UNESCO

UNESCO INSTITUTE for STATISTICS

United Nations Educational, Scientific and Cultural Organization

A PLACE TO LEARN:
Lessons from Research on Learning Environments

A PLACE TO LEARN: LESSONS FROM RESEARCH ON LEARNING ENVIRONMENTS

UNESCO

United Nations
Educational, Scientific and
Cultural Organization

UNESCO
INSTITUTE
for
STATISTICS

UNESCO

The constitution of the United Nations Educational, Scientific and Cultural Organization (UNESCO) was adopted by 20 countries at the London Conference in November 1945 and entered into effect on 4 November 1946. The Organization currently has 195 Member States and 8 Associate Members.

The main objective of UNESCO is to contribute to peace and security in the world by promoting collaboration among nations through education, science, culture and communication in order to foster universal respect for justice, the rule of law, and the human rights and fundamental freedoms that are affirmed for the peoples of the world, without distinction of race, sex, language or religion, by the Charter of the United Nations.

To fulfil its mandate, UNESCO performs five principal functions: 1) prospective studies on education, science, culture and communication for tomorrow's world; 2) the advancement, transfer and sharing of knowledge through research, training and teaching activities; 3) standard-setting actions for the preparation and adoption of internal instruments and statutory recommendations; 4) expertise through technical co-operation to Member States for their development policies and projects; and 5) the exchange of specialized information.

UNESCO is headquartered in Paris, France.

UNESCO Institute for Statistics

The UNESCO Institute for Statistics (UIS) is the statistical office of UNESCO and is the UN depository for global statistics in the fields of education, science and technology, culture and communication.

The UIS was established in 1999. It was created to improve UNESCO's statistical programme and to develop and deliver the timely, accurate and policy-relevant statistics needed in today's increasingly complex and rapidly changing social, political and economic environments.

The UIS is based in Montreal, Canada.

Acknowledgements

Table of contents

List of figures, boxes and tables

Executive summary

This report was originally drafted as part of an activity undertaken by the UNESCO Institute for Statistics for the purpose of informing the international education community on new pathways for assessing and improving the quality of learning environments. More specifically, the terms of reference for this study called for i) an overview of existing research on the conditions of learning from the major perspectives; and ii) identification of the links and common ground among those perspectives.

In its final version, 'A Place to Learn' presents a comprehensive review of research on learning environments from multiple perspectives, broadly grouped as those that focus on the physical conditions, psychosocial environment and/or organizational climate of classrooms, schools and other learning spaces. Beginning with a sampling of the wide spectrum of paradigms currently used to approach these dimensions, the review purposefully steps back to consider their common theoretical roots. In-depth descriptions of selected state-of-the-art research methods and tools are then provided along with numerous examples of their application in different parts of the world. The general conclusions and recommendations offered in light of the collected findings are intended to assist learning communities, particularly those in countries with limited resources, with a practical framework for creating and sustaining safe, healthy, equitable and inclusive environments that foster effective learning.

The selection of background sources and recent research on learning environments was guided by a simple question:

How can schools and other learning places
create optimal conditions for learning?

The preliminary search covered both primary and secondary sources on the theoretical underpinnings of current research paradigms and identification of studies representing the major approaches. In the end, from the over 300 sources reviewed during the preliminary search, 91 background references and 58 studies were selected from such diverse disciplines as educational philosophy, cognitive psychology, evolutionary biology and architecture. The majority of the case studies illustrating the use of methods and tools for assessing and improving learning conditions are grounded in the rapidly evolving field of learning environments research (LER). In addition, large-scale studies involving elements of isolated elements of learning environments as well as insights from ideological, ethnographic and indigenous research are also included in the review. Although the bulk of the sources cited and examples identified for close examination were drawn from the literature available in English, a number of studies available exclusively in French, Spanish, and Portuguese were also included in the review. Priority was given to published studies carried out in non-Western contexts, where available.

As a means of organizing and consolidating the vast array of evidence gathered from these collected sources, the report is structured around three interrelated lines of inquiry:

- What are the major theoretical roots that have given rise to current approaches to the study of learning environments?
- How are 'learning environments' and 'enabling conditions for learning' understood and assessed within the international framework of quality education for all?
- How can the quality of learning environments be measured and improved?

In response, 'A Place to Learn' reaches the following general conclusions:

- Assumptions and beliefs about the nature and impact of learning environments are as old as human civilization. The written historical record yields a rich variety of perspectives which, considered collectively as the antecedents to scientifically based theoretical insights, form a strong foundation for current approaches to the study of learning conditions.
- The essential features of learning environments perceived as essential to reaching the goal of quality education for all are well defined within the EFA literature. However, robust strategies for assessing and improving them at national and local levels are rarely found outside of the developed world.
- Researchers from a wide variety of academic disciplines have contributed to a rapidly expanding pool of expertise, including well-crafted methods and tools, on how learning environments can be measured and improved. However, the application of these in countries with limited resources and weak learning achievement records has been painfully slow.

In view of the compiled findings, this report urges policy-makers, researchers, architects, interior designers, teachers, parents, learners and community members to combine their expertise to create and sustain conditions that assure every learner's right to a quality education. Finally, ten recommendations are proposed for consideration by everyone concerned assessing and improving learning environments, but especially by stakeholders in parts of the world where the most basic requirements for safe, healthy, equitable and inclusive conditions of learning are not currently being met.

Introduction

In brief, the environment consists of those conditions that promote, or hinder, stimulate or inhibit, the characteristic activities of a living being.
—John Dewey

In the race to achieve Education for All (EFA) goals by 2015, the importance of creating optimal conditions to enable and sustain learning has sometimes been overlooked as a 'peripheral' factor in the provision of quality education. However, a rapidly expanding body of research on the conditions of learning suggests that physical, social and organizational environments in which teaching and learning processes take place have a more central role than previously acknowledged. As the evidence gathered for this report asserts, the design and management of learning spaces is fundamental to the achievement of positive learning outcomes as well as to the health and well-being of learners. Simply put, good learning environments foster quality learning, and bad learning environments do not.

This exhaustive review of the literature on learning environments aims to provide all those who wish to fulfil the promise of EFA with evidence-based suggestions for creating and sustaining 'good' learning environments. Whether applied to formal schooling, alternative learning, or non-formal education contexts, the reflections and findings contained herein offer a rich and varied knowledge base for policy makers, educators and communities to develop strengthened policies and actions that meet local needs in the creation and maintenance of enabling places to learn.

Background

In today's world, education systems must constantly evolve in order to effectively respond to the rapidly changing demands of the societies they serve. Innovations in curricula, methodologies, materials and technologies may require major changes in the design and organization of the environments in which they are housed. Innovations can be relatively simple and inexpensive, such as re-arranging schedules and seating patterns to allow additional time and space for guided group practice or collaborative problem solving. In a school garden environment, community members skilled in traditional methods can be invited to participate as mentors and teachers at a relatively minimal cost. In another example, teachers, school managers, parents and learners may respond to the increasing occurrence of verbal abuse and physical violence by collaborating to develop a viable policy for constructive school discipline. In yet another, university researchers can engage with teachers to design assessment tools to measure learners' perceptions of teacher and peer stereotyping based on gender, ethnicity or economic status in their classrooms and schools.

To reach a common understanding of how both the physical and social dimensions of learning environments affect the quality of learning processes, an exploration of the relationship between place and process is needed. To understand this relationship, the following questions must be answered: How does one define 'a place to learn'? Why is it that children learn more effectively when there is a clear connection between the place of learning and the world in which they live? How can the different elements of learning environments be assessed in relation to local, national and international definitions of quality?

On a broader scale, educational systems undergoing reconstruction or reform may opt to undertake a radically different approach to the way schools are designed, managed and resourced in support of new visions and goals. Other systems may focus on achieving a more equitable distribution of resources in the wake of reports pinpointing clear discrepancies in the provision of basic facilities

and services, such as access to drinking water and toilets. In either case, the effectiveness of an intervention or on-going change can only be sustained if it is subject to a process of assessment, reflection and incremental improvement. Thus, this review aims to raise awareness of the complete range of possible tools and methods to measure and improve places to learn. To further inspire and motivate those responsible for bringing learning environments to life, it also covers a wide range of research on innovations at various stages of planning and implementation.

Purpose of the review

The original purpose of this review was to inform the discussions of the UNESCO 'Learning Counts' International Working Group on Assessing and Improving the Quality of Education (IWG) by providing a report on the vast and diverse body of literature on how learning environments and corresponding conditions for learning are conceptualized, implemented and assessed. At the outset, the IWG agreed to the following set of questions as a means of organizing the review and its findings:

- What are the major theoretical roots that have given rise to current approaches to the study of learning environments?
- How are 'learning environments' and 'enabling conditions for learning' understood and assessed in the international framework of quality education for all?
- How can the quality of learning environments be measured and improved?

To address the first question, the review covers historical perspectives and themes frequently referenced as background to the more recent body of evidence-based research on learning environments. In response to the second, the review presents an extensive overview of current approaches to LER and several of its antecedents. In view of its potential application in developing countries, emphasis has been placed on approaches to assess the quality of learning environments in the global framework of EFA. To provide a more complete response to the second question, this paper also seeks to provide evidence for the ever-expanding common ground between learning environments research (LER), school effectiveness research (SER) and assessments of quality education for all. In response to the third question, numerous examples of tools and processes to assess learning environments are listed together with a cumulative set of suggestions for core variables to measure and improve the conditions essential to quality learning.

Links to international definitions of quality

The *Dakar Framework for Action* explicitly articulates the quality of education as Goal #6 of Education for All:

> "Improving every aspect of the quality of education and ensuring their excellence so that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy and essential life skills."

Important aspects of quality education are also embedded in each of the other five goals, including special attention to girls' educational success and assuring access to quality education by groups and individuals who have previously been excluded from schools.

For some learners, the road to academic achievement is strewn with obstacles in the form of environments that instil fear of daily violence or verbal abuse, lack access to water, food or toilets – this includes environments where learners may be confined for hours in a noisy, poorly ventilated, crowded classroom with virtually no learning resources or stimulating activities. The barriers to

learning are even greater for those who are denied equal opportunities to learn based solely on their race, age or gender. Yet, such 'disabling conditions' are common in the public education systems of many of the world's poorest countries as well as in less privileged areas (both urban and rural) of some of the world's wealthiest. Recognizing the importance of the learning environment in facilitating quality learning, the *Dakar Framework for Action* (Strategy 8) calls upon 'all stakeholders – teachers, students, parents, community members, health workers and local government officials to work together to develop environments conducive to learning.'[1]

There are a few key principles that recur throughout the *World Declaration on Education for All*, the *Dakar Framework for Action* and numerous other declarations, reports and documents produced by UNESCO and other international organizations concerned with improving the quality of education. Of these common principles, the four most prominent are: *safety, health, equity* and *inclusion*, each of which describes an essential feature of a quality learning environment. Layered upon these fundamental principles, the meta-view of enabling learning environments – produced by a combination of learning theory and contemporary evidence-based studies – points to a trio of common themes. These are *effectiveness*, *connectedness* and *cohesiveness*, which describe the characteristics necessary to sustain effective learning processes.

Together, these seven elements figure prominently in the organizational and academic research literature[2] on learning environments worldwide *(see **Figure 1**)*. As such, they may be viewed as essential components of a generic framework to measure and improve conditions for learning, whether in isolation, as clusters of interrelated variables or as an aggregated whole.

Figure 1. Key features of enabling learning environments
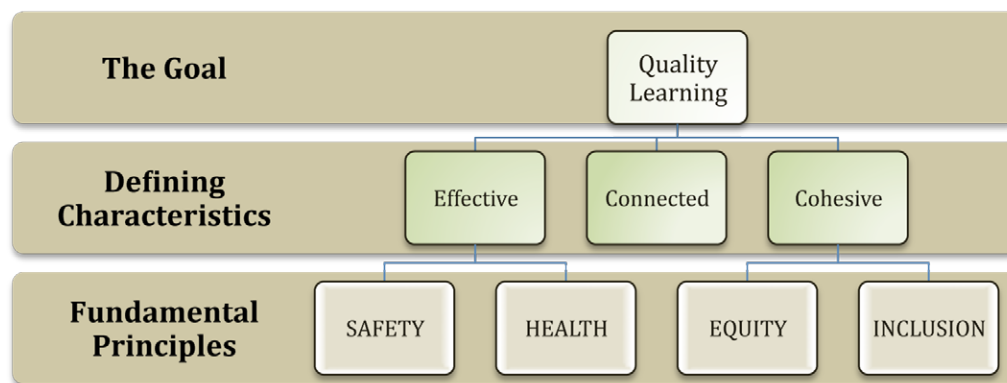
As a specialized field, LER takes the position that the creation and maintenance of enabling conditions for learning is both a means and an end. All the components that are essential to the quality of the outcome are interdependent and all are measurable using different sets of tools. Teaching and learning processes are shaped by their physical, social and organizational environment, and the design of learning environments is, in turn, influenced by the processes that take place within them. Both are important to measure and to continuously adjust in order to improve the quality of education.

---

1   See Box 5 for the complete text of Strategy 8.
2   Even though they often overlap and are subject to different interpretations, these broad concepts are the most frequently referred to throughout the literature as the essential components of quality learning environments. Both tangible and intangible elements related to these themes are identified as variables that can be assessed and improved.

Boundaries and limitations

This report aims to guide the reader through the diverse concepts, perspectives and empirical evidence available on learning environments. A wealth of information on, if not definitive solutions to, the three main study themes (achieving effective, connected and cohesive learning) are revealed through the use of examples. However, literature reviews are sometimes best defined by what they do not cover. In this case, documents and other resources were selected based on their relevance to the overall purpose of the study, their internal validity and reproducibility and their perceived pertinence to the activities of the UNESCO 'Learning Counts' International Working Group on Assessing and Improving the Quality of Education. Studies focusing mainly on teacher qualifications, methodologies and curriculum content were not considered germane to the purpose of this study. Several large scale cross-national studies on the overall quality of education were reviewed in developing countries and were scanned for specific elements concerned with assessing and improving learning environments, leaving the bulk of their components on the periphery of this review. Surveys focusing mainly on socioeconomic and other factors external to the immediate learning environment of a school or programme were also considered outside the scope of this review. Research on learning environments in higher education, particularly those involving sophisticated and expensive technologies, were also excluded in this paper to maintain focus primarily on learning environments for basic formal education in developing countries with limited resources.

Terminology and definitions

In the research literature as well as in the current international discourse on learning environments, there is considerable confusion over the terms 'conditions of learning,' 'learning environments,' 'school/classroom climate' and 'school classroom culture'. This lack of clarity arises from the imprecise ways these terms are used both within and across disciplines, and is further muddled in popular literature. To complicate matters, each term has historical and cultural referents that are often inadvertently lost in translation across languages, cultures and organizational jargon. For consistency and clarity, the key terms used in this review will be defined as follows (as per recent academic literature):

- *Learning environment* – the complete physical, social and pedagogical context in which learning is intended to occur. The term most often refers to school classrooms but may include any designated place of learning such as science laboratories, distance learning contexts, libraries, tutoring centres, teachers' lounges, gymnasiums and non-formal learning spaces. The components and attributes of a learning environment are conceptualized in relation to their impact on learning processes and outcomes in both cognitive and affective domains.[3] This term may also refer to the natural environment surrounding school buildings[4] when they are used as a learning space.

- *Conditions of learning* – factors embedded in the shared physical and social learning environment of the school or classroom that influence learning processes. These include (but are not limited to) health and safety features, social and pedagogical interactions, time limitations and sequencing of learning events, space, furniture, light, sound, temperature and access to learning resources. The term may also refer to the state of mental receptivity to learning (e.g. physical, emotional and cognitive readiness of an individual bodybrain[5] to embark on a new learning task).

---

3 Adapted from the interpretation offered in the general description of *Learning Environments Research: An International Journal* (2000-present).

4 For example, service learning, oral histories, field trips and science projects involving the use of the natural environment.

5 The term *bodybrain* was coined by Robert Sylwester (2003) to emphasize the point that 'biology no longer supports the notion of a body-brain separation,' reinforcing the notion that the educational environments must be designed in ways that educate the 'whole child.'

- *School (or classroom) climate* – the general atmosphere of a learning space, incorporating multiple dimensions of organizational, social, emotional, structural and linguistic elements that can be measured in terms of how well they support learning.
- *School (or classroom) culture* – the values, symbols, languages, communication and behavioural codes shared by a learning group. School and classroom cultures are by nature representative of the cultural fabric of the surrounding community.
- *Organizational climate (of schools)* – the collective perceptions of the characteristics and practices of learning organizations held by the people who work and learn in them.

The boundaries between these concepts are often blurred both within and across the studies reviewed here. One branch of research, for example, is only concerned with what is defined above as the 'classroom climate' but peripherally, it may examine elements of organizational climate and culture. Other studies, especially in behavioural psychology, focus exclusively on the 'conditions of learning' as mental states of readiness to receive and process new information. In more recent studies, particularly in the past 10 years, the concept of 'learning environments' has been approached more holistically and is often used interchangeably with 'conditions of learning' in the organizational literature to describe the totality of factors that influence learning processes.

Structure of the report

The first section (*Current Approaches and Their Theoretical Roots*) begins with a preview of three very different approaches to LER in response to local efforts to improving educational quality in varied international settings. These snapshots, which are intended to illustrate the diversity of research objectives, goals and methodologies, are followed by a sampling of some their common theoretical roots. Section 2 (*Lessons from the Field*) explores a wider range of current research on examining, assessing and improving learning environments. Section 3 (*Methods and Tools*) focuses on several state-of-the-art approaches and tools for measuring and improving learning environments. Section 4 (*Conclusions and Recommendations*) reflects on the connections and common ground among the different research streams and the evidence they have brought to light on the nature and importance of learning environments. Finally, 10 recommendations are offered with the intention of assisting all those concerned with a practical set of ideas for assessing and improving learning environments.

1. Theoretical roots

*In schools, let the pupils learn to write by writing, to speak by
speaking, to sing by singing, to reason by reasoning, etc., so that
schools may simply be workshops in which work is done eagerly.*
—Comenius

What makes a place to learn a good one? Why is this an important question? The seminal ideas of such luminaries such as Confucius (551-479 B.C.E.), Plato (427-347 B.C.E), St. Augustine (354-440), Jon Amos Comenius (1592-1650), Jean-Jacques Rousseau (1712-1728) and John Dewey (1859-1952) have had a role in shaping the way modern researchers have gone about finding the answers. Globalization and rapid advances in information technologies have also sparked a major shift in the way these age-old questions are explored. In place of speculation based mainly on personal observation and anecdotal evidence, modern science demands that generalizations on how and where we learn are backed by empirical evidence using valid, reliable tools. In the past two decades, startling developments in the field of neuroscience have also shed new light on earlier conclusions on the biological and cultural dimensions of learning. In some cases, these insights into how the brain functions along with the growing body of evidence on how physical conditions and social interrelationships affect learning have sparked new perspectives on conclusions reached by much earlier theorists.

The development of ever more sophisticated technologies for gathering and analysing evidence has enabled researchers from specialized disciplines (i.e. psychology, sociology, anthropology, architecture, economics and instructional technology, among others) to broaden their perspectives. Educational research has since developed into a field of study with its own set of methods and tools, and its scope of inquiry has extended to cross-cultural and international development contexts. As such, the challenge of identifying and prioritizing optimal conditions for learning has evolved into an even wider range of approaches. The first part of this Section (1.1) introduces three typical approaches to learning environment research (LER) in different parts of the world. Following this preview, a broader and deeper discussion of the major perspectives framing the international discourse on LER (1.3, 1.4) seeks to uncover some of their common theoretical roots.

1.1 Approaches to assessing learning environments: Three recent examples

Three recent studies carried out in very different contexts and using distinctively different methodologies illustrate the wide range of approaches to research on learning environments. The first example, 'Assessment of Free Primary Education (FPE) in Kenya', is a large-scale study in which the assessment of learning environments comprises a significant component. The aim of the second project 'Study of Conditions for Early Childhood Education in Northwest Spain' was to establish correlations between the physical conditions of schools and children's health in order to influence national regulatory frameworks to establish minimum standards. In the third example, researchers in Singapore used two standard tools from LER to measure children's perceptions of their learning environments. They then correlated the results of these measures with the children's cognitive and affective learning outcomes. Each case reflects a different perspective on the nature of the learning environment as well as on the dimension of the environment selected for study. However, all three studies respond in their different ways to the general question of how schools and other learning spaces can create and sustain optimal conditions for learning.

1.1.1 Assessment of Free Primary Education (FPE) in Kenya

> *Lessons conducted under trees are subject to weather conditions.*
> —UNESCO Nairobi Office and MOEST of the Republic of Kenya

In 2004, as a follow-up to the implementation of free primary education (FPE) in Kenya, the Ministry of Education and Science (MOEST)[6] undertook an ambitious assessment of the initial results of Kenya's FPE initiative and to use the findings to address emerging challenges. The study sample consisted of 162 randomly selected schools in districts within five (of seven) provinces, and targeted several groups of stakeholders within the schools, including pupils (Grades 4-8), teachers, parents and members of the school committees.

The field research was carried out by some 60 research assistants trained by UNESCO and MOEST to use a mix of qualitative and quantitative methods for gathering and recording data in a systematic way. The research design entailed collecting and analysing gender and age-specific enrolment data for each district, including new admissions, repetition and drop-out data on the number and ratio of teachers in the sample districts. Additionally, the researchers used checklists and field notes to record their observations on the status of school facilities, school compounds and physical conditions of classrooms. Classroom observations included walls, roofing, window lighting, ventilation and acoustics as well as the condition of furniture, chalkboards and visual aids. Focus group discussions that were conducted among learners, teachers, parents and school committee members tended to centre on issues of affordability and quality – in particular, the problems caused by overcrowding, mixed age groups and poor facilities. The report (2005) paints a bleak picture of primary schooling within the sampled districts. The stark narrative is interlaced with quotations from the focus groups and photographs showing dilapidated buildings, learning spaces with no place to sit or write, makeshift classrooms and open air latrines.

In its long list of recommendations, the report prioritizes not only the recruitment of more teachers to match the burgeoning enrolments, but also on-going support for existing school staff to manage over-age pupils and those with special needs. In-service courses to train teachers on 'new ways of instilling discipline without using the cane' (p. 72) are also recommended. The study also calls upon the government to assist in improving the physical conditions of schools at the most basic level through the provision of clean water and separate toilet facilities for boys and girls.

1.1.2 Study of conditions for early childhood education in northwest Spain

> *Children in nursery education lack basic grammar and syntax skills and therefore do not possess the resources needed to recognize words or expressions they fail to perceive due to sound interference.*
> — Julia Comesaña & Maragita Juste

This exploratory study (Comesaña and Juste, 2007) sought to establish how certain factors affect the physical and emotional health of pre-school children aged 4-6 years. The university-based research team combined expertise in school architecture, early childhood education, psychology and public health to support the theory that the design and physical features of school buildings are linked to health and, therefore, to successful learning (Hall, 1970; Proshansky et al, 1978). The definition of

---

6 With technical assistance from the UNESCO Nairobi Office.

the school environment referenced by the authors is 'the school building, with all its spaces and its indoor and outdoor facilities, placed in a given social and environmental context, either urban or rural' (Pol and Molares, 1991).

As a starting point, the team identified variables (e.g. light and ventilation, colour, sound, temperature and safety) to be analysed and measured against the minimum standards for each of these factors established by current government regulations. The sample population consisted of 83 teachers and 21 headmasters from 23 schools in the Autonomous Region of Galicia, Spain. Data collection instruments included observation, photographic records, audio recordings, document analysis, questionnaires and field notebooks.

The use of mixed methods yielded a wealth of 'insider-generated' information. As a final recommendation, the researchers proposed using this collection of endogenous knowledge to launch additional lines of action to supplement the official minimum standards for the physical conditions of schools in Spain *(see **Annex II**)*. For example, teachers were adamant about the need for young children to have a quiet place to rest and sleep – a point that was not addressed originally in the development of the government regulations. The study also revealed that 'more attention should be paid to outdoor facilities and the attempt to integrate nature, humanize schools and integrate pupils and teachers into safe and harmonious learning communities (Comesaña and Juste, 2007, p. 215).

1.1.3 Psychosocial climate and learning outcomes in Singapore

> *A striking feature of the field of Learning Environments Research is the availability of a variety of economical, valid and widely-applicable questionnaires that have been developed and used for assessing students' perceptions of classroom environment.*
> —Barry J. Fraser

This ground-breaking study was among the first to explore learner perceptions of the psychosocial dimensions of classroom environments at the primary level (Grade 5). The researchers (Goh and Fraser, 1998, 2000) used two instruments – the My Class Inventory (MCI) and the Questionnaire on Teacher Interaction (QTI-primary version) – to explore the relationship between two aspects of the learning environment and children's learning outcomes in both cognitive and affective domains. The investigation was carried out using a random sample of 1,512 students in 13 co-educational government schools in Singapore. The QTI-primary was adapted from the original QTI developed by Wubbels and Levy (1993) in the Netherlands. In the Singapore study, the tool was used to measure interpersonal teacher behaviour based on seven 'dimensions of leadership' (Goh, 2000, pp. 203-204): helping/friendly, understanding, student responsibility/freedom, uncertain, dissatisfied, admonishing and strict. The MCI is a simplified version of the Learning Environments Inventory (LEI) developed by Walberg and Anderson (1968) to measure learners' perceptions of the classroom climate. The MCI required elementary school students to respond with a simple 'yes' or 'no' to such statements as:

- Students are always fighting with each other.
- In my class, everyone is my friend.
- Some students are not happy in this class.
- In our class, work is hard to do.
- Most students can do their schoolwork without help.
- This class is fun.[7]

---

7   Full English version of the MCI and instructions for calculating scores can be viewed at www.routledge.com/textbooks/TeachingScience/inventory.pdf

Learning achievement by participating students in the Singapore study was measured using a specially designed mathematics assessment and the Liking Mathematics Scale (LMS) – a widely used tool originally developed in the United States to measure attitudes toward the subject and its related terms, symbols and routines (Aiken, 1972).

To analyse environment-outcome associations, simple, multiple and canonical correlation analyses and multilevel analyses were conducted using two units of analysis – the individual student and the class mean (Goh and Fraser, 1998, p. 199). To analyse gender differences, multivariate analyses of variance for repeated measures were performed for the two outcome measures and the classroom environment scales (QTI and MCI).

The data analyses yielded consistent associations between positive perceptions of the classroom environment and learning outcomes. Simply stated, this evidence supports the view that learners do better if they like their teachers and perceive their social climate as a place with a high degree of cohesion and little friction (Goh, 2000, p. 204). Results of the study further confirm that teachers are both more likeable and effective at producing improved learning outcomes if they are friendly, helpful and understanding.

1.2   Reflection on the three studies

The Kenyan study illustrates how LER is often buried within a wider research agenda in national and cross-national assessments of educational quality. In this case, it forms one component of an overall assessment of the impact of implementing a large system-wide structural change. In the Spanish case study, the object under investigation was more narrowly focused on the physical features of learning environments that may be deemed less critical to the enhancement of learning than the more basic physical conditions identified in the Kenyan study. The Spanish study also differs in its scope and sample size. Nonetheless, both studies bear some similarity – they seek to use information collected from individuals and groups from within the learning environment to influence educational policy. While the Kenyan researchers directly address policy-makers by calling for specific and urgent improvements, the Spanish researchers hope to supplement the official government standards with practical guidelines based on 'insider' knowledge of early childhood learning processes and the interactions between the children, their teachers and the learning environment. In the third example, the researchers of the Singapore study did not seek to reform or assess a system-wide policy, but rather they sought to inform other researchers, teachers and administrators on the importance of creating a positive classroom climate and to validate the tools for doing so in the process.

Despite their differences in approach, methodology and purpose, there are several points at which the three studies converge. First, all three studies affirm that the quality of both the learning experience and levels of learning achievement are strongly influenced by the school and classroom environment. Second, the conceptual frameworks on which these studies are based further assume that the learning environment consists of a complex web of factors (physical, psychosocial and others) that shape the overall conditions for learning. Such assumptions are rooted in the theory of socially situated cognition, which asserts that there is a reciprocal causation among cognitive, behavioural and environmental factors that guides learning processes (Bandura, 1986; Bruner, 1996; Janosz, 1998; Levine, Resnick and Higgins, 1993). Third, all three studies are oriented toward gaining information on learning environments and learning conditions from internal perspectives (i.e. from those closest to the action) – teachers, principals, parents and in two of the examples, from the learners themselves. Finally, the combined use of qualitative instruments (e.g. structured or semi-structured interviews, focus group discussions and field notes) in combination with quantitative data collection methods represents a growing trend in educational research to make

use of complementary methodologies in search of deeper contextual understanding and more thoughtfully-designed recommendations.

1.3   Major perspectives framing the current international discourse

A wealth of old and new knowledge on how environmental factors influence learning is widely available, but obstacles to seeing the 'whole picture' remain. It is rare, for example, for specialists in educational psychology to share their views on learning environments with architects or experts in educational management. However, innovative researchers have frequently stepped across such boundaries and drawn from each other's findings, producing new hybrid approaches and tools. For example, Jerome Bruner (1996) traced the evolution of the study of the mind by emphasizing the different contexts of its role as information processor, instrumental actor and biological organ. He notes that how we perceive the mind influences how we understand its interactions with the environment. As a result, Bruner concluded that to truly understand this relationship and apply it to education, knowledge from the fields of biology, anthropology and psychology must be more freely exchanged.

Overall, perspectives framing the current international discourse can be grouped into three major categories: i) approaches that reflect a shift from the epistemological seeds embedded in cultural, philosophical and religious traditions toward evidence-based theories of learning; ii) conceptual frameworks grounded in ideologically-driven critiques of educational systems and the societies that support them; and iii) practical perspectives, which seek to improve efficiency without necessarily advocating fundamental systemic change.

1.3.1 Philosophical perspectives

Surely there are people who achieve things without knowledge, but I, for my part, lack this characteristic.

—Confucius

Throughout recorded history, numerous clues point to what may have been considered optimal conditions for learning in the world's great religious and philosophic traditions. While there are far too many examples to be described individually in this review, several of those with clear links to current approaches are summarized below.

In the *Analects* of Confucius (551-479 B.C.E.), there are repeated references to the importance of cultivating a 'fondness' or love for learning as a primary condition for success in life. Today, this might be interpreted as the necessity for a positive attitude to achieve measurable learning outcomes. Regarding the physical aspects of learning environments, the Buddhist *Vinaya*[8] lays down the exact specifications for rooms in which religious teachings are to be conducted. The history of Islamic education refers to the establishment of the *kuttab* (pl. *katatib*) – places for the purpose of basic religious instruction that are frequently attached to a mosque or situated above a fountain. By the mid-eighth century, *katatib* were the primary places for literacy acquisition as well as religious schooling and could be found in virtually every part of the Islamic empire (Al-Attas, 1979).

---

8   The date of the original writing of the collection of texts known as the Vinaya is unknown, but it is thought that the disciples of the Buddha passed them down orally through several generations before they were recorded in Sanskrit and Pali.

Pedagogical methods associated with modern social theories of learning (including physical environments) have early roots in religious educational traditions. In the first known treatise on learner-centred methodologies in formal education, St. Augustine (354-440) in his essay 'On the Teacher' proposed the radical idea that no human teacher has the capacity to convey knowledge through the use of words (Matthews, 2003, p. 50). Instead, what teachers could do is put learners in situations where they can 'come to know' or become illuminated through their own faculties of intelligence.

Over a thousand years later, the Czech philosopher Jan Amos Comenius (1592-1650) produced *The Great Didactic*, in which he proposed an a priori science of education. In his review of this work, Jean Piaget[9] noted that Comenius regarded education as 'a process affecting man's whole life and the countless social adjustments he must make' (p. 2). Comenius promoted learning as a lifelong activity and also advocated active learning as 'the only way in which truth is established' (p. 7). In terms of the conditions for learning, Comenius established three rules *(see Box 1)* for the 'spontaneous development' of children, which Piaget suggests should be 'written in gold on the door of every modern school – so applicable are they still, and unfortunately, so seldom applied.' (Piaget, 1993, p. 5).

Box 1. Comenius' conditions for facilitating teaching and study

Comenius believed that optimal learning will occur if:

1. Class instruction is curtailed as much as possible, namely to four hours, and if the same length of time be left for private study.

2. The pupil is forced to memorize as little as possible, that is to say, only the most important things; as for the rest, they need only grasp the general meaning.

3. Everything is arranged to suit the capacity of the pupil, which increases naturally with study and age.

Note: Reference is made elsewhere in the article (p. 6) to Comenius' reflections on the needs for the necessary classroom equipment (books, pictures, specimens, models, etc.).

Source: Piaget, 1993, p. 5.

Many other dimensions of Comenius' work foreshadowed modern educational theory and practice, including his advocacy of active learning, which asserted that children acquire concepts through a process of discovery rather than receiving them from teachers or textbooks. He also opposed the practice of corporal punishment as a means of maintaining discipline.

Jean-Jacques Rousseau (1712-1778) – known best for his political philosophy – was harshly critical of established contemporary education practices, which he considered destructive to children's natural inquisitiveness and playful spontaneity. In *Emile*, Rousseau's major treatise on education,[10] he challenged the emphasis given to literacy in early primary schooling, arguing forcefully that direct experience in nature is by far the better teacher until children reach adolescence. Rousseau contended that skills for reading should be developed only when the child is ready and interested in developing them:

---

9 Published by UNESCO-IBE in Prospects, vol. 23, no. 2-2 (1993)

10 At the time Rousseau wrote *Emile*, he was living among people of wealth and rank who could afford to have their children tutored at home. The treatise was originally written as advice to his patroness, who was concerned about the education of her son.

Reading is the greatest plague of childhood. Emile at the age of twelve will scarcely know what a book is. But at least, I will be told, he must be able to read. I agree. He must be able to read when he needs to read. Before that, it will only be a bother to him. (Rousseau, 1762, trans. Bloom, 1979, p. 219)

According to Rousseau, the role of the teacher is to guide children through the phases of natural development using games and reflections on their interactions with the natural environment rather than to drill them in skills for decoding books and memorizing facts. In this way, and only in this way, would they be able to reach their full potential as autonomous adults capable of participating in Rousseau's vision of 'the good society.'

Rousseau's major impact on 21st century educational thinking lies in his insistence on a 'child-centred' learning environment in which the teacher or tutor acts mainly as a consultant and guide. In a similar vein, John Dewey (1859-1952) saw experience as the primary source of learning, asserting that 'we can never educate directly, but indirectly by means of the environment' (Dewey, p. 391). In *Schools of Tomorrow*, John and Evelyn Dewey expressed their deep dissatisfaction with conventional schooling, claiming that its main function was to 'train children to docility and obedience, to the careful performance of imposed tasks because they are imposed, regardless of where they lead' – a purpose suited only to autocratic societies (Dewey and Dewey, 1915, p. 303).

Unlike Rousseau who saw learning as an individual matter, Dewey stressed the importance of social groups and communication in facilitating acts of learning:

"The experience has to be formulated in order to be communicated. To formulate requires getting outside of it, seeing it as another would see it, considering what points of contact it has with the life of another so that it may be got into such form that he can appreciate its meaning." (ibid, p. 383)

These essential interactions were, in Dewey's view, the foundation for all learning, whether formal, non-formal, or informal. Like Comenius and Rousseau, Dewey was concerned with both the process and quality of teaching and learning interactions in light of their intended outcomes. Simply stated, the purpose of schooling should be to prepare children for the life they are to lead in the world (Dewey and Dewey, 1915, p. 303). Education systems should, therefore, endeavour to establish autonomous, intelligent environments that are expressly designed to influence the cognitive and moral development of children – in Dewey's words, 'a purified medium of action' (op. cit., p. 392) free of the negative elements of the broader society and therefore capable of becoming a laboratory for social transformation.

1.3.2 Evidence-based theories

Science is imagination in search of the verifiable truth.
— Gerald Edelman

Formal research on the psychological processes involved in learning has focussed more narrowly on how to enhance these internal processes through the use of certain techniques, instruments or adjustments to mediating elements. Prescriptions for optimal learning environments grounded in this type of research tend to identify such elements, such as the presence of stimulating materials and learning events that motivate and guide learning processes.

In a clear departure from the views of Rousseau and Dewey, psychologists in the behaviourist tradition believed that learning could be explained entirely in terms of observable behaviours. Edward Thorndike's *Fundamentals of Learning* (1927) established the theory of connectionism, which posits that learning is the result of association between stimuli and responses. In practical classroom applications, learners require stimuli, practice and rewards. Intelligence is a function of the number of connections learned through these sequences. Using this equation, optimal conditions for learning are those that encourage practice, reward positive behaviours and help learners make connections with prior knowledge. B.F. Skinner, building on the work of Thorndike, developed the well-known theory of 'operant conditioning', which holds that the behaviour of an organism is conditioned by the types of stimuli it encounters in its immediate surroundings (Skinner, 1938).

Box 2. Teaching principles based on operant conditioning theory

B.F. Skinner suggested that any age-appropriate skill can be taught using these five principles:

1. Give the learner immediate feedback.
2. Break down the task into small steps.
3. Repeat the directions as many times as possible.
4. Work from the simplest to the most complex tasks.
5. Give positive reinforcement.

Source: Skinner, 1938.

In this scenario, it is the teacher's responsibility to create these pedagogical conditions through specific actions (i.e. immediate feedback, small 'chunks' of content, repetition, sequencing and positive reinforcement). Another widely influential[11] and more elaborate theory that stems from laboratory-based experimental research introduced a distinction between internal and external conditions (Gagne, 1965). Internal conditions referred to mental states such as attention, motivation and recall. External conditions, in Gagne's view, could be thought of as factors surrounding and supporting a learner's behaviour.

Successive waves of experimental research rejected the behaviourist claim that learning is purely a process of stimulus and response and that it can be facilitated in all contexts using a prefabricated and mechanistic recipe. However, elements of behaviourist thought have continued to influence emerging theories of learning as well as the adjoining notions on the nature and quality of learning environments they have spawned. At the same time, views on how people learn stemming from outside Western European and North American scholarly traditions have started to enter the mainstream and draw from one another internationally. For example, John Dewey (1859-1952) lectured in universities in Japan and China, studied the Turkish school system and travelled to Russia to study the system there as well. Shortly after Dewey's death, his 'progressive education' movement experienced something of a revival, both within the United States and in education systems around the globe. Around the same time, the translated works of Paulo Freire (1921-1997) and Lev Vygotsky (1896-1934) started gaining influence in English-speaking research communities and continue to influence educational theory and practice worldwide.

---

11 Especially in the development of instructional technology and design of instructional events, as in ICT-based distance learning.

Figure 2. Vygotsky's model of mediated learning
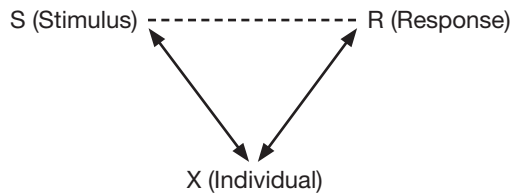
Source: Vygotsky, 1975, p. 40.

Figure 3. Social-cognitive model of learning environments
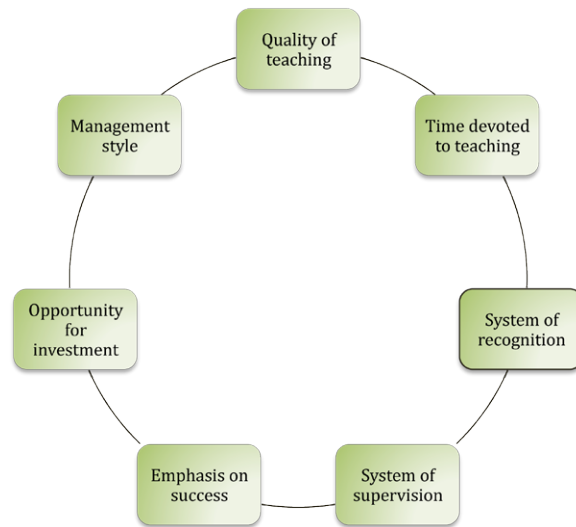
Source: Adapted from Janosz, Georges and Parent, 1998.

In particular, Vygotsky's model of mediated learning conceptualizes learning as a three-way process involving an action between a stimulus (S) and an individual (X) learner, leading to a reciprocal, mediated interaction between the individual and his or her response (R) (*see **Figure 2***). This model requires the active engagement of the individual in establishing the link between stimulus and response, which in turn leads the learner to higher levels of understanding. Essentially, the theory of mediated learning has changed the role of the teacher from that of provider of knowledge to orchestrator of engaging learning experiences within highly supportive and stimulating learning environments.

The work of Jerome Bruner (1915-present) added the dual dimensions of biology and culture to Vygotsy's schemata, forming the precursor of subsequent perspectives on learning based on evolutionary theory and brain research (OECD, 2007, Edelman, 2006, Tomasello, 1999). Like Vygotsky, Bruner was a developmental psychologist whose experiments on the learning processes of children led to a theory of the mind as a creator of meaning, not simply the processor of information. Bruner assigned great importance to the role of structure in the learning process. In *The Process of Education*, he argued that it is more important for the mind to develop its natural capacity to learn than to be filled with facts and techniques (1960). The implications of this insight for educators lay mainly in the construction of a 'spiral' curriculum that would allow children to use their natural intuitive faculties to grasp basic concepts at a very early age. From this perspective, optimal conditions for learning are those which foster children's interest, intuitive thinking and structuring of personal experience.

A clear departure from previous conventions in the way learning environments are designed and lessons are conducted in 'modern' school systems emerged during the last half of the 20th century with the popular application of teaching and learning practices attributed largely to the theories of Vygotsky and Bruner. The physical design of classrooms based on authoritarian, teacher-centred models of education have given way to learning spaces designed to support active, learning processes based on constructivist models. Learners may be engaged in different tasks using assigned areas of the learning space, freely interacting with each other, the teacher and mediating tools that connect them to the learning environment.

Expanding on Bruner's model, Albert Bandura (1925-present) elaborated a new theory that assigns a primary role to self-regulatory and self-reflective processes in human adaptation and learning – a view that has continued to influence international research on school and classroom climate (Aldridge and Fraser, 2000; Majeed, Fraser and Aldridge, 2002; Khalil and Saar, 2009). Applying this concept, known as social-cognitive theory, to practical strategies for improving the quality of learning, Janoscz, Georges and Parent (1998) proposed a model that represents a broader range of elements shaping the daily interactions among teachers, learners and their shared environment (see **Figure 3**). Reflecting the complexity of current thinking on learning environments, this model encompasses organizational features of the learning space, the time dimension, socio-economic characteristics of teachers and learners, school social climate and other factors contributing to the overall pedagogical climate.

From yet another angle, experimental research conducted by cognitive psychologist Herman Witkin (1916-1979) stressed the importance of acknowledging individual and group differences in cognitive styles. Witkin's research concluded that every person is equipped with a unique set of cognitive tools from birth that are already well developed by the time a child begins school. From this perspective, the quality of a learning environment is determined in large part by how well it supports and responds to children's unique learning styles. More recently, Howard Gardner's widely acclaimed theory of multiple intelligences suggests that rather than one-dimensional, human intelligence is multi-faceted (1993; 2006). Simply put, people have different cognitive strengths and contrasting cognitive styles (p. 5). In order to better prepare students for the future, school environments and curricula must be designed to respond to the full range of human intelligences.[12] Complementing Gardner's hypothesis, Daniel Goleman contends that 'emotional intelligence,'[13] is actually the strongest indicator of human success in the world (1995; 2006). Based on extensive research on the brain and how it functions, Goleman asserts that emotional intelligence is largely shaped by early life experiences but is also a characteristic that can be nurtured and strengthened through appropriate schooling.

Cutting-edge research on the nature of learning and learning environments has also drawn on new developments in such fields as evolutionary theory and neuroscience. For example, developmental psychologist Michael Tomasello has studied the similarities and differences in the cognitive capabilities of both nonhuman primates and human children. Noting that humans and chimpanzees share some 99% of their genetic material, Tomasello argued (1999) that what sets humans apart is a species-specific mode of cultural transmission that allows us not only to innovate but also to accumulate knowledge and skills over time so that they do not need to be re-learned by each generation. 'The basic fact,' writes Tomasello, '…is that human beings are able to pool their cognitive resources in ways that other animal species are not' – a process he calls 'cumulative cultural evolution' (p. 5). This process is naturally used by young children to acquire linguistic and other communicative symbols that help structure their reality. A supportive learning environment that will enhance and guide the natural process is one that creates a rich cultural 'habitas' for children to learn from their social, cultural and natural surroundings (Vayer, Duval and Roncin, 1991).

Neuroscience, traditionally understood as a branch of science that focuses on the biological functioning of the brain, has evolved into an interdisciplinary field that combines elements of cognitive psychology, biochemistry, genetics, medicine and frequently merges with philosophy on such topics as consciousness and the origins of knowledge. Research in cognitive neuroscience is characterized

---

12 Gardner's original set of intelligences, proposed in the 1980s, consisted of musical, bodily-kinaesthetic intelligence, logical-mathematical, linguistic, interpersonal and intrapersonal intelligences. He has since considered the addition of a naturalist and a spiritual intelligence. For a reflective discussion based on his eight criteria for intelligence, see Gardner (1999), pp. 18-21.
13 Defined in terms of self-awareness, altruism, personal motivation, empathy and the ability to love and be loved by friends, partners and family members.

by the use of increasingly sophisticated technological tools, such as computational modelling of neural networks to reveal the structure and functioning of the human brain. New imaging technologies[14] combined with traditional experimental methods allow neuroscientists to address such questions as how human cognition is mapped to specific neural circuitries *(see **Box 3** for an example).*

While researchers have gained novel insights into how the brain functions from trial experiments, it is even more astonishing for educators to imagine the potential of these technologies to increase our knowledge of learning and to manage it more effectively. Underscoring the relevance of learning environments to healthy brain development, is important to note that from the neuroscientific perspective, the study of the biological brain and nervous system does not separate the brain from the body, or the body from its natural environment. On this point, biologist Gerald Edelman (1929-present)[15] writes:

> "We must not lose sight of one set of facts: the brain is embodied and the body is embedded. First, consider embodiment. The brain's maps and connections are altered not only by what you sense but by how you move. In turn, the brain regulates fundamental biological functions of your body's organs in addition to controlling the motions and actions that guide your senses. Second, consider embeddedness. Your body is embedded and situated in a particular environment, influencing it and being influenced by it. This set of interactions defines your econiche, as it is called. It is well to remember that the human species evolved (along with the brain) in a sequence of such niches." (Edelman 2006, p.23)

Box 3. Does culture influence brain function? An example of neuroscience in action

In an interesting example of the use of brain imaging to explore the possibility that cultural differences influence the way we make perceptual judgments, a team of researchers at the Massachusetts Institute of Technology asked a group of 10 East Asians recently arrived in the United States and 10 Americans to make quick perceptual judgments while in a functional magnetic resonance imaging (fMRI) scanner. Both groups were shown a sequence of stimuli consisting of lines within squares and were asked to compare each stimulus with the previous one. In some trials, they judged whether the lines were the same length regardless of the surrounding squares (an absolute judgment). In other trials, they were asked whether the lines were in the same proportion to the squares, regardless of the absolute size (a relative judgment).

The tasks were easy enough that there were no differences in levels of performance between the two groups. However, the two groups showed different patterns of brain activation when performing the tasks. Americans, when making relative judgments that are typically harder for them, activated brain regions involved in attention-demanding mental tasks. They showed much less activation of these regions when making the more culturally familiar absolute judgments. East Asians showed the opposite tendency, engaging the brain's attention system more for absolute judgments than for relative judgments.
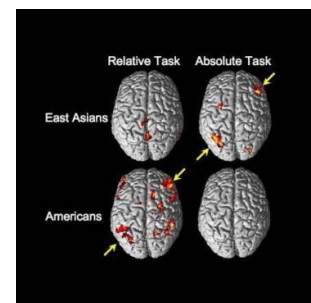
Source: *ScienceDaily*, Jan 13, 2008.

---

14 For example, advances in functional magnetic resonance imaging (fMRI) can create a three-dimensional representation of a whole brain instantaneously. The process can be repeated immediately, allowing scientists to observe changes in brain activity over a period of time.

15 Winner of the Nobel Prize in Physiology of Medicine for his work on the immune system. Edelman's later work focused on the links between neuroscience and philosophy of mind.

It follows that the embodied brain and embedded body, or 'econiche', clearly benefits from physical and social conditions in which it can thrive (Sylwester, 2003). Factors such as adequate rest, creative play, ventilation, light and sound are critical to nurturing both body and brain. There are, however, other probable links between recent theoretical insights that are less obvious, and their implications for shaping optimal learning environments and processes have yet to be fully explored.

The capacity of the human brain to change in response to environmental demands, a characteristic known as 'plasticity', is a major point on which most cognitive scientists agree (OECD, 2007; Edelman, 2006; Sylwester, 2003). This core feature of the brain allows it to create and strengthen some neuronal connections and weaken others throughout its lifetime (OECD, 2007, p. 15). In other words, the plasticity of the brain enables it to modify these connections depending on the type, length and intensity of learning that takes place. In *Teaching with Poverty in Mind*, Eric Jensen suggests that the plasticity of the brain enables it to be taught 'fluid intelligence' – the ability to rapidly adjust our strategies and thought processes from one context to another[16] (2009). Evidence is also mounting that positive emotions can play a powerful role in the learning process (op. cit., p. 76). In other words, the positive feelings that come with grasping a new idea, or what teachers recognize as the 'aha moment' can trigger a life-long association with learning as a pleasurable activity.

Although modern neuroscience is still in its infancy, studies have already revealed fresh insights into how the brain acquires language, literacy and numeracy. Many of these are not entirely new revelations, but affirmations of the conclusions of existing theories as well as everyday observations. For example, brain research has confirmed the importance of making efficient use of instructional time in the primary schools of developing countries (Abadzi, 2006) by establishing early grade literacy and using brain-friendly narrative pedagogies in interactive learning environments (Hazel, 2008). Such insights complement the work of cognitive psychologists who have emphasized the role of context, emotion, rehearsal and routine in building knowledge and creating long-term learning experiences (Goleman, 1995; Pinker, 2009; Willingham, 2009). They have also widened the pool of evidence supporting approaches to classroom management which nurture healthy emotional and physical development (Sylwester, 2003). In the design of learning environments, new knowledge about how the brain works reinforces 'holistic approaches that recognize the close interdependence of physical and intellectual well-being and the close interplay of the emotional and cognitive' domains (OECD, 2007, p. 14). This sentiment resonates with advice from many education advocacy groups and international guidelines, including those endorsed through EFA, to provide learning spaces that are safe, healthy, equitable and inclusive. These fundamental principles guide all efforts to improve the quality of learning, and challenge policy-makers, practitioners and researchers at all levels and in all parts of the world to ensure that they become a reality.

1.3.3 Ideological perspectives

> *There is hope, however timid, on the street corners, a hope in*
> *each and every one of us. Hope is an ontological need.*
> — Paolo Freire

Research based on ideologically driven critiques of educational systems is explicitly concerned with education as a means to achieve social and political change or as a lever for economic

---

16 According to Jensen, fluid intelligence generally encompasses problem solving, pattern recognition, abstract thinking and reasoning skills as well as the ability to draw inferences and understand the relationships of concepts outside the formal, specific instruction and practice related to those concepts (p. 53).

development, national achievement and/or personal advancement. Studies undertaken from this perspective often promote the complete transformation of institutions of learning and the socio-political systems they serve. Habermas (1987), for example, argued that these systems place demands on schooling that actually undermine the conditions for meaningful learning. In Habermas' view, a disproportionate emphasis on individual achievement in the interests of the system make it impossible for learning processes that depend on communication between teachers and learners to occur. As a solution to this dysfunctional relationship, Habermas advocates the recreation of schooling as an 'enchanted space' where 'authentic learning and knowledge are still highly valued' (Kemmis, 1998, p. 300).

In *A Pedagogy of the Oppressed,* the highly influential Brazilian educator, Paulo Freire, proposed replacing the existing system's use of 'banking education' with the practice of 'liberation education', which would empower learners to bring about social and political change. In Freire's view, this happens through acts of cognition reminiscent of the theoretical views of Vygotsky, Bruner and Bandura *(refer to Section 1.3.2).* Michel Foucault, whose ideas have also inspired the work of educators worldwide, compared contemporary schools to prisons, asylums and other institutions of moral and social control (Ball, 1990). A rich body of ethnographic literature (reviewed in Levinson, 1998) has followed in the critical theory tradition, challenging authoritarian models of learning environments as complicit in the perpetuation of economic and social inequality (Willis, 1977; Everhart, 1983).

Educational research grounded in anti-establishment ideologies also paved the way for indigenous peoples to distinguish and articulate their philosophical and methodological stances. As pointed out by Maori researcher Linda Tuhiwai Smith, 'research' has until very recently been 'one of the dirtiest words in the indigenous world's vocabulary because it originated and is conducted by external authorities for external purposes (1999, p. 1). As alternatives to mainstream paradigms, indigenous scholars have sought to 'decolonize research' by reviving, creating and practicing methodologies suited to their own purposes (Denzin, Lincoln and Smith, 2008). For example, the primary aim of schooling among the Kagga people of Kenya is to educate the whole person in mind, body and spirit (Mosha, 2000). It follows that research on learning environments should be designed and conducted collaboratively to inform school managers, teachers and families on how best to connect schools and other learning places to the life, culture and aspirations of the community. Community-based indigenous approaches include participatory action research, performance ethnography and narrative poetics. A major objective of using these approaches in education is to restore indigenous knowledge, arts, communication systems and multidimensional as well as complex bodies of understanding 'which have been viewed by Euroculture as inferior and primitive' (Kinchloe and Steinberg, 2008). Accomplishing this requires educators at all levels to become researchers that are empowered to understand multiple epistemologies and interpret the meaning of information from a variety of perspectives (ibid, p. 149).

From the point of view of international economic and social development, assessments of the quality of education in the context of EFA and the right to education are also ideologically driven as they seek to influence policy in ways that result in systemic change. These types of studies (large scale or limited in scope) address such questions as:

- How well are educational systems (and school environments) fulfilling the human right to quality education for all?
- How well are school environments and curricula preparing learners for life and work in the 21st century?
- How well are school systems protecting children's rights within school settings?
- How can school climates be improved to enhance achievement and satisfaction for all learners?

Cross-national studies with components for assessing selected conditions of learning undertaken in the framework of EFA in developing countries have been oriented toward evaluating the effectiveness of selected conditions under the general rubric of quality education. A broad framework for such studies was elucidated in *The Dakar Framework for Action*: *Meeting Our Collective Commitments* (2000) in Strategy 8 *(see Box 4).*

Box 4. EFA strategy for learning environments

Dakar Framework for Action, Strategy 8

65. All stakeholders – teachers and students, parents and community members, health workers and local government officials – should work together to develop environments conducive to learning. To offer education of good quality, educational institutions and programmes should be adequately and equitably resourced, with the core requirements of safe, environmentally friendly and easily accessible facilities; well-motivated and professionally competent teachers; and books, other learning materials and technologies that are context specific, cost effective and available to all learners.

66. Learning environments should also be healthy, safe and protective. This should include: (1) adequate water and sanitation facilities, (2) access to or linkages with health and nutrition services, (3) policies and codes of conduct that enhance physical, psycho-social and emotional health of teachers and learners, and (4) education content and practices leading to knowledge, attitudes, values, and life skills needed for self-esteem, good health and personal safety.

Source: World Education Forum, 2000, p. 20.

Studies conducted by Schleicher, Siniscalco and Postlethwaite (1995), Henevald et al (2006), LLECE (2002), SACMEQ I and II, PASEC[17], Pole de Dakar (on-going), and OREALC, (2007; 2008), among others, have used mainly quantitative methods to assess the impact on literacy and numeracy of factors such as teacher qualifications, pupil/teacher ratio, availability of books and instructional time in relation to levels of learner achievement. Some of the surveys also take into consideration the physical conditions of schools (buildings, classroom equipment, water and toilet facilities), organizational features (school management and cohesiveness) as well as out-of-school factors, such as parents' level of education, socio-economic status, languages spoken at home and amount of reading material in children's homes. Government sponsored national studies, such as the Kenya assessment of FPE (*refer to Section 1.1.1*) may well include components that address specific issues, such as improvement of learning conditions for working children and difficult-to-reach nomadic populations.

Other large-scale international studies conducted by on-going programmes (IEA, PISA, WEI) may also influence national policies within the context of EFA, but their main purpose is to serve as a broad resource to inform and improve education at all levels and in all participating countries.

---

17 In regard to avenues for moving from research results of PASEC and SACMEQ studies to policy reform in sub-Saharan Africa as reviewed in Ross and Genevois (2006), *Cross-National Studies of the Quality of Education: Planning Their Design and Managing Their Impact*.

1.3.4 Practical perspectives

Any one factor will not in itself determine a school's climate and its influence on the learning of students. However, it is the interaction of school and classroom climate factors that create a fabric of support that enables members of the school community to teach and learn at their optimal levels.
— H. Jerome Freiberg

In contrast to philosophical and ideological perspectives, practical approaches to the study of learning environments do not seek to establish new learning theories or to bring about profound systemic change. As their names imply, the primary focus of school effectiveness research (SER) and educational effectiveness research (EER) is to make existing schools and systems more effective at achieving pre-set goals, usually measured in terms of learning outcomes. Learning environments are considered important, but not the sole factor in reaching these goals.

In SER, the emphasis is on internal conditions of the schools (i.e. conditions that enable students to reach both their personal goals and the goals of the community). What is unique about SER, as pointed out by Levin and Lockheed, is its 'emphasis on transformation of the entire school rather than on a specific aspect of curriculum, or instructional strategies, or school organization' (Levin and Lockheed, 1993, p. 5). From this point of view, it is not sufficient to identify single or several unconnected factors for experimental research, as this does not provide enough information on how the school environment influences learning. In SER, researchers have compiled lists of common characteristics of effective schools (Purkey and Smith, 1983; Mortimore et al, 1988; MacBeath and Mortimore, 2001). By the late 1990s, no fewer than 719 factors were found to be associated with school effectiveness. Fortunately, this list was reduced in a meta-analysis to 11 salient factors (Sammons et al, 1996):

1. Professional leadership;
2. Shared vision and goals;
3. A learning environment;[18]
4. Concentration on learning and teaching;
5. High expectations;
6. Positive reinforcement;
7. Monitoring progress;
8. Pupil rights and responsibilities;
9. Purposeful teaching;
10. A learning organization;[19]
11. Home-school partnership.

Further to the identification of common features as a composite framework for improving school effectiveness, Creemers (2006) proposed the development of a new, dynamic model which would: i) be multilevel in nature; ii) be based on the assumption that some achievement effectiveness factors may be curvilinear; iii) illustrate the dimensions upon which the measurement of each effectiveness factor should be based; and iv) define relations among the effectiveness factors.

---

18 Interpreted here as an environment that fosters learning.
19 Interpreted here as an organization focussed on learning.

EER is based on principles and practices similar to SER, but has a system-wide scope. As defined by Stringfied, EER is 'the process of differentiating existing ideas and methods of schooling among dimensions deemed to be of value' (in Reynolds et al, 1994). Ultimately, the goal is to improve educational systems in ways that improve their institutional efficiency, but not to challenge their fundamental organizational structures or the social and political systems in which they are embedded. As with SER, learning environments are viewed as one factor among many which influence the effectiveness of a school or educational system.

Operating within a similar framework, there is a tangential body of research that focuses more narrowly on identifying and measuring the disparate elements that comprise learning environments. Activities in this area of research fall under the general rubric of school climate research (SCR) or LER and rest largely on the seminal work of Rudolph Moos. In *Evaluating Educational Environments* (1979), Moos delineated three major domains of social-environmental variables in secondary level classroom settings[20] *(see Table 1).*

Table 1. Domains of social climate dimensions in classroom settings

	Domains		
Type of setting	Relationship	Personal growth	System maintenance and change
Secondary school classroom	• Involvement • Affiliation • Teacher support	• Task orientation • Competition	• Order and organization • Rule clarity • Teacher control • Innovation

Source: Moos, 1979, p. 17.

Measures of factors in the relationship domain assess the extent to which learners are involved in the social and physical setting. The personal growth domain incorporates both cognitive and emotional development. The system maintenance and change domain measures the extent to which the learning environment is 'orderly and clear in its expectations, maintains control and responds to change' (ibid). Moos and his colleagues developed the Classroom Environment Scale to measure these domains and the variables in each group (Moos and Trickett, 1974). This instrument has become the prototype for a plethora of tools developed and/or adapted by school climate researchers over the past three decades.

Moos' conceptual framework and the assessment instruments it inspired have had a coalescing effect on the way some mainstream research assesses learning environments. Rather than seeking to determine how isolated variables affect one or more categories of learning outcomes, research grounded in this type of model considers the learning environment more holistically as an atmosphere made up of a complex web of different features. Moos grouped these features into several categories that all actively interact with one another within a living, breathing, learning society *(see Figure 4).*

---

20 In the United States, junior and senior high schools were among the settings where Moos and his colleagues carried out their research. In applying the framework to other settings, the variables identified would be different, but the domains would remain the same.

Figure 4. Model of the determinates of classroom climate
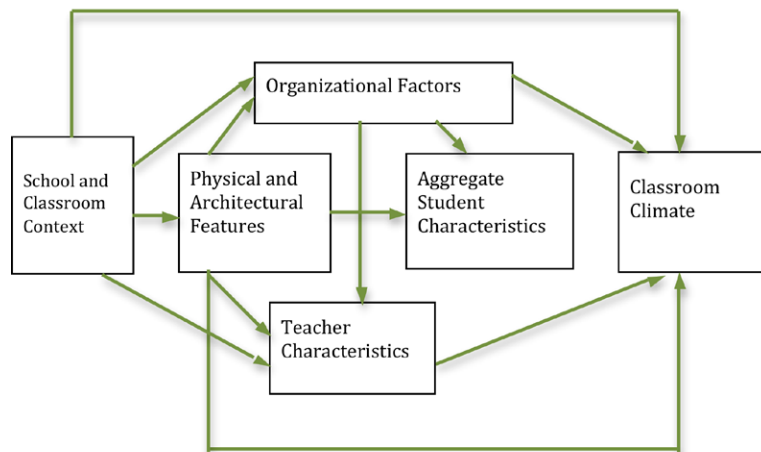
Source: Moos, 1979, p. 161.

Expanding upon early models for classroom climate research, methodologies have developed from the exclusive use of surveys (mostly with teachers) to surveys and interviews with student focus groups, videotaped discussions and town meetings with students, parents and community members (Freiberg, 1999). Examples based on this and other models for conceptualizing the school climate will be discussed in Section 2 (*Lessons from the Field*). Before embarking on this discussion, there is one more important but often overlooked perspective to be visited – the physical and architectural features of schools and other learning spaces. Moos' model (*see Figure 4*) places this group of factors in a prominent position but until recently, the architectural and physical conditions remained the focus of specialized studies were only occasionally alluded to as a factor relevant to improving the quality of learning. In reality, learning communities are well aware of this pivotal issue, especially in cases where conditions become noticeably *dis*abling. As teachers surveyed in the Spanish study on the physical conditions in early childhood education reported, lack of a quiet place for young children to rest affects their mood and ability to concentrate *(see Section 1.1.2).* In poor countries with minimal resources, the lack of access to such basic amenities as clean water and separate toilet facilities for girls is often cited as the main reason that students drop out of school.

The fact that school architecture conveys cultural messages is often overlooked as an element in how social and pedagogical interactions transpire. For example, the box-like structure of schools and classrooms, sometimes referred to as the 'cells and bells' model, is based on the assumption that a predetermined number of students will all learn the same thing at the same time from the same person in the same way for several hours a day' (Nair, Fielding and Lackney, 2009, p. 25). These types of school environments often have insufficient natural lighting and poor acoustics, transmitting the message that acts of learning are highly structured, sedentary, linear, dull and weakly communicated. They are, as Orr (1999) observed, constructed following a model of 'deplacement' by replicating the architectural design of strip malls, multi-lane freeways and office towers, bearing no resemblance to settings where the 'biological brain in cultural classroom' (Sylwester, 2003) could hope to survive and flourish.

While a growing body of empirical research on the effects of physical conditions on mental and physical health continues to shed light on the nature of these fundamental links, there is a need for more studies on the deeper effects of architectural space on all dimensions of learning. Rena Upitis, among others, has suggested that studies of this nature could be based in complexity theory,[21] which

---

21 Drawn from biology and mathematics, complexity science has involved the study of adaptive and self-organizing systems such as ant colonies and pigeon flocks.

seeks to explain how a system functions when there are multiple members involved in some form of self-organization (Upitis, 2009). Due to its roots in biological and cultural knowledge, complexity theory serves as an appropriate language to describe the interaction between learning and the architecture of schools (Bruner, 1996; Edelman, 2006; Tomasello, 1999).

1.4   Summary and reflection

The theory and practice of LER has evolved over the course of centuries, from philosophical treatises and guidelines found in canonical literature to multivariate data analysis and brain scans. Only a few of the most noteworthy examples were selected for this review *(summarized in **Table 2**)* on the basis of their relevance to the major perspectives framing the current international discourse.

Table 2. Summary of philosophical perspectives

Sources		Propositions relevant to conditions of learning
St. Augustine (354-440)	*On the Teacher*	• Human teachers do not have the capacity to convey knowledge. • Learners must be placed in situations where they can 'come to know.'
Jon Amos Comenius (1592-1650)	*The Great Didactic*	• Active learning is the only way truth can be established. • Learning events should be arranged to suit the capacity of the pupil.
Jean-Jacques Rousseau (1712-1778)	*Emile*	• Teachers should guide pupils through phases of natural development using games and reflections on the environment.
John Dewey (1859-1952)	*Experience and Education* *Democracy and Education* *Schools of Tomorrow*	• Acts of learning are facilitated through participation in social groups • School environment should be a 'purified medium of action' for cognitive and moral development
Paulo Freire (1921-1997)	*A Pedagogy of the Oppressed*	• Teacher-learner dichotomy should end: teachers learn, learners teach • Learning contexts should support emancipatory change through democratic, critical pedagogies.

Current models and methodologies such as SER and research on physical conditions of schools *(see **Table 3**)* also have more recent roots in the fields of cognitive psychology, critical theory, anthropology, biology, neuroscience, architecture and environmental studies. Stepping outside the mainstream to sample an important perspective from outside the industrialized world, the theoretical foundations of indigenous research methodologies have also been briefly described.

Studies on school climate over the past decade credit the sages of constructivism – especially Dewey, Vygotsky, Bruner and Tomasello – as having paved the way for current approaches to conceptualizing learning environments. Some also pay tribute to Moos, Haertel, Walberg, Fraser, Freiberg and others who have created and refined the instruments for measuring them.

Throughout the review of past and present theoretical roots, three major trends have become evident. First, conceptualizing learning environments has evolved into a more holistic and eclectic approach as it has become more widely informed through international exchange and interdisciplinary overlap (Jonnaert and Vander Borght, 2009). Over the past few years, the internet has made activities and reports more easily accessible across disciplines as well as across cultures and languages. Second, boundaries separating the types of methodologies identified in the studies of conditions of learning

Table 3. Summary of theoretical frameworks and models

Framework/ model	Sources		Propositions relevant to conditions of learning
Connectionism	Edward Thorndike	*Fundamentals of Learning* (1927)	• Conditions should reward positive behaviours and make connections with prior knowledge.
Operant conditioning	B.F. Skinner	*The Behavior of Organisms* (1938)	• Learning through interactions with immediate environment • Teacher's role is to give feedback, break down tasks and give reinforcement.
Cultural mediation	Lev Vygotsky	*Thought and Language* (1934)	• Learning through guided participation at one's 'zone of proximal development' (ZPD).
Social-cognitive theory	Jerome Bruner	*The Process of Education* (1960)	• Humans have a species-specific mode of cultural transmission. • People learn naturally in groups through interaction with the environment.
	Albert Bandura	*Foundations of Thought and Action* (1986)	• Learning environments should provide a rich 'habitas' in which the learning process can flourish.
Biological brain research	Gerald Edelman	*Second Nature* (2006)	• The brain is embodied, the body is embedded in a particular environment. • The brain's interactions with the environment define its 'econiche'.
	Robert Sylwester	*A Biological Brain in a Cultural Classroom* (2003)	• Enabling learning environments nurture positive emotional development.
Indigenous research	Linda Tuhiwai Smith	*Decolonizing Methodologies* (1999)	• Research methodologies should suit local purposes. • Role of teachers in creating culturally responsive contexts. • Change power relations to enhance learners' existing knowledge. • Emphasize the role of indigenous knowledge, arts and communication systems.
	Bishop and Glynn	Culture Counts (1999)	
	Kincheloe and Steinberg	*Indigenous Knowledges in Education* (2008)	
School effectiveness research	Levin and Lockheed	*Effective Schools in Developing Countries* (1993)	• School is the centre of change. • School effectiveness is generally measured in terms of 'outputs' or measures of learning achievement.
	Jaap Scheerens	*Improving School Effectiveness* (2000)	• Focus of research is on the internal conditions of schools. • Seeks to establish the factors that matter most.
School climate research	Rudolph Moos	*Evaluating Educational Environments* (1979)	• Provides detailed framework for measuring the health of educational environments. • Proposes three domains of social and environmental elements (varying according to context).
	Jerome Freiberg	*School Climate: Measuring, Improving and Sustaining Healthy Learning Environments* (1999)	• Reviews the development, validation and use of measurement scales. • Views learning environments holistically.
School architecture and physical conditions research	David Orr	*Ecological Literacy* (1992)	• Design and physical conditions of learning environments (light, sound, temperature) have a significant impact on learning. • Classroom is the most visible expression of educational philosophy.
	Nair, Fielding and Lackney	*The Language of School Design* (2009)	• The shape of buildings affects human interactions and therefore shapes social and organizational climate.
	Rena Upitis	*Complexity and Design: How Architecture Influences Learning* (2009)	• Architecture carries cultural messages. • Interior conditions affect the emotional state and motivation of teachers and learners.

and learning environments have become less rigid. Generally, educational researchers trained in quantitative methods or experimental techniques, for example, now feel less exclusively bound to these methods and tools. As shown in the three introductory studies discussed in Section 1.1, researchers trained in quantitative methodologies may choose qualitative techniques such as ethnographic interviewing or focus groups to probe more deeply into issues raised in the analysis of surveys, checklists and questionnaires. As will be seen in the review of additional studies in the next Section, the use of mixed methodologies has opened the door to deeper insights and more informed strategies for improvement. Third, there appears to be a general trend toward expanding desirable educational outcomes to include those which sustain learning throughout life. Confucius expressed this as a 'love of learning', Jerome Bruner as cognitive structures for 'learning to learn', Daniel Goleman as the necessity for developing emotional intelligence in addition to cognitive skills in order to succeed in life, both socially and professionally. Neuroscientists speak of the plasticity of the brain and how it can be self-motivated to experience the 'joy of learning'. In sum, the theoretical roots of current approaches to the study of learning environments help shape the vision of places to learn that are conducive to building cognitive, emotional and social skills as an essential ingredient in the provision of quality education for the 21st century.

2.   Lessons from the field

School climate is like the air we breathe – it tends to go unnoticed until
something is seriously wrong.
— H. Jerome Freiberg

While philosophical reflections and culturally grounded beliefs on how to create positive learning environments have shaped teaching and learning processes for centuries, empirically driven research on conditions of learning and learning environments has only gained legitimacy over the last 40 years – primarily in Western Europe, North America and the industrialized countries of Asia. Studies exclusively devoted to assessing and improving learning environments are still relatively rare in less developed parts of the world. This Section presents an overview of the range of field-based studies on learning environments with deference to the practical perspectives covered in Section 1.3.3 with the intent that they will have direct implications for the improvement of educational systems struggling to meet EFA goals.

Over the past decade, educational researchers have gravitated toward conceptualizing the learning environment as an integrated whole that consists of closely interconnected elements that can be studied in multiple ways. Interrelationships between the major categories of learning conditions can be depicted in the form of a simple Venn diagram that groups physical conditions and school climate (i.e. psychosocial conditions) into intersecting circles, with teaching and learning conditions in the shared space between them *(see **Figure 5**).*

Figure 5. Major categories of learning conditions from a holistic perspective
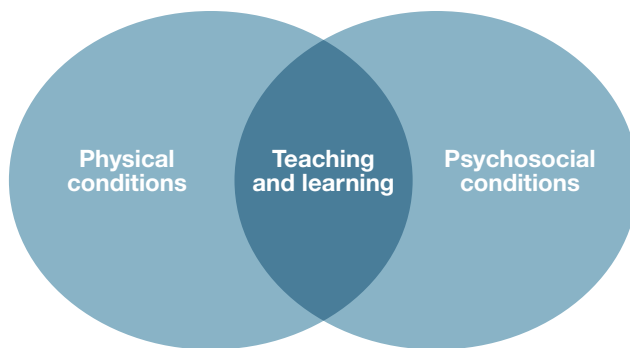
This common space (Teaching and Learning) is where the tangible and intangible elements of the environment merge. It is also the locus of teaching and learning, mediated by curricula, materials, assessment practices and more. The quality of these interactions depends not only on how well the environmental elements support learning but also on the skill of the teacher in motivating, managing, building self-efficacy and scaffolding the learning sequences.

To address concerns about the quality of education as well as specific issues related to the quality of learning environments, the studies reviewed in this Section are grouped broadly into i) comprehensive studies covering multiple dimensions and factors associated with learning environments; and ii) smaller scale more focused studies concentrating on a particular dimension or problem. The first category includes large-scale international assessments designed to ensure that the data collected could be compared internationally. The second is drawn mainly from the body of local, national and cross-cultural research on learning environments, including those seeking to solve such problems

as school-based violence, learning deficit disorders and anti-social behaviours. In this section, one or more examples are described from each of these two types of studies along with their main conclusions and recommendations.

2. 1   Cross-national studies

Typical approaches to the study of learning environments in the 1980s and 1990s sought to link specific factors of teachers' and learners' perceptions of their learning environments to improved learning outcomes – similar to methodologies employed during initial waves of school effectiveness research (SER). A quantitative synthesis of 12 studies on 823 classrooms in 4 countries (USA, Canada, Australia and India) identified the characteristics of learning environments that most frequently correlated positively with learning gains and outcomes. These were identified as cohesiveness, satisfaction, task difficulty, formality, goal direction, democracy and the material environment (Heartel, Walberg and Heartel, 1981). Factors that were negatively associated with learning outcomes were friction, cliqueness and disorganization. In this analysis, learning outcomes were found to be co-determined by three sets of variables: student aptitude; the quantity and quality of instruction; and the psychosocial environments of the class, school, home, peer group and the mass media. However, the relative impact of each of these sets of variables on cognitive and affective outcomes has since been widely contested, particularly in regard to the perceived relationships between learners' socio-economic status (SES) and their academic achievement. In contrast, there is far less dispute over the direct influence of instructional quality (i.e. teaching and learning processes) and learning environments (including social climate and learning outcomes).

Studies by Carron and Chau, (1996), LLECE (2002), Heneveld et al. (2006), Rajonhson (2006) and Torrecila (2006) indicate a mounting interest among international researchers in the centrality of creating enabling conditions for learning, including consideration for the 'satisfaction' or 'happiness' factor. This simple but often overlooked element reflects Lozanov's principle of 'joy, absence of tension, and relaxation' as a fundamental human condition for learning (1978, p. 31). The LLECE study of schools is a prime example of cross-national research that includes attention to the social climate of schools. The study found that in 7 out of 13 Latin American countries, positive climates were characterized by 'intense, non-authoritarian relationships' among the different actors. In these supportive climates, 'students feel good about going to school, are treated with kindness and like to go to classes.'

Parallel to the development of LER into a field in its own right, elements of classroom and school environments have increasingly been incorporated into models of school effectiveness and school improvement research (Creemers, 1994) as well as in cross-national assessments of the quality of basic education (PASEC, SACMEQ I and II, OREALC, WEI, and OECD). Even though there is a clear distinction between these approaches (i.e. classroom/school climate versus classroom/school effectiveness), they are often viewed as complementary and mutually enriching as both have overlapping or identical goals. Creemers and Reezigt (1999) depict this relationship in terms of 'climate factors' in the overall context of improving school effectiveness *(see **Figure 6**)*.

The UIS cross-national study, *A View Inside Primary Schools* (UIS, 2008) looks at a wide range of factors in the primary schools of 11 countries. The factors studied include school resources, physical conditions, instructional time, school management, teaching and learning styles and the opportunity to learn.[22] The UIS Report is unique not only because it takes multiple factors into account, but also due to the depth in which each factor is examined. Researchers also looked inside classrooms

---

22 Argentina, Brazil, Chile, India, Malaysia, Paraguay, Peru, the Philippines, Sri Lanka, Tunisia and Uruguay.

Figure 6. Climate factors in educational effectiveness

```
┌─────────────────────────────────────┐        ┌─────────────────────────────────────┐
│ School climate                      │        │ School effectiveness factors        │
│  • Physical environment of the school│ ⟺    │  • Quality                          │
│  • Social system in the school      │        │  • Time for learning                │
│  • Orderly environment in the school│        │  • Opportunity to learn             │
│  • Expectations about teacher       │        │                                     │
│    behaviour/student outcomes       │        │                                     │
└─────────────────────────────────────┘        └─────────────────────────────────────┘
                │                                              │
                ▼                                              ▼
┌─────────────────────────────────────┐        ┌─────────────────────────────────────┐
│ Classroom climate                   │        │ Classroom effectiveness factors     │
│  • Physical environment of the      │ ⟺    │  • Quality of instruction           │
│    classroom                        │        │  • Time for learning                │
│  • Social system in the classroom   │        │  • Opportunity to learn             │
│  • Orderly classroom environment    │        │                                     │
│  • Expectations on student outcomes │        │                                     │
└─────────────────────────────────────┘        └─────────────────────────────────────┘
                │                                              │
                ▼                                              ▼
┌─────────────────────┐              ┌─────────────────────────────────────┐
│ Student motivation  │─────────────▶│ Educational outcomes                │
└─────────────────────┘              │  • Cognitive                        │
                │                    │  • Affective                        │
                ▼                    └─────────────────────────────────────┘
┌─────────────────────┐                            ▲
│ Aptitudes           │────────────────────────────┘
│ Social background   │
└─────────────────────┘
```

Source: Creemers and Reezigt, 1999, p. 31.

at teaching and learning processes as well as at school management factors. Unsurprisingly, the study found that resources for teaching and learning such as school libraries, science laboratories, blackboards, computers, copying equipment and classroom reading corners were sorely lacking in poor, rural schools. Inequalities by school location are shown in **Figure 7**.

In North America and Western Europe, action-oriented research on learning environments frequently addresses such issues as school-based violence (Denmark et al, 2005), lack of motivation to learn (Galand, 1988), non-compliance (Levinson, 1998), and emotional dysfunction. In *Last Child in the Woods: Saving Our Children from Nature Deficit Disorder* (2008)*,* Richard Louv argues that many of the physical and behavioural problems[23] exhibited by children in industrialized countries can be attributed to restricted access to outdoor, spontaneous play. Referencing a wide array of educational theorists and progressive models of schooling (including that of Finland), Louv promotes a vision of education that allows increased time for play and exposure to nature through, for example, less reliance on computers as learning tools, more frequent recesses, fewer computers and 'green schoolyards'.

The 2009 OECD Report *Creating Effective Teaching and Learning Environments: First Results from TALIS* focuses mainly on teachers, teaching practices and the teaching profession in 23 participating countries*.* Drawing mainly on the perceptions of teachers and principals, TALIS examines the role of teacher beliefs, attitudes and practices, appraisal and feedback, on-going professional development and school leadership in shaping the conditions for effective learning. The overall purpose of the study is to help the 23 participating countries review and develop policies that will

---

23 Such as the growing incidence in the United States of attention deficit disorder (ATD), clinical depression and problems linked to childhood obesity.

Figure 7. Availability of school resources in village and city/town schools in 11 WEI-SPS countries
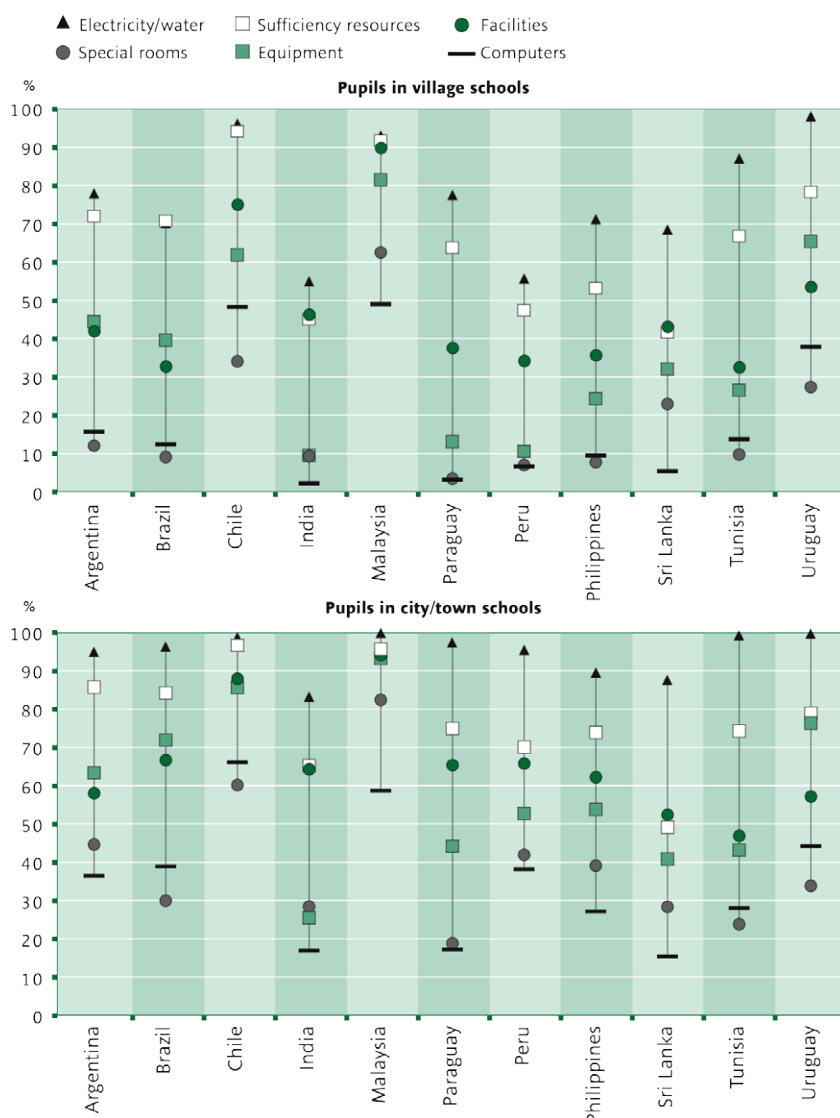
Source: WEI-SPS database; Table A2.8.

make the teaching profession more attractive and effective. TALIS views teacher beliefs and practices from two perspectives: i) direct transmission beliefs; and ii) constructivist beliefs. Results show that the constructivist view prevails mainly in northwest European countries, Scandinavia, Australia and Korea while the direct transmission view is more prevalent in Brazil, southern Europe and Malaysia (OECD, 2009, p. 130). Overall, the results identify close links between an open and positive school climate, teachers' beliefs, appraisal and feedback, professional development experiences and the adoption of innovative teaching practices.

On the down side, the first results of TALIS show a lack of adequate resources and pedagogical support along with a rise in discipline problems in all countries. Teachers specify the need for professional development to help them meet the challenges of increasingly heterogeneous learning groups and new learning technologies. Both the UIS Report and the first results from TALIS offer

fresh insights into learning environments and the processes that take place within them. While no quick fix was identified to eliminate the barriers to creating and sustaining such environments, clear recommendations are offered to policy-makers in all participating countries to consider as practical means to assess and improve existing learning conditions and processes.

2.2 Smaller-scale studies

Smaller scale studies deliberately focused on learning environments give researchers the advantage of investigating selected features in more depth, which will ideally result in concrete collaborative actions. The studies were often conducted using a mix of quantitative and qualitative methods. Within this subfield, this review will examine examples of research from three different perspectives: (1) architecture, physical conditions and classroom geography; (2) social climate; and (3) organizational structure.

2.2.1 Architecture, physical conditions and the geography of learning spaces

Many aspects of the effects of interior learning space design and the physical conditions of schools on the wellbeing of its occupants have been studied (Steuebing, 1995; Hebert, 2003, Comesaña and Juste, 2007; Upitis, 2009). The underlying assumption of these studies is that the quality of learning is enhanced by an inviting physical environment that ensures the safety and health of learners. Connectedness is an additional element that has risen to prominence in both reflective and research-based literature on the physical conditions of schools. As structures embedded in the wider community, the architecture of schools should reflect their connection to the cultural and natural features of the surrounding environment. This connectedness fosters consistency and relevance of the learning that takes place in schools with the informal learning that occurs within families and communities.

In *Architecture for the Poor*, the renowned Egyptian architect, Hassan Fathy (2000) bemoaned the structure and climate of modern school buildings that did not make use of natural lighting or traditional dome designs to create comfortable temperatures and healthy ventilation *(see Figure 8)*. In order to provide optimal conditions for children to learn, Fathy contended that the architect 'has a grave duty of creating in a building, a source of love and encouragement for children and must let nothing come before it' (ibid, p. 83).

Figure 8. Ventilation system at girls' primary school designed by Hassan Fathy
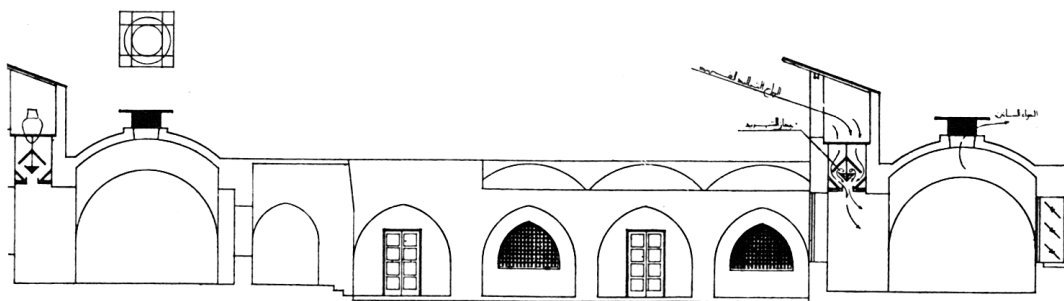
Source: Fathy, 2000, illustration 100 (following p. 232).24

---

24 Additional images of and architectural drawings of schools designed by Hassan Fathy can be viewed at http://archnet.org/library/sites/one-site.jsp?site_id=3791

> **Box 5. Lessons on school design from KwaZulu Natal**
>
> Our new school design was, thus, centred on the symbolic tree, donated to the school at the end of the construction project, to grow tall and shady as the school itself developed. The school rooms, constructed of low maintenance facebrick walls and tiled roof, formed a large open courtyard, 30 metres on a side, with the tree at its centre. The entire school was made up of two of these courtyards (a lower and upper school), with a tree at the centre of each, with the administration and main entrance where the two meet as a focus, as in a figure of eight. Entrances to all the rooms opened into the courtyards and brick pathways set in lawns linked open corridors around the entire perimeter in irregular radiating walkways centred on the tree.
>
> The courtyard provides a strong sense of space and identity for all within and provides a safe refuge in a violent land. During construction, hundreds of local villagers would shelter in the partially built school buildings during the night and build fires and cook in the courtyards, safe from marauding street gangs on the outside.
>
> The design of the classroom, although conventionally rectangular in shape, allowed the teacher more control. Conventional classroom design places the teacher and blackboard on the short side of the rectangle where he has difficulty controlling pupils at the back of the room, so we turned the classrooms through 90 degrees and placed the teacher on the long side. All pupils are closer to the teacher and easier to control. This layout has the additional advantage of providing more wall space (uninterrupted by windows) for blackboards and pinning boards.

Source: Breetzke, 2003.[25]

Fathy's prototypical school design includes a welcoming courtyard, an open-air assembly place and individually distinctive classrooms within which each group can establish a unique learning community reminiscent of the theoretical concepts of 'habitas' (Bandura, 1986) and 'econiche' (Sylwester, 2003; Edelman, 2006). Each classroom is designed to let in enough natural light and air while deflecting the heat of the intense desert sun. The school is constructed of local materials and takes advantage of an ancient and familiar technology, making it possible to build and maintain at low cost to the community.

In a similar personal reflection, architect Keith Breetzke describes his experience of working with the local community in KwaZulu Natal Province, South Africa in the 1990s *(see Box 5)*. He was there to help build a school that would enable teachers to control their large classes and the headmasters to keep the school community safe from outsiders. 'The only logical approach,' explained Breetzke, 'was to go back to first principles.'

In *The Language of School Design: Design Patterns for 21ˢᵗ Century Schools*, Nair, Fielding and Lackney draw upon their experiences as school architects and planners as well as a collected pool of best practices in school design from over 20 countries.[26] Based on this, the authors have identified 28 patterns which they feel represent a 'fairly complete range of the various design principles that define best practices' (ibid, p. 21), as shown in **Table 4**.

---

25 Retrieved from www.gurteen.com/gurteen/gurteen.nsf/.../school-spaces-africa
26 Case study photos can be accessed at www.designshare.com

Table 4. Categories of good practices in international school design

Category	Description	Examples
Parts of the whole	Patterns that describe specific functional areas of the school	• Welcoming entry • Student display space • Science labs, art studios and life skills areas • Music and performance • Health and physical fitness • Home-like bathrooms
Spatial quality	Characteristics of the quality of a given space or spaces which also cut across functional areas	• Transparency and flexibility • Interior and exterior vistas • Indoor-outdoor connection
Brain-based	Related to the design of spaces that stimulate the brain in ways that are beneficial to learning and overall human development	• Shared learning resources • Designing for multiple intelligences • Campfire space • Watering hole space
High performance	Patterns that apply to the efficient operation of the building and to the way it is designed to get the best performance from students	• Daylight and solar energy • Natural ventilation • Learning, lighting and colour • Sustainable elements and building as a 3-D textbook
Community connected	Patterns that reflect community reflective design features and connect schools to social and economic life of the community	• Participation in community activities • Local signature • Strong social ties
Higher order	Encompasses all other patterns	• Holistic view of principal learning areas • Bringing it all together

Source: Adapted from Nair, Fielding and Lackney, 2009.

In a case study cited as an example of good practice in community connectedness[27], the architectural firm Edgar Wade Architects collaborated with the Djidi Djidi Aboriginal School in Western Australia to design the Djidi Djidi Aboriginal School in an indigenous community in Picton, Western Australia *(see **Figure 9**).* In the initial consultation with the community (including staff, elders, family members and children), the architects sought guidance from the community to: i) ensure that the school represented the aspirations and visions of the local community; ii) enabled the expression of the group's rich cultural heritage; and iii) engendered ownership by the school community. Educators also had opportunities for input during the planning process, consulting with the architects to decide how the design of the school could best support its major educational objectives to: i) improve learning outcomes for indigenous students; ii) strengthen and affirm indigenous culture; iii) increase student attendance and retention; and iv) involve indigenous community members in school decision making and lifelong learning. The result was a school design that responds to these sets of priorities. Its overall design is derived from the shape of a native bird species, reflecting the bird's distinctive wing formations. There is a cultural centre at the heart of the school incorporating a 'Tree of Life', which represents the historical web or relationships in the community and serves as a performance and meeting space. The school grounds retain as much of the natural bush land as possible. There is also a fire pit for story-telling and a natural watering hole. The wider community has access to the school's sports fields and parents play a significant role in tutoring and mentoring the students in 'retreat nooks' designed for this purpose as well as for small group reading and individual work.

---

27 For a complete account, please see http://www.designshare.com/index.php/projects/djidi-djidi/narratives

Figure 9. A place of the people: Djidi Djidi Elementary School, Western Australia

Source: http://www.designshare.com/index.php/projects/djidi-djidi/narratives

From the perspective of teachers and learners, it is clear that the design of schools and classrooms directly influences what goes on inside them, and can sometimes be a critical factor in how well students succeed in school. This is an everyday reality. Yet, cases in which teachers, learners and parents are approached for their suggestions and recommendations to improve these conditions have rarely been reported. It is also uncommon for educational policies to address the physical dimensions of learning environments beyond setting minimal standards for health and safety. Active, participatory learning methodologies are not easily implemented when learners are crowded into rectangular boxes separated from the natural world and are seated in fixed row-and-column seating arrangements. Even though such conditions have been found to inhibit social interaction, culturally informed pedagogies and the nurturing of higher-order thinking skills (Dessus, n.d.; Marx, Fuhrer and Hartig 1999; Boykin, Lilja and Tyler, 2004), the physical design of schools and classrooms has been slow to change. To support more proactive policies for the renovation and construction of buildings and learning spaces that are conducive to 21st century learning, more vigorous, comprehensive and well-targeted research is needed to convince policy-makers and the general public of the central role of school design in improving learning outcomes.

2.2.2 Social and pedagogical climate

The cross-disciplinary study of the less tangible features of school climate associated with the personal growth dimension proposed by Moos (1979) has sparked a flurry of research over the last four decades. In academically oriented studies of the school and classroom climate, extensive use has been made of instruments developed specifically to measure learners' and parents' perceptions, such as the Learning Environment Inventory (LEI), Classroom Environment Scale (CES) and My Class Inventory (MCI).[28]

---

28 Additional examples of tools to measure and improve learning environments are given in Section 3 (*Methods and Tools*).

In a study involving teachers, learners and parents, Allen and Fraser (2007) used a modified version of What Is Happening In this Class? (WIHIC) in conjunction with interviews and classroom observations to compare 4th and 5th grade students' perceptions of science classroom learning environments with those of their parents. The dimensions of the learning environment addressed in the questionnaires for parents and learners were: i) overall satisfaction with the classroom-learning environment; ii) student cohesiveness (social climate); iii) teacher support; iv) involvement; v) task orientation; and vi) investigation. The sample consisted of 520 students (aged 9-11) from 22 classes in 3 schools and 120 parents of students in classes in South Florida, USA. To determine the statistical significance of differences between parents' and students' perceptions, a multivariate analysis was performed with the set of WIHIC scales as the dependent variables and the group responding to the instrument (students versus parents) as the independent variable (Allen and Fraser, 2007, p. 74). Overall, researchers found that there were significant differences between what parents would prefer to happen in their children's classrooms and what children would prefer *(see **Figure 10**)*.

Figure 10. Comparison of average item means for students and parents in their actual and preferred WIHIC scores
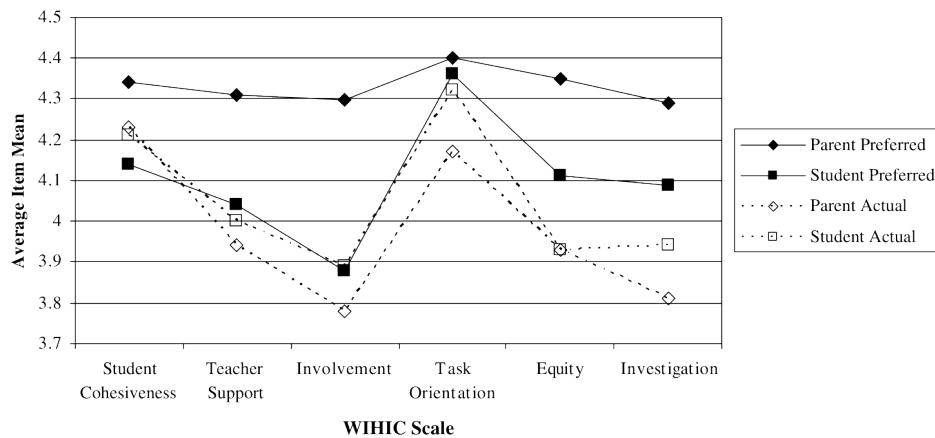
Source; Allen and Fraser, 2007, p. 82.

The researchers also measured students' individual attitudes[29] toward their science lessons and their learning achievement[30] to see if there were correlations between perceptions of the learning environment on the one hand and attitudes and performance on the other. In addition, they conducted follow-up observations and interviews with both students and parents. In the interviews, both groups were asked to express how they perceived the learning environment in the current science classroom versus in an ideal science classroom. The quantitative data analysis yielded only weak correlations between students' perceptions of their learning environment and their attitudes toward achievement in science. The picture drawn by the qualitative probes, however, was more revealing and complex. For example, the interviews revealed that parents perceived the learning environment less favourably than students did but for reasons that were outside the control of teachers. These included such negatively perceived factors as the pressure on teachers to prepare children for state mandated standardized testing. Parents also felt that overcrowding of classrooms and discipline problems created by the overcrowding had negatively impacted their children's learning environment.

Overall, the results of the study indicated that 'while learners were fairly satisfied with their learning environment, parents wanted more for their children' (ibid, p. 79). The researchers saw the involvement

---

29 Using the Attitude to Scientific Inquiry and Enjoyment of Science Lessons scales from the Test of Science Teacher Attitudes (TOSRA) (Fraser, 1981).
30 Science achievement was assessed using the Stanford Achievement Test (SAT-9) and a school-based final grade.

of parents as an important breakthrough as it offered them an opportunity to become active supporters of their children's learning and to voice their opinions on the larger, systemic problems. While this type of research does not claim to have an immediate impact on school and classroom environments, it does serve as a means of validating the instruments adapted for use within a particular context. It also reveals specific feedback on the health of the school and classroom climate that teachers can use as a guide for change. For instance, teachers may have been surprised by learners' perceptions that they did not treat all students equally and that some students did not participate fully in class activities for fear of embarrassment or humiliation by the teacher. Used as constructive feedback, perceptions such as these could result in significant changes in teachers' behaviours and help cultivate a more welcoming and inclusive school culture.

Bowker and Pearle (2007) used a somewhat different approach to gathering and understanding learners' perceptions and attitudes in an international project, 'Gardens for Life', which involved 67 schools in England, Kenya and India. The theoretical framework for both the project and the study was derived from experiential learning with references to Dewey, Vygotsky and Bruner. The researchers used concept maps (i.e. children's drawings representing their ideas and how they are interrelated) to find out how the children (aged 7-14) perceived school gardening as a learning environment. Concept maps are described as a child-centred and 'cognitively-demanding form of simple diagrammatic representation' consistent with a constructivist approach to learning in that they represent 'what a child knows rather than how accurately she/he has been taught' (Bowker and Tearle, 2007, p. 89). Concept mapping was also chosen because of its minimal requirement for words, which was important in some of the settings where fluency in written and spoken English was limited. As shown in **Figure 11**, the concept mapping was augmented by interviews and contextual observations – the latter recorded through the use of diagrams, pictures and field notes.

Figure 11. School gardening research project – data flow between methods
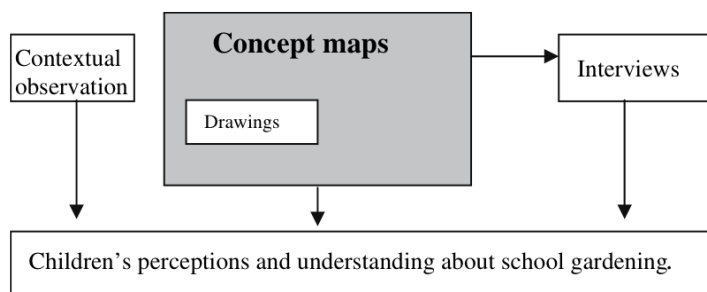
Source: Bowker and Tearle, 2007, p. 89.

Data were collected from children who had been involved with the project in 6 of the 67 schools. Concept maps were completed by all of the children in all six classes, and interviews were carried out with 12 children selected at random from each class. In the interviews, children were invited to discuss their concept maps, share their ideas on how they felt about the gardening project and reflect on what impact they thought it had on their learning. A detailed analysis of the concept maps and interview tapes resulted in the identification of 10 concepts: (1) fruit and vegetables; (2) flowering plants and trees; (3) garden features and design; (4) gardening activity and knowledge; (5) gardening tools and their use; (6) affective responses; (7) wildlife including conservation; (8) climate and weather; (9) curriculum and community links; and (10) global links. Of these, the area of learning most frequently associated with school gardening by children in Kenya and India was 4 (gardening activity and knowledge) while more frequent references to 2 (flowering plants and trees) and 3 (garden features and design) were made in the drawings and interviews of English children (*see **Figure 12***).

Figure 12. Extent scores for school gardening concepts in England, India and Kenya
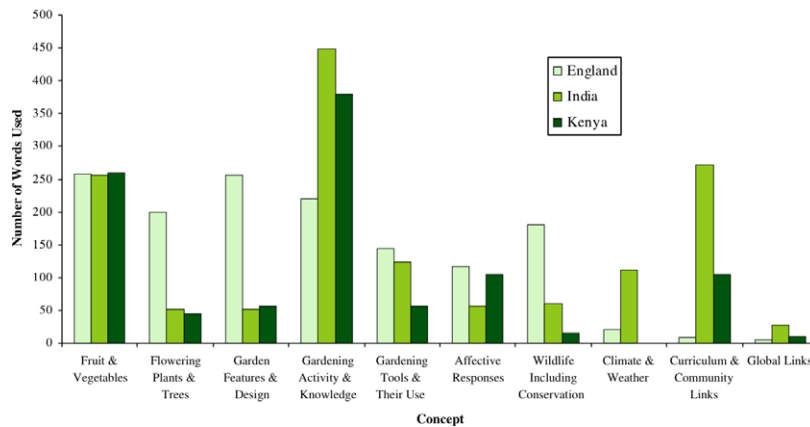
Source: Bowker and Tearle, 2007, p. 93.

Overall, researchers noted a significant difference between the way English children perceived the garden (i.e. mainly as a place for leisure, play and enjoyment) versus the way Kenyan and Indian children considered the school garden (i.e. as a place of learning, community, security and peace) (Bowker and Tearle, 2007, p. 95). One of the many interesting insights that researchers found was that the Kenyan children's knowledge of tool use seemed much more sophisticated and extensive than that of Indian children. The positive 'feel good factor' was very strong across all three cultures and continents (ibid, p. 97). This supports the observations of Louv (2005) and others on the link between children's emotional wellbeing and their ability to experience the natural environment. The researchers' initial reflections during the first year of the project was that school gardening has the potential to go beyond its function as a setting for integrating and delivering many aspects of the school curriculum to becoming an environment that enables children to experience a deeper understanding of ecological systems and become more aware of global issues and solutions (ibid., p. 99).

Ethnographic studies generally seek to address a specific problem and often recommend approaches that involve working with study participants to take action towards achieving long-term solutions. To address the widespread problem of school violence and student non-compliance in secondary schools in the United States, Levinson (1998) reviewed several book-length ethnographic studies that when taken together allow for an insider's perspective on the organizational structures and social hierarchies of schools that lead to non-compliance and resistance. Paul Willis (1977) in a classic study of the transition from school to work of a group of working class boys in a small industrial town in England (*Learning to Labour: How Working Class Kids Get Working Class Jobs*) shows how the rebellion of boys against school authority ultimately prepares them for subordinate roles in the socio-economic system. Based on the insights gained from these types of studies and acknowledging that the problem of adolescent non-compliance is complex and multi-faceted, Levinson suggests that administrators and teachers heed the elements in the learning environment that may actually provoke forms of misconduct and violence. As one of the studies reviewed by Levinson concludes 'schools must establish 'institutional legitimacy' with their students by creating conditions of trust (Erickson, 1987, quoted in Levinson, 1998, p. 612). Without this legitimacy, students act up or tune out.

Illustrating another approach to research on learning environments, Kai-ming Cheng (1996) conducted a non-comparative study of 50 primary schools in 10 school districts in the Zhejiang Province in China. This study took physical aspects (e.g. walls, light, size, ventilation and noise levels) into account as well as non-physical aspects (e.g. seating arrangements and the quality of bulletin boards). Cheng also observed the manner in which learners and teachers prepared for learning activities as a kind of 'warm-up' pre-condition that enables the process to begin:

"Some classrooms might choose to greet teachers quietly by standing up. In some schools particularly in the lower grades, students sang a song or two to stabilize the atmosphere… these activities were seen to have led over 90 per cent of the students in to a state ready for learning." (Cheng, 1996, p. 35)

Cheng's observation of atmosphere – the overall ethos of the learning climate – calls into view the dimension of learning conditions that is considered by many as the most difficult to measure. Like 'the air we breathe' (Freiberg, 1999, p. 1), the atmosphere in the classroom can be the determining factor in whether teachers teach effectively, whether students enthusiastically engage in learning at a critical time in their lives and whether they succeed in reaching their goals.

While the creation of positive classroom conditions rests largely with teachers, there are almost always elements that lie beyond the control of teachers, learners, parents and other community members. Therefore, this section on lessons from the field of LER must also include a look at the health of learning climates as a systemic issue resulting from a multiplicity of factors situated in the third of Rudolph Moos' domains – namely, that of organizational structure and management.

2.2.3 Organizational structure and management

The organizational dimension of classrooms and schools is made up of elements that determine their structure, rules and degree of openness to change. This domain, which includes factors such as instructional time (allocated and actual), class size, discipline codes, management structure, parent and community involvement and school atmosphere, continuously interact with factors in the relationship growth domains as well as with the architectural design and physical conditions of the school. The extensive body of research on the relationship between instructional time and learning achievement in developing countries as frequently examined in cross-national studies of quality was reviewed in *Prospects* (Baker et al., 2004; Benavot and Gad, 2004). The impact of class size and pupil-teacher ratio on the quality of teaching and learning has also been routinely included as a component of cross-national and national school efficiency studies but rarely as a topic for in-depth investigation. However, studies related to the time factor tend to look closely at how the amount of time available is or should be used (Abadzi, 2006; Blatchford, 2007; Helf, Cook and Flowers, 2009).

The Finnish model described by Halinen and Järvinen (2008) provides a good example of educational management *(see **Box 6**)*.

Box 6. Lessons on educational management from Finland

The entire system aims to support the process of teaching and learning.

The educational administration is flexible and supportive. The national administration interacts naturally and vigorously with municipalities. Instead of control, the Finnish system emphasizes trust, support and development (Välijärvi, 2003). Instead of nationwide examinations or lists ranking schools, it focuses on self-evaluation. Based on national and municipal goals, the task is to find areas for improvement (Halinen et al, 2006). At the national level, education authorities evaluate the success of educational policy. At the municipal level, they evaluate their own activities and take responsibility for national, sample-based evaluations of student achievement and of students' health and welfare, and by thematic evaluations, one of which looks at special needs education.

Source: Halinen and Järvinen, 2008, p. 79.

The guide by the HM Inspectorate of Education of Scotland, *How Good is Our School?* provided to teachers, school heads, support staff, parents and community groups is another good example of national support for the creation of positive learning environments. The guide is practical and user-friendly yet does not shy away from addressing the very complex process of teaching and learning, including new evidence from neuroscience, social interaction and constructivist theory. As a way of guiding users towards establishing a common vision and achieving their goals, ten 'dimensions of excellence' are described followed by a more detailed exploration, a framework for self-evaluation and, finally, a planning guide. An audio-visual resource, *Journeys to Excellence*, reflects on how change has happened, specifically in areas such as building a collaborative culture, dealing with complexity and diversity, and developing a community of learners.[31] The European Socrates Project (Evaluating Quality in School Education), based on extensive research on school improvement in 18 European countries, also developed a number of guidelines and self-evaluation tools to gauge organizational health (MacBeath et al., 2000). The project is elaborated further in Section 3.2.1.

The rise in school-based violence is a matter of global concern that calls for urgent action in the area of curriculum reform and the creation of safe, healthy and inclusive learning environments. The UN Secretary-General's *Study on Violence Against Children* documents the reality of violence against children and young people around the world and recommends ways of preventing it (Pinheiro, 2006). A number of case studies in different parts of the world have led to the general conclusion that misconduct often originates within schools rather than outside them (Galand, 1988; de Cruz Bennetti et al, 2009). In other words, noncompliance, absenteeism and misconduct, including violent behaviours often occur in response to the organizational and discursive conditions of modern schools. The Brazilian case example discussed in Section 1 found that alienation and drop out is the result of a long process between the learner and the school, where a link fails to be established between the 'habitas' of the school and the student, and where a context for supporting individual autonomy is not developed (de Cruz Bennetti et al., 2009).

For many, the way toward improving the problem of school-based violence is not for schools to enact further repressive measures but to 'establish institutional legitimacy with their students by creating conditions of trust' (Levinson, 1998). Practical guidelines for constructive school discipline and violence prevention in schools have also been produced by several provincial and state school systems in Europe and North America as well as by UNESCO (Hart et al., 2005; UNESCO, 2009).

2.3   Summary and reflection

The wealth of findings, experiences, and insights revealed through these 'lessons' unequivocally support the view that optimal conditions for learning impacts learning outcomes. The wide range of approaches to exploring the nature of this connection is reflected in the summary of research reports, reflections and practical guides in **Table 5**.

Because they share common theoretical roots, the studies reviewed in this Section generally assume that child-centred, active learning methodologies are more effective and desirable than teacher-centred, authoritative models. Many also conclude that more active, focused research on learning environments is needed to effectively respond to pervasive problems and correct disparities across social and economic boundaries. On the other hand, expensive buildings and abundant resources do not guarantee optimal conditions for learning. As a school researcher who has studied school innovation and school reforms since 1967 recently pointed out:

---

31 All of these resources are accessible at the 'Journey to Excellence' website http://www.ltscotland.org.uk/journeytoexcellence/index.asp

"I have probably more questions now than 30 years ago. How is it possible for a teacher with more than 70 children in the middle of the jungle of Sri Lanka, to perform wonderful project instruction, authentic learning for the children, without any external support and with only the very minimum of local materials?" (Per Dalin, 2005, p. 25)

As in all aspects of education processes and environments, mysteries such as these continue to puzzle researchers and policy-makers. However, an inclusive social climate based on caring and respectful interrelationships between teachers and students, teachers and administrators and among the students themselves are generally accepted as a fundamentally enabling condition for

Table 5. Examples of recent research reports, reflections and guides

Dimension	Source	Conclusions/recommendations
School and classroom climate	*A View Inside Primary Schools* (UIS, 2008)	• Correct imbalances in the quality of school buildings and basic resources. • Correct imbalances in access to materials and equipment. • More consistency in values, practices, disciplinary methods. • Encourage participatory management styles.
	Creating Effective Teaching and Learning Environments: First Results from TALIS (OECD, 2009)	• Close links between open and positive school climate and: teachers' beliefs, professional development and adoption of innovative teaching practices identified.
Architecture	*Architecture for the Poor* (Hassan Fathy, 2000)	• Use local materials and designs responding to local conditions. • Create in school buildings a source of love, encouragement. • Incorporate natural lighting and traditional technologies for ventilation and temperature control.
	A Fresh start for school design in Africa (Breetzke, 2003)	• Create designs in collaboration with local communities. • Take teacher and school managers' needs into consideration. • Incorporate traditional symbols and integrate natural environment.
	The Language of School Design: Design Patterns for the 21st Century (Nair, Fielding and Lackney, 2009)	• Design principles that define the identified best practices. • Six categories for school design patterns that positively impact identified learning. • Collaborate with local communities on school design planning.
Social and pedagogical climate	*Psycho-psychological environments and learning* (Haertel, Walberg, and Haertel, 1981)	• Characteristics positively and negatively associated with identified learning gains and outcomes (in review of 12 studies). • Sets of variables co-determining identified learning outcomes.
	Parent and student perceptions of learning environment and its association with learning outcomes (Allen and Fraser, 2007)	• Existing instruments for measuring classroom climate can be adapted to different contexts. • Use qualitative methods to augment statistical analysis. • Learning environments research can create new avenues for parent involvement.
	Gardening as a learning environment (Bowker and Tearle, 2007)	• Concept mapping is a valid instrument for measuring learning environments. • Differences in perceptions are shaped by culture. • School gardens as a learning environment has positive impact on learning across cultures.
	Towards inclusive education: the case of Finland (Halinen and Järvinen, 2008)	• Learning-centred pedagogies prevail throughout the system. • Administration is flexible and supportive. • Focused on students' learning achievement, health and welfare.
	How Good is Our School? (HM Inspectorate of Education, Scotland, 2006)	• Practical guide for all involved in educational process. • Explains theory in digestible terms. • Provides a framework for school self-evaluation and improvement.

learning. Lessons from the field also suggest that orderly school and classroom environments with well-defined rules and codes of conduct are conducive to learning. However, in some contexts, overly authoritarian environments may lead to noncompliance, low achievement and rebellion. European teachers express their need for professional development that will help them cope with unruly children while teachers in South Africa suggest that a change in architectural design would help them keep students under control. The problem of violence against and among children is global but there is overall agreement that solutions must be local and must involve families and communities.

There is also substantial evidence that integrative learning environments, such as school gardens and small learning communities, serve the dual purposes of engaging learners in acquiring knowledge while instilling in them an 'illumination' or joy of learning. In the world's poorest countries, where research of this type has yet to be widely undertaken, the question of how schools can create optimal conditions for learning could be reworded as 'How can we create environments that allow for joy to bypass drudgery?' As will be shown in Section 3, the answer to creating such environments may be found in local knowledge, community participation and access to inexpensive, effective and reliable methods and tools.

3.   Methods and tools

Educators need not feel they must choose between striving to achieve constructive classroom environments and attempting to enhance student achievement of cognitive and affective aims. Rather, constructive educational climates can be viewed as means to valuable ends and as worthy ends in their own right.
— Barry J. Fraser and Herbert J. Walberg

Traditionally, methods for measuring the quality of learning environments have relied on adaptations of a basic generic set of conventional research tools, including the ubiquitous questionnaire, the observation checklist and the interview. More recently, new instruments have been created, validated and freely adapted to different research contexts. Methods and tools employed by governments and international organizations to assess the quality of schools and school systems draw freely from all of the above as a means of driving policy change, devising strategies for system-wide reform or providing practical support and advice to schools. More recently, internationally and nationally coordinated projects have provided inspiration, models and support to schools and other learning organizations to develop their own evidence based self-evaluation and improvement programmes.

Studies grounded in these diverse perspectives often complement each other, resulting in a growing tendency to incorporate various combinations of qualitative and quantitative techniques and to freely exchange data gathering and analysis tools (Freiberg, 1999; Fraser and Walberg, 1991, 2005; Goh, 2000). This is partly because the instruments for measuring learning environments developed over the past four decades within both the LER and SER paradigms are well constructed, flexible and adaptable to different situations.

The main purpose of this Section is to offer a closer look at some of these generic tools as well as their various adaptations and the ways they have been used in different parts of the world for different purposes.

3.1   Tools for measuring and improving physical conditions

The impact of well-designed learning spaces on academic performance has been well established (e.g. Berner, 1992, Peters 2003, Tanner and Langford, 2003). Some studies have focused on the effects of physical conditions on the emotional and physical health of learners and teachers, while the main consideration in others is the organizational health of the school (*see Upitis, 2009 for a comprehensive review*). When measuring such factors, the focus is often on the state of actual conditions in comparison to externally developed sets of standards in such categories as building safety and appearance, sanitation and health, acoustics, light, air quality, classroom equipment, teacher and staff workspace, playgrounds, classroom/lab equipment and learning resources. Studies on the physical conditions of learning environments are undertaken within a variety of disciplinary fields and focus on factors such as:

- Quality of the natural environment surrounding the school or learning space;
- Design and structure of the compound and school building(s), including recreational areas and gardening spaces;
- Exterior and interior condition of the school buildings;
- Size of learning spaces relative to the number of learners;

- Basic facilities available to members of the learning community;
- Interior design and arrangement of classrooms, resource areas, laboratories, libraries, cafeterias and social spaces;
- Quality of interior environmental elements such as light, acoustics, colour and ventilation.

While the full set of instruments used to measure the physical dimension of learning environments is too numerous to describe in detail, a sampling of types that are typically used (or have the potential for being used) in countries with limited resources are featured below.

3.1.1 Cross-national and national studies

To offer education of good quality, educational institutions and programmes
should be adequately and equitably resourced, with the core requirements
of safe, environmentally friendly and easily accessible facilities.
— Dakar Framework for Action, Strategy #8

Cross-national and national assessments carried out by regional networks and/or supported by governments and international organizations frequently employ tools such as the structured observation checklist, completed either by trained external or participant observers.

The Kenyan study, for example, used a comprehensive checklist for observers to record their descriptions of school compounds, buildings and classrooms *(see **Appendix I**).* Items referring to overall general conditions establish whether classrooms are permanent or temporary, if there is a fence surrounding the compound and whether there are open-air areas that serve as classrooms. Observers are instructed on the form to 'visit the toilet facilities and describe what you see' in terms of numbers designated for boys and girls, type (flush or unventilated pit latrines) and condition (clean or dirty).

In the same study, classroom conditions are rated using descriptors unique to each item. For example, the number of children in a classroom (of unspecified size) is simply recorded. Observers are asked to rate walls, windows, roofing, floor, lighting, ventilation and noise by selecting from a series of set descriptors. For example, the condition of walls is rated as being in 'good condition, unstable, moving, or crumbling' while ventilation is rated as 'stable and pleasant, hot, chilly and cold, damp and humid, breezy or uncomfortable.'

Observers in the Kenya FPE study also rated the presence and quality of classroom furniture, wall charts, chalkboards[32] and visual aids fixed on the walls within the classrooms, as well as the presence of facilities to accommodate children with special needs. The tools used in the Kenyan study to assess the physical aspects of learning conditions refer to all four themes identified as fundamental principles for a generic framework on quality learning environments: *safety* (fence surrounding the school, structural integrity of buildings), *health* (access to and conditions of toilets, water supply), *equity* (separate facilities for boys and girls) and *inclusion* (physical access to children with special needs).

---

32 Chalkboards were also rated in terms of their visibility from all angles of the classroom, with the result that only half of the classrooms observed had chalkboards that were visible to all students. Of the visual aids observed, most were in poor condition and some 25% had no visual aids at all.

In SACMEQ II countries[33], the conditions of school buildings are rated on a scale based on the observer's assessment of their condition or need for repair – 'complete rebuilding, some major repairs, mostly minor repairs, some minor repairs, good condition.' Other categories in measuring classroom conditions, equipment and learning resources may simply require observers to report the existence or non-existence of particular items. For example, the basic set of classroom conditions detailed in 4 PASEC and 14 SAQMEC II countries consists of 13 items, combining elements of structure, equipment and classroom supplies (i.e. permanent classroom, electricity, desk, teacher's chair, cupboard, blackboard, chalk or marker for the blackboard, ruler for the blackboard, set square for the blackboard, compass for the blackboard, dictionary, map or earth globe and geometrical instruments for the classroom).

Several baseline requirements for the physical conditions of schools to ensure safety and health have made their way into national education plans in EFA-FTI countries (Kenya, 2005, Lesotho 2005, Nicaragua 2002) as well as into the research models, tools and programmatic initiatives of international organizations. Environmental components of the UNICEF/WFP *Essential Learning Package*, for example, include improvement of school infrastructure, school-based nutrition programmes, potable water supplies and separate sanitary facilities for girls. Some overall assessments of quality include reviews of government standards for the physical conditions of schools. For example, the work of a commission appointed by the Government of Botswana to establish standards for the physical environments of primary schools recommended the following specific measures, which was reported in a SACMEQ II study (2005):

- Adequate number of classrooms up to a maximum of 22;
- Administration block with office space for school head, deputy school head, typist, staff room and 2 store rooms for storage of books and food;
- Library;
- Resource centre;
- Fully equipped science room/science equipment;
- Room for health activities;
- A sports field;
- A tool shed for storage of agricultural and other tools;
- Teachers' quarters with a minimum of 2 bedrooms;
- Adequate toilet facilities (including provisions for the disabled);
- Sufficient land for agricultural purposes and future development;
- Electrification of school buildings including teachers' quarters.

Conditions of learning in parts of the world affected by conflict or recovering from emergencies are in a somewhat different category, and have received special attention from international organizations and NGOs. In each situation, different methods and tools for assessing learning environments are adapted to measure conditions against certain basic requirement, primarily those developed by the Inter-Agency Network for Education in Emergencies (INEE). Key indicators for measuring actual conditions against INEE Standard 3 on Access and Learning Environments stipulates that facilities are listed in **Box 7**.

---

33 Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Uganda, Zambia, Zanzibar

1. The learning structure and site are accessible to all, regardless of physical ability.

2. The learning environment is marked by visible boundaries and clear signs, as appropriate.

3. The physical structure used for the learning site is appropriate for the situation and includes adequate space for classes and administration, recreation and sanitation.

4. Class space and seating arrangements are in line with an agreed ratio of space per learner and teacher, as well as grade level, in order to promote participatory methodologies and learner-centred approaches.

5. Communities participate in the construction and maintenance of the learning environment.

6. Adequate sanitation facilities are provided, taking account of age, gender and special education needs and considerations, including access for persons with disabilities.

7. Adequate quantities of safe drinking water and water for personal hygiene are available at the learning site.

Source: INEE, 2004, p. 47.

For donors, education ministries, and implementing organizations, assessments that measure the physical conditions of schools in developing countries as well as those in areas suffering from emergency situations serve as a means to determine how well tangible inputs on the renovation or upgrade of physical conditions actually improve learning outcomes as measured by cognitive achievement tests and indirectly through drop-out and repetition rates. For schools, communities and organizations, these assessments can to serve as a means to develop evidence-based strategies for school improvement.

3.1.2 Health-related studies

Case studies on the relationship between physical conditions and learning generally take a deeper look into a narrow field of variables, such as the impact of a certain cluster of physical conditions on selected cognitive or affective outcomes (Comesaña and Juste, 2007, Teixeira, 2009). Data gathering in these types of studies generally involves several types of tools. The purpose is often to produce hard evidence on specific issues in order to convince educational planners and policy-makers that improvement in the physical conditions of schools is an urgent necessity.

In the Spanish study summarized in Section 1.1.2, Comesaña and Juste (2007) aimed to gather and consolidate fresh evidence on how certain conditions affect learner's health, behaviour and thus, indirectly, their self-efficacy as learners. In this case, a pre-defined cluster of environmental factors were assumed to have a measurable impact on children's physical and emotional health and hence on their readiness and ability to learn. Basing their approach on a list of government established regulations (*see Appendix II*), the researchers used a combination of six data gathering tools to collect extensive information on four environmental variables: i) lighting and ventilation; ii) noise; iii) temperature; and iv) safety *(see Box 8)*.

Data on each variable was intentionally collected from multiple viewpoints "so as to ensure that a level of data saturation was achieved that provided us with a full view of the reality we wanted to study and of all the elements comprising this reality" in order to produce concrete, actionable recommendations (Comesaña and Juste, 2007).

> **Box 8. Measuring health-related learning conditions in Spain**
>
> 1. *Observation* was used to check compliance with legal provisions and to record the different activities carried out in the school spaces (classrooms, corridors and offices)
>
> 2. *Photographic records* were made of both indoor and outdoor spaces.
>
> 3. *Tape recordings* were made of interviews with the headmasters.
>
> 4. An *analysis* was carried out of the *content* of both institutional documents (pertaining to educational projects, school curriculum, general planning for the coming year and annual reports) and internal documentation (minutes of staff and School Board meetings, press clippings and documents received from the Administration).
>
> 5. A *questionnaire* was completed by nursery school teachers.
>
> 6. A *field notebook* was kept, detailing the observers' personal impressions regarding the way in which users interacted with the different spaces.

Source: Comesaña and Juste, 2007.

Experimental studies where the objective is to assess the effectiveness of an intervention often rely on such measures as pre- and post-testing of learning gains in study and control groups. Tools for measuring such gains include conventional tests of skills and/or knowledge, measures of attitudinal change or direct observation. In a study investigating the relationship between classroom seating arrangements and the question-asking of fourth grade children, the researchers used a taxonomic observational system to compare the frequency, type and patterns of the teacher-learner interactions when seated in a semi-circle compared with the same children in a row-and-column seating arrangement (Marx, Fuhrer, and Hartig, 1998).

Studies where the dependent variable is the physical and mental health of learners may have a more clinical orientation and generally seek to produce hard evidence to convince policy-makers as well as the general public of the need for improvement. In a study that investigated the effects of a single variable (natural light) on the health and behaviour of eight- and nine-year-old school children, researchers compared each individual's production of a stress hormone (cortisol) with classroom performance and sick leave in four classrooms – each with a different type of lighting arrangement (Küller and Lindsten, 1992). Measures of the dependent variables included: (1) analysis of urine samples, (2) behavioural observations, (3) recordings of annual body growth and (4) reports of sick leave. Results of this year-long study, in which seasonal variations of hormone production and behaviour patterns were also taken into account, suggested that classrooms without daylight disrupted the basic hormone production pattern in children. This disruption may, in turn, affect their ability to cooperate and concentrate and may eventually have an impact on their annual body growth and frequency of illness (ibid., p. 316). To counter these negative effects, the authors recommend increased exposure to natural light during periods of learning.

3.1.3 Planning the design of learning spaces

As described in Section 2.2.1, a number of innovative ideas and experiments on how the architectural design of schools enhance learning (Fathy, 2000; Breetzke, 2003) have been proposed but to date, very few of these claims have been supported by empirical evidence from the perspective of learning outcomes research. Until recently, assessments used to measure educational environments have lacked the essential tools to undertake such studies. In an attempt to remedy this situation, an online

tool, the Educational Facilities Effectiveness Instrument (EFEI) was privately developed[34] to measure 'the most important elements of a school's design relative to its ability to support education' (Nair, Fielding and Lackney, 2009, p. 191). In contrast to observation checklists and other conventional instruments, EFEI rates physical conditions as components of learning-friendly school design and considers this to be most influential on the school's effectiveness as a place for teaching and learning in the 21st century. The components were selected on the basis of widely accepted best practice principles in good school design that enables a wide variety of teaching and learning activities (including whole group instruction, peer tutoring, story-telling, small group learning, collaborative teaching, hands-on science learning, physical fitness and individual project work).

The EFEI has a formative rather than summative function as a tool used during the planning phase of a new school or for the redesign of existing spaces. To date, individual school planning committees, districts and government departments have used this tool at different phases of planning or renovation. Basic categories of design features based on 'good practice in school design' include a welcoming entry, student display space, areas for small group work, life skills areas, indoor/outdoor connection, connection to the community, large assembly spaces and shared learning resources. **Box 9** is a sample of an EFEI template[35] designed to rate conditions in the category of classrooms and/or learning studios[36] in order to evaluate architectural drawings for a new elementary school. Each checklist item is rated by an objective in-house reviewer and an aggregate 'score' is produced as a means of gauging existing conditions and making plans for renovating older buildings or constructing new ones. The EFEI online tool is supplemented by images of photos and drawings that show best practices in school design from around the world.

Box 9. Sample items from the Educational Facilities Effectiveness Instrument (EFEI)	
CLASSROOMS/LEARNING STUDIOS **How effectively do classrooms serve as learning studios and suites?**	
1. Majority are L-shaped (0.5 pts) with learning centres and nooks (0.5 pts) for independent study	
2. A majority of classrooms have collaborative tables for small group work (1 pt)	
3. Wet area for activity-based, hands-on learning (1 pt)	
4. Room facilitates mobile computer use (e.g., data ports or wireless) (1 pt)	
5. Data projector (0.5 pts) and raised platform (0.5 pts) for student-led presentations and performance	
Raw Pattern score (out of 5)	0
Weighted Pattern score (out of 5.0)	0.0

Source: www.goodschooldesign.com

This type of tool promotes certain features of school design over what are considered by its creators as obsolete, even debilitating models (i.e. rectangular classrooms, student desks arranged in rows facing the teacher). The tool is inspired by environmentally connected, constructivist learning theory. However, it is adjustable – planners are free to adapt it to their own requirements. For example, spaces for teacher centred, traditional classroom activities are not ruled out but points are given to those that also include space for small group and independent learning. High marks are also awarded for features of school design that promote strong links between school cultures and the communities in which they are embedded – a connection which figures prominently in studies of the intangible dimension of both learning environments and school effectiveness.

3.2   Measures of overall quality

Increased awareness of the influence of school and classroom climate on learning processes and outcomes has spawned the invention and adaptation of a medley of tools to assess the intangible aspects of learning environments, namely their psychosocial and organizational dimensions. From most perspectives, the school and classroom climates are differentiated for the sake of investigation, but there is general agreement that one is nested within the other and that both have social (or psychosocial) and pedagogical dimensions which clearly impact one another. The prototypical models to measure these less tangible dimensions of learning environments have emerged mainly from the fields of psychology, anthropology and, later, from learning environments and school effectiveness research (LER and SER).

In brief, LER departs from its antecedents and parallel paradigms as it takes a broad view of learning environments, each of which is composed of a web of overlaying dimensions, determinates and attributes. SER, on the other hand, seeks to identify specific factors in the school and classroom environment (e.g., classroom management, use of time and home-school partnerships) that can be positively correlated to improved learning outcomes.

Studies focused on the school and classroom climate as well as in SER where selected aspects of learning environments are perceived to play a significant role use tools for data gathering and analysis that are selected and customized to fit specific purposes. The applications of these tools fall into three main categories:

1. Gathering factual information on selected aspects or dimensions of the learning environment (systematic observation, official records analysis, surveys, questionnaires, interviews);
2. Collecting and measuring the perceptions of participants in the learning environment (questionnaires, rating scales, diaries, drawings, concept mapping, focus group discussions, semi-structured or unstructured interviews);
3. Collecting and analysing data on learning outcomes in both cognitive and affective domains (standardized or study-specific skills assessments, observation checklists, rating scales, reflective interviews).

Many of the tools in each category are multifunctional. For example, an instrument designed to measure students' attitudes toward learning may be also used as a barometer of classroom climate to inform teachers on how to improve the situation. The same tool may be used in an experimental design as a measure of attitudinal outcomes to gauge the impact of an innovation. Some studies opt to apply previously validated tools with minimal modifications, such as changes in the wording of a questionnaire to suit the age or role of respondents. In other cases, new tools are created as alternatives to existing ones, which calls for a pilot study to be built into the overall design in order to validate the new tool(s).

In recent years, the quantitative-qualitative divide in LER has come close to vanishing as tools drawn from both methodologies are combined in study designs in ways that reinforce and complement each other. Generally, information gathered using quantitative tools is used as a springboard for deeper probes using in-depth interviews, focus groups, journals or other qualitative tools.

3.2.1 Assessments of school and classroom climate

Surveys of school and classroom climate may focus on a relatively limited cluster of factors such as class size, student-teacher ratio, school organization and safety (survey by *Education Week*, 1997 reported in Freiberg and Stein, 1999), or on a more complex, multi-dimensional set of topics. An example of the latter approach is the Dutch Checklist for the Assessment of the Quality of Classroom and School Climate – a self-evaluation tool[37] that provides schools with the means to investigate four dimensions in detail, each of which is considered important for a positive school climate *(see Appendix III)*:

- School plan for effectiveness;
- Physical environment;
- Teacher behaviour;
- School's system.

The Dutch checklist requires yes/no responses on a group of items within each topic. In the process, it constructs a culturally integral and relevant profile of a safe, highly supportive learning environment that actively fosters the achievement of positive affective and cognitive outcomes.

PASEC evaluations foster educational improvement within countries by selecting and analysing key factors relevant to the overall quality of basic education systems – several of which are related to school and classroom climate. The methodology seeks to identify a hierarchy of potential interventions such as reducing the frequency of grade repetition and increasing in-service teacher training, which in turn can be expected to improve both the conditions and processes of learning. Learning outcomes are measured by the regular administration of pre-tests in French and mathematics to all 2nd and 5th graders at the beginning of each academic year. The annual administration of the pre-test provides a tool for researchers to measure the impact of variables introduced during the same time period. Additional tools, such as questionnaires for teachers, school managers and students, are employed at regular intervals to measure progress over time. An example of a PASEC study in Senegal on the effects of early grade repetition is described in **Box 10**. This study can be related to learning conditions as the practice of grade repetition was shown to have a measurable impact on both learning achievement and the learning environment (i.e. increasing and already crowded conditions create a negative psychosocial climate).

The longer term impact of the ministerial decision brought about by the PASEC study affects the quality of learning environments for subsequent cohorts of students not only by creating additional space but also through its probable influence on student motivation and school climate.

Cross-national and regional studies in developing countries use a variety of methods and tools to gather data (either directly or indirectly) on the social and organizational climate of classrooms and schools. Data collected via PASEC and SACMEQ (I and II) surveys and questionnaires, for example,

---

37 One of a set of four instruments originally developed for representatives of the Inspectorate. Items on the original checklist were restated for consideration by teachers and schools as a means of diagnosing and taking action to improve school climate (reported in Creemers and Reezigt, 1999, p 39-40)

> **Box 10. Measuring the impact of grade repetition in Senegal**
>
> The main objective of this PASEC study was to gain insights into the effects of grade repetition, an extremely common practice in francophone Africa. A cohort of second grade students was followed for five years (1995-2000). In addition to the pre-tests in mathematics and French administered each year, questionnaires were designed to gather complementary information from teachers, school managers and the students themselves on their progress.
>
> Initial results for the first three grade levels were presented at the CONFEMEN ministerial meeting in 1998, and final results were published in 2004. The results of the study were consistent, robust and clear: grade repetition does not have a significant impact on achievement by weaker students, and has a detrimental impact on intermediate and better students. The results also show that more than 25% of the students targeted for repetition belong to the latter category, indicating that these students have been ill-targeted. The study also suggests that the continued practice of early grade repetition may lead to higher drop-out rates. These results indicated that a policy of reduced repetition would not have a negative impact on quality, which led to a ministerial decision to fully prohibit repetition between Grades 1 and 2, Grades 3 and 4, and Grades 5 and 6.

Source: Bernard and Michaelowa, n.d., p. 5.

yield information on the gender, age and experience of teachers as well as on their facility with local languages, which are all contributing factors to the social climate of classrooms and schools (Bernard, 2003; Bonnet 2007; 2009).

Local, national and international projects supporting the self-evaluation of schools take a holistic view of quality. The tools designed for such projects enable administrators, teachers, parents and learners to assess current conditions in order to improve both social climate and academic effectiveness. These functions are not considered in opposition to one another but are mutually supportive and intertwined goals. In support of this view, the French professor of school effectiveness in *Self-evaluation in European Schools* stated in a hypothetical conversation with a group of young learner-participants:

> "Wellbeing? I think that's what it's called. It's something we French researchers take very seriously. And you'll be pleased to know that we've learned from these studies that schools which are academically effective are often also schools where students are happy, enjoy school, get on with their teachers and believe that their teachers want the best for them. Of course, it's a little more complicated than that, but let's just say that it makes a lot of sense that these things together – feeling good and doing well – are a powerful combination." (Macbeath et al., 2000, p. 66)

To measure school climate in terms of these intertwined goals, a subset of the School Effectiveness Profile (SEP) developed during the course of the European Socrates project 'Evaluating Quality in School Education'[38] can be used to gather data on aspects of school life that describe the quality of its social, pedagogical and professional environment. In a similar vein, the Government of Scotland's self-evaluation manual[39] invites teachers, administrators, students, parents and community members

---

38 The pilot project on quality evaluation was launched in 1997 with the approval and support of the Council of Ministers of Education and involved 101 secondary schools in 18 countries. A full description of the project may be viewed at
http://ec.europa.eu/education/archive/poledu/present_en.html
39 HM Inspectorate of Education, How Good is Our School? Revised edition, 2007. Part 3 — How good are we now? How good can we be?

to contemplate management issues such as staff sufficiency, deployment, development and review. Touching directly on organizational health dimensions, the guidelines and tools for schools participating in the European project suggest that a school might seek answers to questions such as:

- Is there a climate of mutual respect between pupils, rather than bullying and disrespect?
- What is the quality of relationships between pupils and staff?
- Does the school provide opportunities for pupils to exercise decision-making and responsibility?
- Are rules clear and accepted by all?
- Are rewards and sanctions applied with equity and justice?
- More generally, does the life at the school contribute to pupils' learning and development?

Delving more deeply into selecting areas to be investigated and tools to be adapted, the European project provides a specific set of guidelines to structure self-evaluation processes, including the development of strategic plans to improve school quality. Practical instructions with examples are given for conducting interviews and focus groups as well as developing questionnaires, rating scales, surveys, logs, force fields, observation checklists, shadowing, sorting and prioritising, profiling and imaging. According to a summary of project outcomes, the main purpose of the School Effectiveness Profile (i.e. a simple, flexible tool used at the beginning of each process) was to act as a 'highly stimulating starting activity, giving schools the opportunity to bring together a range of stakeholders from the outset, allowing schools to review their current state of organizational health' and to reach agreement on areas for improvement (MacBeath et al, 2000, p. 188). The use of micro-tools (*see Section 3.2.2*) gives potential users a range of options and their detailed description provides a good understanding of the possibilities and consequences of using them. As the summary points out, however, the first round of self-evaluation is only a start – ultimately, the goal is to set into motion a longer term process, resulting in continuous quality improvement in step with our changing times.

In a comprehensive effort to improve school effectiveness, the Ministry of Education, Culture and Sports of the Republic of Nicaragua established standards and targets, as reported in its EFA-FTI country proposal (2002). Improvement of learning conditions forms a significant part of the Nicaraguan 'Schooling Improvement Plan' as shown in the targets established for individual schools *(see **Table 6**).*

In another example of a national initiative to improve the overall quality of schools, the Government of Chile created a website called 'educarchile'[40] aimed at school self-improvement. The information is directed primarily at teachers, students and parents with a rich collection of teaching and learning resources for each group. The 'teachers' category includes suggestions and guidelines for classroom management and to improve both the social climate and physical conditions of learning spaces.

Assessments that focus more narrowly on the social aspects of learning environments tend to rely on measures of social climate and attitudinal change to unearth evidence that will contribute to the sustainable improvement of teaching and learning. In these types of studies, cognitive outcomes are seen as desirable although they are not necessarily the primary objective. Unlike conventional school effectiveness research (SER), which typically involves observations by outsiders using externally developed instruments, school climate research is often undertaken collaboratively and oriented toward measurements based on the perceptions of teachers and the learners themselves.

Within LER and other closely related paradigms, research on the social climate of classrooms and schools does not 'require demonstrations of performance but involves judgments of psychological

---

40 http://www.educarchile.cl/Portal.Base/Web/VerContenido.aspx?GUID=123.456.789.000&ID=130336

Table 6. Levels of school improvement strategies in Nicaragua

	Fundamental level	Satisfactory level	Superior level
School development	School prepares simple 'School Development Plan' to determine investments required to raise standards.	School staff and school community implement the 'School Quality Self Assessment' Instrument.	School sets short and long-term goals and targets, monitors them together with consejo.
Management	School is autonomous or meets conditions to become autonomous. School council meets regularly.	School council (consejo) meets regularly throughout the year to make decisions and manage funds in consensus with teachers and the student council.	School management information system computerized in larger schools. Management of routine processes in place.
Educational materials	School has classroom book corner or school library, textbook set, consumables for all students, basic teacher materials such as chalk.	Package of instructional materials. A desk and chair for every student, with appropriate ergonomic characteristics.	School program or other comprehensive schooling improvement program
Security and infrastructure	Protection against rain and vandals, secure place for materials, parent involvement (35% need some type of physical improvement).	School can be closed and locked, assures security conditions (fence if necessary).	Functioning electricity, school security in place, connection to town water and sewage (if available) are in place.
Health	Safe drinking water, separate toilet facilities for boys and girls under hygienic conditions.	Annual screening and medical referral for hearing, vision and other health problems, mainstream special needs students. Separate toilet facilities for every 45 students. Safe wastewater and solid waste disposal.	Full integration of children with special needs, including teaching aides. Immunization and oral hygiene programs in place.

Source: Republic of Nicaragua, Ministry of Education, Culture and Sports, 2002, pp. 28-29.

or social-psychological states of classes or schools' (Fraser and Walberg, 1991). Methods and tools have diversified significantly since the early conceptual work of Moos and Trickett (1974) and the development of the Classroom Environment Scale (CES). As illustrated in the preview studies in Section 1.1[41], mixed methods and multiple tools are employed to gather, analyse and convert data into actionable recommendations for policy-makers, funders and implementers (including teachers and parents) at different levels of the system. As Freiberg pointed out:

'Sources of data collection have expanded from the exclusive use of surveys (mostly with teachers) to surveys and interviews with student focus groups; to videotaped discussions; to town meetings with students, parents, teachers and others; and from fixed category to open ended observation measures in a move to verify and triangulate findings.' (Freiberg, 1999, p. 3)

Along with the expansion of LER activities in the six categories mentioned above, over the last three decades, scores of new questionnaires and rating scales have been developed, refined and adapted for use in widely diverse learning contexts. A sampling of the instruments that have been used internationally[42] to measure social and pedagogical climate in the context of basic formal education[43] are listed in **Table 7**.

---

41 Examples of three recent approaches: Assessment of Free Primary Education in Kenya, Study of conditions for early childhood education in northwest Spain, and Psychosocial climate and learning outcomes in Singapore
42 To date, development and adaptation of instruments to measure learning environments has been largely limited to Western European and East Asian contexts.
43 Mainly classrooms and science laboratories, grades 4-10.

Table 7. Sample LER instruments for data gathering

Acronym	Instrument	Data gathered	Available languages
CES	Classroom Environment Scale	• Lower secondary • All classrooms	English Spanish Japanese
CLEES	Classroom Learning Environment of Elementary Students	• Upper elementary • All classrooms (adaptation of CES)	English Arabic
CLES	Constructivist Learning Environment Survey	• Lower secondary • All classrooms	English Chinese Korean
ECWES	Early Childhood Work Environment Survey	• Early childhood (teachers and managers)	English
GMOS	General Studies Metacognitive Orientation Scale	• Primary year 3 • general studies classrooms	English Chinese
LEI	Learning Environment Inventory	• Lower secondary • Science and social studies classrooms	English Hindi
MCI	My Class Inventory	• Upper elementary (8-12) • Lower secondary	English Malay
NCEI	New Classroom Environment Instrument	• 13-year-old students (on computer use)	English
QTI	Questionnaire on Teacher Interaction	• Lower secondary • Upper secondary	Dutch English
SLEI	Science Laboratory Environment Inventory	• Upper secondary science laboratories	English Korean
SLEQ	School-Level Environment Questionnaire	• Teachers perceptions of overall school environment	English
WIHIC	What Is Happening in This Class?	• Upper and lower elementary classrooms • Lower secondary science classrooms	English Indonesian Korean Mandarin

These types of instruments have been used for multiple purposes in widely varying contexts (reviewed in Fraser and Walberg, 1981; Fraser, 2002). Although most were developed from branches of LER that focus on social, pedagogical and organizational climate, they have been widely employed in SER as well as in other approaches.

To date, the application of this group of tools internationally has been limited mainly to research activities in the Americas, Europe and in the wealthier countries of Asia. Assessments of students' perceptions of school climate using Spanish language versions of the original Classroom Environment Scale (CES) of Moos and Trickett (1977) and comparable instruments have been employed in case study research in Spain (Angulo and Garcia, 1985) and Colombia (Giraldo and Mera, 2000). The Learning Environment Inventory (LEI), originally developed (Walberg and Anderson, 1968) to investigate the relationship between individual satisfaction with classroom climate[44] and learning achievement, was translated into Hindi for use in a large study involving approximately 3,000 10th grade students in science and social studies classes (Walberg, Singh, and Rasher, 1977). The LEI was later simplified to form the 'My Class Inventory' (MCI), which is suitable for children aged 8-12 years and contains a reduced number of dimensions and items. The MCI has also been used internationally.

---

44 Items on the LEI are grouped into 15 dimensions, including only concepts previously identified as good predictors of learning or relevant to the social psychology of the classroom.

For example, in a study involving 1,565 students in Brunei Darussallam to measure the association between learning environment and learning satisfaction (Majeed, Aldridge and Fraser, 2002).

The What is Happening in This Class? (WHIC) questionnaire is among the most popular instruments to measure the social and pedagogical climate of classrooms, in particular environments where science is learnt. Earlier in this review (*Lessons from the Field*, Section 2, pp. 46-47), a study using a modified version of the WIHIC in three Florida (USA) elementary schools was described as an example of a recent, innovative investigation involving children and their parents which employed combined quantitative and qualitative methods (Allen and Fraser, 2007). The WIHIC was simplified from earlier versions for use in younger learners while a second form was produced with appropriate changes in wording for use in parents – the aim being to elicit and compare the perceptions of both groups. As the result of an earlier study, the WIHIC had already undergone an overhaul which reduced the original 90 items to 56 (Fraser, Fisher and McRobbie, 1996). This revision was based on an analysis of data from 355 junior high school science students, including extensive interviews with the students on their classroom environments in general, the wording of the items and their own responses.

In addition to its use in school-based case studies, the WIHIC has been employed in cross-national studies involving 2,960 Australian and Taiwanese junior high school students and 3,980 Australian, Canadian and British students, respectively, as well as in numerous others (Aldridge and Fraser, 2000; Dorman 2001). The updated English version of the WIHIC has been translated, cross-validated and adapted to study science and computing learning environments in Brunei Darussalam, Singapore, Taiwan and Korea. Sample groups have ranged between 8th grade students and adult learners enrolled in evening computer classes. **Box 11** contains sample items in the WIHIC in six of the dimensions of learning environments measured: student cohesiveness, teacher support, involvement, task orientation, cooperation and equity.

Box 11. Sample items from WIHIC (What is Happening in this Class?)

Each item is rated on a scale of 1-5 (almost never – almost always)
Student cohesiveness
I make friends among students in this class.
I work well with other class members.
Teacher support
The teacher is interested in my problems.
The teacher helps me when I have trouble with the work.
Involvement
I give my opinions during the class.
I am asked to explain how I solve problems.
Task orientation
I know the goals in this class.
I am ready to start class on time.
Cooperation
I cooperate with other students when doing assignment work.
I share my books and resources with other students when doing assignments.
Equity
The teacher gives as much attention to my questions as to other students' questions.
I receive the same encouragement from the teacher as other students do.

Source: http://technologyassessments.wikispaces.com/file/view/What+is+WIHIC.pdf

Whereas the MCI and WIHIC were designed to measure perceptions of several dimensions of classroom climate, the Questionnaire on Teacher Interaction (QTI) focuses specifically on interpersonal relationships between teachers and students (Wubbels and Brekelmans, 1998). QTI scales assess student perceptions of eight behaviour aspects and characteristics of teachers (leadership, helpful/friendly, understanding, student responsibility/freedom, uncertain, dissatisfied, admonishing and strict). The QTI originated in the Netherlands and has been used extensively in studies in North America, Australia and several Asian countries.

3.2.2 Assessments of organizational climate and management effectiveness

Why measure the organizational climate of schools? Will it make schools better? There are no quick fixes. But healthy schools are better places to work and learn than unhealthy ones. Teachers are more productive, administrators are more reflective, and students achieve at higher levels.
— Hoy and Feldman, 1999

Organizational climate and school management issues constitute an important dimension of many assessments of overall quality, whether of a system or school. This dimension is sometimes viewed within the context of school climate and culture or as a set of variables related to the health of a school as a learning organization. The first approach tends to use instruments developed in the LER tradition that focus mainly on the psychosocial dimensions of the work environment from the perspective of teachers and school heads. Studies in the second group, on the other hand, have adapted and refined instruments from models of organizational research as applied in business, health care or industrial settings. A subcategory of the second group is even more specifically focused on monitoring the management effectiveness of schools – either as part of an externally driven quality assurance process or as a part of school and community based processes of self-evaluation and improvement.

The measurement methods and tools designed for use in different international contexts can reveal interesting insights into the cultural and political foundations of schools and school systems. For example, several of the process indicators identified in surveys designed for use in developing countries of the South reflect a distinctly different management style than the norm in LER and SER paradigms typically employed in Western, industrialized countries or in developing countries with strong democratic traditions. In the former, surveys and questionnaires are designed to measure how well the school management structure complies with authoritarian management models. The objective in the latter is to measure progress toward a cohesive and supportive school climate where teachers, parents and other stakeholders have participatory and constructive roles. This definition of a 'healthy' organizational climate posits that positive attitudes among teachers and other school staff is a potent and accurate predictor of school effectiveness.

The Early Childhood Work Environment Survey (ECWES) is one example of a widely used LER tool to measure the organizational climate. It was initially developed to address the problem of alarmingly high turnover in early childhood teachers in the United States (Jorde-Bloom, 1991). The ECWES was 'based on a need for a standardised instrument that could describe and differentiate child care settings along several dimensions, could demonstrate a satisfactory level of reliability and validity and could serve as a useful tool for early childhood practitioners wishing to monitor and improve their work climate' (ibid., p. 163). The ECWES, which consists of 100 items designed to measure 10 dimensions of organizational climate, was developed over a two-year period, involving a field-testing and revision phase and the participation of over 2,250 early childhood workers in 150 centres in the United States and Canada.

Variables were chosen through a process which involved collecting interview data from participants and analysing comparable climate scales in other work environments. The instrument also exists in a short form for use in a rapid assessment of an early child care and education (ECCE) work setting. The ten dimensions of organizational climate measured on scales of 1-10 by the ECWES are described in **Box 12**.

Box 12. Ten dimensions of organizational climate measured by ECWES	
Collegiality	Extent to which staff are friendly, supportive and trust one another and the peer cohesion of the group
Professional growth	The degree of emphasis placed on personal and professional growth
Supervisor support	The degree of facilitative leadership that provides encouragement, support and clear expectations
Clarity	The extent to which policies, procedures and responsibilities are clearly defined and communicated
Reward system	The degree of fairness and equity in the distribution of pay, fringe benefits and opportunities for advancement
Decision-making	The degree of autonomy given to staff and the extent to which they are involved in centre-wide decisions
Goal consensus	The degree to which staff agree on the goals and objectives of the centre
Task orientation	The emphasis placed on good planning, efficiency and getting the job done
Physical setting	The extent to which the spatial arrangement of the centre helps or hinders staff in carrying out their responsibilities
Innovativeness	The extent to which the organization adapts to change and encourages staff to find creative ways to solve problems

Source: Jorde-Bloom, 1991, p. 164.

Beyond its value as a window onto the dynamics of organizational life in early childhood care and education settings, the ECWES has also served as a self-evaluation tool to measure and improve organizational practices. To launch this work, participating programmes[45] receive a Work Environment Profile (WEP) and a companion manual as a springboard to guide their school improvement efforts (Jorde-Bloom, 1989).

The Organizational Health Instrument (OHI) is another widely-used instrument developed in the LER tradition to measure the climate of learning organizations. The OHI was developed during the 1990s by Wayne Hoy and John Feldman for use both by researchers and schools. It was constructed based on the definition of organizational climate as 'the set of internal characteristics that distinguishes one organization from another and influences the behaviour of its participants' (Hoy and Feldman, 1999). The OHI zeroes in on conditions that foster effective organizational performance, which builds on the

---

45 Participating programmes in the Early Childhood Professional Development Project were coordinated by the National College of Education, National-Louis University in Chicago, Illinois, USA.

earlier work of Halpin and Croft (1963) in conceptualising and measuring the school organizational climate and the construct of the 'health' metaphor. Based on the assumption that a healthy school is one in which the technical, managerial and institutional levels are in harmony (p.87), OHI subscales include measures of such factors as institutional integrity, resource support, morale and academic emphasis (Hoy and Feldman, 1999, p. 94). A composite 'school health profile' is generated based on the compiled OHI ratings by teachers and administrators, producing a score in each dimension. Compared with prototype scores for healthy and unhealthy schools, the scores in each area produce a descriptive rating of school health, ranging from very high to very low in each area. The school or system builders can then decide what to do with the resulting profile of a particular school. The tool is intended to point to areas perceived to be most in need of improvement. Typical paths toward constructive use of these data include engaging the services of outside specialists to aid in organizational development and/or initiate an internal process of self-improvement.

The Snapshot of School Management Effectiveness (SSME) is a practical tool closely associated with school effectiveness research (SER). The SSME is currently under development by the USAID EdData II project and is designed mainly for use in developing countries. It responds uniquely to the need for an easily applicable, low-cost way for countries and donors to 'quickly assess levels of educational quality in a district, region or country' through the lens of management effectiveness (Crouch, 2009, p. 1). The SSME is also intended to provide a template for countries to improve their quality assurance systems (ibid., p. 1). Interestingly, the tool alludes to quick surveys used in the health sector as a parent model to catch large differences in behaviour as well as to check on whether certain behaviours are taking place (ibid.). Unlike large-scale assessments of overall quality, the SSME is designed for use by a single external evaluator during a one-day school visit using a combination of structured interviews and observation checklists. In contrast to the ECWES and the OHI, the SSME takes an expansive view of organizational and management issues – for example, it not only covers school management but also the dimensions of classroom management and parent/community involvement in the school.

The SSME incorporates a measure of learning achievement (the Early Grade Reading Assessment) as 'an approximate proxy for outcome quality.' At this stage of its development, the tool has been field-tested in Jamaica and Peru in 48 and 64 schools respectively, resulting in the conclusion that, with some modifications and refinement, it is now ready for non-pilot applications. The goal is to offer a standardized item bank of questions that can be used to collect and analyse data from students, teachers, principals and parents, resulting in a faithful 'snapshot' of school quality. The next steps in the development of the SSME are to further refine the tool and to begin producing diagnostics and policy recommendations.

3.2.3 Alternative routes: Ethnographic and indigenous methods

A classroom should be a place where students form a small caring community, a small family of learners. The teacher sets the pace, lets each student disclose his or her predisposition of communality, and things begin to happen. I have often been amazed by the awesome potential for caring in students whenever they are given a chance.
— R. Sambuli Mosha

Indigenous research methods applied to schools, informal and non-formal learning environments seek to re-construct traditional knowledge in ways that empower people to regain and sustain culture. Approaches designed to strengthen the performance of indigenous children and young people enrolled in majority culture schools also tap into their cultural and linguistic heritage. For instance,

the nationally supported *Te Kotahitanga* project in New Zealand established in collaboration with teachers supports an 'Effective Teaching Profile' and states, as its preamble, 'Effective teachers of Maori students create a culturally appropriate and responsive context for learning in their classrooms' (Bishop et al., 2003). This requirement evokes the conclusions of cognitive psychologists and brain researchers that all learners will flourish in inclusive 'communities that care', where learners' cultural identities are understood and respected (Goleman, 1995).

The New Zealand example, among others, has added to a growing collection of methods and tools developed 'off the grid' of mainstream educational research. Conversely, methods originating in traditional academic disciplines, particularly in psychology and cultural anthropology, have made their way into ethnographic and indigenous studies that investigate aspects of educational environments. These involve such techniques as collecting children's drawings, concept mapping, interviewing, journaling, 'naturalistic' observation, analysis of storytelling and traditional knowledge transfer, focus group discussions or town meetings involving whole communities on a particular issue.

As another example of methods originating from outside the mainstream, researchers have used young children's drawings to help them understand how the children perceive their relationships with their teachers and their peers. The sample below by a second grader in a school in the United States reveals a precocious level of map-making skills but depicts an inordinately great distance between the teacher and the students *(see **Figure 13**).*[46]

**Figure 13. Young child's rendering of classroom climate**
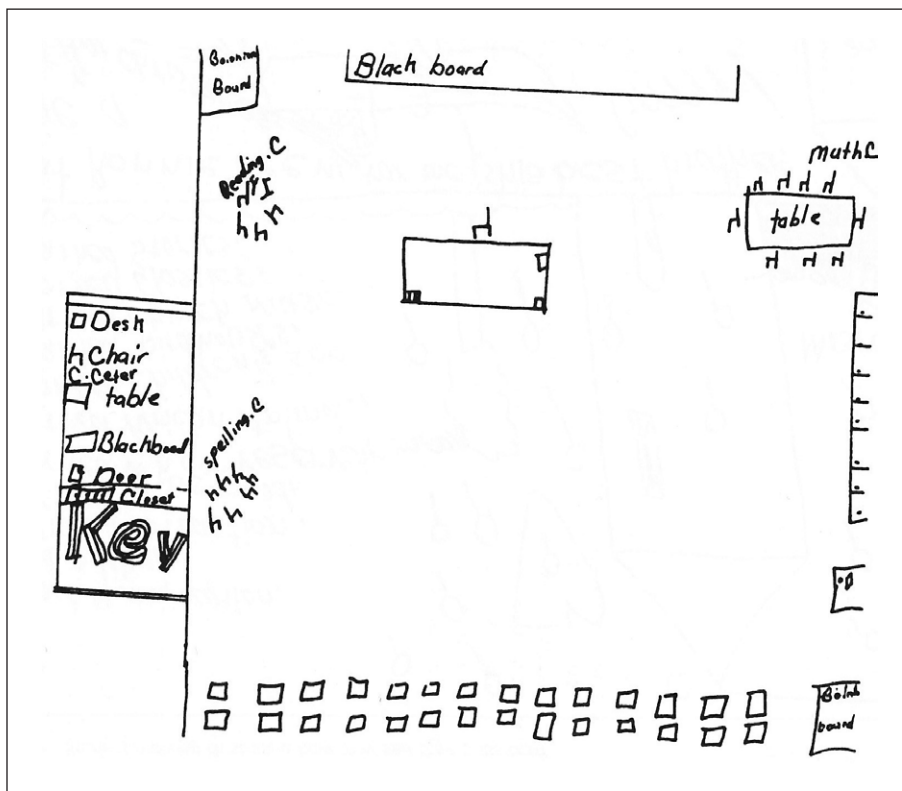
Source: Freiberg and Stein, 1999, p. 18.

---

46 This drawing is contrasted to another produced in a different classroom by a different child who names the teacher and depicts her surrounded by smiling children.

The concept mapping technique involves more abstract skills and is therefore used with older children, as in the 'Gardens for Life' project described in Section 2.2.2 (*Lessons from the Field*) (Bowker and Pearle, 2007). Concept maps are often used in conjunction with other data gathering tools, such as focus groups and interviews. In the school gardening study, the concept maps provided springboards for interviews and contextual observation to help researchers better understand children's perceptions (aged 9-14) of the school garden as a place of learning. Hence, the items depicted on the map tied concrete things, such as tools, and garden products to values and children's perceptions of positive outcomes (good health and power for work) *(see Figure 14).*

Figure 14. School garden concept map
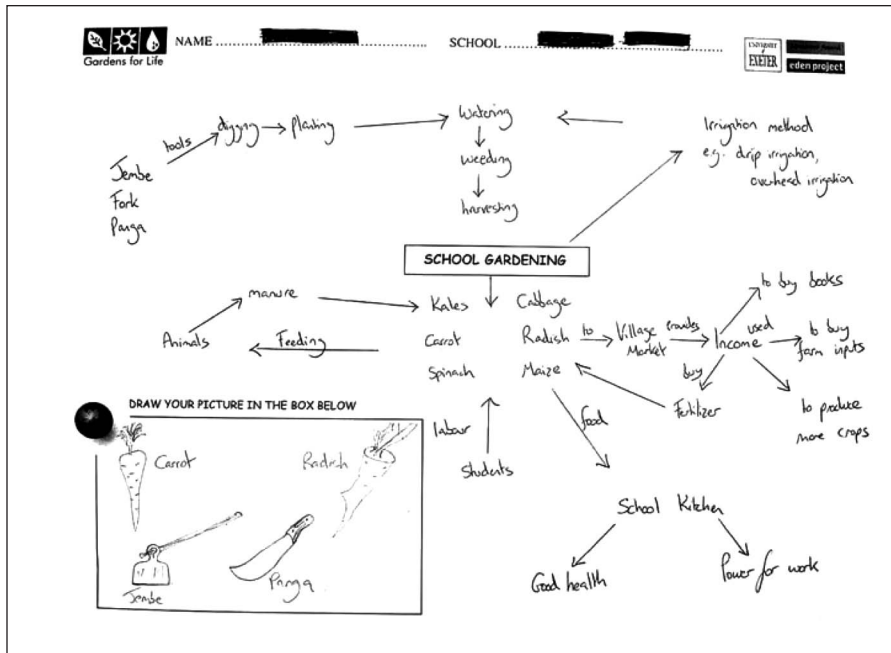
Source: Bowker and Tearle, 2006, p. 92.

Structured or semi-structured interviews (i.e. with teachers, students, principals, parents) and focus groups with the different stakeholders have also become common methods to assess the social and pedagogical climate of classrooms and schools. As in the Kenyan FPE assessment (Section 1.1.1) and the Spanish in-depth study of physical conditions (Section 1.1.2), qualitative tools such as these are increasingly used in combination with other instruments to probe more deeply into issues that may have surfaced through the use of quantitative tools.

In the cross-national 'Gardens for Life' project, interviews were used to help with the interpretation of the concept maps and to find out how children perceived the knowledge and skills gained through school gardening related to subject-based content in parts of the curriculum, mainly science and health. In the affective domain, the researchers found that the children interviewed in all three countries 'almost without exception showed enthusiasm for gardening and associated it with extra food (Kenya), a better awareness for environmental issues (India), links and communications with people outside the school (all countries) and even a reason for attending school (India and Kenya) (Bowker and Tearle, 2006, p. 97.)

In-depth interviewing in LER typically involves fewer participants over longer periods of time, usually in combination with prolonged observations of school and classroom environments, processes and

social interactions (Everhart, 1983, Levinson, 1998). The direction of these types of interviews is generally, but not always, oriented toward identifying the roots of problematic behaviour, alienation and dropout. Conversely, semi-structured and structured interviews have been used to seek out resilience factors that cause some young people in Brazil to stay in school in spite of social and economic vulnerability (de Cruz Benetti, 2009). Other studies use similar methods to explore cultural and class identity issues among adolescents that can serve to perpetuate social and economic inequalities. In an ethnography of 12 working class boys in an English comprehensive school, the researcher used observation, participant observation, recorded group discussions, individual interviews and diaries over a period of approximately two years to study their lives, including six months of investigation into their working lives (Willis, 1977). The study concluded that the rebellion of the group against school authority prepared them for a life of working class labour.

Interviewing techniques modelled on indigenous principles were developed in New Zealand as part of the long-term, nationwide *Te Kotahitanga* project. The interviews were aimed at gaining a better understanding of the classroom experiences of year 9 and 10 Maori students and their relationships with their teachers. The research process was based on an indigenous strategy (*whakawhanaungatanga*) to establish relationships and called for researchers to 'understand themselves to be involved somatically in the research processes; that is, physically, ethically, morally and spiritually and not just as a 'researcher' concerned with methodology' (Bishop, 2003, p.15). The interview technique called for developing spiral discourse by constructing 'conversations' rather than eliciting responses to a pre-set list of questions. At each site, the researchers began with a group interview and then asked for volunteers to continue either as a group or individually. Transcripts of the interviews were then shared and corrected and narratives were produced and shared before being analysed for factors deemed to be most influential on learning achievement.

Classroom observation using video recordings to capture the full essence of the learning environment has also been used in innovative ways to involve teachers, managers, parents and communities in group reflection and change. A prime example of this process is reported in *Pre-School in Three Cultures* (Tobin, Wu and Davidson, 1989). In this study, the researchers use multivocal ethnography – a method associated with cultural anthropology research and ethnographic film – to stimulate dialogue among practitioners and researchers of early childhood education in and among the three cultures (Japan, China and the United States). In the first stage, the researchers recorded 'a typical day' in the life of a preschool in each culture. These recordings were then edited down into 20-minute 'visual ethnographies.' During the second stage of the research, each edited tape was taken back to the school where it was shot and shown to teachers and parents and later to other audiences at other preschools in the same country. The researchers used semi-structured interview techniques to elicit group discussion and analysis from both 'insiders' at the schools where the videos were shot as well as the 'outsiders' in other schools. Finally, audiences in each country were shown the videotapes from the two other countries.

Following all of the screening and discussion sessions, rating sheets were used to collect respondents' views on such issues as classroom management, teacher-child relationships, safety, pace and equipment as shown in each film. Audiences were also asked to express their views on the larger questions, such as the role of preschools in society and the most important characteristic of a preschool teacher. The advantage of this type of methodology lies in the enduring change it can set into motion through deep reflection on one's own cultural and educational practices, including the shaping of the learning environment, especially when viewed in comparison with those of cultures other than one's own.

4. Conclusions and recommendations

It is relatively new to look at effective teaching (aimed at high cognitive outcomes) and methods of classroom interaction (teacher behaviour) aimed at student wellbeing at the same time.

— Bert Creemers

As highlighted In Sections 1 (*Theoretical Roots*) and 2 (*Lessons from the Field*), much of the emphasis of research on learning conditions conducted within academic circles has focused on pinpointing and measuring the characteristics of schools and learning spaces that enable and enhance the effectiveness of teaching and learning processes. A significant amount of activity by international organizations, NGOs and regional networks has also been dedicated to assuring that learners everywhere have access to environments that foster their development as human beings, ensure their safety and protect their rights. As Creemers suggests in the quotation above, taking both objectives into account at the same time is relatively new. Section 3 (*Methods and Tools*) reviewed the wide range of assessment instruments used from the perspectives of different stakeholders to measure and improve the different dimensions of learning environments, grouped broadly as physical, psychosocial, and organizational. From this complex tangle of historical roots, current approaches and research methods, several points of convergence can be identified, leading to some general conclusions in the three areas of concern guiding this review. Based on these conclusions, a framework for action is suggested along with a list of sample core variables and possible indicators. Finally, a set of recommendations for research and action is offered with both the material limitations of educational systems in many developing countries in mind, but also for the use of everyone concerned with assessing and improving learning environments.

4.1 General conclusions

The expansive fields of research on learning environments are continually being refined and shaped by new circumstances and ideas. Returning to the original three questions posed in the introduction to this review, the literature has yielded some important insights and uncovered some salient connections, if not conclusive answers:

- *What are the major theoretical roots of learning environments research (LER)?* From the musings of philosophers to the evidence-based conclusions of cognitive psychologists, it is apparent that the concept of improving learning environments is not a new idea. There have been both conflicting and converging viewpoints on the role of the physical and psychosocial dimensions of places to learn in facilitating quality education. Views that dominate the current international discourse tend to consider the conditions of learning as a whole environment made up of a complex web of living, interacting components, rather than as pieces of a complex puzzle that somehow produces quality learning outcomes. Current approaches and practices in designing and maintaining quality learning environments are based mainly on situative social-cognitive theory and are continuously informed by fresh insights from neuroscience research on learning. In many aspects, these insights resonate well with traditional and indigenous views of the world and age-old ways of communicating cultural knowledge and technical skills.

- *How are learning environments understood and assessed in the framework of quality education for all?* Approaches to conceptualizing enabling learning environments, enabling conditions for learning and quality education must always take into account a broad spectrum of contextual

factors. As a result, ways and means for assessing them have branched out into diverse forms – from large scale cross-national and national survey research to local and school-based evaluations using combined methods and tools. In the former, studies devoted to measuring the quality of learning environments tend to employ a range of tools for measuring additional factors perceived as relevant to improving the learning outcomes. In the latter, studies are typically more focused, engage internal points of view and reveal deeper insights on problematic issues.

- *How can the quality of learning environments be measured and improved?* Seeking to close the gap between theory, knowledge and action, researchers from a variety of disciplines have contributed to a rapidly expanding knowledge base using a collection of validated and trusted instruments. What remains to be seen is how well the evidence gathered through research around the world will be put into practice in the places it is most needed. Huge disparities remain in the provision of basic resources in some countries while in others, efforts to introduce systemic change are hampered by weak or non-supportive organizational structures. Research-based calls to action in response to a host of problems (rising violence in schools, low levels of achievement, student non-compliance, drop out, depression) reveal negative, alienating learning environments that are disconnected from the natural world. On the positive side, the search for solutions to endemic problems has also led to policy change in some school systems with remarkable results. The best of these provide recommendations not only for policy-makers and researchers, but also guidelines and resources for what parents, students and communities can do to make their schools a better place to learn. Practical guides, tools and other resources to measure and improve the classroom climate have also been published and made widely available as Internet resources.

4.2   A framework for action

The role of positive learning environments in promoting both the overall wellbeing and achievement of learners has drawn increased attention from researchers, policy-makers and international organizations concerned with the quality of education. Along with the proliferation of research on isolated dimensions of learning environments, certain elements of LER have become more prevalent in both broad and narrow scale assessments of school quality. As more is understood about the impact on learning of such elements as teacher-learner relationships, the shape of learning spaces and the connectedness of classroom and community cultures, the less such factors are considered peripheral to the quality of learning. The general movement toward more integrated approaches has encouraged a broader view of the range of elements needed for positive learning environments (Freiberg, 1999, p. 28). Following this trend, new tools have been developed with increased capabilities to function as 'magnifying glasses to enlarge the scope of the work' (ibid.).

In the wake of recent developments in both theory and practice, it is possible to construct a generic plan of action based on three propositions:

- Learning environments matter
- Each individual learning environment is made up of a complex web of interacting factors
- Learning environments research (LER) is an effective and flexible approach to assessing and improving learning environments.

The assumption that learning environments are critical to the achieving educational quality, however interpreted, is taken for granted by practitioners, researchers and communities around the world. However, attention to assessing and improving such environments but does not necessarily comprise a core factor in the strategic plans of many developing countries. The challenge for global initiatives in this domain is to recognize their importance as a major factor in enhancing learning and to reach agreement on a relatively short list of variables and accompanying indicators for measuring their quality across cultures, ideological and political boundaries. At the national level, the challenge is to foster active research and policy development at all levels of the system, resulting in concrete and measurable strategies for positive change.

The second proposition arises from increasing evidence of fading boundaries among perspectives, disciplines and methodologies that have surfaced during the course of this review. New approaches based on integrated, holistic concepts have drawn increased attention to their impact on teaching and learning. Along with major innovations in creating research initiatives that are immediately responsive to the problems faced by education systems and schools, new tools have been invented and refined to gather and analyse data more efficiently and accurately. Despite such breakthroughs, deeply rooted convictions from different ideological and methodological viewpoints continue to hamper progress toward integrated research agendas that could potentially produce more coordinated and effective action at all levels. To overcome such roadblocks, fresh opportunities are needed to foster collaboration among researchers, practitioners, learners and communities that will leave room for new growth but also preserve the existing pathways.

Third, the evidence covered in this review supports the efficacy and relevance of LER as a valid and flexible research model that can easily be adapted to address issues specific to education systems with limited resources. This approach is steadily gaining ground internationally through the spread of a vibrant and culturally diverse research community, and does not require highly sophisticated methods and tools. Despite the mass of evidence pointing to the need for urgent action to improve all aspects of school quality, this is the area where progress has been sluggish in part of the world where it is needed most. One perennial barrier to acting upon the findings of both LER and SER is resistance to change by those who have a vested interest in maintaining the *status quo* – whether it is in the way classroom seating is organized or the way teachers' meetings are conducted. Another is the failure to develop realistic policies and plans of action from which all participants, especially learners, can benefit. The implementation of such evidence-based policies may require major restructuring of roles, re-allocation of practices and the redesign of physical environments – none of which is possible without enlightened leadership, a shared vision and access to the necessary resources.

Given the complex interrelationships among the factors involved in assessments of learning environments, any attempt to reduce these to a brief list of core variables should be undertaken with caution. To produce and prioritize realistic strategies for improvement in developing countries, more and better research is needed focusing on local conditions and concerns. Turning to the possibilities for concrete action, it is useful to visualize the levels of an educational system as concentric circles *(see Figure 15),* each of which borders but also lies within the context of the entire system. In this model, which is inspired by the holistic framework developed by UNICEF (2000) and further refined by UNESCO (Pigozzi, 2006), the classroom or learning space is at the centre of all activity. As quality of the classroom environment is embedded in the physical and organizational climate of the school, so the school (or programme) is part of the wider system which has varying levels of control over its physical, organizational and pedagogical environment. These, in turn, are also at the local level (also to varying degrees) by community involvement and support as well as the broader social and cultural context.

Figure 15. Areas of impact on the quality of learning environments by level
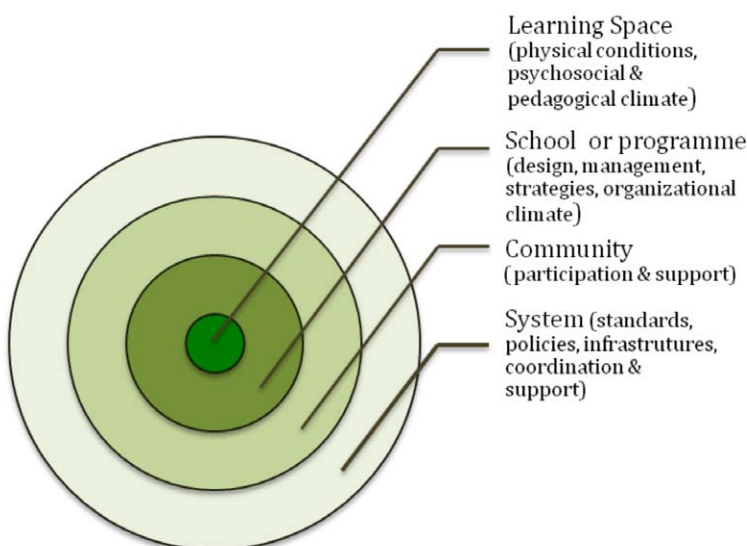
For planning purposes, additional factors within each category could then be identified and prioritized in collaboration with the relevant stakeholders. This information could then be developed into a customized list of core variables and indicators, following the model suggested in **Table 8**.

Table 8. Sample core variables and possible endicators

Level(s)	Category	Variable	Indicators
Classroom/ Learning space	Effectiveness	Classroom Climate	• Increase in positive learners' perceptions of classroom climate • Learners' work displayed on classroom walls • Flexible seating arrangements for varied learning activities
	Inclusion	School Climate	• Improved academic achievement by previously marginalized groups • Level-appropriate learning resources available in learners' mother tongues • Evidence of accommodation strategies for handicapped learners
School-community	Connectedness	Parent and community participation	• Number of schools with shared school-community learning projects • Average number of school-community meetings per year focusing on school management issues
	(Gender) Equity	Access to basic facilities	• Number of schools with separate toilet facilities for boys and girls • Reduction in girls' dropout rates • Improvement in girls' academic achievement
	Safety	School climate (psychosocial)	• Number of school staff trained in conflict resolution • Number of schools with violence prevention strategies • Reduction in number of incidents of bullying and school based violence
System	Cohesiveness	School climate (organizational)	• Existence of a policy document and action plan for improving system management • Evidence of shared understanding of the policy framework • Evidence of participatory management practices
	Health	Physical conditions	• Existence of system-wide minimum standards for light, sound and ventilation • Number of schools and classroom meeting minimum standards • Number of schools with potable water supply • Documented reduction in absenteeism due to illness and fatigue

In practice, the selection of methods and tools to measure progress and plan improvement strategies against such indicators will vary according to capacity and purpose (i.e. official or unofficial, on-going or summative, accountability or self-improvement, internal or external). It is important to note that the interpretation of categories will also vary and that variables identified in an international context should not be conceived as a 'one size fits all' set. Economic and social equity may, for example, be important to target as a separate category in some systems, schools and classrooms. Health and safety might take priority in specific situations as in systems ravaged by HIV and AIDS or in post-disaster recovery. However, as we reach the end of this review, the hope is that these suggestions will provide all those concerned with fulfilling the promise of EFA with a basis to develop and strengthen policies and actions that meet local needs in the creation and maintenance of enabling learning environments.

4.3   Recommendations

As the mass of evidence gathered for this review infers, concepts of what constitutes a 'place to learn' have evolved and expanded along with new technologies, new theories of learning, and new channels for delivering the curriculum. Among the diverse approaches to conceptualizing these environments and naming their characteristics, common ground can be found in the context of their connection to national and international definitions of quality and the right to education. As with other key components of an educational system, the defining characteristics of the physical, psychosocial and organizational environment are based on the measure to which it is effective, connected and cohesive. These characteristics, in turn, are grounded in the overall vision of quality and the fundamental principles upon which the system is based.

Recommendations for creating and sustaining quality learning environments in countries with limited material resources include:

1.   Fulfilment of the national commitments to provide quality education for all through accelerated efforts to meet the basic requirements for learning environments specified in EFA Strategy 8 (page 26). To accomplish this, governments should conduct an audit of the current state of affairs in schools throughout the system and devise an urgent plan of action to close the gaps in the provision of support and resources to schools. The plan should incorporate specific baseline standards for school architecture, construction and physical conditions (i.e. light, sound levels, building integrity, sanitary facilities) and benchmarks/indicators for reaching them.

2.   Within national education systems, adoption of a 'bottom up' approach that affords countries and regional networks increased opportunities to provide inputs to the global initiative to meet the above basic requirements. The results of such inputs would lead to more informed choices in the development of international common core indicators for learning environments which could be correlated with progress toward desired learning outcomes.

3.   Involving parents and community members on the revitalization of local (and/or indigenous) knowledge and communication systems that can inform the design and social climate of learning spaces. This should include working with communities on ways to actively integrate cultural knowledge and skills into the school curriculum and use local knowledge to inform the physical, social and organizational dimensions of learning environments.[47]

---

47 For additional examples, please refer to the UNESCO LINKS (Linking Indigenous Knowledge Systems) programme at http:// portal.unesco.org/science/en/ev.php-URL_ID=1945&URL_DO=DO_TOPIC&URL_SECTION=201.html

4. Conducting on-going reflective, participatory research using customized methods and tools for conducting assessments that can inform teachers, parents and learners on the quality of the classroom climate, including its psychosocial dimension, with emphasis on equity and inclusion of girls and learners with special needs. Such research can be launched through the training of school managers and teachers as researchers with the objective of an immediate impact on classroom and school quality, with good practices shared via informal networking, newsletters and school improvement websites.

5. Using the findings of classroom and school-based research to develop effective strategies to address pervasive problems that threaten the health of the learning community, such as high levels of repetition and dropout, school-based violence and gender discrimination. Such strategies should recommend ways to improve school and classroom management, physical conditions of schools and develop mutually beneficial links between schools and communities.

6. Encouraging education systems to establish links between stakeholders in school improvement and research communities actively involved in producing evidence-based studies of school effectiveness and learning environments. Increasing access to research findings and examples of good practices for different groups of stakeholders, including policy-makers, school managers, architects, teachers, parents and learners, will help initiate or inform continued action on school improvement.

7. Assisting in the development of context specific, system-wide guides and tools to improve schools based on processes of internal self-evaluation. Inspiration can be drawn from such examples as the Scottish programme (*How Good is Our School?* 2006), the Pilot European Project (*Self-Evaluation of European Schools*, 2000) and the Nicaraguan Schooling Improvement Plan to advise school leaders, teachers, parents and community members on how to articulate their own visions and create the necessary physical, pedagogical and social conditions to make it happen.

8. Creating an international, multilingual electronic clearinghouse to share research, tools and good practices in the measurement and improvement of learning environments. The clearinghouse could include abstracts and links to historical and philosophical perspectives, experimental studies, reports, ethnographic and indigenous studies, and architectural models as well as a generic 'toolkit' to measure the school and classroom climate and establish local guidelines for physical conditions and planning school designs.

9. Development of a practical guide to research that would enable conditions of learning using mixed methodologies – similar to the existing IIEP guide on quantitative research methods (Postlethwaite, 1995). Technical workshops could also be organized in collaboration with research institutes, networks and teacher training institutions to further assist in capacity building for innovative research methods and practices.

10. Incorporating prime examples of theory and practice from the international body of knowledge on learning environments research in teacher education curricula and professional development programmes. In addition to enriching shared local knowledge on culturally-based theoretical concepts and values, teacher education curricula and resources for on-going training should include the findings of new research in the field of cognitive neuroscience and practical examples of good practices worldwide.

List of studies reviewed

Aikin, L. (1972). Research on attitudes toward mathematics. *The Arithmetic Teacher*, 19(3), 229-234.

Aldridge, J., and Fraser, B. (2000). A cross-cultural study of classroom learning environments in Australia and Taiwan. *Learning Environments Research, 3*(2), 101-134.

Allen, D., and Fraser, B. (2007). Parent and student perceptions of classroom learning environment and its association with learning outcomes. *Learning Environments Research* 10 (1), 67-82.

Angulo, L. and Garcia, C. (1985). Estudio y evaluación del ambiente escolar en relación a otras variables*:* contextualización del rendimiento escolar. Bordon. Revista de Pedagogia, 257, 255-272.

Arter, J. (1987). Assessing school and classroom climate: A consumer's guide. Northwest Regional Educational Lab. Office of Educational Research and Improvement, Washington, DC. Retrieved from www.eric.ed.gov/ERICWebPortal/recordDetail?accno=ED295301

Baker, D. (2004). Instructional time and national achievement: Cross-national evidence. *Prospects, 34*(3), 311-334.

Berner, M. Building conditions, parental involvement, and student achievement in the District of Columbia Public School System. *Urban Education*, 28 (1), 6-29.

Bishop, R., Berryman, M., Tiakiwai, S., and Richardson, C. (2003). *Te Kotahitanga: The Experiences of Year 9 and 10 Maori Students in Mainstream Classrooms.* Report to the New Zealand Ministry of Education*.* Ministry of Education, New Zealand.

Blatchford, P. (2007). The effect of class size on the teaching of pupils aged 7-11 years. *School Effectiveness and School Improvement, 18*, 147-172.

Bowker, R. and Tearle, T. (2007). Gardening as a learning environment: A study of children's perceptions of gardens as part of an international project. *Learning Environments Research*, 10(2), 83-100.

Boykin, A., Lilja, A., and Tyler, K. (2004). The influence of communal vs individual learning contexts on the academic performance in social studies of Grade 4-5 African-Americans. *Learning Environments Research,* 7(3), 227-224.

Carron, G., and T.N. Chau (1996). *The Quality of Education in Different Development Contexts.* Paris: UNESCO-IIEP.

Cheng, K. (1996). *The Quality of Primary Education: A Case Study of Zheng Province, China.* Paris: UNESCO-IIEP.

Comesaña, J., and Juste, M. (2007). Description of environmental factors in schools: Lessons from a study in Northwest Spain. *Review of Education ,* 53.

Crouch, L. (2008). The Snapshot of School Management Effectiveness: Report on pilot applications. Prepared by RTI International for USAID.

de Cruz Bennetti, S. et. al (2009). Resiliência e escola- identificação de fatores de proteção da evasão escolar na adolescência. Graduate program in Psychology and Social Action Project of EDUCAS, Univeridade do Vale do Rio do Sinos, Sao Leopoldo, Brasil. Retrieved from: http://www.redinnovemos. org/content/view/994/108/lang,po/

Dorman, J.P. (2001). Associations between classroom environment and academic efficacy. *Learning Environments Research* 4, no. 3 (October 2001): 243-257.

Everhart, R. (1983). *Reading, Writing and Resistance: Adolescence and Labor in a Junior High School*. Boston, MA: Routledge and Kegan Paul.

Grunbaum, L., Pedersen, M. and Nielsen, S. (2004). Study on innovative learning environments in school education. Final Report. Study produced by RAMBOLL Management for the European Commission DG Education and Culture.

Fraser, B. (1981). Test of Science-Related Attitudes (TOSRA). Melbourne, Australia: Australian Council for Educational Research.

Fraser, B., Fisher, D. and McRobbie, C. (1996). Development, validation and use of personal and class forms of a new classroom environment instrument. Paper presented at the annual meeting of the American Educational Research Association, New York.

Galand, B. (1988). Le rôle du contexte scolaire et de la démotivation dans l'absentéisme des élèves. *International Journal of Psychology , 23*, 125-142.

Giraldo, L. and Mera, R. (2000). Clima escolar: percepciones estudantiles. Colombia Med, 31, 23-27. Retrieved from: http://colombiamedica.univalle.edu.co/VOL31NO1/clima.html

Goh, S. and Fraser, B. (1998). Teacher interpersonal behavior, classroom environment and student outcomes in primary mathematics in Singapore. *Learning Environments Research*, 1, pp. 199-229.

Goh, S. and Fraser, B. (2000). Teacher interpersonal behavior and elementary students' outcomes. *Journal of Research in Childhood Education*, 14(2), 216-231.

Halinen, I. and Järvinen, R. (2008). Towards inclusive education: The case of Finland. *Prospects*, 38, 77-97.

Heaertel, G.; Walberg, H. and Haertel, E. (1981). Socio-psychological environments and learning: a quantitative synthesis. *British Educational Research Journal*, 7(1), pp. 27-36.

Hazel, P. (2008). Toward a narrative pedagogy for interactive learning environments. *Interactive Learning Environments*, 16(3), pp. 199-213.

Helf, S., Cooke, N., and Flowers, C. (2009). Effects of two grouping conditions on students who are at risk for reading failure. *Preventing School Failure*, 53 (2), pp. 113-128.

Hoy, W. and Feldman, J. (1999). Organizational health profiles for high schools. In S. Freiberg (Ed.) *School Climate: Measuring, Improving and Sustaining Healthy Learning Environments* (pp. 84-102). London and New York: Routledge Falmer.

Jorde-Bloom, P. (1991). Organizational climate in child care settings. In B. Fraser and H. Walberg (Eds.) *Educational Environments: Evaluation, Antecedents and Consequences* (pp. 161-176). Oxford, UK: Pergamon Press.

Kankkunen, M. (2001). Concept mapping and Pierce's semiotic paradigm meet in the classroom environment. *Learning Environments Research*, 4(3), 287-384.

Khalil, M., and Saar, V. (2009). The classroom learning environment as perceived by students in Arab elementary schools. *Learning Environments Research*, 12, pp. 143-156.

Kinpara, M. *Um estudo da interação professor-aluno a partir da análise do processo de construção de conhecimentos.* Retrieved from: http://scielo.bvs-psi.org.br/scielo. php?pid=S1676-73142008000200008&script=sci_arttext&tlng=pt

Henevald, W. et al. (2006). Synthesis report: Local studies on the quality of education in four countries. *ADEA Biennial on Education in Africa.* Libreville, Gabon.

Latin American Laboratory for Assessment of the Quality of Education. (2002). *Qualitative Study of Schools with Outstanding Results in Seven Latin American Countries.* OREALC/UNESCO Santiago.

Loup, K. (2003). Measuring the professional learning environment of schools: Linkages to school effectiveness and effects. *International Journal of Educational Research,* 27(4), pp. 321-331.

Majeed, A., Fraser, J., and Adlridge, J. M. (2002). Learning environment and its association with student satisfaction among mathematics students in Brunei Darussalam. *Learning Environments Research, 5*(2), pp. 203-226.

Marx, A., Fuhrer, U. and Hartig, T. (1999). Effects of classroom seating arrangements on children's question-asking. *Learning Environments Research, 2* (3), 249-263.

Massachusetts Institute of Technology (2008, January 13). Culture influences brain function, study shows. *Science Daily*. Retrieved from http://www.sciencedaily.com/releases/2008/01/080111102934.htm

Morillo-Torrecilla, F. (Ed.) (2006). *Estudios sobre eficacia escolar en Iberoamerica.* Bogata, Colombia.

Nair, P., Fielding, R. and Lackney, J. (2009). *The Language of School Design: Design Patterns for 21st Century Schools* (2d ed.). DesignShare.com

OECD. (2009). *Creating Effective Teaching and Learning Environments: First Results from TALIS.* Paris: OECD.

Orr, D. (1999). Reassembling the pieces: architecture as pedagogy. In S. Glazer (Ed.), *The Heart of Learning: Spirituality in Education* (pp. 139-149). New York: Penguin.

Peters, P. (2003). Here for the children. *Texas Architect*, 53(1), pp. 22-25.

Rajonhson, L. (2006). Etude locale sur les caracteristiques des ecoles primaires efficaces dans la province de Toamasina, Madagascar. Bianale l'association pur le développement de l'éducation en Afrique.

Republic of Kenya Ministry of Education and Science and UNESCO Nairobi Office (2005). *Challenges of Implementing Free Primary Education in Kenya.* UNESCO Nairobi Office.

Reynolds et al (Eds.) (1994). *Advances in School Effectiveness Research and Practice*. Oxford, UK: Pergamon Press.

Schleicher, A. , Siniscalco, and Postlethaite, N. The condition of primary schools: A pilot study in the least developed countries. A report to UNESCO and UNICEF. Retrieved from: http://unesdoc.unesco.org/Ulis/cgi-bin/ulis.pl?database=&lin=1&futf8=1&ll=s&gp=0&look=default&sc1=1&sc2=1&nl=1&req=2&au=Schleicher,%20Andreas

Stevenson, K. (2006). School size and its relationship to student outcomes and school climate: A review and analysis of eight South Carolina state-wide studies. National Clearinghouse for Educational Facilities, Washington, D.C. Retrieved from: www.ncef.org/pubs/size_outcomes.pdf

Tanner, C. and Langford, A. (2003). The importance of interior design elements as they relate to student outcomes. Dalton, GA (USA): Carpet and Rug Institute.

Teixeira, R. (2009). Espaços, recursos escolares e habilidades de leitura de estudantes da rede pública municipal do Rio de Janeiro: estudo exploratório. *Revista Brasileira de Educação*, 14 (41), pp. 232-245.

Walberg, H., Singh, R. and Rasher, S. (1977). Predictive validity of student perception: a cross-cultural replication. *American Educational Research Journal*, 14, pp. 45-49.

Tobin, J., Wu, D., and Davidson, D. *Preschool in Three Cultures*. New Haven, CT (USA): Yale University Press.

Torrecila, F. (Ed.) (2006). *Estudios sobre eficacia escolar en Iberoamerica.* Bogata, Colombia.

UNESCO Institute for Statistics (UIS) (2008). *A View Inside Primary Schools: A World Education Indicators (WEI) Study.* Montreal: UNESCO-UIS.

Willis, P. (1977). *Learning to Labor: How Working Class Kids Get Working Class Jobs*. New York; Columbia University Press.

Wubbels, Th. and Brekelmans, M. (1998). The teacher factor in the social climate of the classroom. In B. Fraser and K. Tobin (Eds.), *International handbook of science education* (pp. 565-580). Dordrecht, The Netherlands: Kluwer.

Zandvliet, V. and Straker, L. (2001). Physical and psychosocial aspects of the learning environment in technology rich classrooms. Retrieved from www.informaworld.com/index/713808652.pdf

References

Abadzi, H. (2006). *Efficient Learning for the Poor: Insights from the Field of Cognitive Neuroscience.* Washington, D.C.: International Bank for Reconstruction and Development.

Al-Attas, S. (1979). *Aims and Objectives of Islamic Education*. Jeddah, Saudi Arabia: Hodder and Stoughton.

Ball, S. (Ed) (1990). *Foucault and Education*. New York: Routledge.

Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory.* Englewood Cliffs, NJ: Prentice Hall.

Benavot, A., and Gad, L. (2004). Actual instructional time in African primary schools: factors that reduce school quality in developing countries. *Prospects, 34* (3), pp. 291-309.

Bernard, J., and Michaelowa, K. (2006). How can countries use cross-national research results to address 'the big policy issues'? (Case studies from Francophone Africa). In K. E. Ross (Ed.), *Cross-National Studies of the Quality of Education.* UNESCO.

Bishop, R., and Glynn, T. (1996). *Culture Counts: Changing Power Relations in Education.* London: Zed Books.

Breetzke, K. (2003). A fresh start for school spaces in Africa: Lessons for office spaces for the 21st century? Retrieved from: www.gurteen.com/gurteen/gurteen.nsf/.../school-spaces-africa

Bransford, J., Brown, A. and Cocking, R. (Eds.) (2000). *How People Learn: Brain, Mind, Experience and School*. Washington, D.C.: National Academy Press. http://www.nap.edu

Bruner, J. (1996). *The Culture of Education.* Cambridge, MA: Harvard University Press.

Confucius (n.d.). *The Analects*. (D.C. Lau, Trans. 1979). London: Penguin Books.

Crahay, M. (2009). Enseignement et construction des connaissances. Pour un effort de rapprochement entre les différents courants théoriques traversant le champ de la psychopédagogie . In J. Ducret (Ed.), *Actes du 3e Colloque Constructivisme et éducation*, (pp. 163-179).

Creemers, B. (2006). Critical analysis of the current approaches to modelling educational effectiveness: The importance of establishing a dynamic model. *School Effectiveness and School Improvement, 17* (3), pp. 347-366.

Creemers, B. and Reezigt, G. (1999). The role of school and classroom climate in elementary learning environments. In Freiberg, S. (Ed.) *School Climate: Measuring, Improving and Sustaining Healthy Learning Environments.* London and New York: Routledge Falmer.

Dalin, P. (2005). Developing the twenty-first century school: A challenge to reformers. In Hopkins, D. (Ed.) *The Practice and Theory of School Improvement*, pp. 25-39. Dordrecht, The Netherlands: Springer.

Denmark, F. et al (Eds) (2005). *Violence in Schools: Cross-National and Cross-Cultural Perspectives*. New York: Springer Science + Business Media.

Denzin, N., Lincoln, Y. and Smith, L. (Eds.) (2008). *Handbook of Critical and Indigenous Methodologies*. London: Sage Publications.

Dessus, P. L'école et la classe, des lieux de vie? *Séminaire d'analyse des pratiques d'enseignement/ apprentissagge.* Grenoble: IUFM.

Dewey, J. (1938). *Experience and Education*. New York: Touchstone.

Dewey, J., and Dewey, E. (1915). *Schools of Tomorrow.* New York: E.P. Dutton.

Edelman, G. (2006). *Second Nature: Brain Science and Human Knowledge.* Yale University Press.

Egan, K. (1997). *The Educated Mind: How Cognitive Tools Shape Our Understanding.* Chicago, IL, USA: University of Chicago Press.

Fathy, H. (2000). *Architecture for the Poor: An Experiment in Rural Egypt.* Chicago: University of Chicago Press.

Freiberg, S. (Ed.) (1999). *School Climate: Measuring, Improving and Sustaining Healthy Learning Environments*. London and New York: Routledge Falmer.

Fraser, B. (2002). Learning environments research: yesterday, today and tomorrow. In Goh, S. and Khine, M. (Eds.) *Studies in Educational Learning Environments: An International Perspective,* pp. 1-26. World Scientific Publishing Co.: Singapore.

Fraser, B. and Walberg, H. (2005) Research on teacher-student relationships and learning environments: Context, retrospect and prospect. *International Journal of Educational Research*, 43, pp. 103-109.

Fraser, B. and Walberg, H. (Eds.) (1991). *Educational Environments: Evaluation, Antecedents and Consequences*. Oxford, UK: Pergamon Press.

Freiberg, J. (Ed.) (1999). *School Climate: Measuring, Improving and Sustaining Healthy Learning Environments*. London and New York: Routledge Falmer.

Friere, P. (2000). *Pedagogy of the Oppressed* (30th Anniversery ed.). (M. Ramos, Trans.) New York: Continuum.

Gagne, R. (1965). *Conditions of Learning.* New York: Holt, Rinehart and Winston.

Gardner, H. (2006). F*rames of Mind: The Theory of Multiple Intelligences*. New York: Basic Books.

Goleman, D. (1995). *Emotional Intelligence: Why It Can Matter More than IQ.* New York: Bantam Books.

Habermas, J. (1981).*The Theory of Communicative Action: Lifeworld and System: A Critique of Functionalist Reasoning* (Vol. 2). (T. McCarthy, Trans.) Boston: Beacon Press.

Hall, E. (1970). The Anthropology of Space: An Organizing Model. In Prochansky, Ittelson and Rivlin (Eds.) *Environmental Psychology: Man and His Physical Setting* (pp. 16-26). New York: Holt, Reinhart and Winston.

Halpin, A. and Croft, D. (1963). Organizational Climate Descriptive Questionnaire (OCDQ). In A. Halpin and B. Croft (Eds.). *The Organizational Climate of Schools* (pp. 122-124). Chicago: University of Chicago.

Hart, S. et al. (2005). *Eliminating Corporal Punishment.* Paris: UNESCO.

HM Inspectorate of Education of Scotland (2006). *How Good is Our School*? Livingston: HMIE. Retrieved from: www.hmie.gov.uk/documents/publication/hgiosjte.pdf

Hopkins, D. (Ed.) (2005) *The Practice and Theory of School Improvement: International Handbook of Educational Change*. Dordrecht, The Netherlands: Springer.

Janosz, M., Georges, P. and Parent, S. (1998). L'environment socioéducatif à l'école secondaire: un modèle théorétique pour guider l'évaluation du milieu. Revue Canadienne de Pscho-éducation, 27 (2), 285-306.

Jensen, E. (2009). *Teaching with Poverty in Mind*: *What Being Poor Does To Kids' Brains and What Schools Can Do About It.* Alexandria, VA (USA): ASCD.

Johnston, A. (2009). The invitational classroom. Personal interview. The Monarch School, Heron, MT (USA).

Jonnaert, P., and Vander Borght, C. (2009). *Créer des conditions d'apprentissage : un cadre de référence socioconstructiviste pour une formation didactique des enseignants.* (3me, Ed.) Brussels: De Boeck Universite.

Jorde-Bloom, P. (1989) Measuring work attitudes: Technical manual for the early childhood Job Satisfaction Survey and the Early Childhood Work Environment Survey. Evanston, IL (USA): Early Childhood Professional Development Project, National College of Education.

Kemmis, S. (1998). System and lifeworld, and the conditions of learning in late modernity. *Pedagogy, Culture and Society*, 6(3), pp. 269-305.

Kinchloe, J., and Steinberg, S. (2008). Indigenous knowledges in education: complexities, dangers and profound benefits. In N. Denzin, Y. Lincoln, and L. Smith (Eds.), *Handbook of Critical and Indigenous Methodologies* (pp. 135-156). Thousand Oaks, CA: Sage.

Levine, J., Resnick, L., and Higgins, E. (1993). Social foundations of cognition. *Annual Review of Psychology, 44*, pp. 585-612.

Levin, H. and Lockheed, M. (1993). *Effective Schools in Developing Countries.* Washington, D.C.: The Falmer Press.

Louv, R. (2005). *Last Child in the Woods: Saving Our Children from Nature Deficit Disorder.* Chapel Hill, North Carolina: Algonquin Books.

Lozanov, G. (1978). Suggestology and suggestopedia: theory and practice*.* Working document for the Expert Working Group (11-16 December), Sofia. Presented by the Bulgarian National Commission for UNESCO and the Bulgarian Ministry of Peoples' Education.

Matthews, G. (2003). The educational thought of Augustine. In R. Curran (Ed.) *A Companion to the Philosophy of Education* (pp. 52-61). Blackwell Publishing.

MacBeath, J. et al (2000). *Self-Evaluation in European Schools: A Story of Change*. London and New York: Routledge Falmer.

MacBeath, J. and Mortimore, P. (Eds.) (2001). *Improving School Effectiveness*. Buckingham, UK: Open University Press.

Moos, R. (1979). *Evaluating Educational Environments*. London and San Francisco: Jossey Bass.

Moos, R. and Trickett, E.J. Classroom Environment Scale Manual. Palo Alto, CA: Consulting Psychologists Press.

Mortimore, P., et al. (1988). *School Matters.* Berkeley, CA: University of California Press.

Mosha, R. (2000). *The Heartbeat of Indigenous Africa. A study of the Chagga Educational System.* New York: Garland.

OECD. (2007). *Understanding the Brain: The Birth of a Learning Science.* Paris.

———. (2006). *21st Century Learning Environments.* Paris: OECD.

OREALC; UIS . (2008). *The State of Education in Latin America and the Caribbean: Guaranteeing Education for All.* Santiago: OREALC/UNESCO.

Piaget, J. (2001). *Psychology of Intelligence* (2d ed.). London: Routledge.

———. (1993). Jan Amos Comenius. *Prospects , 23* (1/2), 173-96.

———. (1950). Social Factors in Intellectual Development. In J. Piaget, *The Psychology of Intelligence* (M. Piercy, and D. Berlyne, Trans., pp. 156-166). Abington, Oxon, UK: Routledge.

Pigozzi, M. (2006). What is the 'quality of education'? — A UNESCO perspective. In K. Ross and I. Genevois (Eds.), *Cross-National Studies of the Quality of Education: Planning their Design and Managing their Impact*. Paris, UNESCO/IIEP.

Pinheiro, P. (2006). United Nations Secretary-General's Study on Violence Against Children. Retrieved from: www.crin.org/.../UNVAC_World_Report_on_Violence_against_Children.pdf

Pinker, S. (2009). *How the Mind Works. New York*: W.W. Norton.

Pol, E., and Molares, M. (1991). El entorno escolar desde la psicologia ambiental. In F. Jimenez, and J. Ignacio, *Introduccion a la psicologia ambiental* (pp. 283-302). Madrid, Spain: Alianza Psicologia.

Prochansky, H. et al. (1970). *Environmental Psychology: Man and his Physical Setting*. New York: Holt, Reinhart and Winston.

Postlethwaite, N. (2005). Quantitative research methods in educational planning. Paris: UNESCO Institute for Educational Planning.

Purkey, S., and Smith, M. (1983). Effective schools: A review. *The Elementary School Journal, 83* (4), pp. 427-452.

Reynolds, S. et al. (1994). *Advances in School Effectiveness Research.* Oxford, UK: Pergamon.

Rousseau, J-J. (1776). *Emile, or On Education*. (A. Bloom, Trans. 1979) New York: Basic Books.

Sammons, P. et al. (1996). Do schools perform consistently across outcomes and areas? In J. Gray, and et al (Eds.), *Merging Traditions; The Future of Research on School Effectiveness.* London: Cassells.

Scheerens, J. (2000). *Improving School Effectiveness*. Paris: UNESCO/IIEP.

Skinner, B. (1982). *Skinner for the Classroom.* (R. Epstein, Ed.) Champaign, IL: Research Press.

———. (1938). *The Behavior of Organisms: An Experimental Analysis.* Cambridge, MA: B.F. Skinner Foundation.

Smith, L. (1999). *Decolonizing Methodologies*. New York: Zed Books.

Soëtard, M. (1999). Jean-Jacques Rousseau. *Prospects*, 24 (3-4), pp. 423-38.

Stuebing, S. (1995). *Redefining the Place to Learn.* Paris: OECD.

Sylwester, R. (2003). *A Biological Brain in a Cultural Classroom: Enhancing Cognitive and Social Development through Collaborative Classroom Management* (2d ed.). Thousand Oaks, CA: Corwin Press.

Tableman, B. (2004). School climate and learning. University-Community Partnerships, University of Michigan. Best Practices Briefs, 31.

Thorndike, W. (1913). *Educational Psychology: The Original Nature of Man* (Vol. I). New York: Teachers College, Columbia University.

Tomasello, M. (1999). *The Cultural Origins of Human Cognition.* Cambridge, MA: Harvard University Press.

UNESCO (2009). *Stopping Violence in Schools: A Guide for Teachers*. UNESCO: Paris. unesdoc.unesco. org/images/0018/001841/184162E.pdf

Upitis, R. (2009). Complexity and design: How school architecture influences learning. *Design Principles and Practices: An International Journal, 3* (2), pp. 1-14.

Vayer, P., Duval, A. and C. Roncin (1991). *Une écologie de l'école*. Paris: Presses Universitaries de France.

Vygotsy, L. (1978). *Mind in Society: The Development of Higher Psychological Processes.* (M. Cole, Ed.) Cambridge, MA: Harvard University Press.

Walberg, H. and Andersen, G. (1968). Classroom climate and individual learning. *Journal of Educational Psychology*, 59, 414-419.

Willingham, D. (2009). *Why Don't Students Like School? A Cognitive Scientist Answers Questions About How the Mind Works and What it Means for the Classroom*. San Francisco, CA (USA): Jossey-Bass.

Witkin, H. (1977). *Cognitive Styles in Personal and Cultural Adaptation.* Worcester, MA (USA): Clark University Press.

World Bank Independent Evaluation Group (2006). *From Schooling Access to Learning Outcomes: An Unfinished Agenda: An Evaluation of World Bank Support to Primary Education*. Washington, D.C.: World Bank.

World Conference on Education for All. (2000). *The Dakar Framework for Action: Meeting Our Collective Commitments.* Paris: UNESCO.

———. (1990). *Meeting Basic Learning Needs*. Paris: UNESCO.

Wubbels, Th. and Levy, J. (Eds.). (1993). *Do you Know What You Look Like: Interpersonal Relationships in Education*. London: Falmer Press.

Zandvliet, D. Learning environments for environmental education. Paper presented at the Australian Association for Research in Education. Fremantle, Australia, November, 2007.

Appendix I

Assessment of free primary education in Kenya: School observation checklist

1. Describe the general school facilities:

Permanent classrooms
Temporary classrooms
Open-air teaching areas that serve as classrooms
Classrooms in another venue away from school compound
School compound

- Look at a typical Class 1 and a typical Class 2 classroom and describe.
- Look at two typical primary school classrooms (Classes 5 to 8) and describe.
- You will have a total of four classroom descriptions for each school.

2. Record the number of children in each of the four classrooms and describe conditions.

Walls – good condition/unstable/moving/crumbling
Windows – glass in place/broken/no glass
Roofing – good covering/caving in/open in places/leaking
Floor – flat and smooth/uneven/potted/dusty/muddy
Lighting – generally good seeing conditions/poor visibility/too bright or too dark/bothersome contrasting light
Ventilation – stable and pleasant/hot/chilly and cold/damp and humid/breezy/uncomfortable
Noise – classroom acoustics good/noisy and poor with interference from other classrooms or outdoors
Space – ample space for pupils to work/classroom cheerful/classroom dull and drab/classroom crowded
Walls charts, visual aids – materials on walls of classrooms, quality and condition
Chalkboards – visible from all segments of classroom/presence of glare/poor legibility from some parts
Furniture – sufficient, suited for ages and size of pupils/inadequate in number and size/mismatched desks and seats/broken furniture stored in classroom/children sitting comfortably/uncomfortably

3. Visit toilet facilities and describe what you see.

	TEACHERS				PUPILS			
	Male		**Female**		**Male**		**Female**	
Type of toilet		NOT working		NOT working		NOT working		NOT working
Flush toilet								
Ventilated pit latrines								
Unventilated pit latrines								
NONE								

- Are toilets clean/dirty? Who cleans toilets? Are toilets gender-sensitive?

4. School safety and security. (good, fair, poor, not available)

Is there a boundary wall/fence?

Security guard/service

First aid kit

Other

5. School water supply

Is there water at school? (is it adequate? all the time? only sometimes?)

What is the source?

Where does the school get its water supply? How far away?

Do children bring water to school?

Is water at the school safe for drinking?

6. Describe facilities for co-curricular activities (e.g. sports).

7. Describe special rooms and amenities:

- Staff room, principal's office, library, school hall, storerooms, workshops, science laboratory, other
- Electricity, telephone, typewriter, duplicating machine, computer, radio, television, tape recorder, other
- School feeding programme, if any
- Describe the situation concerning children with special needs:
- Are there special facilities for these children to accommodate their needs (e.g., ramps, toilets?)

Source: Republic of Kenya Ministry of Education and Science and UNESCO Nairobi Office, 2005, pp. 89-90)

Appendix II

Minimum requirements for physical conditions in Spain

Environmental Variables	Summary of Legal Requirements
Lighting and ventilation	• 300 lux are to be guaranteed in teaching facilities • Maximum artificial light support is to be 150 lux • Longitudinal light is to be projected on blackboards to prevent reflections • Lighting devices are to be equipped with diffusers to prevent dazzling • Ventilation should be natural, direct and adjustable
Noise	• Teaching centres are to be located in separate, dedicated buildings • Sound insulation at ceiling level is advised
Temperature	• Waterproof double glazing is to be used in all windows • The facilities are to be equipped with air or water based heating systems • Minimum required temperature of 18°C for classrooms, teaching offices and administrative offices • Minimum required temperature of 15° • Minimum required temperature of 15° for the gymnasium • Minimum required temperature of 14° where people are to circulate (corridors, stairways) • No minimum temperature is required for toilets, warehouses and waste storage facilities • To save energy, heating systems in different areas are to be programmed to operate individually
Safety	• Schools for children are to be located in single-storey buildings without stairways • In cases where child education has been integrated into larger teaching centres, child education classrooms are to be located on the ground floor • Potentially dangerous elements should be clearly marked and protected • Taps are to be single taps enabling hot and cold water to be combined • Compliance with fire protection, intruder, burglar and vandalism regulations is to be ensured

Source: Comasaña and Juste, 2007, p. 210)

Checklist for the assessment of the quality of classroom and school climate in Dutch elementary schools

Dimension A: School plan for effectiveness		
Does your school pursue the following cognitive outcomes?		
• Curiosity and willingness to learn	YES	NO
• Cedication to learning	YES	NO
• A positive, critical attitude	YES	NO
• Taking initiative	YES	NO
• Independent studying	YES	NO
• Concentration	YES	NO
• A high achievement motivation	YES	NO
Does your school pursue the following affective student outcomes?		
• Student responsibility for own learning, social behaviour, fellow students, the environment	YES	NO
• Social functioning: showing solidarity, being interested in others, being able to play and work together, showing respect and tolerance, social skills	YES	NO
• Values: development of an individual set of values, accepting the values of society, ability to change values in a rational way, show courtesy and being friendly	YES	NO
• The acceptance of one's own and others' feelings	YES	NO
• The acceptance of one's own restrictions	YES	NO
• A feeling of safety	YES	NO
Dimension B: Physical environment: classroom and school		
Do your classrooms meet the following criteria?		
• Student work displayed on classroom walls	YES	NO
• Furniture that is clean, intact and well adapted to the size of students	YES	NO
• Pleasant temperature	YES	NO
• No unnecessary materials on student tables	YES	NO
• Tidy classroom, learning materials and teacher's table	YES	NO
• Learning materials looked after by teacher	YES	NO
Does your school meet the following criteria?		
• Schoolyard divided for younger and older students	YES	NO
• Proper supervision before school, during breaks and after school	YES	NO
• Waste-paper baskets emptied regularly	YES	NO

• No trash in the schoolyard	YES	NO
• Schoolyard separated from the street	YES	NO
• Playing materials safe for children and lawns, sandboxes, etc. Well kept	YES	NO
• Tidy corridors and canteen	YES	NO
• Individual lockers for students	YES	NO
• School sufficiently illuminated	YES	NO
• Student work on walls	YES	NO
• Students assisting in the maintenance of the school	YES	NO
Dimension C: Teacher behaviour		
Do the teachers create a relaxed classroom climate?		
• Showing a relaxed attitude and not acting superior	YES	NO
• Creating a safe atmosphere	YES	NO
• Making students feel free to ask and answer questions	YES	NO
• Encouraging students to engage in discussions	YES	NO
• Fostering a positive attitude in the class and student-teacher cooperation	YES	NO
Do the teachers show interest in all students and provide positive feedback?		
• Not showing sympathy or antipathy for individual students	YES	NO
• Involving all students in the learning processes and valuing student participation positively	YES	NO
• Not stigmatizing students when they answer questions incorrectly	YES	NO
• Handling incorrect answers in a positive way and valuing student effort	YES	NO
Do the teachers guard discipline and structuring?		
• Students know the classroom rules and sanctions after breaking rules;	YES	NO
• The teacher acts according to rules when students break the rules.	YES	NO
• When given assignments students know what they are expected to do.	YES	NO
• Student absence is registered.	YES	NO
• Achievement, progress, and socio-emotional development is registered.	YES	NO
Do the teachers stimulate self-discovered learning?		
• The teacher is not impatient when students do not answer immediately.	YES	NO
• The teacher provides a rich learning environment and stimulates learning by discovery.	YES	NO
• The teacher simulates group discussions and guards the participation of all students.	YES	NO
• The teacher is not constantly talking.	YES	NO

Do teachers model what they expect their students to do?		
• The teacher shows respect for all students.	YES	NO
• The teacher creates an atmosphere of community.	YES	NO
Dimension D: The school's system		
Does your school have clear agreements about pedagogical behaviour of teachers and behavioural rules for students?		
• There are written school agreements about the pedagogical behaviour of teachers.	YES	NO
• Agreements concerning the way teachers interact with students, the way students interact, discipline, interpretation of rules, punishment, reinforcement, feedback to students.	YES	NO
• The timetable sets some time aside for social-affective outcomes	YES	NO
• Behavioural rules are written statements, known to students and parents.	YES	NO
• There are sanctions when students break the rules and parents are informed.	YES	NO
• Sanctions are used whenever necessary.	YES	NO
• The school is alert to problem behaviour and has a policy (for bullying, discrimination, truancy, criminal behaviour, breaking classroom rules).	YES	NO
Does your school enhance affective outcomes?		
• Teachers have sufficient knowledge about the social-emotional development of students, behavioural problems, learning problems, gifted students.	YES	NO
• The school is alert to the training of pedagogical skills of teachers.	YES	NO
• The school pays extra attention to minority students.	YES	NO
• The school pays attention to pedagogical contents in materials.	YES	NO
• The school uses grouping procedures to enhance affective development.	YES	NO
• Does your school evaluate pedagogical behaviour?	YES	NO
• The school evaluates the pedagogical behaviour of teachers.	YES	NO
• There is a policy on the pedagogical climate in the school.	YES	NO
• The social-emotional development of students is registered frequently and systematically.	YES	NO
Does your school have essential internal and external contacts?		
• The principal actively supports the pedagogical behaviour of teachers.	YES	NO
• The principle pays attention to communication between teachers.	YES	NO
• The parents are informed about the pedagogical policy of the school.	YES	NO
• The school pays attention to the home situation of students.	YES	NO
• Parents are content with the school and the way the school acts toward the students.	YES	NO
• The school has contacts with relevant institutions such as support services, special education, health services, police, social services.	YES	NO

Source: Creemers and Reezigt, 1999, p. 42.

In a crowded Nairobi suburb, about 70 fifth-graders crammed into a single classroom struggle to hear their teacher over the roar of the traffic just outside. At a pre-school in northwest Spain, teachers meeting in a focus group agree that their most urgent priority is to dedicate a quiet space for children to rest. In Singapore, researchers find that primary school children who say that their friends like them are likely to achieve higher learning outcomes.

There is growing research on the importance of learning environments, but these findings tend to remain on the periphery of international discourse on educational quality. Meanwhile, rising incidences of bullying, discrimination and random school violence all over the world threaten to undermine children's fundamental right to learn. To realise the promise of Education for All, educational systems must step up their efforts to ensure that schools and other learning spaces are safe, inclusive, healthy and conducive to learning. But there is no simple, 'one-size-fits-all' solution.

As part of the UIS Observatory of Learning Outcomes (OLO), this report provides a range of perspectives on how the physical, social and psychological dimensions of learning environments can be systematically measured and improved. Methodologies, processes and tools are described in detail, and a generic framework for strategic planning serves as a starting point for further discussions.

Lessons from the field point to the need for close collaboration among researchers, policymakers and communities. For researchers, this means reaching across disciplinary boundaries and using a variety of methods to incorporate local knowledge and perspectives. For policymakers, it means working with communities to design and maintain intelligent, child-friendly schools. For managers, teachers, learners and parents, it means actively participating as equal partners to take the necessary steps toward sustainable solutions.