areas for community interaction near the entrance	0			
2.3 Signage and pavements to define accessible areas for visitors	0			
2.4 Clearly defined limits to ensure access control		1		
Score	2/8			
Average score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

3. Child scale and developmental needs	0	1	2	n/a
3.1 Variation in ceiling heights acc. to the intended use of space	0			
3.2 Spaces and furniture considering child scale		1		
3.3 Whiteboard and other equipment respecting child scale		1		
3.4 Soft classrooms with curvilinear shapes, pillows, rugs, etc.	0			
3.5 Accessible material storage		1		
3.6 Door handles, switches, etc. at child's scale	0			
3.7 Variety of sizes of spaces	0			
Score	3/14			
Average score (10)	2.1			

0 = Inadequate, 1 = Adequate, 2 = Excellent

4. Ergonomic considerations for posture correction	0	1	2	n/a
4.1 Variety of furniture that is flexible and easy to use.	0			
4.2 The furniture improves posture and is in good repair.		1		
4.3Workstations are designed to accommodate information technology.	0			
4.4 Floor seating and opportunity for reclining provided at a corner of the classroom.	0			
4.5 Popliteal heights, elbow angle, and other anthropometric considerations are taken care of.	0			
4.6 Footrest is provided for shorter children.	0			
4.7 Tables and built-in shelves have rounded edges.		1		
Score	2/14			
Average score (10)	1.4			

0 = Inadequate, 1 = Adequate, 2 = Excellent

5. Careful use of colour	0	1	2	n/a
5.1 Variety of colours used while being careful about overstimulation		1		
5.2 Contrast between the board and the back wall just appropriate		1		
5.3 Colour and lighting are considered together	0			
5.4 Colourful displays on the walls and doors		1		

5.5 Warmer tones are preferred for younger children and cooler tones for older children	0			
5.6 Physical activity areas like gyms, yoga halls, etc. are painted in cooler colours	0			
5.7 Privacy niches/withdrawal areas are painted in cooler colours	0			
5.8 Stage area in the auditorium is in contrast with the surroundings and is painted in relaxing colours like beige, peach, or pastel green	0			
Score	3/16			
Average score (10)	1.9			

0 = Inadequate, 1 = Adequate, 2 = Excellent

6. Outdoor learning spaces	0	1	2	n/a
6.1 Provision of an accessible green/open space immediately outside the classroom	0			
6.2 An amphitheatreis readily available for outdoor plays, performances, and presentations.		1		
6.3 Provision of temporary structures and benches to facilitate outdoor classroom	0			
Score	1/6			
Average score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

7. Density and crowding	0	1	2	n/a
7.1 Ample space to move around		1		
7.2 Gross Area provision per child is between 7-10 sq.m.		1		
7.3 Children divided into smaller groups/cohorts	0			
7.4 Uncluttered rooms as well as walls		1		
7.5 No. of students per class is between 17-25			2	
Score	6/10			
Average score (10)	6			

8. Accessibility and universal design	0	1	2	n/a
8.1 Simple, clear circulation with clearly defined paths, doorways, etc.		1		
8.2 Provision of handrails as necessary and material textures considered as tactile means of way finding.	0			
8.3 Power doors to improve accessibility for all users.	0			
8.4 Provision of ramps for barrier free access		1		
8.5 "Maze" entrances to washrooms improve access for all users and reduce hygiene issues associated with doorknobs/levers.	0			
8.6 Circulation routes are of appropriate width (min. 1.5m wheelchair turning diameter) and are kept clear of obstacles.		1		
8.7 Hardware and controls are located within reach of users and ensure ease of operation.	0			
8.8 Special consideration of acoustics for the visually impaired: buildings and rooms are designed to reduce echo, reverberation, and extraneous background noise.	0			
8.9 Provision of appropriate lighting (natural and artificial) for circulation. Glare is avoided though.			2	
8.10 Large flat panel light switches, which can be used with either hand, closed fist, elbow, etc. are provided.	0			
8.11 Rough or textured borders, which contrast with smooth walking surfaces and indicate a change in grade or material, are used.	0			
8.12 Door lever does not require grip strength and can be operated by a closed fist or elbow.	0			
Score	5/24			
Average score (10)	2.1			

0 = Inadequate, 1 = Adequate, 2 = Excellent

9. Natural light for overall health and efficiency	0	1	2	n/a
9.1 Diffused (glare-free), usable daylight in every space where children spend long periods of time.		1		
9.2 Smaller windows at eye level are installed for views along with skylights or clerestory windows high in the wall deliver glare-free light deep into the space.	0			
9.3 Unrestricted views (when glare is not a problem) provide a perspective to ease eyestrain and bring the outside and inside worlds together.	0			
9.4 Daylight is supplemented with electric light. An acceptable design includes artificial light plus natural light from the outside.	0			
9.5 Direct view of bright light sources like the sun, a bright sky, or an electric lamp that may create glare and visual discomfort is avoided.		1		
9.6 Diffused daylight enters from multiple directions and minimizes shadows, balancing the light across the room.		1		
9.7 For every 10 square meter of classroom floor space, at least 2.5 square meter of window space is provided.	0			
9.8 Windows have some form of glare control, but are in use (when glare is not a problem), and are without painted obstructions.		1		
Score	3/16			
Average score (10)	1.9			

0 = Inadequate, 1 = Adequate, 2 = Excellent

10. Flexible spaces to facilitate multiple modalities of learning	0	1	2	n/a
10.1 Space can be made larger/ smaller or of a varying shape with a few changes in furniture arrangement		1		
10.2 The spatial layout allows the use of multiple learning modalities		1		
10.3 Movable and flexible partitions that can be operated easily	0			
10.4 Possibility for expansion/change is present	0			
10.5 Adjustable furniture to support both technology use and writing/drawing, etc. by hand	0			
10.6 Curtains/blinds, etc. to allow the usage of projector, SMART Board, etc.		1		
Score	3/12			
Average score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

11. Variety of engaging spaces that initiate a state of flow	0	1	2	n/a
11.1 Engaging library with vibrant furniture, furnishings, colours, etc.		1		
11.2 Reading areas are well-lit with spaces for group work	0			
11.3 Acoustically well designed and well-lit music and dance areas		1		
Score	2/6			
Average score (10)	3.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

12.Common spaces for peer/teacher interaction	0	1	2	n/a
12.1 Enough space/opportunities for 4 or more children, in more than 3 locations in visible/safe locations is provided	0			
12.2 Space for having a meal together with peers and teachers	0			
12.3 Presence of auditorium, amphitheatre, etc. in school		1		
Score	1/6			
Average score (10)	1.7			

0 = Inatequate, 1 = Adequate, 2 = Excellent

13. Natural ventilation and thermal comfort	0	1	2	n/a
13.1 Passive techniques for thermal insulation in extreme climates	0			
13.2 Provision for windows at various levels to be used during varied weather conditions	0			
13.3 Less noisy mechanical systems, if any		1		
13.4 Mechanical systems with a capacity to draw significant amount of outside air into the building	0			
13.5 Use of natural airflow patterns to circulate fresh air	0			
13.6 Higher ceiling heights wherever possible	0			
Score	1/12			
Average score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

14. Effective noise reduction	0	1	2	n/a
14.1 Site located in a peaceful area with low noise and air pollution			2	
14.2 Barriers and buffers are provided to counter traffic noise			2	
14.3 Landscaping is used as a dampener		1		
14.4 Toilets, storerooms, etc. are used as buffer zones	0			
14.5 Hard materials that cause echo are avoided		1		
14.6 Appropriate sound absorbing materials are used		1		
Score	7/12			
Average score (10)	5.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

15. Welcoming entry and signature elements emphasizing the cultural context	0	1	2	n/a
15.1 An inviting and highly visible entrance with well-defined architectural features, signs, lighting, artwork, landscaping, and other landmarks such as flags		1		
15.2 Scale of the entrance is not intimidating for the child		1		
15.3 Motivational signs that send positive messages and invite children to school are used	0			
15.4 Landscaping features or small play areas are visible from the entrance			2	
15.5 Covered entrance that provides shelter from bad weather and facilitates the transition		1		
15.6 Safe drop off/pick up		1		
15.7 Separate access for students and visitors		1		
15.8 Signature elements emphasizing the local/cultural context	0			
Score	7/16			
Average score (10)	4.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

16. Safety and security through natural surveillance	0	1	2	n/a
16.1 Centrally located administrative offices to enhance student safety	0			
16.2 Parking areas are delineated for staff and visitors		1		
16.3 Entrances and exits are easily and effectively monitored		1		
16.4 All student/pedestrian pathways are passively monitored		1		
16.5 No hiding spaces created by landscaping, fencing, etc.		1		
16.6 Separate age-level playgrounds for various age cohorts with developmentally appropriate and safe playground equipment		1		
16.7 Extensive use of windows and glazed doors to enhance natural surveillance of entrances, pathways, etc.		1		
16.8 No unattractive barriers such as barbed wire on the school grounds		1		
16.9 Toilets are attached to classrooms, if not then they have auditory connections with adjoining areas	0			
16.10 Security devices are unimposing		1		
16.11 Security system (alarms, lights, locks) provides elevated levels of security		1		
16.12 The site and learning environments are free of excessive non-pedestrian traffic, hazards, and noise			2	
16.13 There are no high voltage power lines in the proximity of the school			2	
Score	13/26			
Average score (10)	5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

17. Ownership/territoriality through personalisation of spaces	0	1	2	n/a
17.1 Personal workspace with lockers for each student		1		
17.2 Spaces for personal artefacts		1		
17.3 Personal storage for books, stationery, etc.		1		
17.4 Distinctive design elements and display spaces for student works		1		
Score	4/8			
Average score (10)	5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

18. Sensory aesthetics and active design elements	0	1	2	n/a
18.1 Attractive and plenty of well-maintained landscape areas		1		
18.2 Highly articulated fenestrations for framing of views	0			
18.3 Visually pleasing staircases and other movement pathways to encourage walking	0			
18.4 Age-appropriate design of walking routes	0			
18.5 Avoidance of long narrow corridors and use of nature connected pathways instead		1		
18.6 Provision of dedicated indoor spaces for physical activities		1		
18.7 Provision of sensory gardens with various activity spaces to suit the needs of children with varied temperaments		1		
Score	4/14			
Average score (10)	2.9			

0 = Inadequate, 1 = Adequate, 2 = Excellent

19. Self-reflection (privacy) and small group activities	0	1	2	n/a
19.1 Social spaces where a small group of children may go to be alone (i.e., reading areas, quiet places, reflection areas, listening areas, etc.)	0			
19.2 Space and furniture in classroom and other learning areas that provide 2–3 spaces for children to feel a sense of privacy and to control their interaction with others.	0			
19.3 Inviting yet supervisedcave spaces where students can take a deep breath, albeit momentarily, from their hectic lives.	0			
19.4 Classrooms have clear breakout zones or breakout rooms attached to them. Breakout zones within corridors and separate from the classroom are avoided.	0			
Score	0/8			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

20. Use of appropriate materials and textures	0	1	2	n/a
20.1 Use of natural materials and visible details	0			
20.2 Multisensory materials are used that impart qualities like smoothness, roughness, brightness, transparency, etc. to the surfaces	0			

20.3 Use of materials that exude warmth	0			
20.4 Use of glass to connect inside-outside making children feel secure		1		
20.5 Overuse of cold and hard materials is avoided		1		
20.6 Use of curvilinear shapes wherever possible		1		
Score	3/12			
Average score (10)	2.5			

21. Homelike environments with familiar elements	0	1	2	n/a
21.1 Soft furniture, such as a couch or large armchair	0			
21.2 Nontoxic indoor plants are used	0			
21.3 Soft and comforting elements like pillows, plants, soft furnishings to add warmth and security of being home	0			
21.4 Other decorative touches, such as area rugs or repurposed furniture	0			
21.5 Provision to hang children's artwork and their pictures on the walls		1		
21.6 Pastel paint colours with less stimulating displays (not visually overwhelming)		1		
Score	2/12			
Average score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

22. Agentic learning and green/sustainable architecture	0	1	2	n/a
22.1 Spaces to learn from natural processes like sun orientation, wind flow patterns, etc.	0			
22.2 Visible energy conservation/sustainable measures like rainwater harvesting, solar panels, etc.	0			
Score	0/4			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

23. Biophilic design to counter nature deficit & attention restoration	0	1	2	n/a
23.1 Ample availability of green and natural spaces in the school campus		1		
23.2 Views of nature from inside of the classroom	0			
23.3 Possibility of going out in the natural environment during breaks	0			
23.4 Use of biomorphic patterns in the interior environment	0			
23.5 Views of parking lots, roads, etc. area are avoided		1		
23.6 Restorative spaces with items such as soft furnishings, plants, animals, window seat or aquarium are generously available	0			
Score	2/12			
Average score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

24. School pets and empathy	0	1	2	n/a
24.1 Outdoor spaces conducive for pets along with safety concerns of children	0			
24.2 Presence of farm area for children to tend to	1			
Score	1/4			
Average score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

25. Student participation in planning and design	0	1	2	n/a
Students maintain their own green patch	0			
Students volunteer for renovations and refurbishments in school	0			
Student participation was considered during design and planning process	0			
Score	0/6			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

26. Stimulating playgrounds and sense of adventure	0	1	2	n/a
26.1 Opportunities for tree climbing and innovative play with movable parts	0			
26.2 Ample space for running, jumping and other age-appropriate activities			2	
26.3 Presence of safety nets and other safety measures to avoid injury		1		
26.4 Proximity of school infirmary from play areas		1		
Score	4/8			
Average score (10)	5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

27. School configuration and smaller learning communities	0	1	2	n/a
27.1 The school is split into small learning communities through blocks or levels	0			
27.2 Each learning community has its own open spaces and other indoor areas for socialization	0			
27.3 Each community has sufficient transparency to allow constant passive supervision	0			
Score	0/6			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

Sum of all the average scores	**66.8**
Total Score	**270**
Percentage Score of the School	**25 %**
Health Status of the School	**Poor -- Needs Substantial Changes**

SCORE RULES	
86 % - 100 %	**Excellent**
71 % - 85 %	**Very Good**
51 % - 70 %	**Acceptable**
31 % - 50 %	**Unacceptable -- Needs Work**
0 % - 30 %	**Poor -- Needs Substantial Changes**

Note : For the recorded proformas of schools coded as S2-S9 , Refer Annexure I

5.5 Overall Health Status

The following analysis is for the overall health status of all the schools considered in the study. Each parameter has been assessed for its compliance with the specifications in the HSAT.

5.5.1 SUBSCALE 1: Use effective wayfinding strategies to improve legibility and build assurance.

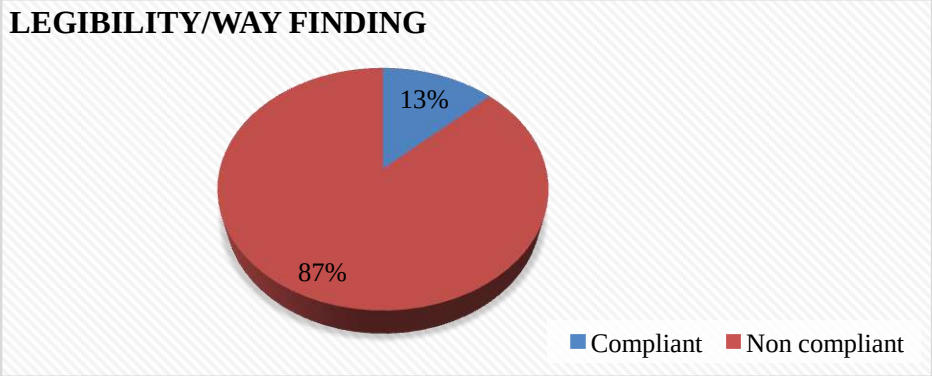


Figure 5.2: Average score of Amritsar schools on Subscale 1

It was observed that on average the nine schools selected in Amritsar city complied only with 13% of the legibility and wayfinding criteria on the Healthy School Assessment Tool (HSAT).In just one of the nine cases was there any effort observed to create a unique identity for each location. Landmarks and visual cues were not easily identifiable, only two of the nine cases however seemed to pay a little heed to these criteria. Three of the schools had well-structured paths with goals, although there were no efforts to make those paths interesting with landscaping features and other design elements. Three of the schools had limited navigational choices and clear sightlines while others were observed to be confusing for new students. Four of the schools had covered pathways among buildings within the campus while none of them used colour coding of indoor pathways to improve legibility.

Image 5. 1: No efforts to improve legibility **Image 5.2: Covered pathway between buildings**

Three schools had reasonably well-lit pathways to activity areas while others were usually doubly loaded corridors with insufficient lighting. In only two of the schools, the main building had an obvious point of reference while in others this aspect was not taken care of. In none of the buildings, however, an easily identifiable distinction was made between various areas with the help of colours, textures, forms, ceiling heights etc.

5.5.2 SUBSCALE 2. Ensure safe community involvement and access control for enhancing competence.

Although six out of the nine schools had well-placed windows to get a somewhat clear view of the entrance in most cases the utility of the windows was compromised by using tinted glasses or blinds etc. CCTV cameras and security personnel at the entry points were relied upon for the check. Five of the nine schools had spaces near the entrance that could be used for community involvement with school children without entering the student areas.

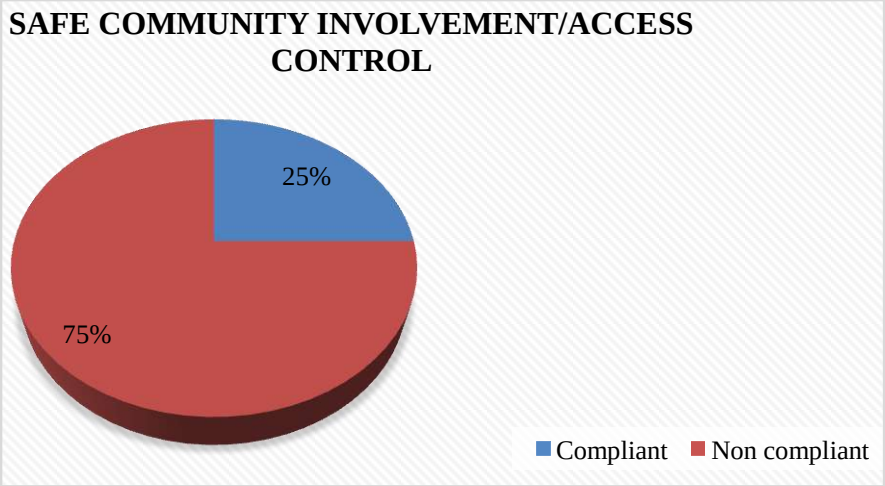


Figure 5.3: Average score of Amritsar schools on Subscale 2

Image 5.3: Glazed entrance for passive surveillance

Image 5.4: View from the reception area

However, a well organised covered space for the same was provided only in of those five schools. There was signage to direct the visitors at only one school, others relied on security personnel to keep visitors away from the student areas. A clearly defined limit of access control through various building design elements was however ensured only in four of the nine schools.

5.5.3 SUBSCALE 3: Consider appropriate scale & developmental needs to foster autonomy and self-esteem.

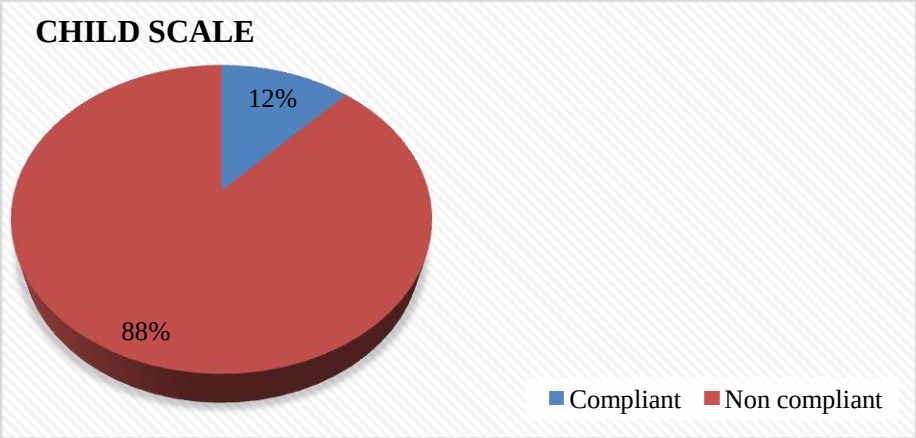


Figure 5.4: Average score of Amritsar schools on Subscale 3

Variation in ceiling heights as per the intended use of space was almost missing in all nine schools. Five of the nine schools considered child scale in their standardised furniture but the space sizes remained unattended. Whiteboard and other equipment considered child scale in nearly 50% of the schools surveyed. Soft classrooms with curvilinear shapes furnished by some pillows, a rug etc. was a completely missing feature beyond the playpen level that was excluded from this study. None of the schools considered providing door handles, switches etc. at the child's scale. Most of the classrooms were of standard sizes and there were no partitions or privacy niches to address the developmental needs of various types of learners.

Image 5.5 : Steps at the entrance

Image 5.6: No height consideration in toilets

5.5.4 SUBSCALE 4: Apply ergonomic considerations to improve posture and increase efficiency.

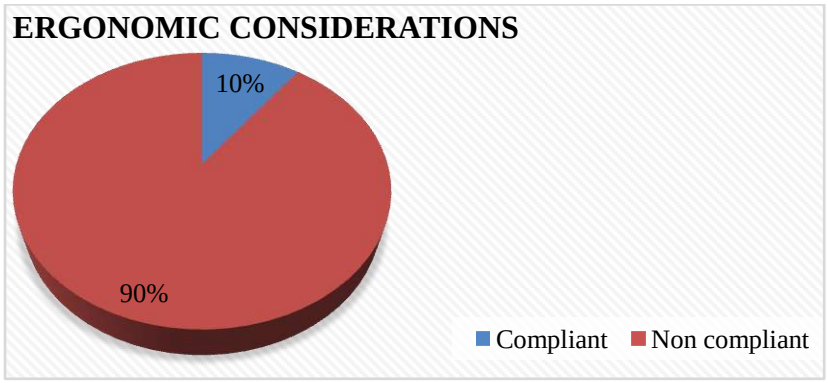


Figure 5.5: Average score of Amritsar schools on Subscale 4

All of the nine schools have standardized and inflexible furniture. While most of the schools still use hardwood and steel benches, only two of them had age-appropriate variations and were found to be in a good state of repair. Only one of the school's workstations were designed to partially accommodate the information technology in the classroom. Only three out of nine schools had sufficient space in the classrooms to allow the movement of children, others were mostly overcrowded. The reason for the ones having a low density was however the fact that the schools were relatively new and had low student enrolment as compared to other schools. Floor seating opportunity was missing in all the schools above the playpen level. Furniture was found to be in a satisfactory level of repair and with anthropometric considerations in only two of the nine schools that were newly constructed. There were no attempts of personalisation like footrest for shorter children etc in any of the schools surveyed.

Image 5.7: Standardised inflexible furniture

Image 5.8: Standardised inflexible furniture

5.5.5 SUBSCALE 5. Use colours carefully to avoid visual fatigue and enhance psychological comfort.

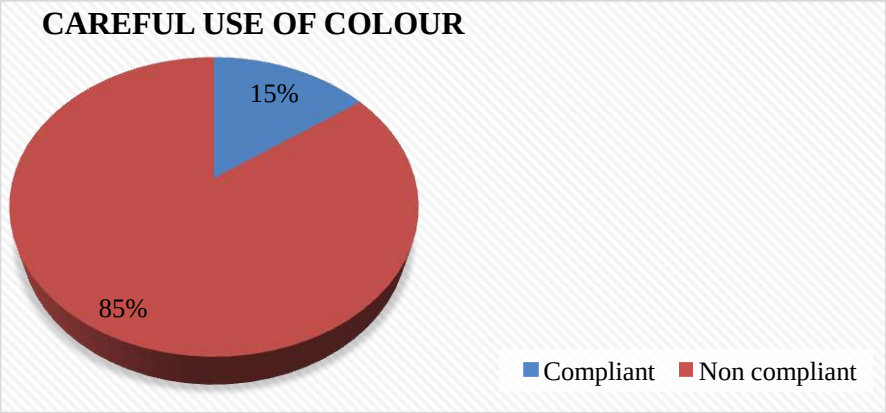


Figure 5.6: Average score of Amritsar schools on Subscale 5

Six out of the nine schools used colours without paying any heed to the overstimulation they may be causing. Overuse of primary colours and other bright colours made classrooms, corridors and in the case of government schools, even the outer facades unpleasant for children Only three schools were found to have used colours judiciously while one had a complete grey façade making it unpleasant at the very first look. In just three of the schools, the contrast between the black/whiteboard and the wall was just right, in that it did not strain the eyes. None of the schools however considered colours and lighting together. Most of the classrooms in the selected schools had colourful displays on walls and doors.

Image 5.9: Overstimulation through colour

Image 5.10: Overstimulation through colour

There was no preference seen for painting classrooms for younger children in warmer tones and older children in cooler tones. There were hardly any areas of withdrawal so the choice of colours was not available. In just three of the nine schools, the stage area was in contrast with the surroundings and painted in relaxing colours like beige, peach or pastel green.

5.5.6 SUBSCALE 6. Provide outdoor spaces to augment collateral learning and social connections.

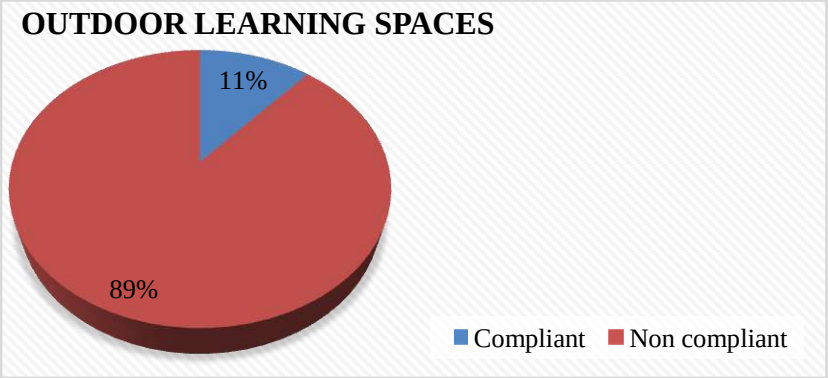


Figure 5.7: Average score of Amritsar schools on Subscale 6

Accessible green open spaces immediately outside the classroom were completely absent in all nine schools. Most of the schools had a completely missing inside-outside connection. The only open space readily available for children was the corridors that weren't wide enough to accommodate any kind of learning activities. In half of the schools, the doubly loaded corridors took away even the much needed psychological break that children get by looking at the life beyond the walls. Two of the nine schools however had an amphitheatre for outdoor plays, performances and presentations. Although three of the nine schools had spaces that could be used to facilitate outdoor classrooms, none of them had any temporary structures and benches placed for the same.

Image 5.11: Space outside classroom

Image 5.12: Semi open space between classroom

5.5.7 SUBSCALE 7. Manage density & crowding to improve self-worth and ensure social distance.

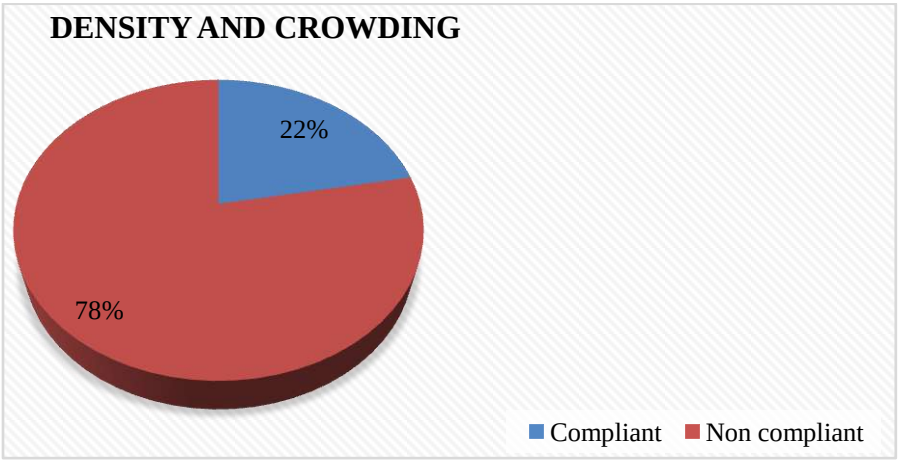


Figure 5.8: Average score of Amritsar schools on Subscale 7

In only three of the nine schools, there was ample space for children to move around in the classroom/principal learning areas. The rest of the classrooms had a closely-packed layout of benches evenly distributed throughout the classroom. Classroom density and the type of furniture used were the predominant factors in deciding the free movement of children in the classroom. Although five out of the nine schools satisfied the gross area requirement of 7-10 sq m per child it was only in two of these schools that this number reflected a controlled classroom density as well. The rest of the schools that satisfied this condition had huge playgrounds and other open areas usually cut off from the main academic building.

Image 5.13: Overcrowded classroom

Image 5.14: Overcrowded classroom

This proved that the gross area per child can be a misleading indicator of classroom density. In none of the selected schools' children were divided into small groups by the virtue of classroom layout. Only three of the nine schools had uncluttered rooms and walls while others were observed to be overcrowded and cluttered in one way or the other. Six out of the nine selected schools had more than 25 children in a classroom, some of them even exceeded 40 leading to a sense of overcrowding and anonymity.

5.5.8 SUBSCALE 8: Apply universal design principles to improve accessibility and build self-esteem.

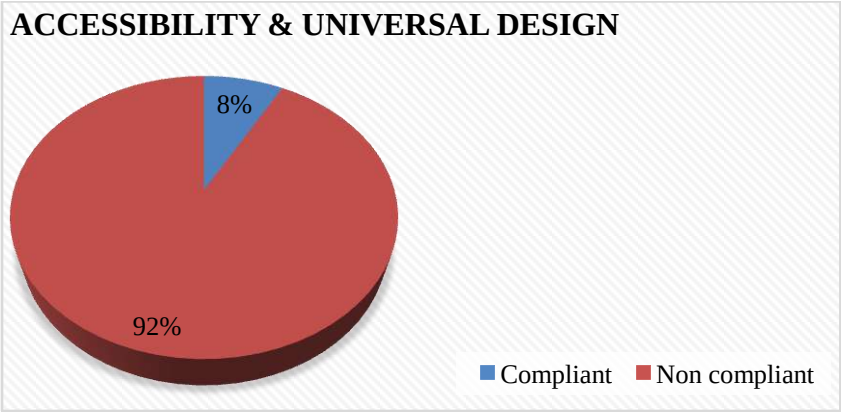


Figure 5.9: Average score of Amritsar schools on Subscale 8

Compliance with accessibility and universal design principles was limited to building ramps and lifts for barrier-free access. Although in most cases the ramp was not included in the main circulation space and was an isolated feature built only to adhere to the norms. Most ramps were not even built on an appropriate slope to allow wheelchair movement. Almost all the school corridors except two had a corridor width to allow wheelchair movement yet only three schools had simple, clear circulation with clearly defined paths, doorways etc. Schools with doubly loaded corridors mostly ended up having insufficient lighting for circulation. Power doors and other advanced features like push switches etc were missing in all the schools. No special considerations for the visually impaired could be observed in any of the schools.

5.5.9 SUBSCALE 9: Ensure ample natural light for enhancing overall health and efficiency.

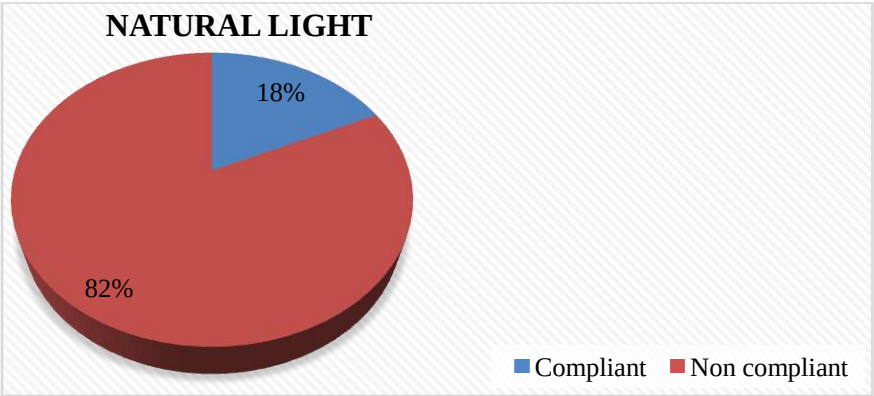


Figure 5.10: Average score of Amritsar schools on Subscale 9

Natural light has not been given its due importance in the design of almost all the selected schools. Although efforts were made to cut the glare and ensure the entry of only diffused light into the learning areas, the amount of daylight entering the rooms was much less than needed. Daylight was not only supplemented by artificial lighting but was neglected due to the presence of artificial lighting. In none of the views, framing of views from the windows at eye level was considered a necessity. Windows were only provided at one level and mostly above the eye level of children. None of the selected schools had a window area of more than 2.5 sq. m for every 10 sq. m of classroom floor space.

Image 5.15: Insufficient natural light

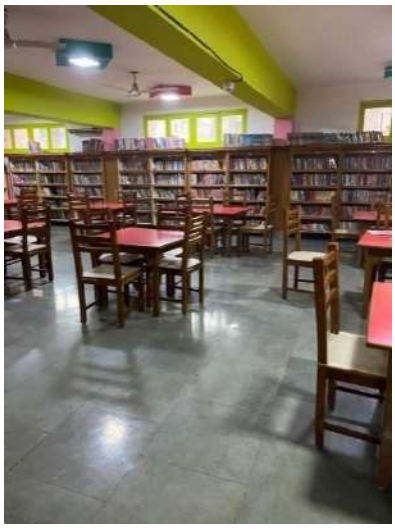


Image 5.16: Windows blocked with stacks

5.5.10 SUBSCALE 10: Facilitate multiple modalities of learning by designing flexible spaces.

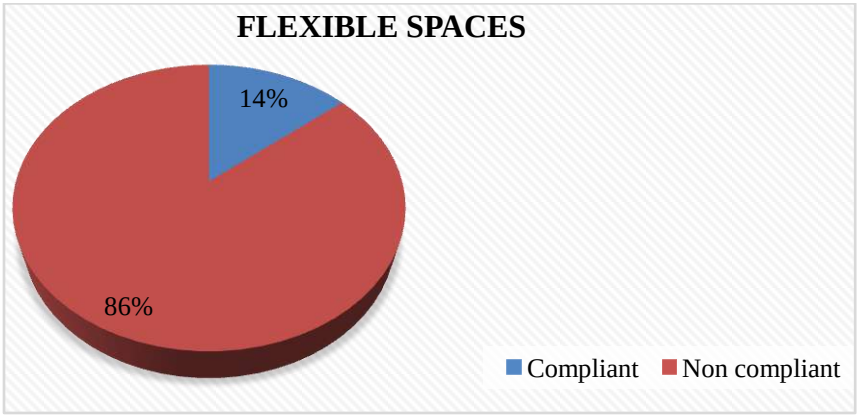


Figure 5.11: Average score of Amritsar schools on Subscale 10

Only two of the nine schools that, had lower classroom densities and also that had chairs instead of benches, could modulate the space according to the varied modalities of learning. Movable and flexible partitions were missing and all the classrooms were of the same standard size due to which the possibility of expansion and change was absent. The furniture in all the schools wasn't flexible, so it could be used with information technology and for handwork. Only one of the schools partially fulfilled this requirement. Almost all the schools had the arrangement to control the amount of natural light entering the room to facilitate the use of Smart class and projector etc.

Image 5.17: Table-chairs allow movement **Image 5.18: Fixed furniture**

5.5.11 SUBSCALE 11. Provide a variety of spaces that enhance engagement and initiate a state of flow.

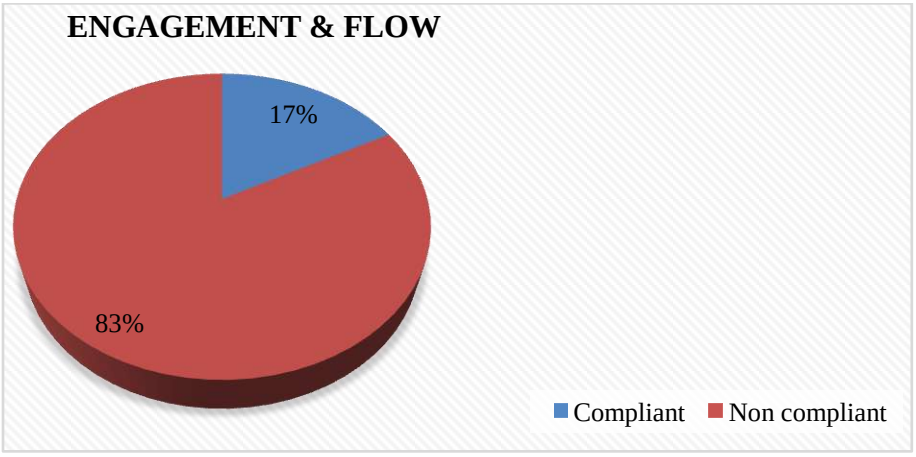


Figure 5.12: Average score of Amritsar schools on Subscale 11

Five out of the nine selected schools had an engaging library with vibrant colours and interiors. However, the furniture in the libraries was not very appealing and comfortable for long hours of use. Another problem was that instead of a number of small reading areas, there was usually a single centralized library and reading area which made it less accessible and appropriate for frequent use by classrooms that are located in other wings or on other floors. There was hardly any provision for group works in reading areas. Only three out of nine schools had acceptable levels of acoustically well designed and well-lit music and dance areas.

Image 5.19: Colors used to create ambience

Image 5.20: Inadequate lighting makes a place repulsive

5.5.12 SUBSCALE 12: Provide common spaces for peer/ teacher interaction to enhance a sense of community/belonging.

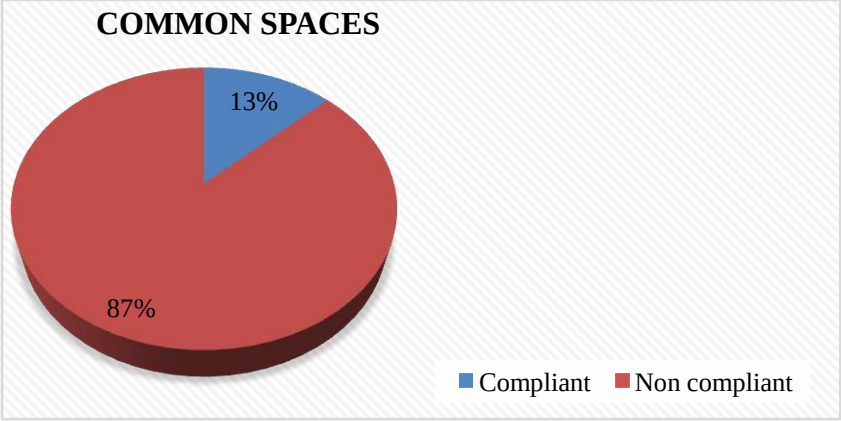


Figure 5.13: Average score of Amritsar schools on Subscale 12

None of the schools had any specifically designed spaces for social interaction among peers and teachers. Most schools had a cafeteria, but there was hardly any space for sitting together with peers and teachers for having a meal. While private schools mostly confined children to classrooms even during lunch breaks, the government schools provide mid-day meal that is prepared in the community kitchen. The two government schools included in the study did not have any dedicated place for children to have a meal together but children managed to socialise fairly enough in the school ground where the meals were served. Five of the nine schools had an auditorium or an

amphitheatre present on the school campus to enhance performance-based learning and hence opportunities for social interaction.

Image 5.21: Mid day meal preparations

Image 5.22: School auditorium

5.5.13 SUBSCALE 13: Maximize natural ventilation and thermal comfort to improve efficiency and overall health.

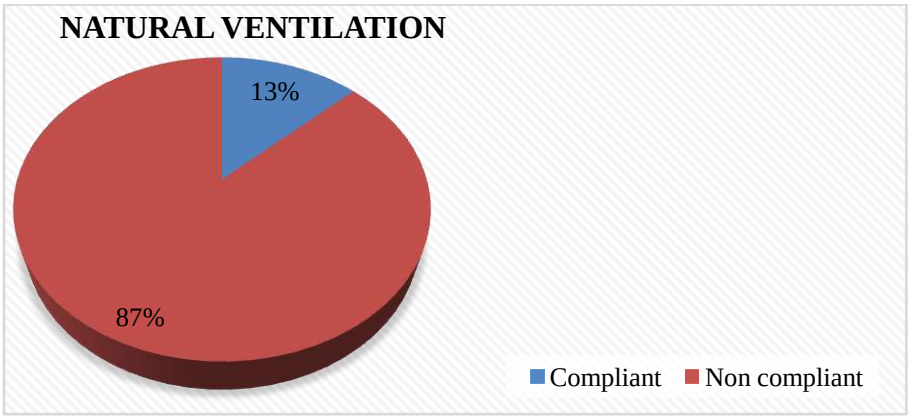


Figure 5.14: Average score of Amritsar schools on Subscale 13

Amritsar city is known for its extremities of climate with a more dominant summer season and short but extremely cold winter season. Despite this, there were not many passive techniques used in the schools surveyed. Less than half of the schools used courtyards for natural ventilation while most others relied only on mechanical means without any inflow of fresh air. There was no provision for windows at various levels that may be used during varied seasons as per the requirement. Four schools had the provision of low noise split ACs in the classrooms while fans used in the non-air-conditioned classrooms were mostly noisy and hindered the communication between teachers and the students. In none of the schools, the use of natural airflow patterns to circulate fresh air was observed.

Image 5.23: Poor orientation leading to insufficient ventilation

Image 5.24: Fixed glasses in classrooms

5.5.14 SUBSCALE 14: Ensure effective noise reduction to combat stress and improve efficiency.

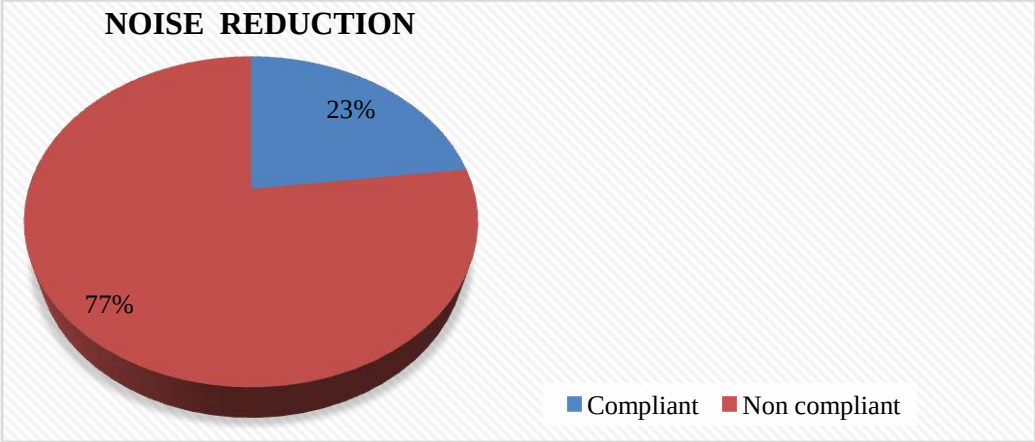


Figure 5.15: Average score of Amritsar schools on Subscale 14

Nearly half of the schools surveyed were located in the heart of the city cramped with traffic noises and air pollution. Due to high enrolment in two of these schools (the most populous schools of the city with more than 13000 children housed in just two campuses), they have become the magnets to attract traffic noise and air pollution. The newer schools however have been located in quiet residential areas and have a relatively very low enrolment that makes them free from traffic noise and air pollution caused by vehicles. Most of the schools had barriers and buffers to counter traffic noise entering

the learning areas. Landscaping was used as a dampener in a few places. Only two of the nine schools intended to use soft floorings and other furnishings that avoid echo and absorb noise.

Image 5.25: Setback to avoid traffic noise

Image 5.26: Green buffer to reduce noise

5.5.15 SUBSCALE 15: Create a welcoming entry and signature elements to help children comprehend the environment better and feel connected.

Almost all the nine schools tried to make the entrances visually appealing but only three of them could be called inviting for children with signs, lighting, artwork, landscaping, landmarks etc. Only four of the nine schools were observed to have taken care of the child‘s scale at the entrance. Motivational signs that sent positive messages to children were displayed in only one of the nine schools. Landscaping or small play areas were visible from the entrance in five out of the nine schools. However, only three schools provided shelter for a safe transition during bad weather.

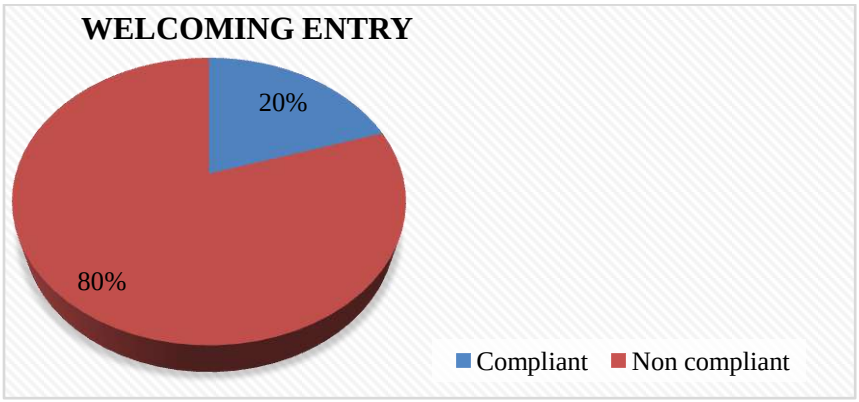


Figure 5.16: Average score of Amritsar schools on Subscale 15

Safe pick up and drop were ensured in most of the schools except the overpopulated ones located on busy roads. Most of the schools had separate access for students and visitors while very few had a signature element visible from the entrance.

Image 5.27: Play area at the entrance

Image 5.28: View of green area from the entrance

5.5.15 SUBSCALE 16. Ensure safety and security through natural surveillance and other design interventions.

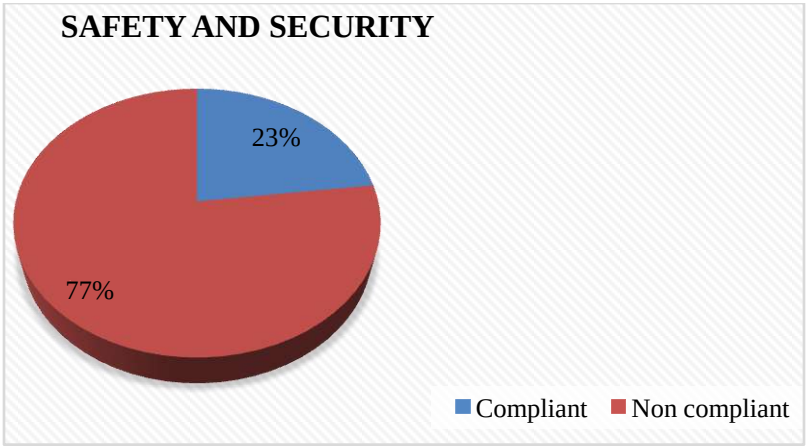


Figure 5.17: Average score of Amritsar schools on Subscale 16

While most schools tried to ensure safety and security in school, natural surveillance however was not an obvious choice in every case. While five of the nine schools had centrally located offices to enhance student safety but none of them extensively used windows or glazed doors for the same. Only four of the nine schools had parking areas for visitors while others majorly relied on on-street parking or just parked on the road. Six of the nine schools had spaces that were not effectively monitored and could act as hiding spaces that invite crime and bullying. None of the schools had toilets attached to the classrooms and in most cases, toilets were isolated

spaces with no auditory connections with the surrounding areas. CCTV cameras were installed in most of the schools while other elevated levels of security systems were largely missing. All the schools' campuses were free of excessive non-pedestrian traffic and other hazardous activities. None of them had high voltage power lines nearby the school.

5.5.17 SUBSCALE 17: Allow personalisation of spaces to encourage ownership/territoriality

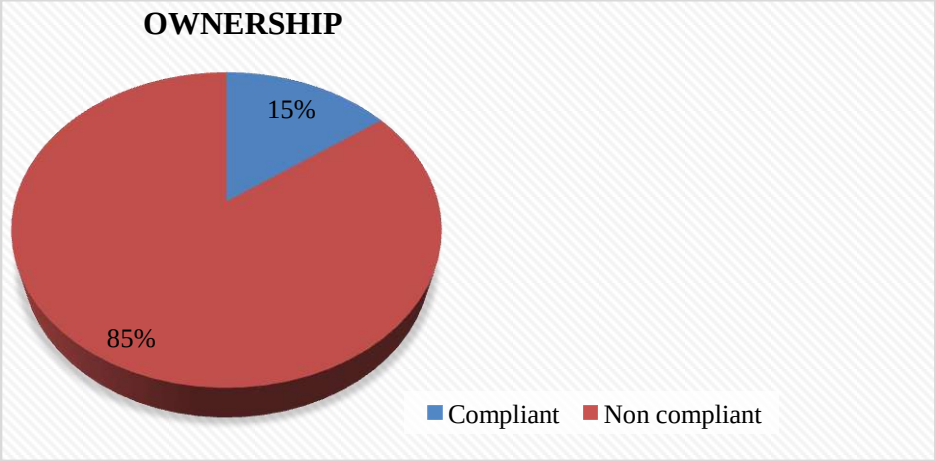


Figure 5.18: Average score of Amritsar schools on Subscale 17

Only two of the schools had personal workspaces with storage areas (not lockers) for each student. Personalisation of spaces wasn‘t evident in any way more than a few wall displays. No personalisation or adjustment was visible in furniture and furnishings. Distinctive design elements were absent making all the rooms look more or less the same.

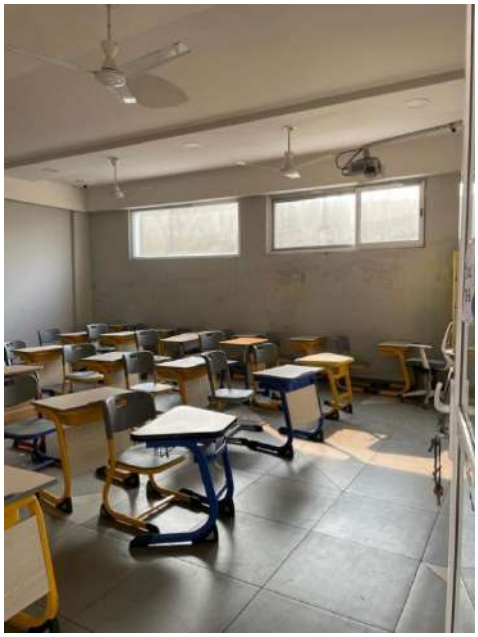


Image 5.29: Missing ownership

Image 5.30: Open racks for storage

5.5.18 SUBSCALE 18: Use sensory aesthetics and active design elements for optimum stimulation (physical & psychological.

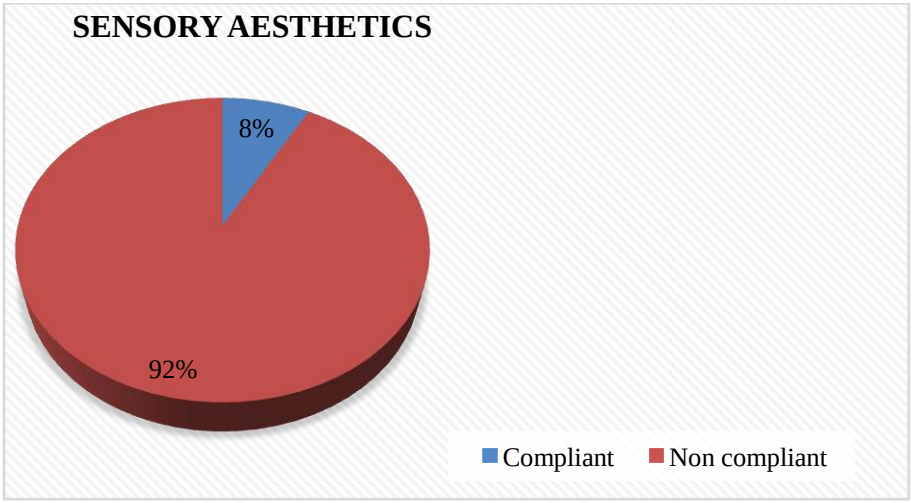


Figure 5.19: Average score of Amritsar schools on Subscale 18

Five of the nine schools had plenty of well-maintained landscaped areas but how often were the children allowed to access those areas could be questionable. Most schools had just one huge playground instead of a hierarchy of green spaces well connected to the learning areas. No attempt could be observed to provide highly

articulated fenestrations for framing of views. In none of the schools was the staircase given a visually appealing appearance. Long narrow/wide corridors were preferred in all the selected schools over nature connected pathways. Five of the nine schools had dedicated indoor spaces for physical activities but their aesthetic quality was questionable in most cases.

Image 5.31: Isolated play area

Image 5.32 : Doubly loaded corridor

5.5.19 SUBSCALE 19: Provide spaces for self-reflection (privacy) and small group activities to enhance autonomy, competence, and relatedness.

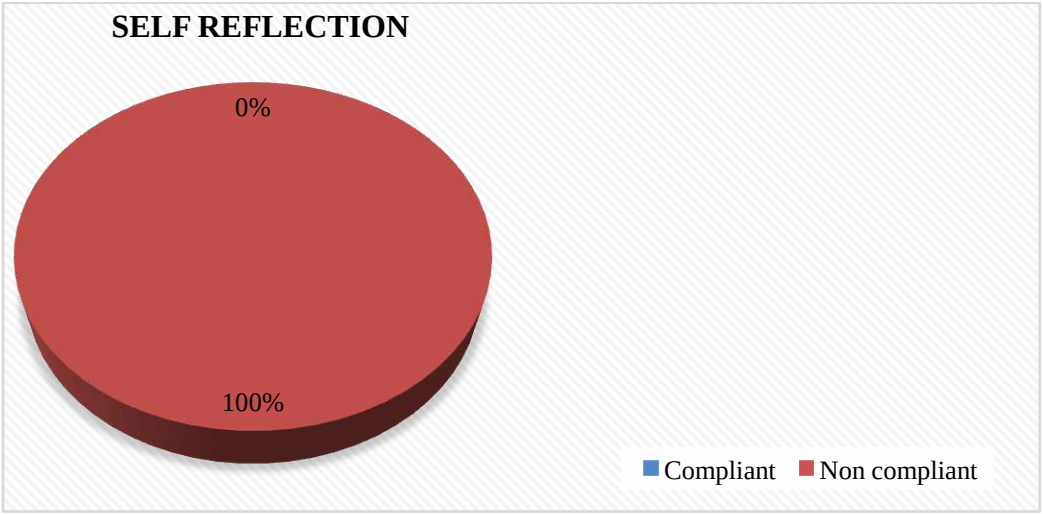


Figure 5.20: Average score of Amritsar schools on Subscale 19

Opportunities for self-reflection were missing in all nine schools. The whole concept of self-reflection and privacy for children seemed alien to the school architects as well as other stakeholders. Privacy spaces are usually understood as enclosed spaces where children can go to be alone or in groups, this scares teachers and parents. Places of self-reflection however need to be under the passive surveillance of school adults and not necessarily be behind closed doors. Niches, corners, partial enclosures etc that provide children with an opportunity to calm down or just be creative are a much-needed addition to these schools.

5.5.20 SUBSCALE 20: Maximise authenticity and psychological comfort through the use of appropriate materials.

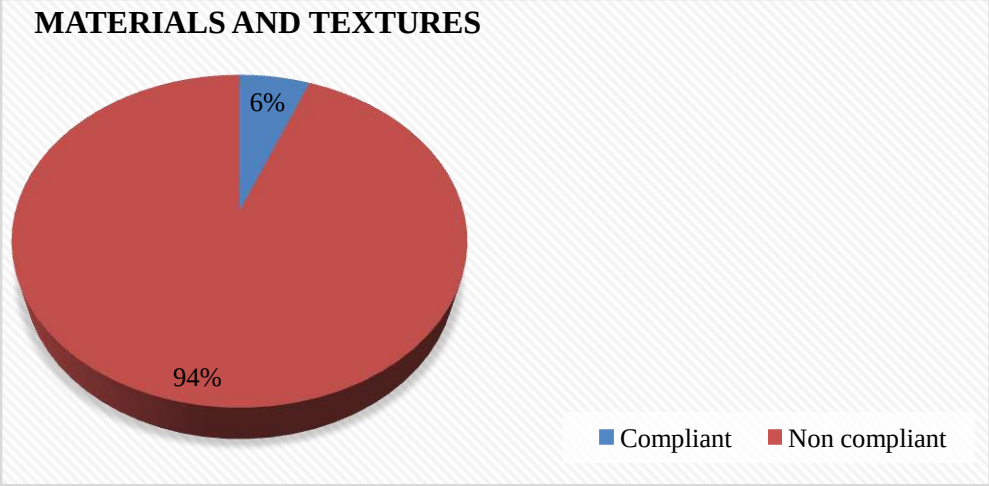


Figure 5.21: Average score of Amritsar schools on Subscale 20

None of the schools used noteworthy multi-sensory materials to impart qualities like smoothness, roughness, brightness, opacity, transparency etc to various surfaces. Almost all the schools used conventional materials like RCC, brick, steel etc Use of aluminium and PVC for doors and windows was also observed. No efforts could be seen to alternately use materials and furnishings that imparted warmth to children's spaces. The reason for the same could range from budget constraints to mere ignorance of children's holistic health needs. There were merely any efforts observed to connect the inside with the outside visually through the glass or other perforations.

5.5.21 SUBSCALE 21: Create homelike environments with familiar elements to enhance the feeling of security and psychological freedom.

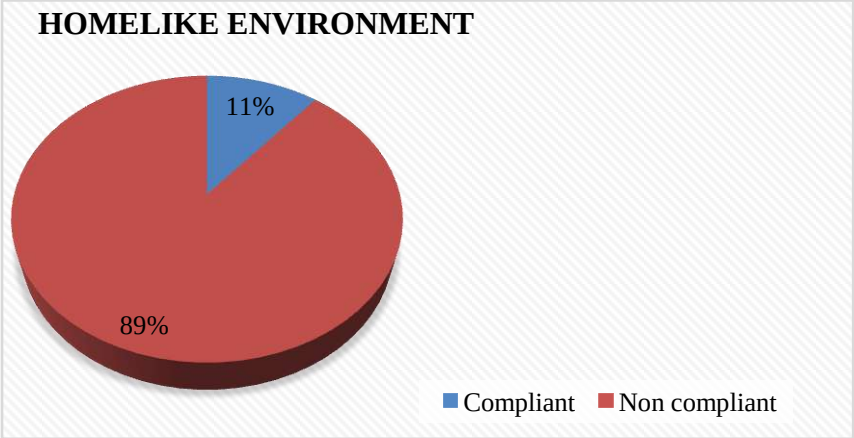


Figure 5.22: Average score of Amritsar schools on Subscale 21

Most schools had a provision to hang children's artwork and pictures on the walls although they weren't used efficiently enough. Only four of the nine schools had pastel paint colours with less stimulating displays that were close to being homelike and not visually overwhelming. The rest of the schools used colours that were either too bright or completely neutral like white or grey with colourful displays in fluorescent colours that might arouse discomfort by being over stimulating. Soft furniture, indoor plants and comforting elements like cushions rugs etc that impart the warmth and security of being home were missing from all the schools surveyed.

5.5.22 SUBSCALE 22: Promote agentic learning and environmental stewardship through visible green/sustainable architecture features.

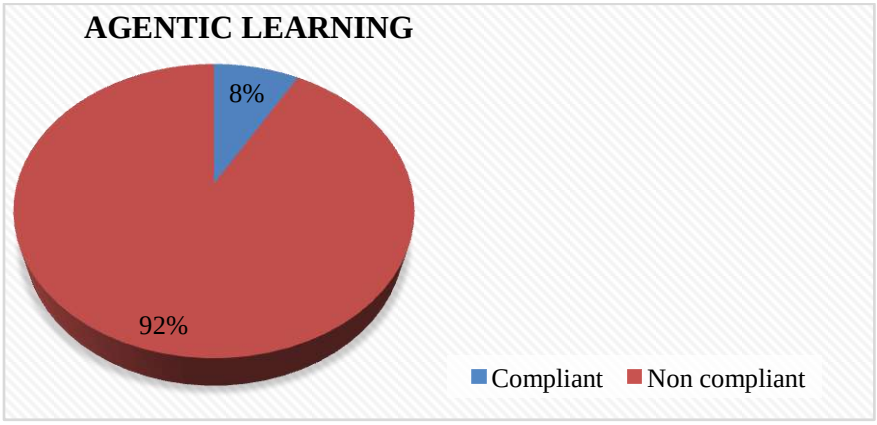


Figure 5.23: Average score of Amritsar schools on Subscale 22

Agentic learning still seems to be a far-fetched dream in the schools of Amritsar city. None of the schools seemed to be familiar with self-designed learning for empowering the students. Although two of the schools were found to be having spaces that could accommodate self-learning activities. Only one of the schools had solar power plants on the rooftop with an observatory that could accommodate learners if needed.

Image 5.33: Rooftop observatory **Image 5.34: Children painting the corridor wall**

5.6.23 - SUBSCALE 23: Apply biophilic design principles to counter nature deficit and for effective attention restoration.

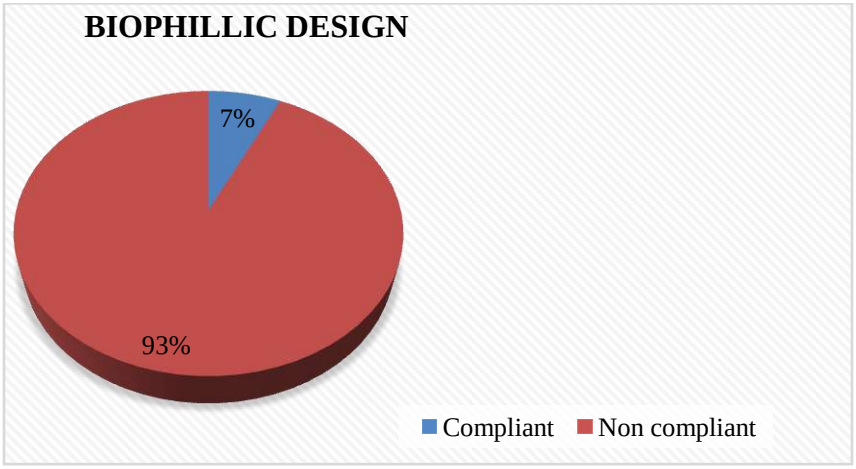


Figure 5.24: Average score of Amritsar schools on Subscale 23

Less than half of the schools surveyed had ample availability of green and natural spaces on the school campus apart from the playground. None of the school designs ensured views of nature from inside of the classroom and neither was there any possibility of going out in the natural environment during the breaks as there were no cluster level spaces to accommodate children in small cohorts. The use of biomorphic patterns in the interior environment and provision of restorative spaces was completely absent in all the schools surveyed.

Image 5.35: Views avoided with high window cills

5.5.24 SUBSCALE 24. Provide spaces for pets in school and a farm area to tend to in order to inculcate responsibility and empathy.

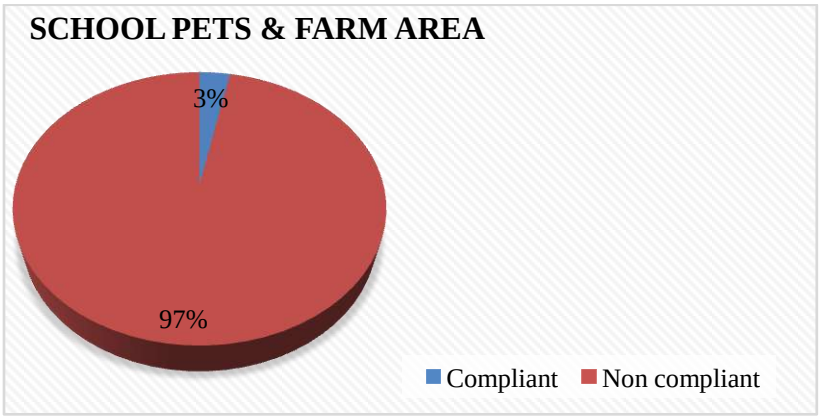


Figure 5.25: Average score of Amritsar schools on Subscale 24

The idea of having school pets is very unusual and new to Indian schools. None of the schools that were surveyed in this research had any school pets; one school however had a farm area that was more like a stable with only horses in it. School pets are known to counter feelings of loneliness and anxiety among children and at the same time can help children become more empathetic and responsible.

Image 5.36: Farm area in one of the schools

5.5.25 SUBSCALE 25. Allow student participation in planning and design of new facilities as well as maintenance/renovation projects.

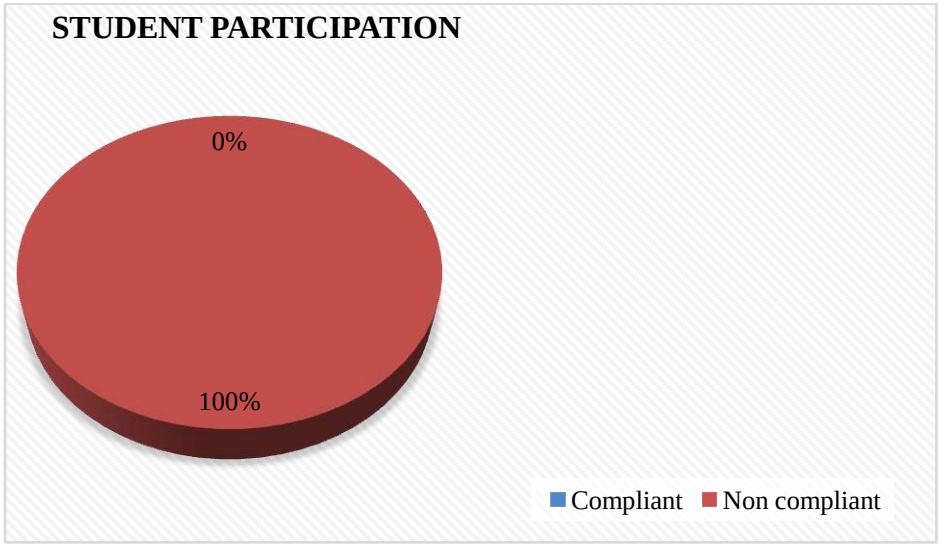


Figure 5.26: Average score of Amritsar schools on Subscale 25

Student participation was another missing aspect in all the nine schools. Although students were given roles like prefects and other responsibilities related to

activities in school, their participation in school planning and renovation etc was amiss. Involving students in the design and planning process not only fuels their competence but also helps architects and facility planners in understanding their needs better.

5.5.26 SUBSCALE 26 : Provide stimulating playgrounds to build risk competence and to experience a sense of adventure.

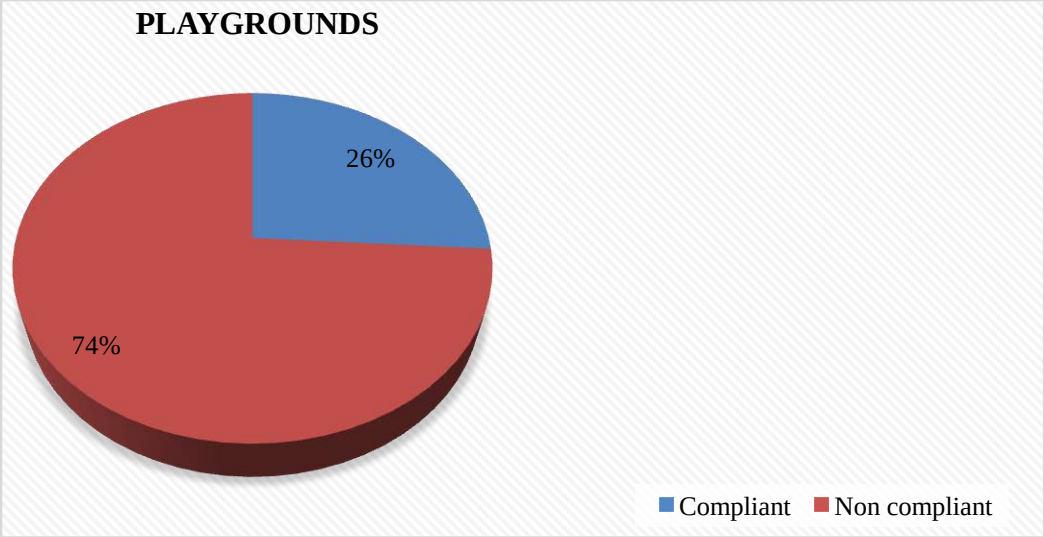


Figure 5.27: Average score of Amritsar schools on Subscale 26

All the schools except two had playgrounds that provided space for running, jumping and other physical activities. The element of stimulation was however mostly absent. Play areas had fixed equipment that left no room for innovation and creative play. Opportunities like tree climbing with safety arrangements weren't there in any of the nine schools. The school infirmary was in proximity to the school ground in almost all the cases.

Image 5.37: Playgrounds for various age groups

Image 5.38: Playgrounds without passive surveillance

5.5.27 SUBSCALE 27. Enhance overall sense of coherence (SOC) by splitting bigger schools into small learning communities (SLC).

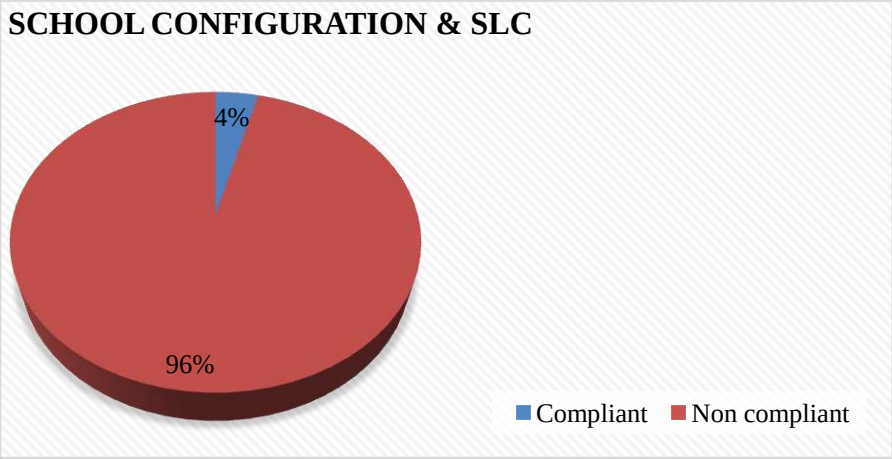


Figure 5.28: Average score of Amritsar schools on Subscale 27

No schools were split into Small Learning Communities (SLC), two of them however encouraged the division through various levels or blocks. This division however did not provide children with their own open spaces and indoor areas for socialization. The small learning community model seems to be a solution to most of the issues related to a healthy school environment discussed in this thesis. It is therefore extremely important to find its application in Indian schools keeping in mind the budget constraints and land availability.

5.6 FINDINGS - The average (%) score of each subscale is shown in Table 5.1

Table 5.1 : Average Score Of Schools In Amritsar City

S No.	PARAMETERS OF HEALTHY SCHOOL ASSESSMENT TOOL (HSAT)	Avg. health score of each parameter
1	Legibility/way finding	13%
2	Safe community involvement	25%
3	Child scale	12%
4	Ergonomic	10%
5	Careful use of colour	15%
6	Outdoor learning	11%
7	Density and crowding	22%
8	Accessibility	8%
9	Natural light	18%
10	Flexible spaces	14%
11	Variety of spaces	17%
12	Common spaces	13%
13	Natural ventilation	13%
14	Noise reduction	23%
15	Welcoming entry	20%
16	Safety and security	23%
17	Ownership	15%
18	Sensory aesthetics	8%
19	Self-reflection	0%
20	Materials and textures	6%
21	Homelike environment	11%
22	Agentic learning	8%
23	Biophilic design	7%
24	School pets	3%
25	Student participation	0%
26	Playgrounds	26%
27	School configuration & SLC	4%
	Average Score of selected schools	**14%**

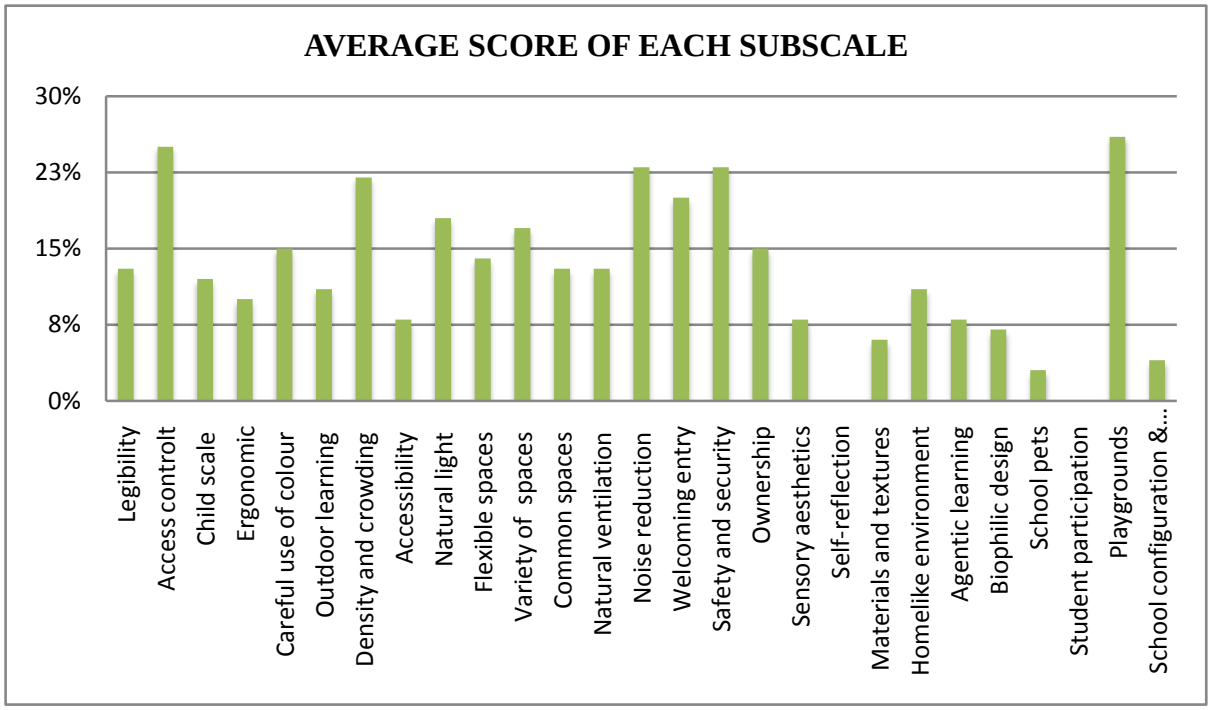


Figure 5.29 : Average score of each subscale

5.7 Analysis and Conclusion

This demonstration of the healthy school assessment tool (HSAT) indicates the plight of the selected schools in Amritsar city from the point of view of holistic health. According to HSAT score rules (Ref. Table 5.2), any score below 30% is considered poor and the school assessed needs to undergo substantial changes in order to be accepted as a healthy school.

Table 5.2: Overall health status of the selected schools (Source : author)

School code	Overall health score	Comments
S6	29%	0 % - 30 % Poor -- Needs Substantial changes
S1	25%	0 % - 30 % Poor -- Needs Substantial changes
S3	12.6%	0 % - 30 % Poor -- Needs Substantial changes
S7	10%	0 % - 30 % Poor -- Needs Substantial changes
S5	8.5%	0 % - 30 % Poor -- Needs Substantial changes
S4	7.1%	0 % - 30 % Poor -- Needs Substantial changes
S9	6.7%	0 % - 30 % Poor -- Needs Substantial changes
S8	3.2%	0 % - 30 % Poor -- Needs Substantial changes

The highest overall score amongst the nine schools assessed in the city of Amritsar is 29%. The highest-scoring school is known to be the best school of the city (as per the various school ranking websites and general opinion of city residents). It, therefore, indicates that even the best school in the city doesn't meet the holistic health needs of children to an acceptable extent.

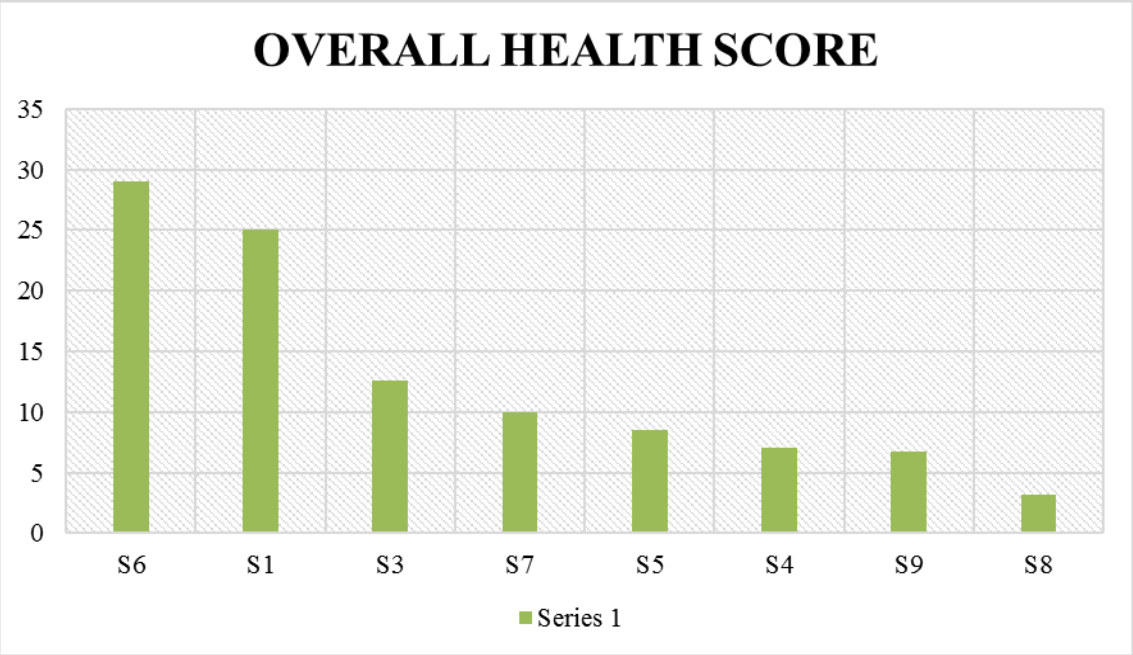


Figure 5.30: Overall health score of selected schools in Amritsar city

The average results clearly point out that the concepts of privacy, self-reflection, school pets and student participation are still alien to the city schools. The small community model, which is apparently the most convenient way of implementing all the salutogenic design guidelines, has not been explored fully in any of the surveyed schools. The applications of biophilic design and agentic learning seem to be more accidental than intentional. All the parameters discussed above have possibly not made it to the design criteria list of the school designers and architects. Most of the building materials are used after considering their durability, regardless of the fact how students perceive them. The only parameters that seemed to be intentionally incorporated in most of the schools surveyed (although not satisfactorily) were the ones linked to density, lighting, playgrounds, safety and security and use of colour.

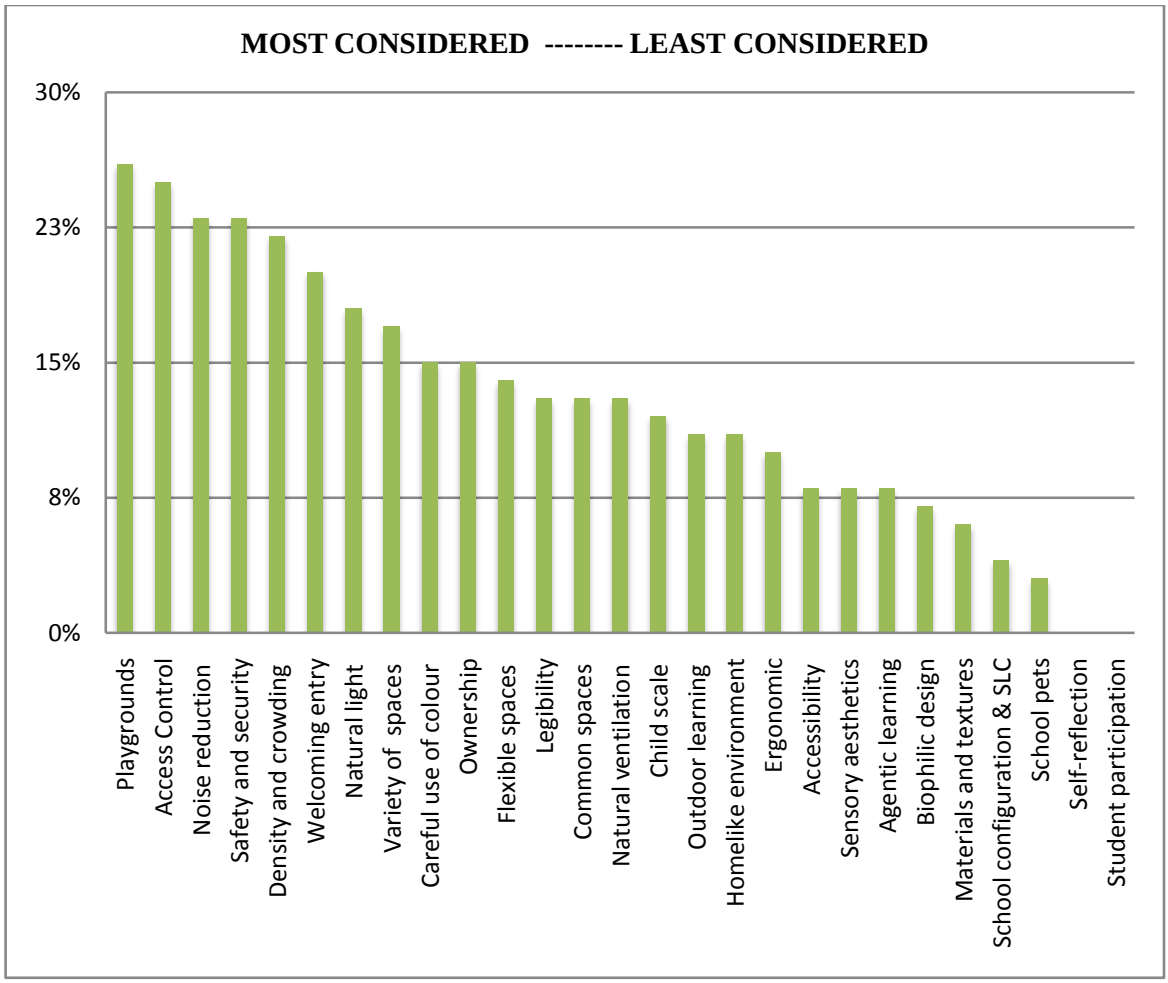


Figure 5.31: Most considered to least considered parameters of HSAT in the selected schools of Amritsar city.

The attention towards other parameters has been almost negligible. It can therefore be concluded that presently, the schools in the city of Amritsar do not give due attention to any of the twenty seven design guidelines for salutogenic design of schools. There is an urgent need of paradigm shift amongst the school architects and facility planners. The demonstration of HSAT is found to have successfully provided useful information about the health status of the schools in the city of Amritsar. It can therefore be used to fruitfully assess an individual school or a group of schools for their performance as healthy environments for children.The assessment also brings to light the neglected parameters and can further help in directing the resources for renovation/revamp etc. in the right direction.

Table 5.3 : Average Score Of Each Parameter In Amritsar Schools (in the ascending order of their presence)

S no.	PARAMETERS OF HEALTHY SCHOOL ASSESSMENT TOOL(HSAT)	Avg. health score of each parameter
1	Playgrounds	26%
2	Access Control	25%
3	Noise reduction	23%
4	Safety and security	23%
5	Density and crowding	22%
6	Welcoming entry	20%
7	Natural light	18%
8	Variety of spaces	17%
9	Careful use of colour	15%
10	Ownership	15%
11	Flexible spaces	14%
12	Common spaces	13%
13	Natural ventilation	13%
14	Legibility/way finding	13%
15	Child scale	12%
16	Homelike environment	11%
17	Outdoor learning	11%
18	Ergonomic	10%
19	Sensory aesthetics	8%
20	Accessibility	8%
21	Agentic learning	8%
22	Biophilic design	7%
23	Materials and textures	6%
24	School configuration & SLC	4%
25	School pets	3%
26	Self-reflection	0%
27	Student participation	0%
	Average health score of schools in Amritsar	**14%**

The case study clearly demonstrates how HSAT can be used as an effective tool for Post Occupancy Evaluation (POE) to indicate the overall health status of a school or a group of schools. It is therefore a great resource for the architects and other stakeholders involved in the design of learning environments. The study results clearly indicate the poor health status of schools in the city of Amritsar and bring to light areas that need urgent attention in these schools.

CHAPTER 6

CONCLUSION

6.1 Attainment of Research Objectives

Any research is said to be successful if it can find answers to the research questions and attain the research objectives formulated at the beginning of the study. The objectives listed at the beginning of this research are as follows:

Objective 1: To identify the determinants of holistic health (holistic health needs) in children through various studies in the fields of holistic health, child psychology and environmental psychology.

- Status: Attained. The study has successfully identified the holistic health needs of children. This identification can greatly assist in the design of built environments that are sensitive to the needs of children and can enhance their state of mind-body-spirit balance. Table 6.1 provides a brief outline to the holistic health needs of children, each of these needs can be elaborated upon by the references given in Chapter 2 of this study. The research question, "What do children need in order to be healthy, holistically?", has been addressed satisfactorily.

Table 6.1: Holistic health needs of children

HOLISTIC HEALTH NEEDS OF CHILDREN
• Habitable environment (Clean air, water, shelter, thermal comfort, natural light, etc.)
• Safety & Security
• Self-esteem/ Personal growth/ Self-acceptance
• Autonomy/ psychological freedom
• Positive relationships with people and places
• Rich experiences leading to positive emotions/Joy/Empathy/Compassion/Enthusiasm
• Competence/ Capability/ Accomplishment/ Mastery
• Engagement/ Purpose in life

Objective 2: To assemble the attributes of salutogenic design, that can contribute to building healthy schools for children, by reviewing the existing research.

Status: Attained. The researcher has discussed the origin and relevance of salutogenic design in the context of learning environments. The nine vital considerations for healthy school design have been compiled after synthesizing the relevant literature. These considerations are supported by the experiences that children seek and the positive emotions that can greatly enhance the sense of coherence (hence, holistic health) in children.

Table 6.2: Nine vital considerations for healthy school design (Source: Author)

Experiences that can lead to positive emotions	**Spatial considerations in school design capable of supporting experiences that may lead to positive emotion**	**Positive emotions leading to improved SOC**
Sense of security, knowing and freedom	i) Give reassurance and build orientation through legible and predictable design ii) Encourage autonomy and psychological freedom in the school environment	Security/Joy Confidence
Sense of self-efficacy and balance	iii) Ensure comfort and safety to increase efficiency in school iv) Create opportunities for attention restoration and stress reduction in school v) Design flexible spaces capable of quick adaptation in changing scenario of the education system vi) Improve accessibility and inclusion by the application of universal design principles to heighten self-esteem and efficacy vii) Encourage participatory planning to build environmental stewardship	Mastery Relaxation/Peace Enthusiasm Acceptance Capability/ Competence
Sense of place and purpose	viii) Create opportunities for social interaction amidst a natural environment ix) Create sensorially rich and actively engaging/challenging environments to foster a sense of purpose	Belonging Curiosity/Awe

These nine considerations were then elaborated to generate thirty-six design cues that formed the basis of design criteria for a healthy school environment. The set of 36 design cues can also act as a checklist for school designers and architects in order to evaluate their design from holistic health (salutogenic design) perspective. The research

questions, "What is salutogenic design and how does it contribute towards the creation of a healthier built environment?","What is the relevance of the built school environment as a determinant of the holistic health of children?" and "Which attributes of salutogenic design have the potential to improve the health and well-being of school children?" have been satisfactorily addressed in this study.

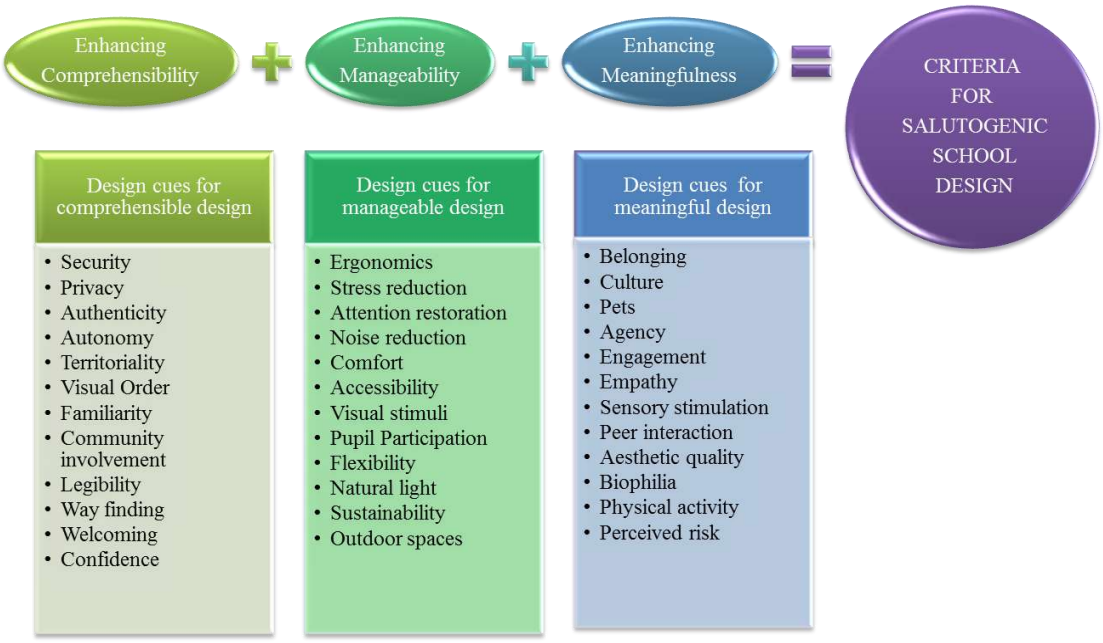


Figure 6.1: Design cues for salutogenic school design. (Source : Author)

Objective 3: To create a set of salutogenic guidelines for healthy school architecture and design by synthesizing the results from interdisciplinary studies and applying them in the context of school design.

- Status: Attained. A detailed study of the thirty-six design cues -- within the interdisciplinary fields of salutogenesis, child psychology and school design -- guided the formulation of twenty-seven design guidelines for salutogenic design of schools. This is a unique guideline (Ref. Table 6.3) that combines the relevant research from various disciplines with an intention to create learning environments that can enhance the holistic health of children. The research question, "What are the guidelines for school architects and planners from a salutogenic design perspective?" has been successfully answered by the researcher.

Table 6.3: Design Guidelines for salutogenic learning environments

27 Design Guidelines for salutogenic learning environments
1. Use effective way finding strategies to improve legibility and build assurance.
2. Ensure safe community involvement and access control for enhancing competence.
3. Consider appropriate scale & developmental needs to foster autonomy and self-esteem.
4. Apply ergonomic considerations to improve posture and increase efficiency.
5. Use colors carefully to avoid visual fatigue and enhance psychological comfort.
6. Provide outdoor spaces to augment collateral learning and social connections.
7. Manage density & crowding to improve self-worth and ensure social distance.
8. Apply universal design principles to improve accessibility and build self-esteem.
9. Ensure ample natural light for enhancing overall health and efficiency.
10. Facilitate multiple modalities of learning by designing flexible spaces.
11. Provide common spaces for peer/ teacher interaction to enhance a sense of belonging.
12. Provide a variety of spaces that enhance engagement and initiate a state of flow.
13. Ensure effective noise reduction to combat stress and improve efficiency.
14. Maximize natural ventilation and thermal comfort to improve efficiency and overall health.
15. Create a welcoming entry and signature elements to help children comprehend the environment better and feel connected.
16. Ensure safety and security through natural surveillance and other design interventions.
17. Allow personalization of spaces to encourage ownership/territoriality
18. Use sensory aesthetics and active design elements for optimum stimulation (physical & psychological.
19. Provide spaces for self-reflection (privacy) and small group activities to enhance autonomy, competence, and relatedness.
20. Maximize authenticity and psychological comfort through the use of appropriate materials.
21. Create homelike environments with familiar elements to enhance the feeling of security and psychological freedom.
22. Promote agentic learning and environmental stewardship through visible green/sustainable architecture features.
23. Apply biophilic design principles to counter nature deficit and for effective attention restoration.
24. Provide spaces for pets in school in order to inculcate responsibility and empathy.
25. Allow student participation in planning and design of new facilities as well as maintenance/renovation projects.
26. Provide stimulating playgrounds to build risk competence and to experience a sense of adventure.
27. Enhance overall sense of coherence (SOC) by splitting bigger schools into small learning communities.

Objective 4: To formulate an assessment tool that can examine the health status of existing school buildings by studying the existing school assessment methods and rating scales.

Status: Attained. The healthy school assessment tool is the most important contribution of this thesis to the field of school design. It covers all the relevant concepts, that can be helpful in the design of healthy school environments, under the umbrella of salutogenic design. HSAT consists of 27 subscales that can not only help in the assessment of the health status of a school but can also guide the design process of new schools. It can rightly direct the distribution of resources in renovation projects with a limited budget.

Objective 5: To test the effectiveness of the assessment tool by conducting a demonstrative study in the chosen schools of Amritsar city.

Status: Attained. The demonstrative study fairly showed the health status of the selected schools in the city of Amritsar. It can be used for assessing individual schools as well as a group of schools. The 27 subscales can clearly identify the areas that need the most attention as well as the areas that are well catered to in an individual school or in a group of schools studied collectively.

6.2 FUTURE DIRECTIONS

This research in the Indian context involved disciplines like holistic health, architecture and education. The study generates a set of twenty-seven guidelines for salutogenic school design. Each of these guidelines is a vast subject in itself and can be elaborated through further research. The detailing of the guidelines and the HSAT as per the various climates and contexts can enrich the field of school design and help in creating healthier learning environments for our children. The study has suggested the practical application of salutogenic design in the case of learning environments. Salutogenic design is fast spreading and a much-needed solution for creating healthier built environments, further research in the case of other types of buildings can open more avenues for its application.

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ANNEXURE 1

HEALTHY SCHOOL ASSESSMENT TOOL (HSAT)

DAV PUBLIC SCHOOL, LAWRENCE ROAD, AMRITSAR (S4)

1. Legibility and way finding	0	1	2	n/a
1.1 A unique identity is created for each location	0			
1.2 Use of landmarks as visual cues	0			
1.3 Well-structured paths with goals	0			
1.4 Limited navigational choices	0			
1.5 Sightlines are used to show what is ahead	0			
1.6 Covered pathways among buildings within the campus		1		
1.7 Colour coded indoor pathways	0			
1.8 Clear and well-lit pathways to activity areas	0			
1.9 The main building has an obvious point of reference among the school's buildings in which paths and buildings connect	0			
1.10 Distinction between various areas is made obvious by the use of colours, textures, forms, ceiling heights, etc.	0			
Average Score (out of 10)	0.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

2. Community involvement and access control	0	1	2	n/a
2.1 Well placed windows to get a clear view of the entrance	0			
2.2 Dedicated areas for community interaction near the entrance	0			
2.3 Signage and pavements to define accessible areas for visitors	0			
2.4 Clearly defined limits to ensure access control	0			
Average Score (out of 10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

3. Child scale and developmental needs	0	1	2	n/a
3.1 Variation in ceiling heights acc. to the intended use of space	0			
3.2 Spaces and furniture considering child scale	0			
3.3 Whiteboard and other equipment respecting child scale		1		
3.4 Soft classrooms with curvilinear shapes, pillows, rugs, etc.	0			
3.5 Accessible material storage		1		
3.6 Door handles, switches, etc. at child's scale	0			
3.7 Variety of sizes of spaces	0			
Average Score (out of 10)	1.4			

0 = Inadequate, 1 = Adequate, 2 = Excellent

4. Ergonomic considerations for posture correction	0	1	2	n/a
4.1 Variety of furniture that is flexible and easy to use.	0			
4.2 The furniture improves posture and is in good repair.	0			
4.3Workstations are designed to accommodate information technology.	0			
4.4 Floor seating and opportunity for reclining provided at a corner of the classroom.	0			
4.5 Popliteal heights, elbow angle, and other anthropometric considerations are taken care of.	0			
4.6 Footrest is provided for shorter children.	0			
4.7 Tables and built-in shelves have rounded edges.		1		
Average Score (out of 10)	0.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

5. Careful use of colour	0	1	2	n/a
5.1 Variety of colours used while being careful about overstimulation	0			
5.2 Contrast between the board and the back wall just appropriate	0			
5.3 Colour and lighting are considered together	0			
5.4 Colourful displays on the walls and doors		1		
5.5 Warmer tones are preferred for younger children and cooler tones for older children	0			
5.6 Physical activity areas like gyms, yoga halls, etc. are painted in cooler colours	0			
5.7 Privacy niches and other areas for withdrawal are painted in cooler colours	0			
5.8 Stage area in auditorium the is in contrast with surroundings and is painted in relaxing colours like beige, peach, or pastel green	0			
Average Score (out of 10)	0.6			

0 = Inadequate, 1 = Adequate, 2 = Excellent

6. Outdoor learning spaces	0	1	2	n/a
6.1 Provision of an accessible green/open space immediately outside the classroom	0			
6.2 An amphitheater readily available for outdoor plays, performances, and presentations.	0			
6.3 Provision of temporary structures and benches to facilitate outdoor classroom	0			
Average Score (out of 10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

7. Density and crowding	0	1	2	n/a
7.1 Ample space to move around in the learning area	0			
7.2 Gross Area provision per child is not less than 10 sq.m.	0			
7.3 Children divided into smaller groups/cohorts	0			
7.4 Uncluttered rooms as well as walls	0			
7.5 No. of students per class is between 17-25	0			
Average Score (out of 10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

8. Accessibility and universal design	0	1	2	n/a
8.1 Simple, clear circulation with clearly defined paths, doorways, etc.	0			
8.2 Provision of handrails as necessary and material textures considered as tactile means of way finding.	0			
8.3 Power doors to improve accessibility for all users.	0			
8.4 Provision of ramps/lifts for barrier free access		1		
8.5 "Maze" entrances to washrooms improve access for all users and reduce hygiene issues associated with door knobs/levers.	0			
8.6 Circulation routes are of appropriate width (min. 1.5m wheelchair turning diameter) and are kept clear of obstacles.	0			
8.7 Hardware and controls are located within reach of users and ensure ease of operation.	0			
8.8 Special consideration of acoustics for the visually impaired: buildings and rooms are designed to reduce echo, reverberation, and extraneous background noise.	0			
8.9 Provision of appropriate lighting (natural and artificial) for circulation. Glare is avoided though.	0			
8.10 Large flat panel light switches, which can be used with either hand, closed fist, elbow, etc. are provided.	0			
8.11 Rough or textured borders, which contrast with smooth walking surfaces and indicate a change in grade or material, are used.	0			
8.12 Door lever does not require grip strength and can be operated by a closed fist or elbow.	0			
Average Score (out of 10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

9. Natural light for overall health and efficiency	0	1	2	n/a
9.1 Diffused (glare-free), usable daylight in every space where children spend long periods of time.	0			
9.2 Smaller windows at eye level are installed for views along with skylights or clerestory windows high in the wall deliver glare-free light deep into the space.	0			
9.3 Unrestricted views (when glare is not a problem) provide a perspective to ease eyestrain and bring the outside and inside worlds together.	0			
9.4 Daylight is supplemented with electric light. An acceptable design includes artificial light plus natural light from the outside.		1		
9.5 Direct view of bright light sources like the sun, a bright sky, or an electric lamp that may create glare and visual discomfort is avoided.		1		
9.6 Diffused daylight enters from multiple directions and minimizes shadows, balancing the light across the room.	0			
9.7 For every 10 square meter of classroom floor space, at least 2.5 square meter of window space is provided.	0			
9.8 Windows have some form of glare control, but are in use (when glare is not a problem), and are without painted obstructions.	0			
Average Score (out of 10)	1.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

10. Flexible spaces to facilitate multiple modalities of learning	0	1	2	n/a
10.1 Space can be made larger/ smaller or of a varying shape with a few changes in furniture arrangement	0			
10.2 The spatial layout allows the use of multiple learning modalities	0			
10.3 Movable and flexible partitions that can be operated easily	0			
10.4 Possibility for expansion/change is present	0			
10.5 Adjustable furniture to support both technology use and writing/drawing, etc. by hand	0			
10.6 Curtains/blinds, etc. to allow the usage of projector, SMART Board®, etc.		1		
Average Score (out of 10)	0.08			

0 = Inadequate, 1 = Adequate, 2 = Excellent

11. Variety of engaging spaces that initiate a state of flow	0	1	2	n/a
11.1 Engaging library with vibrant furniture, furnishings, colours, etc.		1		
11.2 Reading areas are well-lit with spaces for group work	0			
11.3 Acoustically well designed and well-lit music and dance areas	0			
Average Score (out of 10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

12.Common spaces for peer/teacher interaction	0	1	2	n/a
12.1 Enough space/opportunities for 4 or more children, in more than 3 locations in visible/safe locations is provided	0			
12.2 Space for having a meal together with peers and teachers	0			
12.3 Presence of auditorium, amphitheatre, etc. in school	1			
Average Score (out of 10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

13. Natural ventilation and thermal comfort	0	1	2	n/a
13.1 Passive techniques for thermal insulation in extreme climates		1		
13.2 Provision for windows at various levels to be used during varied weather conditions	0			
13.3 Less noisy mechanical systems, if any				x
13.4 Mechanical systems with a capacity to draw a significant amount of outside air into the building				x
13.5 Use of natural airflow patterns to circulate fresh air	0			
13.6 Higher ceiling heights wherever possible	0			
Average Score (out of 10)	1.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

14. Effective noise reduction	0	1	2	n/a
14.1 Site located in a peaceful area with low noise and air pollution	0			
14.2 Barriers and buffers are provided to counter traffic noise		1		
14.3 Landscaping is used as a dampener		1		
14.4 Toilets, storerooms, etc. are used as buffer zones	0			
14.5 Hard materials that cause echo are avoided	0			
14.6 Appropriate sound absorbing materials are used	0			
Average Score (out of 10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

15. Welcoming entry and signature elements emphasizing the cultural context	0	1	2	n/a
15.1 An inviting and highly visible entrance with well-defined architectural features, signs, lighting, artwork, landscaping, and other landmarks such as flags	0			
15.2 Scale of the entrance is not intimidating for the child		1		
15.3 Motivational signs that send positive messages and invite children to school are used	0			
15.4 Landscaping features or small play areas are visible from the entrance	0			
15.5 Covered entrance that provides shelter from bad weather and facilitates transition	0			
15.6 Safe drop off/pick up	0			
15.7 Separate access for students and visitors	0			
15.8 Signature elements emphasizing the local/cultural context	0			
Average Score (out of 10)	0.6			

0 = Inadequate, 1 = Adequate, 2 = Excellent

16. Safety and security through natural surveillance	0	1	2	n/a
16.1 Centrally located administrative offices to enhance student safety		1		
16.2 Parking areas are delineated for staff and visitors	0			
16.3 Entrances and exits are easily and effectively monitored	0			
16.4 All student/pedestrian pathways are passively monitored	0			
16.5 No hiding spaces created by landscaping, fencing, etc.	0			
16.6 Separate age-level playgrounds for various age cohorts with developmentally appropriate and safe playground equipment	0			
16.7 Extensive use of windows and glazed doors to enhance natural surveillance of entrances, pathways, etc.	0			
16.8 No unattractive barriers such as barbed wire on the school grounds		1		
16.9 Toilets are attached to classrooms, if not then they have auditory connections with adjoining areas	0			
16.10 Security devices are unimposing		1		
16.11 Security system (alarms, lights, locks) provides elevated levels of security	0			
16.12 The site and learning environments are free of excessive non pedestrian traffic, hazards, and noise		1		
16.13 There are no high voltage power lines in the close proximity of the school		1		
Average Score (out of 10)	1.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

17. Ownership/territoriality through personalisation of spaces	0	1	2	n/a
17.1 Personal workspace with lockers for each student	0			
17.2 Spaces for personal artifacts		1		
17.3 Personal storage for books, stationary, etc.		1		
17.4 Distinctive design elements and display spaces for student works	0			
Average Score (out of 10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

18. Sensory aesthetics and active design elements	0	1	2	n/a
18.1 Attractive and plenty of well-maintained landscape areas		1		
18.2 Highly articulated fenestrations for framing of views	0			
18.3 Visually pleasing staircases and other movement pathways to encourage walking	0			
18.4 Age-appropriate design of walking routes	0			
18.5 Avoidance of long narrow corridors and use of nature connected pathways instead	0			
18.6 Provision of dedicated indoor spaces for physical activities	0			
18.7 Provision of sensory gardens with various activity spaces to suit the needs of children with varied temperaments	0			
Average Score (out of 10)	0.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

19. Self-reflection (privacy) and small group activities	0	1	2	n/a
19.1 Social spaces where a small group of children may go to be alone (i.e., reading areas, quiet places, reflection areas, listening areas, etc.)	0			
19.2 Space and furniture in classroom and other learning areas that provide 2–3 spaces for children to feel a sense of privacy and to control their interaction with others.	0			
19.3 Inviting yet supervised cave spaces where students can take a deep breath, albeit momentarily, from their hectic lives.	0			
19.4 Classrooms have clear breakout zones or breakout rooms attached to them. Breakout zones within corridors and separate from the classroom are avoided.	0			
Average Score (out of 10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

20. Use of appropriate materials and textures	0	1	2	n/a
20.1 Use of natural materials and visible details	0			
20.2 Multisensory materials are used that impart qualities like smoothness, roughness, brightness, opacity, transparency, etc. to the surfaces	0			
20.3 Use of materials that exude warmth	0			
20.4 Use of glass to connect inside to outside yet making children feel secure	0			
20.5 Overuse of cold and hard materials is avoided	0			
20.6 Use of curvilinear shapes wherever possible	0			
Average Score (out of 10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

21. Homelike environments with familiar elements	0	1	2	n/a
21.1 Soft furniture, such as a couch or large armchair	0			
21.2 Nontoxic indoor plants are used	0			
21.3 Soft and comforting elements like pillows, plants, soft furnishings to add warmth and security of being home	0			
21.4 Other decorative touches, such as area rugs or repurposed furniture	0			
21.5 Provision to hang children's artwork and their pictures on the walls		1		
21.6 Pastel paint colours with less stimulating displays (not visually overwhelming)	0			
Average Score (out of 10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

22. Agentic learning and green/sustainable architecture	0	1	2	n/a
22.1 Spaces to learn from natural processes like sun orientation, wind flow patterns, etc.	0			
22.2 Visible energy conservation/sustainable measures like rainwater harvesting, solar panels, etc.	0			
Average Score (out of 10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

23. Biophilic design to counter nature deficit & attention restoration	0	1	2	n/a
23.1 Ample availability of green and natural spaces in the school campus	0			
23.2 Views of nature from inside of the classroom	0			
23.3 Possibility of going out in the natural environment during breaks	0			
23.4 Use of biomorphic patterns in the interior environment	0			
23.5 Views of parking lots, roads, etc. area are avoided		1		
23.6 Restorative spaces with items such as soft furnishings, plants, animals, window seat or aquarium are generously available	0			
Average Score (out of 10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

24. School pets and empathy	0	1	2	n/a
24.1 Outdoor spaces conducive for pets along with safety concerns of children	0			
24.2 Presence of farm area for children to tend to	0			
Average Score (out of 10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

25. Student participation in planning and design	0	1	2	n/a
25.1 Students maintain their own green patch	0			
25.2 Students volunteer for renovations and refurbishments in school	0			
25.3 Student participation was considered during design and planning process	0			
Average Score (out of 10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

26. Stimulating playgrounds and sense of adventure	0	1	2	n/a
26.1 Opportunities for tree climbing and innovative play with movable parts	0			
26.2Ample space for running, jumping and other age-appropriate activities	0			
26.3 Presence of safety nets and other safety measures to avoid injury	0			
26.4 Proximity of school infirmary from play areas		1		
Average Score (out of 10)	1.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

27. School configuration and smaller learning communities	0	1	2	n/a
27.1 The school is split into small learning communities through blocks or levels	0			
27.2 Each learning community has its own open spaces and other indoor areas for socialisation	0			
27.3 Each community has sufficient transparency to allow constant passive supervision	0			
Average Score (out of 10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

Total score	19/270
Percentage score	7.1 %

SCORE RULES

86 % - 100 %
Excellent

71 % - 85 %
Very Good

51 % - 70 %
Acceptable

31 % - 50 %
Unacceptable -- Needs Work

0 % - 30 %
Poor -- Needs Substantial Changes

Score rules and three point rating scale adapted from: The classroom rating scale in Lorraine Maxwell, "Competency in Child Care Settings: The Role of the Physical Environment," *Environment and Behavior* 20, no. 10 (2006); the EFEI (Educational Facilities Effectiveness Instrument), by FNI. © Fielding Nair International and the EDA SPACE app by Education Design International

HEALTHY SCHOOL ASSESSMENT TOOL (HSAT)

DAV INTERNATIONAL SCHOOL,VERKA BYEPASS, AMRITSAR (S5)

1. Legibility and way finding	0	1	2	n/a
1.1 A unique identity is created for each location	0			
1.2 Use of landmarks as visual cues	0			
1.3 Well-structured paths with goals	0			
1.4 Limited navigational choices	0			
1.5 Sightlines are used to show what is ahead	0			
1.6 Covered pathways among buildings within the campus		1		
1.7 Colour coded indoor pathways	0			
1.8 Clear and well-lit pathways to activity areas	0			
1.9 The main building has an obvious point of reference among the school's buildings in which paths and buildings connect	0			
1.10 Distinction between various areas is made obvious by the use of colours, textures, forms, ceiling heights, etc.	0			
Average Score (10)	0.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

2. Community involvement and access control	0	1	2	n/a
2.1 Well placed windows to get a clear view of the entrance	0			
2.2 Dedicated areas for community interaction near the entrance		1		
2.3 Signage and pavements to define accessible areas for visitors	0			
2.4 Clearly defined limits to ensure access control	0			
Average Score (10)	1.2			

0 = Inadequate, 1 = Adequate, 2 = Excellent

3. Child scale and developmental needs	0	1	2	n/a
3.1 Variation in ceiling heights acc. to the intended use of space	0			
3.2 Spaces and furniture considering child scale		1		
3.3 Whiteboard and other equipment respecting child scale	0			
3.4 Soft classrooms with curvilinear shapes, pillows, rugs, etc.	0			
3.5 Accessible material storage		1		
3.6 Door handles, switches, etc. at child's scale	0			
3.7 Variety of sizes of spaces	0			
Average Score (10)	1.4			

0 = Inadequate, 1 = Adequate, 2 = Excellent

4. Ergonomic considerations for posture correction	0	1	2	n/a
4.1 Variety of furniture that is flexible and easy to use.	0			
4.2 The furniture improves posture and is in good repair.	0			
4.3Workstations are designed to accommodate information technology.	0			
4.4 Floor seating and opportunity for reclining provided at a corner of the classroom.	0			
4.5 Popliteal heights, elbow angle, and other anthropometric considerations are taken care of.	0			
4.6 Footrest is provided for shorter children.	0			
4.7 Tables and built-in shelves have rounded edges.	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

5. Careful use of colour	0	1	2	n/a
5.1 Variety of colours used while being careful about overstimulation	0			
5.2 Contrast between the board and the back wall just appropriate	0			
5.3 Colour and lighting are considered together	0			
5.4 Colourful displays on the walls and doors		1		
5.5 Warmer tones are preferred for younger children and cooler tones for older children	0			
5.6 Physical activity areas like gyms, yoga halls, etc. are painted in cooler colours		1		
5.7 Privacy niches and other areas for withdrawal are painted in cooler colours	0			
5.8 Stage area in auditorium is in contrast with surroundings and is painted in relaxing colours like beige, peach, or pastel green		1		
Average Score (10)	1.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

6. Outdoor learning spaces	0	1	2	n/a
6.1 Provision of an accessible green/open space immediately outside the classroom	0			
6.2 An amphitheater readily available for outdoor plays, performances, and presentations.	0			
6.3 Provision of temporary structures and benches to facilitate outdoor classroom	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

7. Density and crowding	0	1	2	n/a
7.1 Ample space to move around in the learning area	0			
7.2 Gross Area provision per child is between7- 10 sq.m.		1		
7.3 Children divided into smaller groups/cohorts	0			
7.4 Uncluttered rooms as well as walls	0			
7.5 No. of students per class does not exceed 30	0			
Average Score (10)	1			

0 = Inadequate, 1 = Adequate, 2 = Excellent

8. Accessibility and universal design	0	1	2	n/a
8.1 Simple, clear circulation with clearly defined paths, doorways, etc.	0			
8.2 Provision of handrails as necessary and material textures considered as tactile means of way finding.	0			
8.3 Power doors to improve accessibility for all users.	0			
8.4 Provision of ramps/lifts for barrier free access		1		
8.5 "Maze" entrances to washrooms improve access for all users and reduce hygiene issues associated with door knobs/levers.	0			
8.6 Circulation routes are of appropriate width (min. 1.5m wheelchair turning diameter) and are kept clear of obstacles.	0			
8.7 Hardware and controls are located within reach of users and ensure ease of operation.	0			
8.8 Special consideration of acoustics for the visually impaired: buildings and rooms are designed to reduce echo, reverberation, and extraneous background noise.	0			
8.9 Provision of appropriate lighting (natural and artificial) for circulation. Glare is avoided though.	0			
8.10 Large flat panel light switches, which can be used with either hand, closed fist, elbow, etc. are provided.	0			
8.11 Rough or textured borders, which contrast with smooth walking surfaces and indicate a change in grade or material, are used.	0			
8.12 Door lever does not require grip strength and can be operated by a closed fist or elbow.	0			
Average Score (10)	0.4			

0 = Inadequate, 1 = Adequate, 2 = Excellent

9. Natural light for overall health and efficiency	0	1	2	n/a
9.1 Diffused (glare-free), usable daylight in every space where children spend long periods of time.	0			
9.2 Smaller windows at eye level are installed for views along with skylights or clerestory windows high in the wall deliver glare-free light deep into the space.	0			
9.3 Unrestricted views (when glare is not a problem) provide a perspective to ease eyestrain and bring the outside and inside worlds together.	0			
9.4 Daylight is supplemented with electric light. An acceptable design includes artificial light plus natural light from the outside.	0			
9.5 Direct view of bright light sources like the sun, a bright sky, or an electric lamp that may create glare and visual discomfort is avoided.		1		
9.6 Diffused daylight enters from multiple directions and minimizes shadows, balancing the light across the room.	0			
9.7 For every 10 square meter of classroom floor space, at least 2.5 square meter of window space is provided.	0			
9.8 Windows have some form of glare control, but are in use (when glare is not a problem), and are without painted obstructions.	0			
Average Score (10)	0.6			

0 = Inadequate, 1 = Adequate, 2 = Excellent

10. Flexible spaces to facilitate multiple modalities of learning	0	1	2	n/a
10.1 Space can be made larger/ smaller or of a varying shape with a few changes in furniture arrangement	0			
10.2 The spatial layout allows the use of multiple learning modalities	0			
10.3 Movable and flexible partitions that can be operated easily	0			
10.4 Possibility for expansion/change is present	0			
10.5 Adjustable furniture to support both technology use and writing/drawing, etc. by hand	0			
10.6 Curtains/blinds, etc. to allow the usage of projector, SMART Board®, etc.		1		
Average Score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

11. Variety of engaging spaces that initiate a state of flow	0	1	2	n/a
11.1 Engaging library with vibrant furniture, furnishings, colours, etc.		1		
11.2 Reading areas are well-lit with spaces for group work	0			
11.3 Acoustically well designed and well-lit music and dance areas	0			
Average Score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

12.Common spaces for peer/teacher interaction	0	1	2	n/a
12.1 Enough space/opportunities for 4 or more children, in more than 3 locations in visible/safe locations is provided	0			
12.2 Space for having a meal together with peers and teachers	0			
12.3 Presence of auditorium, amphitheatre, etc. in school	1			
Average Score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

13. Natural ventilation and thermal comfort	0	1	2	n/a
13.1 Passive techniques for thermal insulation in extreme climates	0			
13.2 Provision for windows at various levels to be used during varied weather conditions	0			
13.3 Less noisy mechanical systems, if any				x
13.4 Mechanical systems with a capacity to draw significant amount of outside air into the building				x
13.5 Use of natural airflow patterns to circulate fresh air	0			
13.6 Higher ceiling heights wherever possible	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

14. Effective noise reduction	0	1	2	n/a
14.1 Site located in a peaceful area with low noise and air pollution		1		
14.2 Barriers and buffers are provided to counter traffic noise		1		
14.3 Landscaping is used as a dampener		1		
14.4 Toilets, storerooms, etc. are used as buffer zones	0			
14.5 Hard materials that cause echo are avoided	0			
14.6 Appropriate sound absorbing materials are used		1		
Average Score (10)	3.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

15. Welcoming entry and signature elements emphasizing the cultural context	0	1	2	n/a
15.1 An inviting and highly visible entrance with well-defined architectural features, signs, lighting, artwork, landscaping, and other landmarks such as flags	0			
15.2 Scale of the entrance is not intimidating for the child	0			
15.3 Motivational signs that send positive messages and invite children to school are used	0			
15.4 Landscaping features or small play areas are visible from the entrance		1		
15.5 Covered entrance that provides shelter from bad weather and facilitates transition	0			
15.6 Safe drop off/pick up		1		
15.7 Separate access for students and visitors		1		
15.8 Signature elements emphasizing the local/cultural context	0			
Average Score (10)	1.9			

0 = Inadequate, 1 = Adequate, 2 = Excellent

16. Safety and security through natural surveillance	0	1	2	n/a
16.1 Centrally located administrative offices to enhance student safety		1		
16.2 Parking areas are delineated for staff and visitors	0			
16.3 Entrances and exits are easily and effectively monitored	0			
16.4 All student/pedestrian pathways are passively monitored	0			
16.5 No hiding spaces created by landscaping, fencing, etc.	0			
16.6 Separate age-level playgrounds for various age cohorts with developmentally appropriate and safe playground equipment	0			
16.7 Extensive use of windows and glazed doors to enhance natural surveillance of entrances, pathways, etc.	0			
16.8 No unattractive barriers such as barbed wire on the school grounds		1		
16.9 Toilets are attached to classrooms, if not then they have auditory connections with adjoining areas	0			
16.10 Security devices are unimposing		1		
16.11 Security system (alarms, lights, locks) provides elevated levels of security	0			
16.12 The site and learning environments are free of excessive non pedestrian traffic, hazards, and noise		1		
16.13 There are no high voltage power lines in the close proximity of the school		1		
Average Score (10)	1.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

17. Ownership/territoriality through personalisation of spaces	0	1	2	n/a
17.1 Personal workspace with lockers for each student	0			
17.2 Spaces for personal artifacts	0			
17.3 Personal storage for books, stationary, etc.	0			
17.4 Distinctive design elements and display spaces for student works	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

18. Sensory aesthetics and active design elements	0	1	2	n/a
18.1 Attractive and plenty of well-maintained landscape areas		1		
18.2 Highly articulated fenestrations for framing of views	0			
18.3 Visually pleasing staircases and other movement pathways to encourage walking	0			
18.4 Age-appropriate design of walking routes	0			
18.5 Avoidance of long narrow corridors and use of nature connected pathways instead	0			
18.6 Provision of dedicated indoor spaces for physical activities	0			
18.7 Provision of sensory gardens with various activity spaces to suit the needs of children with varied temperaments	0			
Average Score (10)	0.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

19. Self-reflection (privacy) and small group activities	0	1	2	n/a
19.1 Social spaces where a small group of children may go to be alone (i.e., reading areas, quiet places, reflection areas, listening areas, etc.)	0			
19.2 Space and furniture in classroom and other learning areas that provide 2–3 spaces for children to feel a sense of privacy and to control their interaction with others.	0			
19.3 Inviting yet supervised cave spaces where students can take a deep breath, albeit momentarily, from their hectic lives.	0			
19.4 Classrooms have clear breakout zones or breakout rooms attached to them. Breakout zones within corridors and separate from the classroom are avoided.	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

20. Use of appropriate materials and textures	0	1	2	n/a
20.1 Use of natural materials and visible details	0			
20.2 Multisensory materials are used that impart qualities like smoothness, roughness, brightness, opacity, transparency, etc. to the surfaces	0			
20.3 Use of materials that exude warmth	0			
20.4 Use of glass to connect inside to outside yet making children feel secure	0			
20.5 Overuse of cold and hard materials is avoided	0			
20.6 Use of curvilinear shapes wherever possible	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

21. Homelike environments with familiar elements	0	1	2	n/a
21.1 Soft furniture, such as a couch or large armchair	0			
21.2 Nontoxic indoor plants are used	0			
21.3 Soft and comforting elements like pillows, plants, soft furnishings to add warmth and security of being home	0			
21.4 Other decorative touches, such as area rugs or repurposed furniture	0			
21.5 Provision to hang children's artwork and their pictures on the walls		1		
21.6 Pastel paint colours with less stimulating displays (not visually overwhelming)	0			
Average Score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

22. Agentic learning and green/sustainable architecture	0	1	2	n/a
22.1 Spaces to learn from natural processes like sun orientation, wind flow patterns, etc.	0			
22.2 Visible energy conservation/sustainable measures like rainwater harvesting, solar panels, etc.	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

23. Biophilic design to counter nature deficit & attention restoration	0	1	2	n/a
23.1 Ample availability of green and natural spaces in the school campus	0			
23.2 Views of nature from inside of the classroom	0			
23.3 Possibility of going out in the natural environment during breaks	0			
23.4 Use of biomorphic patterns in the interior environment	0			
23.5 Views of parking lots, roads, etc. area are avoided	0			
23.6 Restorative spaces with items such as soft furnishings, plants, animals, window seat or aquarium are generously available	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

24. School pets and empathy	0	1	2	n/a
24.1 Outdoor spaces conducive for pets along with safety concerns of children	0			
24.2 Presence of farm area for children to tend to	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

25. Student participation in planning and design	0	1	2	n/a
25.1 Students maintain their own green patch	0			
25.2 Students volunteer for renovations and refurbishments in school	0			
25.3 Student participation was considered during design and planning process	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

26. Stimulating playgrounds and sense of adventure	0	1	2	n/a
26.1 Opportunities for tree climbing and innovative play with movable parts	0			
26.2Ample space for running, jumping and other age-appropriate activities		1		
26.3 Presence of safety nets and other safety measures to avoid injury		1		
26.4 Proximity of school infirmary from play areas		1		
Average Score (10)	3.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

27. School configuration and smaller learning communities	0	1	2	n/a
27.1 The school is split into small learning communities through blocks or levels	0			
27.2 Each learning community has its own open spaces and other indoor areas for socialisation	0			
27.3 Each community has sufficient transparency to allow constant passive supervision	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

Total score	23/270
Percentage score	8.5 %

SCORE RULES

86 % - 100 %
Excellent

71 % - 85 %
Very Good

51 % - 70 %
Acceptable

31 % - 50 %
Unacceptable -- Needs Work

0 % - 30 %
Poor -- Needs Substantial Changes

Score rules and three point rating scale adapted from: The classroom rating scale in Lorraine Maxwell, "Competency in Child Care Settings: The Role of the Physical Environment," *Environment and Behavior* 20, no. 10 (2006); the EFEI (Educational Facilities Effectiveness Instrument), by FNI. © Fielding Nair International and the EDA SPACE app by Education Design International

HEALTHY SCHOOL ASSESSMENT TOOL (HSAT)

BABA DEEP SINGH KHALSA SENIOR SECONDARY SCHOOL, AMRITSAR (S8)

1. Legibility and way finding	0	1	2	n/a
1.1 A unique identity is created for each location	0			
1.2 Use of landmarks as visual cues	0			
1.3 Well-structured paths with goals	0			
1.4 Limited navigational choices	0			
1.5 Sightlines are used to show what is ahead	0			
1.6 Covered pathways among buildings within the campus	0			
1.7 Colour coded indoor pathways	0			
1.8 Clear and well-lit pathways to activity areas	0			
1.9 The main building has an obvious point of reference among the school's buildings in which paths and buildings connect	0			
1.10 Distinction between various areas is made obvious by the use of colours, textures, forms, ceiling heights, etc.	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

2. Community involvement and access control	0	1	2	n/a
2.1 Well placed windows to get a clear view of the entrance		1		
2.2 Dedicated areas for community interaction near the entrance		1		
2.3 Signage and pavements to define accessible areas for visitors	0			
2.4 Clearly defined limits to ensure access control	0			
Average score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

3. Child scale and developmental needs	0	1	2	n/a
3.1 Variation in ceiling heights acc. to the intended use of space	0			
3.2 Spaces and furniture considering child scale	0			
3.3 Whiteboard and other equipment respecting child scale	0			
3.4 Soft classrooms with curvilinear shapes, pillows, rugs, etc.	0			
3.5 Accessible material storage	0			
3.6 Door handles, switches, etc. at child's scale	0			
3.7 Variety of sizes of spaces	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

4. Ergonomic considerations for posture correction	0	1	2	n/a
4.1 Variety of furniture that is flexible and easy to use.	0			
4.2 The furniture improves posture and is in good repair.	0			
4.3Workstations are designed to accommodate information technology.	0			
4.4 Floor seating and opportunity for reclining provided at a corner of the classroom.	0			
4.5 Popliteal heights, elbow angle, and other anthropometric considerations are taken care of.	0			
4.6 Footrest is provided for shorter children.	0			
4.7 Tables and built-in shelves have rounded edges.	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

5. Careful use of colour	0	1	2	n/a
5.1 Variety of colours used while being careful about overstimulation	0			
5.2 Contrast between the board and the back wall just appropriate	0			
5.3 Colour and lighting are considered together	0			
5.4 Colourful displays on the walls and doors		1		
5.5 Warmer tones are preferred for younger children and cooler tones for older children	0			
5.6 Physical activity areas like gyms, yoga halls, etc. are painted in cooler colours	0			
5.7 Privacy niches and other areas for withdrawal are painted in cooler colours	0			
5.8 Stage area in auditorium is in contrast with surroundings and is painted in relaxing colours like beige, peach, or pastel green	0			
Average score (10)	0.6			

0 = Inadequate, 1 = Adequate, 2 = Excellent

6. Outdoor learning spaces	0	1	2	n/a
6.1 Provision of an accessible green/open space immediately outside the classroom	0			
6.2 An amphitheater readily available for outdoor plays, performances, and presentations.	0			
6.3 Provision of temporary structures and benches to facilitate outdoor classroom	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

7. Density and crowding	0	1	2	n/a
7.1 Ample space to move around in the classroom	0			
7.2 Gross Area provision per child is mbetween 7- 10 sq.m.	0			
7.3 Children divided into smaller groups/cohorts	0			
7.4 Uncluttered rooms as well as walls	0			
7.5 No. of students per class is between 17-25	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

8. Accessibility and universal design	0	1	2	n/a
8.1 Simple, clear circulation with clearly defined paths, doorways, etc.	0			
8.2 Provision of handrails as necessary and material textures considered as tactile means of way finding.	0			
8.3 Power doors to improve accessibility for all users.	0			
8.4 Provision of ramps/lifts for barrier free access	0			
8.5 "Maze" entrances to washrooms improve access for all users and reduce hygiene issues associated with door knobs/levers.	0			
8.6 Circulation routes are of appropriate width (min. 1.5m wheelchair turning diameter) and are kept clear of obstacles.	0			
8.7 Hardware and controls are located within reach of users and ensure ease of operation.	0			
8.8 Special consideration of acoustics for the visually impaired: buildings and rooms are designed to reduce echo, reverberation, and extraneous background noise.	0			
8.9 Provision of appropriate lighting (natural and artificial) for circulation. Glare is avoided though.	0			
8.10 Large flat panel light switches, which can be used with either hand, closed fist, elbow, etc. are provided.	0			
8.11 Rough or textured borders, which contrast with smooth walking surfaces and indicate a change in grade or material, are used.	0			
8.12 Door lever does not require grip strength and can be operated by a closed fist or elbow.	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

9. Natural light for overall health and efficiency	0	1	2	n/a
9.1 Diffused (glare-free), usable daylight in every space where children spend long periods of time.	0			
9.2 Smaller windows at eye level are installed for views along with skylights or clerestory windows high in the wall deliver glare-free light deep into the space.	0			
9.3 Unrestricted views (when glare is not a problem) provide a perspective to ease eyestrain and bring the outside and inside worlds together.	0			
9.4 Daylight is supplemented with electric light. An acceptable design includes artificial light plus natural light from the outside.		1		
9.5 Direct view of bright light sources like the sun, a bright sky, or an electric lamp that may create glare and visual discomfort is avoided.		1		
9.6 Diffused daylight enters from multiple directions and minimizes shadows, balancing the light across the room.	0			
9.7 For every 10 square meter of classroom floor space, at least 2.5 square meter of window space is provided.	0			
9.8 Windows have some form of glare control, but are in use (when glare is not a problem), and are without painted obstructions.		1		
Average score (10)	1.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

10. Flexible spaces to facilitate multiple modalities of learning	0	1	2	n/a
10.1 Space can be made larger/ smaller or of a varying shape with a few changes in furniture arrangement	0			
10.2 The spatial layout allows the use of multiple learning modalities	0			
10.3 Movable and flexible partitions that can be operated easily	0			
10.4 Possibility for expansion/change is present	0			
10.5 Adjustable furniture to support both technology use and writing/drawing, etc. by hand	0			
10.6 Curtains/blinds, etc. to allow the usage of projector, SMART Board®, etc.		1		
Average score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

11. Variety of engaging spaces that initiate a state of flow	0	1	2	n/a
11.1 Engaging library with vibrant furniture, furnishings, colours, etc.	0			
11.2 Reading areas are well-lit with spaces for group work	0			
11.3 Acoustically well designed and well-lit music and dance areas	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

12.Common spaces for peer/teacher interaction	0	1	2	n/a
12.1 Enough space/opportunities for 4 or more children, in more than 3 locations in visible/safe locations is provided	0			
12.2 Space for having a meal together with peers and teachers	0			
12.3 Presence of auditorium, amphitheatre, etc. in school	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

13. Natural ventilation and thermal comfort	0	1	2	n/a
13.1 Passive techniques for thermal insulation in extreme climates	0			
13.2 Provision for windows at various levels to be used during varied weather conditions	0			
13.3 Less noisy mechanical systems, if any				x
13.4 Mechanical systems with a capacity to draw significant amount of outside air into the building				x
13.5 Use of natural airflow patterns to circulate fresh air	0			
13.6 Higher ceiling heights wherever possible	0			
Average score (10)	1.2			

0 = Inadequate, 1 = Adequate, 2 = Excellent

14. Effective noise reduction	0	1	2	n/a
14.1 Site located in a peaceful area with low noise and air pollution	0			
14.2 Barriers and buffers are provided to counter traffic noise	0			
14.3 Landscaping is used as a dampener	0			
14.4 Toilets, storerooms, etc. are used as buffer zones	0			
14.5 Hard materials that cause echo are avoided	0			
14.6 Appropriate sound absorbing materials are used	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

15. Welcoming entry and signature elements emphasizing the cultural context	0	1	2	n/a
15.1 An inviting and highly visible entrance with well-defined architectural features, signs, lighting, artwork, landscaping, and other landmarks such as flags	0			
15.2 Scale of the entrance is not intimidating for the child	0			
15.3 Motivational signs that send positive messages and invite children to school are used	0			
15.4 Landscaping features or small play areas are visible from the entrance	0			
15.5 Covered entrance that provides shelter from bad weather and facilitates transition	0			
15.6 Safe drop off/pick up	0			
15.7 Separate access for students and visitors	0			
15.8 Signature elements emphasizing the local/cultural context	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

16. Safety and security through natural surveillance	0	1	2	n/a
16.1 Centrally located administrative offices to enhance student safety	0			
16.2 Parking areas are delineated for staff and visitors	0			
16.3 Entrances and exits are easily and effectively monitored	0			
16.4 All student/pedestrian pathways are passively monitored	0			
16.5 No hiding spaces created by landscaping, fencing, etc.	0			
16.6 Separate age-level playgrounds for various age cohorts with developmentally appropriate and safe playground equipment	0			
16.7 Extensive use of windows and glazed doors to enhance natural surveillance of entrances, pathways, etc.	0			
16.8 No unattractive barriers such as barbed wire on the school grounds	0			
16.9 Toilets are attached to classrooms, if not then they have auditory connections with adjoining areas	0			
16.10 Security devices are unimposing	0			
16.11 Security system (alarms, lights, locks) provides elevated levels of security	0			
16.12 The site and learning environments are free of excessive non pedestrian traffic, hazards, and noise	0			
16.13 There are no high voltage power lines in the close proximity of the school		1		
Average score (10)	0.4			

0 = Inadequate, 1 = Adequate, 2 = Excellent

17. Ownership/territoriality through personalisation of spaces	0	1	2	n/a
17.1 Personal workspace with lockers for each student	0			
17.2 Spaces for personal artifacts	0			
17.3 Personal storage for books, stationary, etc.	0			
17.4 Distinctive design elements and display spaces for student works	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

18. Sensory aesthetics and active design elements	0	1	2	n/a
18.1 Attractive and plenty of well-maintained landscape areas	0			
18.2 Highly articulated fenestrations for framing of views	0			
18.3 Visually pleasing staircases and other movement pathways to encourage walking	0			
18.4 Age-appropriate design of walking routes	0			
18.5 Avoidance of long narrow corridors and use of nature connected pathways instead	0			
18.6 Provision of dedicated indoor spaces for physical activities	0			
18.7 Provision of sensory gardens with various activity spaces to suit the needs of children with varied temperaments	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

19. Self-reflection (privacy) and small group activities	0	1	2	n/a
19.1 Social spaces where a small group of children may go to be alone (i.e., reading areas, quiet places, reflection areas, listening areas, etc.)	0			
19.2 Space and furniture in classroom and other learning areas that provide 2–3 spaces for children to feel a sense of privacy and to control their interaction with others.	0			
19.3 Inviting yet supervised cave spaces where students can take a deep breath, albeit momentarily, from their hectic lives.	0			
19.4 Classrooms have clear breakout zones or breakout rooms attached to them. Breakout zones within corridors and separate from the classroom are avoided.	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

20. Use of appropriate materials and textures	0	1	2	n/a
20.1 Use of natural materials and visible details	0			
20.2 Multisensory materials are used that impart qualities like smoothness, roughness, brightness, opacity, transparency, etc. to the surfaces	0			
20.3 Use of materials that exude warmth	0			
20.4 Use of glass to connect inside to outside yet making children feel secure	0			
20.5 Overuse of cold and hard materials is avoided	0			
20.6 Use of curvilinear shapes wherever possible	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

21. Homelike environments with familiar elements	0	1	2	n/a
21.1 Soft furniture, such as a couch or large armchair	0			
21.2 Nontoxic indoor plants are used	0			
21.3 Soft and comforting elements like pillows, plants, soft furnishings to add warmth and security of being home	0			
21.4 Other decorative touches, such as area rugs or repurposed furniture	0			
21.5 Provision to hang children's artwork and their pictures on the walls		1		
21.6 Pastel paint colours with less stimulating displays (not visually overwhelming)	0			
Average score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

22. Agentic learning and green/sustainable architecture	0	1	2	n/a
22.1 Spaces to learn from natural processes like sun orientation, wind flow patterns, etc.	0			
22.2 Visible energy conservation/sustainable measures like rainwater harvesting, solar panels, etc.	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

23. Biophilic design to counter nature deficit & attention restoration	0	1	2	n/a
23.1 Ample availability of green and natural spaces in the school campus	0			
23.2 Views of nature from inside of the classroom	0			
23.3 Possibility of going out in the natural environment during breaks	0			
23.4 Use of biomorphic patterns in the interior environment	0			
23.5 Views of parking lots, roads, etc. area are avoided	0			
23.6 Restorative spaces with items such as soft furnishings, plants, animals, window seat or aquarium are generously available	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

24. School pets and empathy	0	1	2	n/a
24.1 Outdoor spaces conducive for pets along with safety concerns of children	0			
24.2 Presence of farm area for children to tend to	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

25. Student participation in planning and design	0	1	2	n/a
25.1 Students maintain their own green patch	0			
25.2 Students volunteer for renovations and refurbishments in school	0			
25.3 Student participation was considered during design and planning process	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

26. Stimulating playgrounds and sense of adventure	0	1	2	n/a
26.1 Opportunities for tree climbing and innovative play with movable parts	0			
26.2Ample space for running, jumping and other age-appropriate activities	0			
26.3 Presence of safety nets and other safety measures to avoid injury	0			
26.4 Proximity of school infirmary from play areas	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

27. School configuration and smaller learning communities	0	1	2	n/a
27.1 The school is split into small learning communities through blocks or levels	0			
27.2 Each learning community has its own open spaces and other indoor areas for socialisation	0			
27.3 Each community has sufficient transparency to allow constant passive supervision	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

Total score	8.7/270
Percentage score	3.2 %

SCORE RULES

86 % - 100 %
Excellent

71 % - 85 %
Very Good

51 % - 70 %
Acceptable

31 % - 50 %
Unacceptable -- Needs Work

0 % - 30 %
Poor -- Needs Substantial Changes

Score rules and three point rating scale adapted from: The classroom rating scale in Lorraine Maxwell, "Competency in Child Care Settings: The Role of the Physical Environment," *Environment and Behavior* 20, no. 10 (2006); the EFEI (Educational Facilities Effectiveness Instrument), by FNI. © Fielding Nair International and the EDA SPACE app by Education Design International

HEALTH ASSESSMENT OF K-12 SCHOOLS IN AMRITSAR

GOVERNMENT GIRLS SECONDARY SMART SCHOOL, MAHNA SINGH ROAD, AMRITSAR (S9)

1. Legibility and way finding	0	1	2	n/a
1.1 A unique identity is created for each location	0			
1.2 Use of landmarks as visual cues	0			
1.3 Well-structured paths with goals	0			
1.4 Limited navigational choices	0			
1.5 Sightlines are used to show what is ahead		1		
1.6 Covered pathways among buildings within the campus	0			
1.7 Colour coded indoor pathways	0			
1.8 Clear and well-lit pathways to activity areas	0			
1.9 The main building has an obvious point of reference among the school's buildings in which paths and buildings connect	0			
1.10 Distinction between various areas is made obvious by the use of colours, textures, forms, ceiling heights, etc.	0			
Average Score (10)	0.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

2. Community involvement and access control	0	1	2	n/a
2.1 Well placed windows to get a clear view of the entrance		1		
2.2 Dedicated areas for community interaction near the entrance		1		
2.3 Signage and pavements to define accessible areas for visitors	0			
2.4 Clearly defined limits to ensure access control	0			
Average Score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

3. Child scale and developmental needs	0	1	2	n/a
3.1 Variation in ceiling heights acc. to the intended use of space	0			
3.2 Spaces and furniture considering child scale	0			
3.3 Whiteboard and other equipment respecting child scale	0			
3.4 Soft classrooms with curvilinear shapes, pillows, rugs, etc.	0			
3.5 Accessible material storage	0			
3.6 Door handles, switches, etc. at child's scale	0			
3.7 Variety of sizes of spaces	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

4. Ergonomic considerations for posture correction	0	1	2	n/a
4.1 Variety of furniture that is flexible and easy to use.	0			
4.2 The furniture improves posture and is in good repair.	0			
4.3Workstations are designed to accommodate information technology.	0			
4.4 Floor seating and opportunity for reclining provided at a corner of the classroom.	0			
4.5 Popliteal heights, elbow angle, and other anthropometric considerations are taken care of.	0			
4.6 Footrest is provided for shorter children.	0			
4.7 Tables and built-in shelves have rounded edges.	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

5. Careful use of colour	0	1	2	n/a
5.1 Variety of colours used while being careful about overstimulation	0			
5.2 Contrast between the board and the back wall just appropriate	0			
5.3 Colour and lighting are considered together	0			
5.4 Colourful displays on the walls and doors		1		
5.5 Warmer tones are preferred for younger children and cooler tones for older children	0			
5.6 Physical activity areas like gyms, yoga halls, etc. are painted in cooler colours	0			
5.7 Privacy niches and other areas for withdrawal are painted in cooler colours	0			
5.8 Stage area in auditorium is in contrast with the surroundings and is painted in relaxing colours like beige, peach, or pastel green	0			
Average Score (10)	0.6			

0 = Inadequate, 1 = Adequate, 2 = Excellent

6. Outdoor learning spaces	0	1	2	n/a
6.1 Provision of an accessible green/open space immediately outside the classroom	0			
6.2 An amphitheater readily available for outdoor plays, performances, and presentations.	0			
6.3 Provision of temporary structures and benches to facilitate outdoor classroom		1		
Score	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

7. Density and crowding	0	1	2	n/a
7.1 Ample space to move around in the classroom	0			
7.2 Gross Area provision per child is between 7- 10 sq.m.		1		
7.3 Children divided into smaller groups/cohorts	0			
7.4 Uncluttered rooms as well as walls	0			
7.5 No. of students per class is between 17-25	0			
Score	1			

0 = Inadequate, 1 = Adequate, 2 = Excellent

8. Accessibility and universal design	0	1	2	n/a
8.1 Simple, clear circulation with clearly defined paths, doorways, etc.	0			
8.2 Provision of handrails as necessary and material textures considered as tactile means of way finding.	0			
8.3 Power doors to improve accessibility for all users.	0			
8.4 Provision of ramps/lifts for barrier free access	0			
8.5 "Maze" entrances to washrooms improve access for all users and reduce hygiene issues associated with door knobs/levers.	0			
8.6 Circulation routes are of appropriate width (min. 1.5m wheelchair turning diameter) and are kept clear of obstacles.		1		
8.7 Hardware and controls are located within reach of users and ensure ease of operation.	0			
8.8 Special consideration of acoustics for the visually impaired: buildings and rooms are designed to reduce echo, reverberation, and extraneous background noise.	0			
8.9 Provision of appropriate lighting (natural and artificial) for circulation. Glare is avoided though.		1		
8.10 Large flat panel light switches, which can be used with either hand, closed fist, elbow, etc. are provided.	0			
8.11 Rough or textured borders, which contrast with smooth walking surfaces and indicate a change in grade or material, are used.	0			
8.12 Door lever does not require grip strength and can be operated by a closed fist or elbow.	0			
Score	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

9. Natural light for overall health and efficiency	0	1	2	n/a
9.1 Diffused (glare-free), usable daylight in every space where children spend long periods of time.		1		
9.2 Smaller windows at eye level are installed for views along with skylights or clerestory windows high in the wall deliver glare-free light deep into the space.	0			
9.3 Unrestricted views (when glare is not a problem) provide a perspective to ease eyestrain and bring the outside and inside worlds together.	0			
9.4 Daylight is supplemented with electric light. An acceptable design includes artificial light plus natural light from the outside.		1		
9.5 Direct view of bright light sources like the sun, a bright sky, or an electric lamp that may create glare and visual discomfort is avoided.		1		
9.6 Diffused daylight enters from multiple directions and minimizes shadows, balancing the light across the room.	0			
9.7 For every 10 square meter of classroom floor space, at least 2.5 square meter of window space is provided.	0			
9.8 Windows have some form of glare control, but are in use (when glare is not a problem), and are without painted obstructions.		1		
Score	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

10. Flexible spaces to facilitate multiple modalities of learning	0	1	2	n/a
10.1 Space can be made larger/ smaller or of a varying shape with a few changes in furniture arrangement	0			
10.2 The spatial layout allows the use of multiple learning modalities	0			
10.3 Movable and flexible partitions that can be operated easily	0			
10.4 Possibility for expansion/change is present	0			
10.5 Adjustable furniture to support both technology use and writing/drawing, etc. by hand	0			
10.6 Curtains/blinds, etc. to allow the usage of projector, SMART Board®, etc.	0			
Score	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

11. Variety of engaging spaces that initiate a state of flow	0	1	2	n/a
11.1 Engaging library with vibrant furniture, furnishings, colours, etc.	0			
11.2 Reading areas are well-lit with spaces for group work	0			
11.3 Acoustically well designed and well-lit music and dance areas	0			
Score	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

12.Common spaces for peer/teacher interaction	0	1	2	n/a
12.1 Enough space/opportunities for 4 or more children to get together in visible/safe locations is provided	0			
12.2 Space for having a meal together with peers and teachers	0			
12.3 Presence of auditorium, amphitheatre, etc. in school	0			
Score	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

13. Natural ventilation and thermal comfort	0	1	2	n/a
13.1 Passive techniques for thermal insulation in extreme climates	0			
13.2 Provision for windows at various levels to be used during varied weather conditions	0			
13.3 Less noisy mechanical systems, if any				x
13.4 Mechanical systems with a capacity to draw significant amount of outside air into the building				x
13.5 Use of natural airflow patterns to circulate fresh air	0			
13.6 Higher ceiling heights wherever possible	0			
Score	1.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

14. Effective noise reduction	0	1	2	n/a
14.1 Site located in a peaceful area with low noise and air pollution		1		
14.2 Barriers and buffers are provided to counter traffic noise		1		
14.3 Landscaping is used as a dampener	0			
14.4 Toilets, storerooms, etc. are used as buffer zones	0			
14.5 Hard materials that cause echo are avoided	0			
14.6 Appropriate sound absorbing materials are used	0			
Score	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

15. Welcoming entry and signature elements emphasizing the cultural context	0	1	2	n/a
15.1 An inviting and highly visible entrance with well-defined architectural features, signs, lighting, artwork, landscaping, and other landmarks such as flags	0			
15.2 Scale of the entrance is not intimidating for the child	0			
15.3 Motivational signs that send positive messages and invite children to school are used	0			
15.4 Landscaping features or small play areas are visible from the entrance	0			
15.5 Covered entrance that provides shelter from bad weather and facilitates transition	0			
15.6 Safe drop off/pick up		1		
15.7 Separate access for students and visitors	0			
15.8 Signature elements emphasizing the local/cultural context	0			
Score	0.6			

0 = Inadequate, 1 = Adequate, 2 = Excellent

16. Safety and security through natural surveillance	0	1	2	n/a
16.1 Centrally located administrative offices to enhance student safety		1		
16.2 Parking areas are delineated for staff and visitors	0			
16.3 Entrances and exits are easily and effectively monitored		1		
16.4 All student/pedestrian pathways are passively monitored	0			
16.5 No hiding spaces created by landscaping, fencing, etc.	0			
16.6 Separate age-level playgrounds for various age cohorts with developmentally appropriate and safe playground equipment	0			
16.7 Extensive use of windows and glazed doors to enhance natural surveillance of entrances, pathways, etc.	0			
16.8 No unattractive barriers such as barbed wire on the school grounds	0			
16.9 Toilets are attached to classrooms, if not then they have auditory connections with adjoining areas	0			
16.10 Security devices are unimposing	0			
16.11 Security system (alarms, lights, locks) provides elevated levels of security	0			
16.12 The site and learning environments are free of excessive non pedestrian traffic, hazards, and noise		1		
16.13 There are no high voltage power lines in the close proximity of the school		1		
Score	1.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

17. Ownership/territoriality through personalisation of spaces	0	1	2	n/a
17.1 Personal workspace with lockers for each student	0			
17.2 Spaces for personal artifacts	0			
17.3 Personal storage for books, stationary, etc.	0			
17.4 Distinctive design elements and display spaces for student works	0			
Score	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

18. Sensory aesthetics and active design elements	0	1	2	n/a
18.1 Attractive and plenty of well-maintained landscape areas	0			
18.2 Highly articulated fenestrations for framing of views	0			
18.3 Visually pleasing staircases and other movement pathways to encourage walking	0			
18.4 Age-appropriate design of walking routes	0			
18.5 Avoidance of long narrow corridors and use of nature connected pathways instead	0			
18.6 Provision of dedicated indoor spaces for physical activities	0			
18.7 Provision of sensory gardens with various activity spaces to suit the needs of children with varied temperaments	0			
Score	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

19. Self-reflection (privacy) and small group activities	0	1	2	n/a
19.1 Social spaces where a small group of children may go to be alone (i.e., reading areas, quiet places, reflection areas, listening areas, etc.)	0			
19.2 Space and furniture in classroom and other learning areas that provide 2–3 spaces for children to feel a sense of privacy and to control their interaction with others.	0			
19.3 Inviting yet supervised cave spaces where students can take a deep breath, albeit momentarily, from their hectic lives.	0			
19.4 Classrooms have clear breakout zones or breakout rooms attached to them. Breakout zones within corridors and separate from the classroom are avoided.	0			
Score	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

20. Use of appropriate materials and textures	0	1	2	n/a
20.1 Use of natural materials and visible details	0			
20.2 Multisensory materials are used that impart qualities like smoothness, roughness, brightness, opacity, transparency, etc. to the surfaces	0			
20.3 Use of materials that exude warmth	0			
20.4 Use of glass to connect inside to outside yet making children feel secure	0			
20.5 Overuse of cold and hard materials is avoided	0			
20.6 Use of curvilinear shapes wherever possible	0			
Score	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

21. Homelike environments with familiar elements	0	1	2	n/a
21.1 Soft furniture, such as a couch or large armchair	0			
21.2 Nontoxic indoor plants are used	0			
21.3 Soft and comforting elements like pillows, plants, soft furnishings to add warmth and security of being home	0			
21.4 Other decorative touches, such as area rugs or repurposed furniture	0			
21.5 Provision to hang children's artwork and their pictures on the walls		1		
21.6 Pastel paint colours with less stimulating displays (not visually overwhelming)	0			
Score	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

22. Agentic learning and green/sustainable architecture	0	1	2	n/a
22.1 Spaces to learn from natural processes like sun orientation, wind flow patterns, etc.	0			
22.2 Visible energy conservation/sustainable measures like rainwater harvesting, solar panels, etc.	0			
Score	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

23. Biophilic design to counter nature deficit & attention restoration	0	1	2	n/a
23.1 Ample availability of green and natural spaces in the school campus	0			
23.2 Views of nature from inside of the classroom	0			
23.3 Possibility of going out in the natural environment during breaks	0			
23.4 Use of biomorphic patterns in the interior environment	0			
23.5 Views of parking lots, roads, etc. area are avoided	0			
23.6 Restorative spaces with items such as soft furnishings, plants, animals, window seat or aquarium are generously available	0			
Score	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

24. School pets and empathy	0	1	2	n/a
24.1 Outdoor spaces conducive for pets along with safety concerns of children	0			
24.2 Presence of farm area for children to tend to	0			
Score				

0 = Inadequate, 1 = Adequate, 2 = Excellent

25. Student participation in planning and design	0	1	2	n/a
25.1 Students maintain their own green patch	0			
25.2 Students volunteer for renovations and refurbishments in school	0			
25.3 Student participation was considered during design and planning process	0			
Score	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

26. Stimulating playgrounds and sense of adventure	0	1	2	n/a
26.1 Opportunities for tree climbing and innovative play with movable parts	0			
26.2Ample space for running, jumping and other age-appropriate activities		1		
26.3 Presence of safety nets and other safety measures to avoid injury	0			
26.4 Proximity of school infirmary from play areas		1		
Score	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

27. School configuration and smaller learning communities	0	1	2	n/a
27.1 The school is split into small learning communities through blocks or levels	0			
27.2 Each learning community has its own open spaces and other indoor areas for socialisation	0			
27.3 Each community has sufficient transparency to allow constant passive supervision	0			
Score	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

Total score	18/270
Percentage score	6.7 %

SCORE RULES

86 % - 100 %
Excellent

71 % - 85 %
Very Good

51 % - 70 %
Acceptable

31 % - 50 %
Unacceptable -- Needs Work

0 % - 30 %
Poor -- Needs Substantial Changes

Score rules and three point rating scale adapted from: The classroom rating scale in Lorraine Maxwell, "Competency in Child Care Settings: The Role of the Physical Environment," *Environment and Behavior* 20, no. 10 (2006); the EFEI (Educational Facilities Effectiveness Instrument), by FNI. © Fielding Nair International and the EDA SPACE app by Education Design International

HEALTH ASSESSMENT OF K-12 SCHOOLS IN AMRITSAR

MILLENIUM SCHOOL.AMRITSAR (S2)

1. Legibility and way finding	0	1	2	n/a
1.1 A unique identity is created for each location	0			
1.2 Use of landmarks as visual cues	0			
1.3 Well-structured paths with goals	0			
1.4 Limited navigational choices		1		
1.5 Sightlines are used to show what is ahead		1		
1.6 Covered pathways among buildings within the campus				x
1.7 Colour coded indoor pathways	0			
1.8 Clear and well-lit pathways to activity areas	0			
1.9 The main building has an obvious point of reference among the school's buildings in which paths and buildings connect				x
1.10 Distinction between various areas is made obvious by the use of colours, textures, forms, ceiling heights, etc.	0			
Average score (10)	1.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

2. Community involvement and access control	0	1	2	n/a
2.1 Well placed windows to get a clear view of the entrance		1		
2.2 Dedicated areas for community interaction near the entrance	0			
2.3 Signage and pavements to define accessible areas for visitors	0			
2.4 Clearly defined limits to ensure access control		1		
Average score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

3. Child scale and developmental needs	0	1	2	n/a
3.1 Variation in ceiling heights acc. to the intended use of space	0			
3.2 Spaces and furniture considering child scale		1		
3.3 Whiteboard and other equipment respecting child scale	0			
3.4 Soft classrooms with curvilinear shapes, pillows, rugs, etc.	0			
3.5 Accessible material storage		1		
3.6 Door handles, switches, etc. at child's scale	0			
3.7 Variety of sizes of spaces	0			
Average score (10)	1.4			

0 = Inadequate, 1 = Adequate, 2 = Excellent

4. Ergonomic considerations for posture correction	0	1	2	n/a
4.1 Variety of furniture that is flexible and easy to use.	0			
4.2 The furniture improves posture and is in good repair.		1		
4.3Workstations are designed to accommodate information technology.	0			
4.4 Floor seating and opportunity for reclining provided at a corner of the classroom.	0			
4.5 Popliteal heights, elbow angle, and other anthropometric considerations are taken care of.		1		
4.6 Footrest is provided for shorter children.	0			
4.7 Tables and built-in shelves have rounded edges.		1		
Average score (10)	2.1			

0 = Inadequate, 1 = Adequate, 2 = Excellent

5. Careful use of colour	0	1	2	n/a
5.1 Variety of colours used while being careful about overstimulation	0			
5.2 Contrast between the board and the back wall just appropriate	0			
5.3 Colour and lighting are considered together	0			
5.4 Colourful displays on the walls and doors		1		
5.5 Warmer tones are preferred for younger children and cooler tones for older children	0			
5.6 Physical activity areas like gyms, yoga halls, etc. are painted in cooler colours		1		
5.7 Privacy niches and other areas for withdrawal are painted in cooler colours	0			
5.8 Stage area in auditorium is in contrast with surroundings and is painted in relaxing colours like beige, peach, or pastel green	0			
Average score (10)	1.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

6. Outdoor learning spaces	0	1	2	n/a
6.1 Provision of an accessible green/open space immediately outside the classroom	0			
6.2 An amphitheater readily available for outdoor plays, performances, and presentations .	0			
6.3 Provision of temporary structures and benches to facilitate outdoor classroom	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

7. Density and crowding	0	1	2	n/a
7.1 Ample space to move around in the classroom		1		
7.2 Area provision per sq. m. per child is between 7-10 sq.m.		1		
7.3 Children divided into smaller groups/cohorts	0			
7.4 Uncluttered rooms as well as walls		1		
7.5 No. of students per class is between 17-25		1		
Average score (10)	4			

0 = Inadequate, 1 = Adequate, 2 = Excellent

8. Accessibility and universal design	0	1	2	n/a
8.1 Simple, clear circulation with clearly defined paths, doorways, etc.	0			
8.2 Provision of handrails as necessary and material textures considered as tactile means of way finding.	0			
8.3 Power doors to improve accessibility for all users.	0			
8.4 Provision of ramps/lifts for barrier free access		1		
8.5 "Maze" entrances to washrooms improve access for all users and reduce hygiene issues associated with door knobs/levers.	0			
8.6 Circulation routes are of appropriate width (min. 1.5m wheelchair turning diameter) and are kept clear of obstacles.		1		
8.7 Hardware and controls are located within reach of users and ensure ease of operation.	0			
8.8 Special consideration of acoustics for the visually impaired: buildings and rooms are designed to reduce echo, reverberation, and extraneous background noise.	0			
8.9 Provision of appropriate lighting (natural and artificial) for circulation. Glare is avoided though.	0			
8.10 Large flat panel light switches, which can be used with either hand, closed fist, elbow, etc. are provided.	0			
8.11 Rough or textured borders, which contrast with smooth walking surfaces and indicate a change in grade or material, are used.	0			
8.12 Door lever does not require grip strength and can be operated by a closed fist or elbow.	0			
Average score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

9. Natural light for overall health and efficiency	0	1	2	n/a
9.1 Diffused (glare-free), usable daylight in every space where children spend long periods of time.	0			
9.2 Smaller windows at eye level are installed for views along with skylights or clerestory windows high in the wall deliver glare-free light deep into the space.	0			
9.3 Unrestricted views (when glare is not a problem) provide a perspective to ease eyestrain and bring the outside and inside worlds together.	0			
9.4 Daylight is supplemented with electric light. An acceptable design includes artificial light plus natural light from the outside.	0			
9.5 Direct view of bright light sources like the sun, a bright sky, or an electric lamp that may create glare and visual discomfort is avoided.		1		
9.6 Diffused daylight enters from multiple directions and minimizes shadows, balancing the light across the room.	0			
9.7 For every 10 square meter of classroom floor space, at least 2.5 square meter of window space is provided.	0			
9.8 Windows have some form of glare control, but are in use (when glare is not a problem), and are without painted obstructions.	0			
Average score (10)	0.6			

0 = Inadequate, 1 = Adequate, 2 = Excellent

10. Flexible spaces to facilitate multiple modalities of learning	0	1	2	n/a
10.1 Space can be made larger/ smaller or of a varying shape with a few changes in furniture arrangement		1		
10.2 The spatial layout allows the use of multiple learning modalities		1		
10.3 Movable and flexible partitions that can be operated easily	0			
10.4 Possibility for expansion/change is present	0			
10.5 Adjustable furniture to support both technology use and writing/drawing, etc. by hand	0			
10.6 Curtains/blinds, etc. to allow the usage of projector, SMART Board®, etc.		1		
Average score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

11. Variety of engaging spaces that initiate a state of flow	0	1	2	n/a
11.1 Engaging library with vibrant furniture, furnishings, colours, etc.	0			
11.2 Reading areas are well-lit with spaces for group work	0			
11.3 Acoustically well designed and well-lit music and dance areas	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

12.Common spaces for peer/teacher interaction	0	1	2	n/a
12.1 Enough space/opportunities for 4 or more children, in more than 3 locations in visible/safe locations is provided	0			
12.2 Space for having a meal together with peers and teachers	0			
12.3 Presence of auditorium, amphitheatre, etc. in school	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

13. Natural ventilation and thermal comfort	0	1	2	n/a
13.1 Passive techniques for thermal insulation in extreme climates	0			
13.2 Provision for windows at various levels to be used during varied weather conditions	0			
13.3 Less noisy mechanical systems, if any		1		
13.4 Mechanical systems with a capacity to draw significant amount of outside air into the building	0			
13.5 Use of natural airflow patterns to circulate fresh air	0			
13.6 Higher ceiling heights wherever possible	0			
Average score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

14. Effective noise reduction	0	1	2	n/a
14.1 Site located in a peaceful area with low noise and air pollution		1		
14.2 Barriers and buffers are provided to counter traffic noise		1		
14.3 Landscaping is used as a dampener		1		
14.4 Toilets, storerooms, etc. are used as buffer zones	0			
14.5 Hard materials that cause echo are avoided	0			
14.6 Appropriate sound absorbing materials are used	0			
Average score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

15. Welcoming entry and signature elements emphasizing the cultural context	0	1	2	n/a
15.1 An inviting and highly visible entrance with well-defined architectural features, signs, lighting, artwork, landscaping, and other landmarks such as flags	0			
15.2 Scale of the entrance is not intimidating for the child	0			
15.3 Motivational signs that send positive messages and invite children to school are used	0			
15.4 Landscaping features or small play areas are visible from the entrance	0			
15.5 Covered entrance that provides shelter from bad weather and facilitates transition		1		
15.6 Safe drop off/pick up		1		
15.7 Separate access for students and visitors		1		
15.8 Signature elements emphasizing the local/cultural context	0			
Average score (10)	1.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

16. Safety and security through natural surveillance	0	1	2	n/a
16.1 Centrally located administrative offices to enhance student safety	0			
16.2 Parking areas are delineated for staff and visitors		1		
16.3 Entrances and exits are easily and effectively monitored		1		
16.4 All student/pedestrian pathways are passively monitored	0			
16.5 No hiding spaces created by landscaping, fencing, etc.	0			
16.6 Separate age-level playgrounds for various age cohorts with developmentally appropriate and safe playground equipment	0			
16.7 Extensive use of windows and glazed doors to enhance natural surveillance of entrances, pathways, etc.	0			
16.8 No unattractive barriers such as barbed wire on the school grounds	0			
16.9 Toilets are attached to classrooms, if not then they have auditory connections with adjoining areas	0			
16.10 Security devices are unimposing	0			
16.11 Security system (alarms, lights, locks) provides elevated levels of security	0			
16.12 The site and learning environments are free of excessive non pedestrian traffic, hazards, and noise		1		
16.13 There are no high voltage power lines in the close proximity of the school		1		
Average score (10)	1.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

17. Ownership/territoriality through personalisation of spaces	0	1	2	n/a
17.1 Personal workspace with lockers for each student	0			
17.2 Spaces for personal artifacts	0			
17.3 Personal storage for books, stationary, etc.		1		
17.4 Distinctive design elements and display spaces for student works	0			
Average score (10)	1.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

18. Sensory aesthetics and active design elements	0	1	2	n/a
18.1 Attractive and plenty of well-maintained landscape areas	0			
18.2 Highly articulated fenestrations for framing of views	0			
18.3 Visually pleasing staircases and other movement pathways to encourage walking	0			
18.4 Age-appropriate design of walking routes	0			
18.5 Avoidance of long narrow corridors and use of nature connected pathways instead	0			
18.6 Provision of dedicated indoor spaces for physical activities		1		
18.7 Provision of sensory gardens with various activity spaces to suit the needs of children with varied temperaments	0			
Average score (10)	0.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

19. Self-reflection (privacy) and small group activities	0	1	2	n/a
19.1 Social spaces where a small group of children may go to be alone (i.e., reading areas, quiet places, reflection areas, listening areas, etc.)	0			
19.2 Space and furniture in classroom and other learning areas that provide 2–3 spaces for children to feel a sense of privacy and to control their interaction with others.	0			
19.3 Inviting yet supervised cave spaces where students can take a deep breath, albeit momentarily, from their hectic lives.	0			
19.4 Classrooms have clear breakout zones or breakout rooms attached to them. Breakout zones within corridors and separate from the classroom are avoided.	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

20. Use of appropriate materials and textures	0	1	2	n/a
20.1 Use of natural materials and visible details	0			
20.2 Multisensory materials are used that impart qualities like smoothness, roughness, brightness, opacity, transparency, etc. to the surfaces	0			
20.3 Use of materials that exude warmth	0			
20.4 Use of glass to connect inside to outside yet making children feel secure	0			
20.5 Overuse of cold and hard materials is avoided		1		
20.6 Use of curvilinear shapes wherever possible		1		
Average score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

21. Homelike environments with familiar elements	0	1	2	n/a
21.1 Soft furniture, such as a couch or large armchair	0			
21.2 Nontoxic indoor plants are used	0			
21.3 Soft and comforting elements like pillows, plants, soft furnishings to add warmth and security of being home	0			
21.4 Other decorative touches, such as area rugs or repurposed furniture	0			
21.5 Provision to hang children's artwork and their pictures on the walls		1		
21.6 Pastel paint colours with less stimulating displays (not visually overwhelming)	0			
Average score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

22. Agentic learning and green/sustainable architecture	0	1	2	n/a
22.1 Spaces to learn from natural processes like sun orientation, wind flow patterns, etc.	0			
22.2 Visible energy conservation/sustainable measures like rainwater harvesting, solar panels, etc.	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

23. Biophilic design to counter nature deficit & attention restoration	0	1	2	n/a
23.1 Ample availability of green and natural spaces in the school campus	0			
23.2 Views of nature from inside of the classroom	0			
23.3 Possibility of going out in the natural environment during breaks	0			
23.4 Use of biomorphic patterns in the interior environment	0			
23.5 Views of parking lots, roads, etc. area are avoided		1		
23.6 Restorative spaces with items such as soft furnishings, plants, animals, window seat or aquarium are generously available	0			
Average score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

24. School pets and empathy	0	1	2	n/a
24.1 Outdoor spaces conducive for pets along with safety concerns of children	0			
24.2 Presence of farm area for children to tend to	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

25. Student participation in planning and design	0	1	2	n/a
25.1 Students maintain their own green patch	0			
25.2 Students volunteer for renovations and refurbishments in school	0			
25.3 Student participation was considered during design and planning process	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

26. Stimulating playgrounds and sense of adventure	0	1	2	n/a
26.1 Opportunities for tree climbing and innovative play with movable parts	0			
26.2Ample space for running, jumping and other age-appropriate activities		1		
26.3 Presence of safety nets and other safety measures to avoid injury	0			
26.4 Proximity of school infirmary from play areas		1		
Average score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

27. School configuration and smaller learning communities	0	1	2	n/a
27.1 The school is split into small learning communities through blocks or levels	0			
27.2 Each learning community has its own open spaces and other indoor areas for socialisation	0			
27.3 Each community has sufficient transparency to allow constant passive supervision	0			
Average score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

Total score	31/270
Percentage score	11.4 %

SCORE RULES

86 % - 100 %
Excellent

71 % - 85 %
Very Good

51 % - 70 %
Acceptable

31 % - 50 %
Unacceptable -- Needs Work

0 % - 30 %
Poor -- Needs Substantial Changes

Score rules and three point rating scale adapted from: The classroom rating scale in Lorraine Maxwell, "Competency in Child Care Settings: The Role of the Physical Environment," *Environment and Behavior* 20, no. 10 (2006); the EFEI (Educational Facilities Effectiveness Instrument), by FNI. © Fielding Nair International and the EDA SPACE app by Education Design International

HEALTH ASSESSMENT OF K-12 SCHOOLS IN AMRITSAR

MOUNT LITERA ZEE SCHOOL, LOHARKA ROAD, AMRITSAR (S6)

1. Legibility and way finding	0	1	2	n/a
1.1 A unique identity is created for each location		1		
1.2 Use of landmarks as visual cues		1		
1.3 Well-structured paths with goals		1		
1.4 Limited navigational choices		1		
1.5 Sightlines are used to show what is ahead	0			
1.6 Covered pathways among buildings within the campus				x
1.7 Colour coded indoor pathways	0			
1.8 Clear and well-lit pathways to activity areas		1		
1.9 The main building has an obvious point of reference among the school's buildings in which paths and buildings connect		1		
1.10 Distinction between various areas is made obvious by the use of colours, textures, forms, ceiling heights, etc.	0			
Average Score (10)	3.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

2. Community involvement and access control	0	1	2	n/a
2.1 Well placed windows to get a clear view of the entrance		1		
2.2 Dedicated areas for community interaction near the entrance			2	
2.3 Signage and pavements to define accessible areas for visitors		1		
2.4 Clearly defined limits to ensure access control		1		
Average Score (10)	6.2			

0 = Inadequate, 1 = Adequate, 2 = Excellent

3. Child scale and developmental needs	0	1	2	n/a
3.1 Variation in ceiling heights acc. to the intended use of space	0			
3.2 Spaces and furniture considering child scale		1		
3.3 Whiteboard and other equipment respecting child scale		1		
3.4 Soft classrooms with curvilinear shapes, pillows, rugs, etc.	0			
3.5 Accessible material storage		1		
3.6 Door handles, switches, etc. at child's scale	0			
3.7 Variety of sizes of spaces	0			
Average Score (10)	2.1			

0 = Inadequate, 1 = Adequate, 2 = Excellent

4. Ergonomic considerations for posture correction	0	1	2	n/a
4.1 Variety of furniture that is flexible and easy to use.	0			
4.2 The furniture improves posture and is in good repair.		1		
4.3Workstations are designed to accommodate information technology.		1		
4.4 Floor seating and opportunity for reclining provided at a corner of the classroom.	0			
4.5 Popliteal heights, elbow angle, and other anthropometric considerations are taken care of.		1		
4.6 Footrest is provided for shorter children.	0			
4.7 Tables and built-in shelves have rounded edges.		1		
Average Score (10)	2.9			

0 = Inadequate, 1 = Adequate, 2 = Excellent

5. Careful use of colour	0	1	2	n/a
5.1 Variety of colours used while being careful about overstimulation		1		
5.2 Contrast between the board and the back wall just appropriate		1		
5.3 Colour and lighting are considered together	0			
5.4 Colourful displays on the walls and doors		1		
5.5 Warmer tones are preferred for younger children and cooler tones for older children	0			
5.6 Physical activity areas like gyms, yoga halls, etc. are painted in cooler colours		1		
5.7 Privacy niches and other areas for withdrawal are painted in cooler colours	0			
5.8 Stage area in auditorium is in contrast with surroundings and is painted in relaxing colours like beige, peach, or pastel green		1		
Average Score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

6. Outdoor learning spaces	0	1	2	n/a
6.1 Provision of an accessible green/open space immediately outside the classroom	0			
6.2 An amphitheater readily available for outdoor plays, performances, and presentations.			2	
6.3 Provision of temporary structures and benches to facilitate outdoor classroom		1		
Average Score (10)	5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

7. Density and crowding	0	1	2	n/a
7.1 Ample space to move around in the learning area		1		
7.2 Gross Area provision per child is between 7- 10 sq.m.			2	
7.3 Children divided into smaller groups/cohorts	0			
7.4 Uncluttered rooms as well as walls		1		
7.5 No. of students per class is between 17- 25			2	
Average Score (10)	6			

0 = Inadequate, 1 = Adequate, 2 = Excellent

8. Accessibility and universal design	0	1	2	n/a
8.1 Simple, clear circulation with clearly defined paths, doorways, etc.		1		
8.2 Provision of handrails as necessary and material textures considered as tactile means of way finding.	0			
8.3 Power doors to improve accessibility for all users.	0			
8.4 Provision of ramps/lifts for barrier free access		1		
8.5 "Maze" entrances to washrooms improve access for all users and reduce hygiene issues associated with door knobs/levers.	0			
8.6 Circulation routes are of appropriate width (min. 1.5m wheelchair turning diameter) and are kept clear of obstacles.		1		
8.7 Hardware and controls are located within reach of users and ensure ease of operation.	0			
8.8 Special consideration of acoustics for the visually impaired: buildings and rooms are designed to reduce echo, reverberation, and extraneous background noise.	0			
8.9 Provision of appropriate lighting (natural and artificial) for circulation. Glare is avoided though.		1		
8.10 Large flat panel light switches, which can be used with either hand, closed fist, elbow, etc. are provided.	0			
8.11 Rough or textured borders, which contrast with smooth walking surfaces and indicate a change in grade or material, are used.	0			
8.12 Door lever does not require grip strength and can be operated by a closed fist or elbow.	0			
Average Score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

9. Natural light for overall health and efficiency	0	1	2	n/a
9.1 Diffused (glare-free), usable daylight in every space where children spend long periods of time.		1		
9.2 Smaller windows at eye level are installed for views along with skylights or clerestory windows high in the wall deliver glare-free light deep into the space.	0			
9.3 Unrestricted views (when glare is not a problem) provide a perspective to ease eyestrain and bring the outside and inside worlds together.	0			
9.4 Daylight is supplemented with electric light. An acceptable design includes artificial light plus natural light from the outside.			2	
9.5 Direct view of bright light sources like the sun, a bright sky, or an electric lamp that may create glare and visual discomfort is avoided.		1		
9.6 Diffused daylight enters from multiple directions and minimizes shadows, balancing the light across the room.		1		
9.7 For every 10 square meter of classroom floor space, at least 2.5 square meter of window space is provided.	0			
9.8 Windows have some form of glare control, but are in use (when glare is not a problem), and are without painted obstructions.		1		
Average Score (10)	3.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

10. Flexible spaces to facilitate multiple modalities of learning	0	1	2	n/a
10.1 Space can be made larger/ smaller or of a varying shape with a few changes in furniture arrangement		1		
10.2 The spatial layout allows the use of multiple learning modalities		1		
10.3 Movable and flexible partitions that can be operated easily	0			
10.4 Possibility for expansion/change is present	0			
10.5 Adjustable furniture to support both technology use and writing/drawing, etc. by hand		1		
10.6 Curtains/blinds, etc. to allow the usage of projector, SMART Board®, etc.		1		
Average Score (10)	3.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

11. Variety of engaging spaces that initiate a state of flow	0	1	2	n/a
11.1 Engaging library with vibrant furniture, furnishings, colours, etc.		1		
11.2 Reading areas are well-lit with spaces for group work		1		
11.3 Acoustically well designed and well-lit music and dance areas		1		
Average Score (10)	5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

12.Common spaces for peer/teacher interaction	0	1	2	n/a
12.1 Enough space/opportunities for 4 or more children, in more than 3 locations in visible/safe locations is provided	0			
12.2 Space for having a meal together with peers and teachers		1		
12.3 Presence of auditorium, amphitheatre, etc. in school		1		
Average Score (10)	3.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

13. Natural ventilation and thermal comfort	0	1	2	n/a
13.1 Passive techniques for thermal insulation in extreme climates		1		
13.2 Provision for windows at various levels to be used during varied weather conditions	0			
13.3 Less noisy mechanical systems, if any		1		
13.4 Mechanical systems with a capacity to draw significant amount of outside air into the building	0			
13.5 Use of natural airflow patterns to circulate fresh air	0			
13.6 Higher ceiling heights wherever possible	0			
Average Score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

14. Effective noise reduction	0	1	2	n/a
14.1 Site located in a peaceful area with low noise and air pollution			2	
14.2 Barriers and buffers are provided to counter traffic noise		1		
14.3 Landscaping is used as a dampener		1		
14.4 Toilets, storerooms, etc. are used as buffer zones	0			
14.5 Hard materials that cause echo are avoided		1		
14.6 Appropriate sound absorbing materials are used	0			
Average Score (10)	4.2			

0 = Inadequate, 1 = Adequate, 2 = Excellent

15. Welcoming entry and signature elements emphasizing the cultural context	0	1	2	n/a
15.1 An inviting and highly visible entrance with well-defined architectural features, signs, lighting, artwork, landscaping, and other landmarks such as flags		1		
15.2 Scale of the entrance is not intimidating for the child		1		
15.3 Motivational signs that send positive messages and invite children to school are used		1		
15.4 Landscaping features or small play areas are visible from the entrance		1		
15.5 Covered entrance that provides shelter from bad weather and facilitates transition		1		
15.6 Safe drop off/pick up		1		
15.7 Separate access for students and visitors		1		
15.8 Signature elements emphasizing the local/cultural context		1		
Average Score (10)	5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

16. Safety and security through natural surveillance	0	1	2	n/a
16.1 Centrally located administrative offices to enhance student safety		1		
16.2 Parking areas are delineated for staff and visitors		1		
16.3 Entrances and exits are easily and effectively monitored		1		
16.4 All student/pedestrian pathways are passively monitored		1		
16.5 No hiding spaces created by landscaping, fencing, etc.		1		
16.6 Separate age-level playgrounds for various age cohorts with developmentally appropriate and safe playground equipment		1		
16.7 Extensive use of windows and glazed doors to enhance natural surveillance of entrances, pathways, etc.	0			
16.8 No unattractive barriers such as barbed wire on the school grounds		1		
16.9 Toilets are attached to classrooms, if not then they have auditory connections with adjoining areas	0			
16.10 Security devices are unimposing		1		
16.11 Security system (alarms, lights, locks) provides elevated levels of security		1		
16.12 The site and learning environments are free of excessive non pedestrian traffic, hazards, and noise		1		
16.13 There are no high voltage power lines in the close proximity of the school		1		
Average Score (10)	4.2			

0 = Inadequate, 1 = Adequate, 2 = Excellent

17. Ownership/territoriality through personalisation of spaces	0	1	2	n/a
17.1 Personal workspace with lockers for each student		1		
17.2 Spaces for personal artifacts		1		
17.3 Personal storage for books, stationary, etc.		1		
17.4 Distinctive design elements and display spaces for student works		1		
Average Score (10)	5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

18. Sensory aesthetics and active design elements	0	1	2	n/a
18.1 Attractive and plenty of well-maintained landscape areas		1		
18.2 Highly articulated fenestrations for framing of views	0			
18.3 Visually pleasing staircases and other movement pathways to encourage walking	0			
18.4 Age-appropriate design of walking routes	0			
18.5 Avoidance of long narrow corridors and use of nature connected pathways instead	0			
18.6 Provision of dedicated indoor spaces for physical activities		1		
18.7 Provision of sensory gardens with various activity spaces to suit the needs of children with varied temperaments	0			
Average Score (10)	1.4			

0 = Inadequate, 1 = Adequate, 2 = Excellent

19. Self-reflection (privacy) and small group activities	0	1	2	n/a
19.1 Social spaces where a small group of children may go to be alone (i.e., reading areas, quiet places, reflection areas, listening areas, etc.)	0			
19.2 Space and furniture in classroom and other learning areas that provide 2–3 spaces for children to feel a sense of privacy and to control their interaction with others.	0			
19.3 Inviting yet supervised cave spaces where students can take a deep breath, albeit momentarily, from their hectic lives.	0			
19.4 Classrooms have clear breakout zones or breakout rooms attached to them. Breakout zones within corridors and separate from the classroom are avoided.	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

20. Use of appropriate materials and textures	0	1	2	n/a
20.1 Use of natural materials and visible details	0			
20.2 Multisensory materials are used that impart qualities like smoothness, roughness, brightness, opacity, transparency, etc. to the surfaces	0			
20.3 Use of materials that exude warmth	0			
20.4 Use of glass to connect inside to outside yet making children feel secure	0			
20.5 Overuse of cold and hard materials is avoided		1		
20.6 Use of curvilinear shapes wherever possible	0			
Average Score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

21. Homelike environments with familiar elements	0	1	2	n/a
21.1 Soft furniture, such as a couch or large armchair	0			
21.2 Nontoxic indoor plants are used	0			
21.3 Soft and comforting elements like pillows, plants, soft furnishings to add warmth and security of being home	0			
21.4 Other decorative touches, such as area rugs or repurposed furniture	0			
21.5 Provision to hang children's artwork and their pictures on the walls		1		
21.6 Pastel paint colours with less stimulating displays (not visually overwhelming)		1		
Average Score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

22. Agentic learning and green/sustainable architecture	0	1	2	n/a
22.1 Spaces to learn from natural processes like sun orientation, wind flow patterns, etc.		1		
22.2 Visible energy conservation/sustainable measures like rainwater harvesting, solar panels, etc.	0			
Average Score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

23. Biophilic design to counter nature deficit & attention restoration	0	1	2	n/a
23.1 Ample availability of green and natural spaces in the school campus		1		
23.2 Views of nature from inside of the classroom	0			
23.3 Possibility of going out in the natural environment during breaks	0			
23.4 Use of biomorphic patterns in the interior environment	0			
23.5 Views of parking lots, roads, etc. area are avoided		1		
23.6 Restorative spaces with items such as soft furnishings, plants, animals, window seat or aquarium are generously available	0			
Average Score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

24. School pets and empathy	0	1	2	n/a
24.1 Outdoor spaces conducive for pets along with safety concerns of children	0			
24.2 Presence of farm area for children to tend to	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

25. Student participation in planning and design	0	1	2	n/a
25.1 Students maintain their own green patch	0			
25.2 Students volunteer for renovations and refurbishments in school	0			
25.3 Student participation was considered during design and planning process	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

26. Stimulating playgrounds and sense of adventure	0	1	2	n/a
26.1 Opportunities for tree climbing and innovative play with movable parts	0			
26.2Ample space for running, jumping and other age-appropriate activities		1		
26.3 Presence of safety nets and other safety measures to avoid injury		1		
26.4 Proximity of school infirmary from play areas		1		
Average Score (10)	3.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

27. School configuration and smaller learning communities	0	1	2	n/a
27.1 The school is split into small learning communities through blocks or levels		1		
27.2 Each learning community has its own open spaces and other indoor areas for socialisation	0			
27.3 Each community has sufficient transparency to allow constant passive supervision	0			
Average Score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

Total score	78.8/270
Percentage score	29 %

SCORE RULES

86 % - 100 %
Excellent

71 % - 85 %
Very Good

51 % - 70 %
Acceptable

31 % - 50 %
Unacceptable -- Needs Work

0 % - 30 %
Poor -- Needs Substantial Changes

Score rules and three point rating scale adapted from: The classroom rating scale in Lorraine Maxwell, "Competency in Child Care Settings: The Role of the Physical Environment," *Environment and Behavior* 20, no. 10 (2006); the EFEI (Educational Facilities Effectiveness Instrument), by FNI. © Fielding Nair International and the EDA SPACE app by Education Design International

HEALTH ASSESSMENT OF K-12 SCHOOLS IN AMRITSAR

SRI GURU HARKRISHAN PUBLIC SCHOOL , BYEPASS ROAD, AMRITSAR (S3)

1. Legibility and way finding	0	1	2	n/a
1.1 A unique identity is created for each location	0			
1.2 Use of landmarks as visual cues	0			
1.3 Well-structured paths with goals	0			
1.4 Limited navigational choices	0			
1.5 Sightlines are used to show what is ahead	0			
1.6 Covered pathways among buildings within the campus		1		
1.7 Colour coded indoor pathways	0			
1.8 Clear and well-lit pathways to activity areas	0			
1.9 The main building has an obvious point of reference among the school's buildings in which paths and buildings connect		1		
1.10 Distinction between various areas is made obvious by the use of colours, textures, forms, ceiling heights, etc.	0			
Average Score (10)	1			

0 = Inadequate, 1 = Adequate, 2 = Excellent

2. Community involvement and access control	0	1	2	n/a
2.1 Well placed windows to get a clear view of the entrance	0			
2.2 Dedicated areas for community interaction near the entrance		1		
2.3 Signage and pavements to define accessible areas for visitors	0			
2.4 Clearly defined limits to ensure access control	0			
Average Score (10)	1.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

3. Child scale and developmental needs	0	1	2	n/a
3.1 Variation in ceiling heights acc. to the intended use of space	0			
3.2 Spaces and furniture considering child scale	0			
3.3 Whiteboard and other equipment respecting child scale	0			
3.4 Soft classrooms with curvilinear shapes, pillows, rugs, etc.	0			
3.5 Accessible material storage	0			
3.6 Door handles, switches, etc. at child's scale	0			
3.7 Variety of sizes of spaces	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

4. Ergonomic considerations for posture correction	0	1	2	n/a
4.1 Variety of furniture that is flexible and easy to use.	0			
4.2 The furniture improves posture and is in good repair.	0			
4.3Workstations are designed to accommodate information technology.	0			
4.4 Floor seating and opportunity for reclining provided at a corner of the classroom.	0			
4.5 Popliteal heights, elbow angle, and other anthropometric considerations are taken care of.	0			
4.6 Footrest is provided for shorter children.	0			
4.7 Tables and built-in shelves have rounded edges.		1		
Average Score (10)	0.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

5. Careful use of colour	0	1	2	n/a
5.1 Variety of colours used while being careful about overstimulation	0			
5.2 Contrast between the board and the back wall just appropriate	0			
5.3 Colour and lighting are considered together	0			
5.4 Colourful displays on the walls and doors		1		
5.5 Warmer tones are preferred for younger children and cooler tones for older children	0			
5.6 Physical activity areas like gyms, yoga halls, etc. are painted in cooler colours		1		
5.7 Privacy niches and other areas for withdrawal are painted in cooler colours	0			
5.8 Stage area in auditorium is in contrast with surroundings and is painted in relaxing colours like beige, peach, or pastel green		1		
Average Score (10)	1.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

6. Outdoor learning spaces	0	1	2	n/a
6.1 Provision of an accessible green/open space immediately outside the classroom	0			
6.2 An amphitheater readily available for outdoor plays, performances, and presentations.	0			
6.3 Provision of temporary structures and benches to facilitate outdoor classroom		1		
Average Score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

7. Density and crowding	0	1	2	n/a
7.1 Ample space to move around in the learning area	0			
7.2 Gross Area provision per child is between 7-10 sq.m.		1		
7.3 Children divided into smaller groups/cohorts	0			
7.4 Uncluttered rooms as well as walls	0			
7.5 No. of students per class does not exceed 30	0			
Average Score (10)	1			

0 = Inadequate, 1 = Adequate, 2 = Excellent

8. Accessibility and universal design	0	1	2	n/a
8.1 Simple, clear circulation with clearly defined paths, doorways, etc.	0			
8.2 Provision of handrails as necessary and material textures considered as tactile means of way finding.	0			
8.3 Power doors to improve accessibility for all users.	0			
8.4 Provision of ramps/lifts for barrier free access		1		
8.5 "Maze" entrances to washrooms improve access for all users and reduce hygiene issues associated with door knobs/levers.	0			
8.6 Circulation routes are of appropriate width (min. 1.5m wheelchair turning diameter) and are kept clear of obstacles.		1		
8.7 Hardware and controls are located within reach of users and ensure ease of operation.	0			
8.8 Special consideration of acoustics for the visually impaired: buildings and rooms are designed to reduce echo, reverberation, and extraneous background noise.	0			
8.9 Provision of appropriate lighting (natural and artificial) for circulation. Glare is avoided though.	0			
8.10 Large flat panel light switches, which can be used with either hand, closed fist, elbow, etc. are provided.	0			
8.11 Rough or textured borders, which contrast with smooth walking surfaces and indicate a change in grade or material, are used.	0			
8.12 Door lever does not require grip strength and can be operated by a closed fist or elbow.	0			
Average Score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

9. Natural light for overall health and efficiency	0	1	2	n/a
9.1 Diffused (glare-free), usable daylight in every space where children spend long periods of time.	0			
9.2 Smaller windows at eye level are installed for views along with skylights or clerestory windows high in the wall deliver glare-free light deep into the space.	0			
9.3 Unrestricted views (when glare is not a problem) provide a perspective to ease eyestrain and bring the outside and inside worlds together.	0			
9.4 Daylight is supplemented with electric light. An acceptable design includes artificial light plus natural light from the outside.		1		
9.5 Direct view of bright light sources like the sun, a bright sky, or an electric lamp that may create glare and visual discomfort is avoided.		1		
9.6 Diffused daylight enters from multiple directions and minimizes shadows, balancing the light across the room.	0			
9.7 For every 10 square meter of classroom floor space, at least 2.5 square meter of window space is provided.	0			
9.8 Windows have some form of glare control, but are in use (when glare is not a problem), and are without painted obstructions.		1		
Average Score (10)	1.9			

0 = Inadequate, 1 = Adequate, 2 = Excellent

10. Flexible spaces to facilitate multiple modalities of learning	0	1	2	n/a
10.1 Space can be made larger/ smaller or of a varying shape with a few changes in furniture arrangement	0			
10.2 The spatial layout allows the use of multiple learning modalities	0			
10.3 Movable and flexible partitions that can be operated easily	0			
10.4 Possibility for expansion/change is present	0			
10.5 Adjustable furniture to support both technology use and writing/drawing, etc. by hand	0			
10.6 Curtains/blinds, etc. to allow the usage of projector, SMART Board®, etc.		1		
Average Score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

11. Variety of engaging spaces that initiate a state of flow	0	1	2	n/a
11.1 Engaging library with vibrant furniture, furnishings, colours, etc.		1		
11.2 Reading areas are well-lit with spaces for group work	0			
11.3 Acoustically well designed and well-lit music and dance areas	0			
Average Score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

12.Common spaces for peer/teacher interaction	0	1	2	n/a
12.1 Enough space/opportunities for 4 or more children, in more than 3 locations in visible/safe locations is provided	0			
12.2 Space for having a meal together with peers and teachers		1		
12.3 Presence of auditorium, amphitheatre, etc. in school		1		
Average Score (10)	3.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

13. Natural ventilation and thermal comfort	0	1	2	n/a
13.1 Passive techniques for thermal insulation in extreme climates		1		
13.2 Provision for windows at various levels to be used during varied weather conditions	0			
13.3 Less noisy mechanical systems, if any		1		
13.4 Mechanical systems with a capacity to draw significant amount of outside air into the building	0			
13.5 Use of natural airflow patterns to circulate fresh air	0			
13.6 Higher ceiling heights wherever possible	0			
Score	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

14. Effective noise reduction	0	1	2	n/a
14.1 Site located in a peaceful area with low noise and air pollution	0			
14.2 Barriers and buffers are provided to counter traffic noise		1		
14.3 Landscaping is used as a dampener		1		
14.4 Toilets, storerooms, etc. are used as buffer zones	0			
14.5 Hard materials that cause echo are avoided	0			
14.6 Appropriate sound absorbing materials are used	0			
Average Score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

15. Welcoming entry and signature elements emphasizing the cultural context	0	1	2	n/a
15.1 An inviting and highly visible entrance with well-defined architectural features, signs, lighting, artwork, landscaping, and other landmarks such as flags	0			
15.2 Scale of the entrance is not intimidating for the child	0			
15.3 Motivational signs that send positive messages and invite children to school are used	0			
15.4 Landscaping features or small play areas are visible from the entrance		1		
15.5 Covered entrance that provides shelter from bad weather and facilitates transition	0			
15.6 Safe drop off/pick up		1		
15.7 Separate access for students and visitors	0			
15.8 Signature elements emphasizing the local/cultural context	0			
Average Score (10)	1.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

16. Safety and security through natural surveillance	0	1	2	n/a
16.1 Centrally located administrative offices to enhance student safety		1		
16.2 Parking areas are delineated for staff and visitors		1		
16.3 Entrances and exits are easily and effectively monitored	0			
16.4 All student/pedestrian pathways are passively monitored	0			
16.5 No hiding spaces created by landscaping, fencing, etc.	0			
16.6 Separate age-level playgrounds for various age cohorts with developmentally appropriate and safe playground equipment	0			
16.7 Extensive use of windows and glazed doors to enhance natural surveillance of entrances, pathways, etc.	0			
16.8 No unattractive barriers such as barbed wire on the school grounds		1		
16.9 Toilets are attached to classrooms, if not then they have auditory connections with adjoining areas	0			
16.10 Security devices are unimposing		1		
16.11 Security system (alarms, lights, locks) provides elevated levels of security	0			
16.12 The site and learning environments are free of excessive non pedestrian traffic, hazards, and noise		1		
16.13 There are no high voltage power lines in the close proximity of the school		1		
Average Score (10)	2.3			

0 = Inadequate, 1 = Adequate, 2 = Excellent

17. Ownership/territoriality through personalisation of spaces	0	1	2	n/a
17.1 Personal workspace with lockers for each student	0			
17.2 Spaces for personal artifacts	0			
17.3 Personal storage for books, stationary, etc.	0			
17.4 Distinctive design elements and display spaces for student works	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

18. Sensory aesthetics and active design elements	0	1	2	n/a
18.1 Attractive and plenty of well-maintained landscape areas	0			
18.2 Highly articulated fenestrations for framing of views	0			
18.3 Visually pleasing staircases and other movement pathways to encourage walking	0			
18.4 Age-appropriate design of walking routes	0			
18.5 Avoidance of long narrow corridors and use of nature connected pathways instead	0			
18.6 Provision of dedicated indoor spaces for physical activities		1		
18.7 Provision of sensory gardens with various activity spaces to suit the needs of children with varied temperaments	0			
Average Score (10)	0.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

19. Self-reflection (privacy) and small group activities	0	1	2	n/a
19.1 Social spaces where a small group of children may go to be alone (i.e., reading areas, quiet places, reflection areas, listening areas, etc.)	0			
19.2 Space and furniture in classroom and other learning areas that provide 2–3 spaces for children to feel a sense of privacy and to control their interaction with others.	0			
19.3 Inviting yet supervised cave spaces where students can take a deep breath, albeit momentarily, from their hectic lives.	0			
19.4 Classrooms have clear breakout zones or breakout rooms attached to them. Breakout zones within corridors and separate from the classroom are avoided.	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

20. Use of appropriate materials and textures	0	1	2	n/a
20.1 Use of natural materials and visible details	0			
20.2 Multisensory materials are used that impart qualities like smoothness, roughness, brightness, opacity, transparency, etc. to the surfaces	0			
20.3 Use of materials that exude warmth	0			
20.4 Use of glass to connect inside to outside yet making children feel secure	0			
20.5 Overuse of cold and hard materials is avoided	0			
20.6 Use of curvilinear shapes wherever possible	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

21. Homelike environments with familiar elements	0	1	2	n/a
21.1 Soft furniture, such as a couch or large armchair	0			
21.2 Nontoxic indoor plants are used	0			
21.3 Soft and comforting elements like pillows, plants, soft furnishings to add warmth and security of being home	0			
21.4 Other decorative touches, such as area rugs or repurposed furniture	0			
21.5 Provision to hang children's artwork and their pictures on the walls		1		
21.6 Pastel paint colours with less stimulating displays (not visually overwhelming)	0			
Average Score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

22. Agentic learning and green/sustainable architecture	0	1	2	n/a
22.1 Spaces to learn from natural processes like sun orientation, wind flow patterns, etc.		1		
22.2 Visible energy conservation/sustainable measures like rainwater harvesting, solar panels, etc.		1		
Average Score (10)	5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

23. Biophilic design to counter nature deficit & attention restoration	0	1	2	n/a
23.1 Ample availability of green and natural spaces in the school campus	0			
23.2 Views of nature from inside of the classroom	0			
23.3 Possibility of going out in the natural environment during breaks	0			
23.4 Use of biomorphic patterns in the interior environment	0			
23.5 Views of parking lots, roads, etc. area are avoided		1		
23.6 Restorative spaces with items such as soft furnishings, plants, animals, window seat or aquarium are generously available	0			
Average Score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

24. School pets and empathy	0	1	2	n/a
24.1 Outdoor spaces conducive for pets along with safety concerns of children	0			
24.2 Presence of farm area for children to tend to	0			
Score	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

25. Student participation in planning and design	0	1	2	n/a
25.1 Students maintain their own green patch	0			
25.2 Students volunteer for renovations and refurbishments in school	0			
25.3 Student participation was considered during design and planning process	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

26. Stimulating playgrounds and sense of adventure	0	1	2	n/a
26.1 Opportunities for tree climbing and innovative play with movable parts	0			
26.2Ample space for running, jumping and other age-appropriate activities		1		
26.3 Presence of safety nets and other safety measures to avoid injury	0			
26.4 Proximity of school infirmary from play areas		1		
Average Score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

27. School configuration and smaller learning communities	0	1	2	n/a
27.1 The school is split into small learning communities through blocks or levels		1		
27.2 Each learning community has its own open spaces and other indoor areas for socialisation	0			
27.3 Each community has sufficient transparency to allow constant passive supervision	0			
Average Score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

Total score	34/270
Percentage score	12 .6 %

SCORE RULES

86 % - 100 %
Excellent

71 % - 85 %
Very Good

51 % - 70 %
Acceptable

31 % - 50 %
Unacceptable -- Needs Work

0 % - 30 %
Poor -- Needs Substantial Changes

Score rules and three point rating scale adapted from: The classroom rating scale in Lorraine Maxwell, "Competency in Child Care Settings: The Role of the Physical Environment," *Environment and Behavior* 20, no. 10 (2006); the EFEI (Educational Facilities Effectiveness Instrument), by FNI. © Fielding Nair International and the EDA SPACE app by Education Design International

HEALTH ASSESSMENT OF K-12 SCHOOLS IN AMRITSAR

SPRINGDALE SENIOR SCHOOL, FATEHGARH CHURIAN ROAD, AMRITSAR (S7)

1. Legibility and way finding	0	1	2	n/a
1.1 A unique identity is created for each location	0			
1.2 Use of landmarks as visual cues		1		
1.3 Well-structured paths with goals		1		
1.4 Limited navigational choices	0			
1.5 Sightlines are used to show what is ahead	0			
1.6 Covered pathways among buildings within the campus		1		
1.7 Colour coded indoor pathways	0			
1.8 Clear and well-lit pathways to activity areas	0			
1.9 The main building has an obvious point of reference among the school's buildings in which paths and buildings connect		1		
1.10 Distinction between various areas is made obvious by the use of colours, textures, forms, ceiling heights, etc.	0			
Average Score (10)	2			

0 = Inadequate, 1 = Adequate, 2 = Excellent

2. Community involvement and access control	0	1	2	n/a
2.1 Well placed windows to get a clear view of the entrance		1		
2.2 Dedicated areas for community interaction near the entrance	0			
2.3 Signage and pavements to define accessible areas for visitors	0			
2.4 Clearly defined limits to ensure access control		1		
Average Score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

3. Child scale and developmental needs	0	1	2	n/a
3.1 Variation in ceiling heights acc. to the intended use of space	0			
3.2 Spaces and furniture considering child scale		1		
3.3 Whiteboard and other equipment respecting child scale		1		
3.4 Soft classrooms with curvilinear shapes, pillows, rugs, etc.	0			
3.5 Accessible material storage		1		
3.6 Door handles, switches, etc. at child's scale	0			
3.7 Variety of sizes of spaces	0			
Average Score (10)	2.1			

0 = Inadequate, 1 = Adequate, 2 = Excellent

4. Ergonomic considerations for posture correction	0	1	2	n/a
4.1 Variety of furniture that is flexible and easy to use.	0			
4.2 The furniture improves posture and is in good repair.	0			
4.3Workstations are designed to accommodate information technology.	0			
4.4 Floor seating and opportunity for reclining provided at a corner of the classroom.	0			
4.5 Popliteal heights, elbow angle, and other anthropometric considerations are taken care of.	0			
4.6 Footrest is provided for shorter children.	0			
4.7 Tables and built-in shelves have rounded edges.		1		
Average Score (10)	0.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

5. Careful use of colour	0	1	2	n/a
5.1 Variety of colours used while being careful about overstimulation		1		
5.2 Contrast between the board and the back wall just appropriate		1		
5.3 Colour and lighting are considered together	0			
5.4 Colourful displays on the walls and doors		1		
5.5 Warmer tones are preferred for younger children and cooler tones for older children	0			
5.6 Physical activity areas like gyms, yoga halls, etc. are painted in cooler colours		1		
5.7 Privacy niches and other areas for withdrawal are painted in cooler colours	0			
5.8 Stage area in auditorium is in contrast with surroundings and is painted in relaxing colours like beige, peach, or pastel green	0			
Average Score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

6. Outdoor learning spaces	0	1	2	n/a
6.1 Provision of an accessible green/open space immediately outside the classroom	0			
6.2 An amphitheater readily available for outdoor plays, performances, and presentations.	0			
6.3 Provision of temporary structures and benches to facilitate outdoor classroom	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

7. Density and crowding	0	1	2	n/a
7.1 Ample space to move around in the classroom	0			
7.2 Gross Area provision per child lies between 7-10 sq.m.	0			
7.3 Children divided into smaller groups/cohorts	0			
7.4 Uncluttered rooms as well as walls		1		
7.5 No. of students per class is between 17-25	0			
Average Score (10)	1			

0 = Inadequate, 1 = Adequate, 2 = Excellent

8. Accessibility and universal design	0	1	2	n/a
8.1 Simple, clear circulation with clearly defined paths, doorways, etc.		1		
8.2 Provision of handrails as necessary and material textures considered as tactile means of way finding.	0			
8.3 Power doors to improve accessibility for all users.	0			
8.4 Provision of ramps/lifts for barrier free access	0			
8.5 "Maze" entrances to washrooms improve access for all users and reduce hygiene issues associated with door knobs/levers.		1		
8.6 Circulation routes are of appropriate width (min. 1.5m wheelchair turning diameter) and are kept clear of obstacles.	0			
8.7 Hardware and controls are located within reach of users and ensure ease of operation.	0			
8.8 Special consideration of acoustics for the visually impaired: buildings and rooms are designed to reduce echo, reverberation, and extraneous background noise.	0			
8.9 Provision of appropriate lighting (natural and artificial) for circulation. Glare is avoided though.	0			
8.10 Large flat panel light switches, which can be used with either hand, closed fist, elbow, etc. are provided.	0			
8.11 Rough or textured borders, which contrast with smooth walking surfaces and indicate a change in grade or material, are used.	0			
8.12 Door lever does not require grip strength and can be operated by a closed fist or elbow.	0			
Average Score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

9. Natural light for overall health and efficiency	0	1	2	n/a
9.1 Diffused (glare-free), usable daylight in every space where children spend long periods of time.	0			
9.2 Smaller windows at eye level are installed for views along with skylights or clerestory windows high in the wall deliver glare-free light deep into the space.	0			
9.3 Unrestricted views (when glare is not a problem) provide a perspective to ease eyestrain and bring the outside and inside worlds together.	0			
9.4 Daylight is supplemented with electric light. An acceptable design includes artificial light plus natural light from the outside.		1		
9.5 Direct view of bright light sources like the sun, a bright sky, or an electric lamp that may create glare and visual discomfort is avoided.		1		
9.6 Diffused daylight enters from multiple directions and minimizes shadows, balancing the light across the room.	0			
9.7 For every 10 square meter of classroom floor space, at least 2.5 square meter of window space is provided.	0			
9.8 Windows have some form of glare control, but are in use (when glare is not a problem), and are without painted obstructions.		1		
Average Score (10)	1.9			

0 = Inadequate, 1 = Adequate, 2 = Excellent

10. Flexible spaces to facilitate multiple modalities of learning	0	1	2	n/a
10.1 Space can be made larger/ smaller or of a varying shape with a few changes in furniture arrangement	0			
10.2 The spatial layout allows the use of multiple learning modalities	0			
10.3 Movable and flexible partitions that can be operated easily	0			
10.4 Possibility for expansion/change is present	0			
10.5 Adjustable furniture to support both technology use and writing/drawing, etc. by hand	0			
10.6 Curtains/blinds, etc. to allow the usage of projector, SMART Board®, etc.		1		
Average Score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

11. Variety of engaging spaces that initiate a state of flow	0	1	2	n/a
11.1 Engaging library with vibrant furniture, furnishings, colours, etc.	0			
11.2 Reading areas are well-lit with spaces for group work	0			
11.3 Acoustically well designed and well-lit music and dance areas		1		
Average Score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

12.Common spaces for peer/teacher interaction	0	1	2	n/a
12.1 Enough space/opportunities for 4 or more children, in more than 3 locations in visible/safe locations is provided	0			
12.2 Space for having a meal together with peers and teachers	0			
12.3 Presence of auditorium, amphitheatre, etc. in school	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Ewxcellent

13. Natural ventilation and thermal comfort	0	1	2	n/a
13.1 Passive techniques for thermal insulation in extreme climates	0			
13.2 Provision for windows at various levels to be used during varied weather conditions	0			
13.3 Less noisy mechanical systems, if any		1		
13.4 Mechanical systems with a capacity to draw significant amount of outside air into the building	0			
13.5 Use of natural airflow patterns to circulate fresh air	0			
13.6 Higher ceiling heights wherever possible	0			
Average Score (10)	0.8			

0 = Inadequate, 1 = Adequate, 2 = Excellent

14. Effective noise reduction	0	1	2	n/a
14.1 Site located in a peaceful area with low noise and air pollution	0			
14.2 Barriers and buffers are provided to counter traffic noise	0			
14.3 Landscaping is used as a dampener	0			
14.4 Toilets, storerooms, etc. are used as buffer zones	0			
14.5 Hard materials that cause echo are avoided	0			
14.6 Appropriate sound absorbing materials are used	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

15. Welcoming entry and signature elements emphasizing the cultural context	0	1	2	n/a
15.1 An inviting and highly visible entrance with well-defined architectural features, signs, lighting, artwork, landscaping, and other landmarks such as flags		1		
15.2 Scale of the entrance is not intimidating for the child		1		
15.3 Motivational signs that send positive messages and invite children to school are used	0			
15.4 Landscaping features or small play areas are visible from the entrance		1		
15.5 Covered entrance that provides shelter from bad weather and facilitates transition	0			
15.6 Safe drop off/pick up		1		
15.7 Separate access for students and visitors	0			
15.8 Signature elements emphasizing the local/cultural context	0			
Average Score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

16. Safety and security through natural surveillance	0	1	2	n/a
16.1 Centrally located administrative offices to enhance student safety		1		
16.2 Parking areas are delineated for staff and visitors	0			
16.3 Entrances and exits are easily and effectively monitored		1		
16.4 All student/pedestrian pathways are passively monitored		1		
16.5 No hiding spaces created by landscaping, fencing, etc.		1		
16.6 Separate age-level playgrounds for various age cohorts with developmentally appropriate and safe playground equipment	0			
16.7 Extensive use of windows and glazed doors to enhance natural surveillance of entrances, pathways, etc.	0			
16.8 No unattractive barriers such as barbed wire on the school grounds		1		
16.9 Toilets are attached to classrooms, if not then they have auditory connections with adjoining areas	0			
16.10 Security devices are unimposing		1		
16.11 Security system (alarms, lights, locks) provides elevated levels of security	0			
16.12 The site and learning environments are free of excessive non pedestrian traffic, hazards, and noise	0			
16.13 There are no high voltage power lines in the close proximity of the school		1		
Average Score (10)	2.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

17. Ownership/territoriality through personalisation of spaces	0	1	2	n/a
17.1 Personal workspace with lockers for each student	0			
17.2 Spaces for personal artifacts	0			
17.3 Personal storage for books, stationary, etc.	0			
17.4 Distinctive design elements and display spaces for student works	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

18. Sensory aesthetics and active design elements	0	1	2	n/a
18.1 Attractive and plenty of well-maintained landscape areas	0			
18.2 Highly articulated fenestrations for framing of views	0			
18.3 Visually pleasing staircases and other movement pathways to encourage walking	0			
18.4 Age-appropriate design of walking routes	0			
18.5 Avoidance of long narrow corridors and use of nature connected pathways instead	0			
18.6 Provision of dedicated indoor spaces for physical activities		1		
18.7 Provision of sensory gardens with various activity spaces to suit the needs of children with varied temperaments	0			
Average Score (10)	0.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

19. Self-reflection (privacy) and small group activities	0	1	2	n/a
19.1 Social spaces where a small group of children may go to be alone (i.e., reading areas, quiet places, reflection areas, listening areas, etc.)	0			
19.2 Space and furniture in classroom and other learning areas that provide 2–3 spaces for children to feel a sense of privacy and to control their interaction with others.	0			
19.3 Inviting yet supervised cave spaces where students can take a deep breath, albeit momentarily, from their hectic lives.	0			
19.4 Classrooms have clear breakout zones or breakout rooms attached to them. Breakout zones within corridors and separate from the classroom are avoided.	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

20. Use of appropriate materials and textures	0	1	2	n/a
20.1 Use of natural materials and visible details	0			
20.2 Multisensory materials are used that impart qualities like smoothness, roughness, brightness, opacity, transparency, etc. to the surfaces	0			
20.3 Use of materials that exude warmth	0			
20.4 Use of glass to connect inside to outside yet making children feel secure	0			
20.5 Overuse of cold and hard materials is avoided	0			
20.6 Use of curvilinear shapes wherever possible	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

21. Homelike environments with familiar elements	0	1	2	n/a
21.1 Soft furniture, such as a couch or large armchair	0			
21.2 Nontoxic indoor plants are used	0			
21.3 Soft and comforting elements like pillows, plants, soft furnishings to add warmth and security of being home	0			
21.4 Other decorative touches, such as area rugs or repurposed furniture	0			
21.5 Provision to hang children's artwork and their pictures on the walls		1		
21.6 Pastel paint colours with less stimulating displays (not visually overwhelming)		1		
Average Score (10)	1.7			

0 = Inadequate, 1 = Adequate, 2 = Excellent

22. Agentic learning and green/sustainable architecture	0	1	2	n/a
22.1 Spaces to learn from natural processes like sun orientation, wind flow patterns, etc.	0			
22.2 Visible energy conservation/sustainable measures like rainwater harvesting, solar panels, etc.	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

23. Biophilic design to counter nature deficit & attention restoration	0	1	2	n/a
23.1 Ample availability of green and natural spaces in the school campus	0			
23.2 Views of nature from inside of the classroom	0			
23.3 Possibility of going out in the natural environment during breaks	0			
23.4 Use of biomorphic patterns in the interior environment	0			
23.5 Views of parking lots, roads, etc. area are avoided	0			
23.6 Restorative spaces with items such as soft furnishings, plants, animals, window seat or aquarium are generously available	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

24. School pets and empathy	0	1	2	n/a
24.1 Outdoor spaces conducive for pets along with safety concerns of children	0			
24.2 Presence of farm area for children to tend to	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

25. Student participation in planning and design	0	1	2	n/a
25.1 Students maintain their own green patch	0			
25.2 Students volunteer for renovations and refurbishments in school	0			
25.3 Student participation was considered during design and planning process	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

26. Stimulating playgrounds and sense of adventure	0	1	2	n/a
26.1 Opportunities for tree climbing and innovative play with movable parts	0			
26.2Ample space for running, jumping and other age-appropriate activities		1		
26.3 Presence of safety nets and other safety measures to avoid injury	0			
26.4 Proximity of school infirmary from play areas		1		
Average Score (10)	2.5			

0 = Inadequate, 1 = Adequate, 2 = Excellent

27. School configuration and smaller learning communities	0	1	2	n/a
27.1 The school is split into small learning communities through blocks or levels	0			
27.2 Each learning community has its own open spaces and other indoor areas for socialisation	0			
27.3 Each community has sufficient transparency to allow constant passive supervision	0			
Average Score (10)	0			

0 = Inadequate, 1 = Adequate, 2 = Excellent

Total score	27/270
Percentage score	10 %

SCORE RULES

86 % - 100 %
Excellent

71 % - 85 %
Very Good

51 % - 70 %
Acceptable

31 % - 50 %
Unacceptable -- Needs Work

0 % - 30 %
Poor -- Needs Substantial Changes

Score rules and three point rating scale adapted from: The classroom rating scale in Lorraine Maxwell, "Competency in Child Care Settings: The Role of the Physical Environment," *Environment and Behavior* 20, no. 10 (2006); the EFEI (Educational Facilities Effectiveness Instrument), by FNI. © Fielding Nair International and the EDA SPACE app by Education Design International

Annexure 2

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LIST OF PUBLICATIONS

1. Research paper titled, “Design Considerations to improve the Health & Well-being of School Children” by Parul Minhas & Karamjit Singh Chahal published in research journal ‘Turkish Online Journal of Qualitative Inquiry’ Link : https://www.tojqi.net/index.php/journal/article/view/8692

2. Book chapter titled, “Salutogenic Design Guidelines for School Environment and Health Outcome” by Parul Minhas and Karamjit Singh Chahal published in ‘Ecological and Salutogenic Design for a Sustainable Healthy Global Society'. Edited by Ken Yeang and Alan Dilani. Cambridge Scholars Publishing ISBN (10): 1-5275-7992-1 ISBN (13): 978-1-5275-7992-7

   https://www.cambridgescholars.com/product/978-1-5275-7992-7

3. White paper titled, “The Design of Learning Environments to Promote Student Health & Well-being” by Parul Minhas and Prakash Nair, for the ‘Association for Learning Environments’, Arizona

   https://educationdesign.com/wp-content/uploads/2022/03/The-Design-of-Salutogenic-Learning-Environments-A4LE-Final.pdf

4. Magazine article titled, “Designing Schools that Promote Student Health and Well-Being” by Parul Minhas and Prakash Nair, published in Learning By Design Summer 2022

   https://pubs.royle.com/publication/?i=749464