Revisiting garden-based learning in basic education

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Food and Agriculture Organization of the United Nations

International Institute for Educational Planning

International Institute for Educational Planning www.unesco.org/iiep

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Published by:

Food and Agriculture Organization
of the United Nations
Viale delle Terme di Caracalla
00100 Rome, Italy
e-mail: sdre@fao.org
FAO web site: http://www.fao.org

International Institute
for Educational Planning
7-9 rue Eugène Delacroix,
75116 Paris
e-mail: information@iiep.unesco.org
IIEP web site: www.unesco.org/iiep

Cover design: Nathalie Pruneau
Cover photo: Lavinia Gasperini
Composition: Linéale Production

ISBN: 92-803-1251-0
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Acknowledgements

This study, commissioned by the Food and Agriculture Organization of the United Nations (FAO) and the International Institute for Educational Planning (IIEP), was made possible through the collaboration of many organizations and individuals. Those who completed surveys and hosted case-study visits by authors spent many hours dissecting their programmes in an attempt to identify the roots of success and implications for education. Other contributors invested countless hours identifying resources, clarifying definitions, and reading drafts to ensure clarity of content and meaning. Thank you all for your time, energy and input.

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Foreword to the series

Education for rural people is crucial to achieving both the Education for All (EFA) goals, and the Millennium Development Goals (MDGs) of eradicating extreme poverty and hunger, ensuring universal primary education by 2015, promoting gender equity and ensuring environmental sustainability. In 1996, the World Food Summit in Rome stressed increased access to education for the poor and members of disadvantaged groups, including rural people, as a key to achieving poverty eradication, food security, durable peace and sustainable development. The 2002 World Summit on Sustainable Development, held in Johannesburg, also emphasized the role of education.

As the majority of the world's poor, illiterate and undernourished live in rural areas, it is a major challenge to ensure their access to quality education. The lack of learning opportunities is both a cause and an effect of rural poverty. Hence, education and training strategies need to be integrated within all aspects of sustainable rural development, through plans of action that are multisectoral and interdisciplinary. This means creating new partnerships between people working in agriculture and rural development, and people working in education.

To address this challenge, the Directors-General of FAO and UNESCO jointly launched the flagship programme on *Education for rural people* (ERP) in September 2002 (http://www.fao.org/sd/erp/), during the World Summit on Sustainable Development. This initiative involves an inter-agency approach to facilitate targeted and co-ordinated actions for education in rural areas.

It is within this framework, and to provide inspiration for the flagship initiative, that the FAO's Extension, Education and Communication Service and UNESCO's International Institute for Educational Planning (IIEP) have jointly launched a series of publications. This series is co-ordinated and edited by David Atchoarena (IIEP) and Lavinia Gasperini (FAO).

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Contents

List of abbreviations

ACTAF	Cuban Association of Agriculture and Forestry Professionals
AEE	Association for Experiential Education
AHS	American Horticultural Society
ANA	Australian Natives Association
ASCD	Association for Supervision and Curriculum Development
CDE	California Department of Education
CFAITC	California Foundation for Agriculture in the Classroom
ESRDF	Ethiopian Social Rehabilitation and Development Fund
FAO	Food and Agriculture Organization of the United Nations
FFA	Future Farmers of America
FLP	Food, Land and People
GBL	Garden-based learning
IPM	Integrated Pest Management
JMG	Junior Master Gardener Program
LLS	Life Lab Science Program
LTL	Learning through Landscapes
MHS	Massachusetts Horticultural Society
MOVIUM	Center for the Urban Environment in Sweden
NAAEE	North American Association for Environmental Education
NAS	United States National Academy of Sciences
NGA	National Gardening Association
PBL	Project-based learning

PDI	Permaculture Drylands Institute
SEER	State Education and Environment Roundtable
STVC	Selam Technical and Vocational Center in Ethiopia
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Preface

The connection between garden-based learning (GBL) and basic education at one level is easy and straightforward. It appears that any effort to combine garden work with basic learning should be logical and natural. But, as one digs deeper into the connection, particularly at a practical level, the union becomes more complicated. As you consider the multiple and sometimes contradictory expectations under which educators in all parts of the world must operate, it is quickly seen that to implement a GBL effort requires skill, resourcefulness, resources and persistence. Complicating the situation further is the question: "What constitutes garden-based learning?"

One of the challenges of this study was defining the discipline or even the practice of GBL. There is, in fact, no single definition. In this study, GBL is defined by the practitioners, and this document hopefully serves as a tool to move all of us towards a better understanding of GBL and its potential contributions to basic education. Despite the challenges, the effort to connect GBL and basic education is well worth the effort.

This document will review the theoretical/conceptual background of GBL as it seeks to provide insights into its role and effectiveness in education globally. There is no defined discipline of GBL but rather a collection of philosophies and practices that draw from a variety of fields. Much of the information presented here was collected from the industrialized world where research and communication are most accessible.

However, with a look into some significant GBL programmes in developing economies, coupled with a review of its historical role, GBL appears to offer an effective strategy for basic education and sustainable development in any socio-economic setting.

Methods

A mix of techniques and methods was used to gather the information on GBL and basic education. Attempts were made to systematically gather data and information from practitioners around the world. A triangulated approach was used and included the use of surveys, observations and information from literature and other secondary data sources. These techniques involved the development and distribution of a questionnaire sent to garden experts/practitioners in both developing and developed countries.[1] Over 50 questionnaires were sent, carried, and/or e-mailed to identified experts/practitioners in Central and Latin America, Asia, Africa, Australia, North America and Europe. While we had a relatively good return from respondents in the latter three continents, we were disappointed with the return from our identified experts in the other sites. We have no way of knowing if the questionnaires arrived at their destination, but we do know that we had a low response. One author (Daniel Desmond) also visited sites in Africa (Ethiopia), Canada and Europe, while another author (James Grieshop) gathered first-hand information on GBL and education in Cuba. In addition, the lead author has drawn upon his almost 30 years of work in GBL. In that time he has established many contacts in North America and Europe and has visited multiple sites. Lessons learned during that time are incorporated, as well as those noted by our other respondents. Finally, the ever-growing literature on gardening, schools, education and learning was a rich source of information and experience.

This document is organized in a manner that takes the reader first to some fundamental definitions of basic education and GBL as used by the authors. Then it moves on to a description of how GBL is most often integrated within educational programming in both formal and non-formal settings (*Chapter 1*). The authors then review the evolution of the practice of GBL (*Chapter 2*) and summarize relevant literature (*Chapter 3*) in order to set the

1. We use the terms 'developing' and 'developed' countries/economies only as a form of identification. Other terms such as 'North' and 'South', 'Third World' and 'First World', and 'resource rich' and 'resource poor' were considered. For ease of identification we chose the former. No implication is intended, nor any inference should be drawn that one is better than the other; we must communicate and learn from one another.

stage for a review of current practices (*Chapter 4*) in developed and developing countries in several locations around the world. From the analysis of cases and related experience, the authors also suggest principles and best practices that seem to be common to successful GBL programmes. In addition, curricular and other 'best products' are detailed. In *Chapter 5* of this work, results of these programmes are identified (impacts and outcomes) and an attempt is made to identify how GBL will continue to evolve within basic education and some of the unique needs (future directions). The *Appendix* gives a collection of information of resources, organizations, web sites, etc., that can be used to assist practitioners and researchers to continue to explore and improve the practice of GBL.

This document is not a recipe or blueprint for creating a GBL programme. Such an objective is far outside the purposes or scope of this work. Rather, it is the wish of the authors that this manuscript will provide some ideas for creatively and productively linking garden-related work to learning and education. In addition, it is our aim that the document will energize practitioners and policy-makers to do more, to take action, and to support local and national efforts to make GBL a reality.

Good planting and harvesting!

Chapter 1
Introduction

1.1 Basic education and garden-based learning

In considering the role of GBL in basic education, it seems important to first explore some definitions and roles for both concepts. In many societies basic education is focused on developing academic skills or capacities (cognitive development) through a core curriculum that includes language arts, science, maths, social studies and visual/performing arts. In addition, we believe that most educators would agree that basic education also includes personal, moral and social development. In some cultures education is also called upon to provide vocational or subsistence training that allows the individual to provide food, clothing and shelter through employment or subsistence production. There may be another component of basic education that occurs in most cultures either in formal educational institutions or non-formal educational settings. This component is frequently referred to as life skill education and focuses on skills that allow children to be capable as well as competent. This aspect would include skills such as critical thinking, co-operation, community service, self-discipline and wise use of resources. In reality the concept of basic education is a continuum of educational practice that varies from community to community, is dependent on the interests of the community and on the various social and political forces (religion, cultural norms, and values) that dominate the cultural landscape.

The approach to basic education offered by the World Conference on Education for All (2000) presents another insight into the world of teaching and learning. In the past 'education' has occasionally been misused as a tool for segregation and discrimination (for example, consider the role of education in colonial settings). Here, we believe it is critical to focus on a philosophy of equality as stressed by the United Nations and one that ensures equal rights for all, taking into account the unique needs and culture of each community.

GBL can be defined simply as an instructional strategy that utilizes a garden as a teaching tool. The pedagogy is based on experiential education, which is applied in the living laboratory of the garden. This simple definition, however, is misleading in that it does not take into account some of the powerful elements of the garden experience. It overlooks the relationship of these experiences to educational reform and to the transformation of contemporary basic education from a sedentary, sterile experience to one that is more engaging of the whole child. It also misses the elements of the garden experience that contribute to ecological literacy and sustainable development. Hopefully we have captured some of these subtler aspects of the practice in the discussion that follows.

In our view GBL has the potential to enrich basic education in all cultural settings. The chapters that follow document the contributions in a number of communities around the world. In cases where it is most effective, GBL is a pedagogy that is used with all children. It has something to contribute to each learning style, and to children at each developmental level. It cannot be viewed as a 'make work' curriculum for slow learners or socially disenfranchised youth, although it has been shown to be a powerful tool in motivating and educating youth who have been identified with such labels.

It is our intention to look at how GBL affects basic education in all of the realms mentioned above. By design and necessity, the review is not comprehensive. It is limited by the number of responses from practitioners and observations by the authors. Nevertheless, these responses and observations do help illustrate how the use of GBL can influence different aspects of basic education. This is not to suggest that all of the influences are positive, or that their impact is significant in all arenas. It is only to point out that the review will comment on the influence of GBL on aspects of basic education including academic skills, personal development, social and moral development, vocational and/or subsistence skills and life skills.

1.2 Theoretical background of garden-based learning

Theoretical and methodological approaches to GBL vary greatly across the educational landscape. However, the application of the pedagogy within

GBL falls principally under one of two frameworks: experiential education and/or environmental education. In theoretical terms GBL finds relevance in a number of contemporary educational theories including Howard Gardner's (1983) theory on multiple intelligences, his work on the naturalist intelligence (Gardner, 1999), and Daniel Goldman's (1995) theory of emotional intelligence. In addition, the theory of experiential learning as proposed by Kolb (1975, in Weatherford and Weatherford, 1987) supports much of GBL as experiential education. Two other theoretical approaches are also relevant to GBL – the theories about children's environment proposed by Moore and Young (1978) and theories from various developmental psychologists (Tuan, 1978; Cobb, 1969).

Theories of intelligence such as Howard Gardner's theory of multiple intelligences and Daniel Goleman's conceptualization of emotional intelligence have contributed to the value of experiential education. They have been applied to work in developing linguistic, musical, logical-mathematical, spatial, bodily kinaesthetic and personal abilities, as well as emotional skills (Carver, 1998). Furthermore, Gardner re-framed his early theory of seven intelligences, making additions with one being naturalist intelligence. Intelligence is identified in reference to a socially recognized and valued role that appears to rely heavily on a particular intellectual capacity (Gardner, 1999). In this way a naturalist intelligence is characterized by a person's ability to recognize and classify his/her natural environment. Gardner claims that just as most children are ready to master language at an early age, so too are they predisposed to explore the world of nature.

According to Kolb's experiential learning model (Kolb, 1975, in Weatherford and Weatherford, 1987), concrete experience leads to observations and reflections that result in the formation of abstract concepts and generalizations of these concepts as well as the capacity to test the implications of these concepts in new situations. Piaget and other scientists have shown that a child's understanding is developed through his actions on the environment and not merely through language. Another unique point about experiential education is that it is based on the intrinsic motivation of the learner.

In a socio-ecological model of a child's outdoor landscape (Moore and Young, 1978), it is theorized that a child lives simultaneously in three interdependent realms of experience. These three are the physiological-psychological environment of body/mind, the sociological environment of interpersonal relations and cultural values, and the physiographic landscape of spaces, objects, persons, and natural and built elements. The freedom of the outdoor environment serves as a balance to a child's supervised indoor environment, resulting in vocational learning.

Developmental psychologists have tried to study children's relationships with nature and whether an innate sense of kinship with nature manifests itself by the time children reach a certain age (Tuan, 1978). Edith Cobb (1969) wrote that middle childhood, approximately from 5 to 6 years of age to 11 or 12 – that is the period between the "strivings of animal infancy and the storms of adolescence" – is when the "natural world is experienced in some highly evocative way". Tuan (1978) additionally suggests that children have to be taught by adults about their natural environment, as "nature is an inarticulate teacher". Children show a natural curiosity about the world, but this curiosity may be easily repressed if adults fail to nurture it.

At a pedagogical level it is the approaches labelled 'experiential education' and 'environmental education' that are most relevant to GBL. There has been a significant growth in interest in experiential education and project-based learning (PBL) – as educators recognize the value of hands-on learning. In its simplest form experiential education is concisely described by the Association for Experiential Education (AEE, 2002) as "a process through which a learner constructs knowledge, skill and value from direct experiences". PBL has been at the roots of effective education and was called for by early educational philosophers and practitioners. The current call to return to this pedagogy is prompted by research on children's learning (Kandel and Hawkins, 1992) and by exemplary projects around the world that demonstrate the value of hands-on learning. The pre-schools of Reggio Emilia, Italy (Edwards *et al.*, 1993), and models such as the Coombs Infant and Nursery School in the United Kingdom as studied by the Center for the Urban Environment in Sweden (MOVIUM), clearly demonstrate the unique contributions made by PBL.

While experiential education and PBL offer excellent strategies or pedagogies, they require a contextual framework or thematic structure in which to operate. Environmental education and more specifically GBL can provide that context or thematic focus. We will look at some examples of this when we examine a few programmes currently in operation around the world.

Much of the activity in GBL is classified as environmental education. One definition of environmental education as proposed by the North American Association for Environmental Education (NAAEE, 2002) states:

> "... a process that aims to develop an environmentally literate citizenry that can compete in our global economy; has the skills, knowledge and inclinations to make well-informed choices; and exercises the rights and responsibilities of members of a community."

Ecological literacy is a holistic yet applied variation of environmental education. It has been defined as the understanding of the principles of organization that ecosystems have developed to sustain the web of life along with the skills to act on that understanding in one's daily life to ensure sustainable communities that support all forms of life.

Agricultural literacy and GBL can also be an example of agricultural education and a variant of environmental education. The United States National Academy of Sciences (NAS), in a 1989 report entitled *Understanding agriculture – new directions for education*, defined agricultural literacy "as education *about* agriculture and was to include a person's understanding of the food and fiber system, its history and current economic, social and environmental significance." This definition encompasses some knowledge of food and fibre production, processing and domestic and international marketing.

Agricultural education, in turn, often infers a type of vocational education in agriculture which includes the development of the specific skills and knowledge necessary to become effectively employed in some aspect of the system of commerce that provides a society's food and fibre. A developing country example in agricultural education can be seen at the elementary level in the Adopt a Garden programmes of the Selam Technical and Vocational

Center in Ethiopia (STVC). Here, the programmes seek to develop the necessary skills and knowledge in elementary and secondary students so that they can provide vegetables for the family diet.

Whether GBL occurs under the definition of environmental education, ecological literacy, agricultural literacy, or agricultural education, it appears to have the potential to contribute to basic education in both developed and developing world settings. The practice of GBL must consider rigorous guidelines, procedures and practices. For example, to be truly effective, GBL programmes must be tied to a comprehensive and cohesive educational plan/programme or garden curriculum that is implemented across grade levels and ideally is tied to local, state or national education standards or needs.

The literature suggests that GBL can be a unique and effective strategy to be used in basic education to introduce an experiential component in support of the traditional curriculum. It can also be used as an environmental education curriculum. As we later look at programmes that utilize GBL (*Chapter 4*), it will be seen that GBL has the potential not only to contribute to academic skills, but also to address a child's development in a social, moral and practical or life skills sense.

But what are the roots of GBL? Also, where lies the foundation for GBL? The next chapter provides some answers to those questions.

Chapter 2
The roots and foundations of garden-based learning

> *"… educators will need to frame clear rationales for including gardening in an already full schedule of mandates."* (Marturano, 1999)

Arlene Marturano, educator and co-ordinator of South Carolina GBL Network, has written extensively about the philosophical roots of garden-based instruction. She has also addressed many of the practical challenges that teachers and educators throughout the world face as they attempt to combine GBL with all forms of education, including basic education. Those challenges may be as basic as developing schedules and times for GBL to finding resources such as shovels and seeds, and from issues of how to harvest the products of a garden to finding the financial resources needed.

She also reminds all of us who seek to practise GBL that we must strive to understand its philosophical roots, to learn from the past and to appreciate the historical foundations of GBL. Those from the past might not be able to teach us, but their words should give us pause to think about GBL and its potential. *Box 1* highlights the thoughts of a mix of GBL philosophers. Take a moment to read and reflect on their ideas.

More contemporary educators and public figures also speak of the value of garden-based instruction. For example, Delaine Eastin, former California State Superintendent of Schools, as she launched a major effort in 1995 to encourage "a garden in every school", articulated a set of principles or values that apply world wide:

- Gardens can create opportunities for children to discover fresh food, make healthier food choices and become better nourished.
- Gardens offer dynamic settings in which to integrate every discipline including science and maths, language arts, history and social studies, and art.
- Young people can experience deeper understandings of natural systems and become better stewards of the earth.
- School garden projects nurture community spirit and provide numerous opportunities to build bridges among students, school staff, families, local businesses, and community based organizations.
- Links with school gardens, school food service programmes, and local farms can ensure a fresh nutritious diet for children while teaching about sustainable food systems.

Box 1. Some thoughts on garden-based learning

Comenius: "[For every school] there should be a garden attached where they [students] may feast their eyes on trees, flowers, and plants ... where they always hope to hear and see something new. Since the senses are the most trusty servants of the memory, this method [gardens] of sensuous perception will lead to the permanent retention of knowledge." (Comenius, 1967)

Rousseau: "... since everything that enters into human understanding comes through the senses, the first reason of man is a reason of the senses. Our first masters of knowledge are our feet, our hands, and our eyes." (Rousseau, 1956)

Pestalozzi: "Students observe first all of the objects in the classroom, observing and naming everything. When this is exhausted, they are taken into the garden, into the fields, and woods – where they are led to notice objects in greater detail, their permanent and changeable qualities, the qualities that are general and those that are peculiar to them, their influence, their function, their destiny." (Green, 1969)

Froebel: "The pupil will get the clearest insight into the character of things, of nature and surroundings, if he sees and studies them in their natural connection ... the objects that are in closest and most constant connection with him, that owe their being to him ... these are the things of his nearest surroundings ... the garden, the farm, the meadow, the field, the forest, the plain ... Instruction should proceed from the nearest and known to the less near and less known." (Froebel, 1826)

Dewey: "Where schools are equipped with gardens ... opportunities exist for reproducing situations of life, and for acquiring and applying information and ideas in carrying forward of progressive experiences. Gardening need not be taught either for the sake of preparing future gardeners, or as an agreeable way of passing time. It affords an avenue of approach to [the] knowledge of the place farming and horticulture have had in the history of the human race and which they occupy in present social organization. Carried on in an environment educationally controlled, they [gardens] are a means for making a study of the facts of growth, the chemistry of soil, the role of light, air, moisture, injurious and helpful animal life, etc. There is nothing in the elementary study of botany, which cannot be introduced in a vital way in connection with caring for the growth of seeds. Instead of a subject belonging to a peculiar study called 'botany,' it will then belong to life, and will find, moreover, its natural correlation with the facts of soil, animal life, and human relations ... It is pertinent to note that in the history of man, the sciences grew gradually out of useful social occupations." (Dewey, 1944)

Montessori: "When he [student] knows that the life of the plants that have been sown depends upon his care in watering them ... without which the little plant dries up, ... the child becomes vigilant, as one who is beginning to feel a mission in life." (Montessori, 1912)

While the advice and principles provided by these historical and contemporary figures is relevant to other forms of experiential and/or environmental education, the garden may be the most basic and sophisticated model for such learning.

2.1 Historical foundations

Although the history of children's gardens and GBL in the United States from the 1890s to the present is well documented, a similar history of school gardens in other parts of the world, and through earlier civilizations, is less well documented.[2]

Elizabeth Meyer (1997), in a paper entitled *Cultivating change – an historical overview of the school garden movement*, describes the early school garden movements, which had their origins in Europe. Meyer discusses the Austrian book *The school garden,* by Erasmus Schwabb, published in 1879 and translated into English by Horace Mann. This publication illustrates much of the early motivation for GBL in Europe. An actual timeline of the early development of school gardens in Europe and the Unites States has been presented by Kendall Dunnigan (1999) who, following Meyer's accounts, traces gardening in schools from the late 1800s in Europe through to 1997, at which time a National Gardening Association (NGA) survey found that over 3.6 million youth in the United States were gardening in school programmes. Dunnigan points out that in 1869, Austrian law mandated a garden in every rural school. By 1898 there were 18,000 school gardens in Austria and Hungary, and by 1905 over 100,000 school gardens in Europe. Thomas Bassett (Bassett, 1979) also documented the early history of school gardens in North America. Bassett notes that many American educators were impressed by the use of school gardens for nature study in Germany, Sweden and Austria, and promoted adoption of the school garden concept. Bassett elaborately describes the school garden movement in the United States, including a description of the "school garden *par excellence*" (Greene, 1910) with illustrations from school gardens in Canada and the United States.

2. Hopefully that history will receive a boost from the publication of this study. Other studies in the planning stages, such as that of the NGA in the United States will add new knowledge and insights to the history and evolution of GBL.

What is important here is not the chronology of this movement but the historical underlying motivations that led educators, parents and public officials to embrace the garden as an effective learning environment. An equally important question we must address is why this rich early history in GBL did not become mainstreamed into the educational curriculum of schools. We summarize the motivations here, drawing on the studies previously mentioned, along with an article by Brian Trelstad (1997), entitled *Little machines in their gardens: a history of school gardens in America, 1891 to 1920*. He and other authors in turn draw from important names in education, child development and psychology, such as Dewey, Kilpatrick and Cuban. In addition the voice of well-known landscape architects and designers such as Francis (1995) and Moore (1995) are drawn upon to offer commentary on garden designs appropriate to enrich the learning experience.

Those who have studied the history of the school garden movement and GBL draw a strong connection to the ongoing cycle of educational reform (Meyer, 1997). In the United States the school garden movement reached its highest points in the following eras and in response to specific reform efforts:

- Early twentieth century (1900-1930s): progressive education and social reform movements encourage GBL.
- Mid-twentieth century (1960-1970): counter culture and environmental movements create a resurgence in school and community gardens.
- Late twentieth century (1990-2000): rebirth of progressive education coupled with renewed interest in environmental education and nutrition/ health issues for children.

There has also always been a vocational and practical side to GBL. That aspect of the practice has not shown the cyclical swings seen in the more academic settings. In this case, using the garden to teach basic vocational skills in plant science, horticulture, agriculture, and environmental science has continued virtually uninterrupted in a variety of formal and non-formal educational settings. Those settings include such diverse ones as *Pioneros* in Cuba, 4-H and Future Farmers of America (FFA) in the United States, and the Adopt a Garden programme at the STVC in Ethiopia. GBL as an informal educational practice also occurs throughout the world as communities and

families teach succeeding generations to garden as a source of food, fibre, and medicinal/social products.

In addition, as Meyer (1997) states, school gardens were seen as settings that "create a sense of community, instil concern for the environment, foster a connection with nature, and help students to develop self-confidence, discipline, skills in co-operation, and multi-cultural understanding."

In summary, from a historical perspective we see that GBL has been viewed as contributing to all aspects of basic education, including academic skills, personal development, social development, moral development, vocational and/or subsistence skills, and life skills. In each era the lure of GBL in basic education was premised on its facilitation of educational strategies that are universally accepted as valid, if not essential, pedagogical approaches to meaningful learning. While certainly related, these concepts – learn-by-doing, PBL, real world learning, child-centred learning – clearly focus on engaging the learner as the central figure in educational experience and in allowing individual and social constructivism.

If, as these authors suggest, GBL can have a significant positive influence in basic education, why has the pedagogy not become institutionalized in the educational mainstream? There are several possible explanations.

One is that the pedagogy has not been critically examined and endorsed by educational researchers and practitioners. A second is that there is no developed discipline in GBL that makes the connection to PBL, effective experiential education, and advancement in academic performance. Related to that shortcoming is the lack of infrastructure support for school gardens or related GBL efforts. Finally, there is often no local strategy to sustain the physical plant of the garden site as a permanent part of the school or programme facility. While school athletic facilities often receive significant school and community investment there are few examples of similar support in the fields of environmental education or GBL. There are significant exceptions to these shortcomings, notably programmes such as the Life Lab Science Program (LLS) in California, the Junior Master Gardener Program (JMG) out of Texas A&M University, and the work of Marcia Eames-Sheavly at Cornell University on school garden sustainability. Despite these excellent efforts, a larger

national and global initiative is necessary to institutionalize the practice in the educational mainstream. Major horticulture organizations such as the NGA and American Horticultural Society (AHS) are addressing these concerns, and hopefully will encourage the partnership of major educational institutions such as the Association for Supervision and Curriculum Development (ASCD) and other major educational research organizations.

The history of GBL and its relationship to basic education as represented here clearly has a Western bias, and there is a need to look at the history of this pedagogy in other cultural settings. The publication of this document by IIEP/FAO could contribute to the identification of additional resources to help tell the story of GBL globally.

Chapter 3
A review of garden-based learning in basic education

> *"... to open the child's mind to his natural existence, develop his sense of responsibility and of self dependence, train him to respect the resources of the earth, teach him the obligations of citizenship, interest him sympathetically in the occupations of men, touch his relation to human life in general, and touch his imagination with the spiritual forces of the world."* (Bailey, 1909)

These early twentieth-century words were expressed with the aim of nature study in mind. It can be seen that the idea of incorporating the natural outdoors as an integral part of the child's educational curriculum is not new. The philosophy behind garden-based education is actually an amalgamation of the philosophies behind experiential education, ecological literacy and environmental awareness, and agricultural literacy. In other words, it involves teaching children by a method where they learn through personal discovery, teaching them in a natural setting where they learn ecological principles that govern all life and inculcate an awareness of the physical environment, and developing in them a sense of connectedness with their land, and all that grows on it. Tracing back these thoughts to their propagators we find some of the most prominent philosophers and leaders in the field of education espousing their views on experiential and environmental education as well as agricultural literacy, subsequently steering the course of school gardens to its present status.

3.1 History and philosophy of garden-based learning

As far back as the seventeenth century, John Ames Comenius (1592-1670) believed that education should be universal, optimistic, practical and

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innovative, and should focus not only on school and family life but also on general social life. He stated: "A school garden should be connected with every school, where children can have the opportunity for leisurely gazing upon trees, flowers and herbs, and are taught to appreciate them" (Weed, 1909, cited in Sealy, 2001). A hundred years later, Jean-Jacques Rousseau (1712-1771) described the defect of teaching a child 'about' things rather than the things themselves. He stated: "You think you are teaching what the world is like; he is only learning the map." Rousseau emphasized the importance of nature in education, stating that nature was the child's greatest teacher and that "his knowledge of the natural world serves as a foundation for his later learning" (cited in Sealy, 2001). Rousseau's teachings were adopted by Heinrich Pestalozzi (1746-1827) who spoke of observation and activity in learning rather than learning mere words. Pestalozzi started his school after working with 25 orphans using gardening, farming, and home skills as practical education. He visualized the balance between the three elements: hands, heart and head. Friedrich Froebel (1782-1852) who studied Pestalozzi's fundamental principles, went a step further to emphasize 'doing' as well as observing in such a way that is not merely mechanical, but rather incorporates the creative energies of the child such that the child is "elevated to productive activity in the full sense of the word" (Froebel web online, 1998). Froebel was one of the most effective proponents of school gardens in the nineteenth century (Sealy, 2001).

3.2 The first school gardens in Europe and Australia

In 1811 Prussia developed the first compulsory school system that included gardening, and in 1869 school gardens became a law. Erasmus Schwab, who was hired to enforce this law, published *The public school garden* in 1871 emphasizing that the natural sciences and agricultural and vocational sciences could be learned in the garden (Sealy, 2001). New educational theories swept the world around the turn of the century and the kindergarten movement developed by Froebel started to spread quickly around Europe. The schoolchild was no longer considered an "information receptacle" but rather a "growing flower" (Robin, 2001). In Australia, the school garden movement was strongly influenced by the annual School Garden Conference in 1903, sponsored by the Australian Natives Association (ANA). This led to

the propagation of school gardens in the early decades of the twentieth century; these were viewed as ideal for integration with the educational curriculum and for incorporating the standards of "progressive conservation" with its concerns for the responsible stewardship of nature as well as the ideas about connections between nature, hard work and moral improvement (Robin, 2001).

3.3 School gardens in the United States

In the United States gardens were first introduced in urban schools as aesthetic and educational rather than practical (Sealy, 2001). School gardens were thus not intended to create gardeners and farmers. The Massachusetts Horticultural Society (MHS) was instrumental in providing educators with a background for teaching gardening in schools. In 1891 Henry Lincoln Clapp was sent to Europe to study school gardens and on his return he installed the first school garden in America at George Putnam School in Roxbury, Massachusetts. John Dewey (1915) referred to the reorganization of rural schools and the utilization of agriculture in education in the early part of the twentieth century, as a "movement towards greater freedom and an identification of the child's school life with his environment and outlook". Maria Montessori (1870-1952) also spoke of "first the education of the senses, then the education of the intellect". She believed that a garden could help children in their moral development and appreciation of nature. Van Evrie Kilpatrick, who was hired as Director of the School Garden Association of New York wrote: "School gardens should be maintained by the city, the city owes it to the children whom it has deprived of breathing places and beauty spots through want of foresight" (cited in Sealy, 2001). Youth gardening had become a national movement, and by 1918 every state in America and every province in Canada had at least one school garden (Sealy, 2001). In 1916, over 1 million students contributed to the production of food during the war effort, following the proclamation by President Woodrow Wilson. However, the educational value of school gardens diminished and waned after the First World War and their brief resurgence during the Second World War (by the growing of Victory Gardens) declined after 1944. Playgrounds and athletic fields took over garden plots and schools became more focused on technology (Sealy, 2001).

The second wave of school gardens in the United States occurred between 1964 and 1975 as an offshoot of the educational reform strategy for the 'war on poverty' (Meyer, 1997, cited in Yamamoto, 2000). With the birth of the environmental movement, public concern for the environment led to the conception of school gardens as a progressive, interactive educational link for children to understand and connect with 'life processes' and environmental understanding. However, school gardens did not gain firm roots in public education, weakened by the conservatism of the 1980s (Yamamoto, 2000).

In the early 1990s there were changes in the trend of education towards more innovative ways of learning. The focus on experiential and environmental education came together with the interest in agricultural literacy, making this decade ripe for school gardens to spread and grow.

3.4 Contemporary movements: people, organizations and trends

3.4.1 People

The contemporary impetus to the school garden movement in the United States is largely influenced by the thoughts of educators, environmentalists, and agricultural reformists. In 1995, California's State School Superintendent Delaine Eastin mandated "a garden in every school" to "create opportunities for our children to discover fresh food, make healthier food choices, and become better nourished". Though this aim has not been fully realized, Eastin's vision gave impetus to the development of gardens in other states as well.

With regard to the value of outdoor experience on child development, David Orr, author of *Earth in mind* (1994) and *Ecological literacy* (1992), states that children raised in ecologically barren settings are deprived of the sensory stimuli and the kind of imaginative experience that can only come from biological richness. Robin Moore (1995) suggests that children's gardening can be introduced within the broader frame of reference of sustainable development, regenerative design, and bio-design. He argues that children, the future consumers and participants of democracy, must interact daily with an educational environment containing a diversity of living ecosystems. Gardening in the primary grades is "the most feasible" pedagogical approach

for ensuring this type of daily learning experience as well as for "reversing a worrisome trend" in the opposite direction.

Alice Waters, a prominent figure in the school garden and organic agricultural movement, as well as the founder of 'The Edible Schoolyard' in Berkeley, California, believes that having a garden for food production at schools will teach compassion, patience and self-discipline. The Edible Schoolyard reflects this belief as a model in the education of social responsibility, community participation, and sustainable agriculture. The programme involves students in all aspects of farming a 1-acre garden, including preparing, serving and eating the food harvested.

3.4.2 Organizations

One organization that has been especially significant in propagating the school garden movement is the AHS that hosts the Children's Garden Conference series. AHS is one of the oldest NGAs in the United States. In 1993 AHS created the first Youth Garden Symposium in order to educate and inspire people to look at garden design as an attempt to reconnect children with nature. Another such organization is the NGA that has taken an active role in children's gardening activities and offers resources for starting and maintaining children's gardens in schools.

3.4.3 International trends

As one considers trends around the globe, Learning through Landscapes (LTL) is noteworthy. LTL is an organization in the United Kingdom that has attempted to move school grounds to the top of the educational agenda. Bill Lucas, describing the goals of LTL, states that a school garden is as important for urban as for rural schools, "helping to bring about a better understanding between town and country", and a "keen power of observation in all things alive". LTL recognizes the importance of gardening by which children gain first-hand experience with the seed-to-seed cycle; the joy of the harvest; the taste, touch and smell of fruit, vegetables and flowers.

In African schools there has been little curricular emphasis in practical skills (Horst *et al.*, 1995). However, the scenario is gradually changing with gardens being the main elements in Niger's new educational policy and in Sierra Leone where up to 80 per cent of all schools have hands-on gardening classes. After gardening in schools, children are more likely to help their parents farm at home, eager to show them what they have learned. This develops prestige for farming in the minds of children.

In Bolivia, the Schoolyard Ecology programme conducted by Audubon, an organization committed to ecological conservation, uses the schoolyard as an extension of the classroom. In this hands-on laboratory, children learn about their physical and biological surroundings through exercises that also allow them to develop basic academic skills. This form of education is clearly setting a new trend as opposed to the standard curriculum of rote recitation of multiplication and vocabulary.

3.5 School garden programmes: strategies, evaluations and impacts

GBL programmes have gained popularity across the international educational landscape and there are innumerable programmes in both formal as well as informal education with myriad strategies and impacts. Much of the literature on garden-based programmes, however, has focused on practical approaches for starting and managing school gardens. Proponents of children's garden programmes talk of the multiple developmental benefits that school gardens can have on children – namely, emotional, aesthetic and even spiritual, in addition to the more obvious social and intellectual benefits.

Priscilla Logan, educational consultant and permaculture instructor from Santa Fe, New Mexico, in *The why, what and how's of outdoor classrooms* in *Branching out*, the newsletter for Permaculture Drylands Institute (PDI), listed four reasons for using gardens as a teaching method (Sealy, 2001):

- *High retention rate:* When children work in gardens, 90 per cent of their experience is classified as 'hands-on'. In a study conducted by Bethel Learning Institute on student retention, it was found that learning by doing produced 75 per cent retention rate and 90 per cent retention

rate if the student teaches another student, as opposed to 11 per cent for lectures.

- *Empowerment:* A connection to the earth gives students a sense of achievement and motivation.
- *Academics:* Science, maths, social studies, art, language and any other subject can be taught as life skills using nature as the learning laboratory, making these concepts more meaningful.
- *Teamwork:* Facilitating co-operation and communication in a real-world setting rather than a classroom, makes learning teamwork possible, as does the class goal of a successful garden become more significant than individual achievement.

The Nutrition Education and Training Section of the California Department of Education (CDE) states five ways in which garden-enhanced nutrition education could contribute (Sealy, 2001). These five are (a) building bridges between school and community; (b) promoting the transfer of information from one generation to another; (c) developing environmental awareness in students by caring for a living environment; (d) providing opportunities for cultural exchange; and (e) building life skills.

The developmental impacts of school gardens have, however, been difficult to evaluate, and hence there are only few evaluations made in this area. The literature ranges from subjective accounts about the importance of gardens in the form of self-reports, parents' and teachers' observations, as well as more empirical assessments of the impact of gardens.

3.6 Impact on academic achievement

One well-evaluated study on experiential education has been reported in *Closing the achievement gap: using the environment as an integrative context for learning* (Lieberman and Hoody, 1998). Here, the State Education and Environment Roundtable (SEER), consisting of 12 state education agencies, sought to identify successful environment-based educational programmes and conduct evaluations in various domains. The 40 successful programmes that use the EIC design share the basic educational strategies of a multidisciplinary approach, hands-on learning experience, problem-solving, team teaching, individualized design, and an emphasis on developing knowledge, understanding

and appreciation for the environment. The documented impacts of the programmes were found to be: (a) better performance on standardized achievement tests of reading, writing, maths, social studies and science; (b) reduced classroom management and discipline problems; (c) increased attention and enthusiasm for learning; and (d) greater pride and ownership of accomplishments.

Programmes such as Life Lab have created garden-based projects for learning science and connecting it to all areas of learning. Their mission has been to encourage respect for life and the environment, an appreciation and understanding of ecological systems, and to create an environmental stewardship towards a goal of a sustainable future. The LASERS programme, a Monterey Bay Science Project (Stoddart *et al.*, 1999), aims to educate teachers in the use of a constructivist, inquiry based approach to the teaching of science and language. Most of the partnership schools use the Life Lab science-based curriculum and are carried out in a classroom grow lab or a school garden. Analyses of the data from the previous seven years of LASERS' activities indicate that students who have been with LASERS-trained teachers for two consecutive years grow at a faster rate in language and maths when compared to students who have not been taught by LASERS-trained teachers.

3.7 Impact on environmental education

GBL has been especially beneficial in environmental education (or ecological literacy) as well as in teaching scientific concepts. According to the North Carolina Environmental Education Plan (1995), hands-on experiences are the best way for students to develop an understanding of their complex world and their place in it. The Down-to-Earth programme aims to provide this kind of learning with the help of school gardens as a knowledge building tool (Williamson and Smoak, 1999). The main purpose of the Down-to-Earth programme is to introduce youth to sustainable agriculture and environmental education using the scientific method as a conceptual and hands-on learning process that stresses critical thinking, reasoning and problem-solving. Youth educators thus draw on rich mixture of multidisciplinary topics such as agriculture, natural resources, environmental management, health and human safety, and horticulture. The impact of the Down-to-Earth programme has been seen through increased knowledge of scientific methods, plants, fertilizer

and pests, as well as positive attitudinal and behavioural changes, increased awareness and facilitation of higher order thinking processes.

With similar goals of achieving an interdisciplinary approach to environmental education, Project Green incorporates the school garden and gardening activity into all disciplines, including maths, science, English, history, social studies, and art (Skelly and Zajiceck, 1998). An evaluation of the project comparing experimental and control groups found that children in the experimental group who participated in the garden programme, had more positive environmental attitudes, with second graders showing higher scores than fourth graders. More specifically, it was found that the more out-door related activities a child experienced, the more positive environmental score they recorded.

3.8 Impact on children's health and nutrition

School gardens have been used to teach children about nutrition and how to make healthier food choices (Lineberger and Zajiceck, 2000). In a garden project called Nutrition in the Garden, teachers were guided to integrate nutrition education as it relates to fruits and vegetables. Evaluations of students participating in the programme showed that their attitudes towards fruit and vegetables had become more favourable, and they were also more likely to choose fruit or vegetables as snacks than before they participated in the gardening programme.

In a garden project with similar goals described by Irene Canaris, the impacts of the garden have led to more benefits than the original aim of improving nutrition and nutritional awareness in children (Canaris, 1995). The gardening activities enhanced the quality and meaningfulness of their learning on a wider level, with children communicating with their communities and parents as well as learning mathematical and scientific principles in the garden.

3.9 Impacts on families and communities

The Evergreen Elementary School in West Sacramento, California, offered small garden plots to families who were non-English-speaking immigrants, primarily from Hmong and Mien cultures, who rarely participated in their children's activities. A demonstration garden grew vegetables and other plants familiar to the Hmong and Mien participants, thus encouraging participation by the parents. This project raised the self-esteem of the children as well as the non-English-speaking parents who were then valued as teachers.

Hands-on involvement in children's designing, creating, caring for, and using school nature areas can help improve children's academic performance as well as inculcate the willingness and capacity to work for the communities of which they are a part (Bell, 2001). Anne Bell also states that teachers are gaining an appreciation for the potential of school ground projects that integrate disciplines, produce tangible outcomes and encourage children to build ties with their communities. 'Lived experience' motivates students and shapes their learning in lasting and personally significant ways.

The Master Gardener Classroom Garden Project provides inner-city children in the San Antonio Independent School District with an experiential way of learning about horticulture, gardening, themselves and their relationships with their peers (Alexander, North and Hendren, 1995). The gardens are used as part of the curriculum as well as a reward for hard work during the day. An evaluation of the benefits of this project was conducted by collecting data in the form of qualitative interviews of second and third graders as well as parents, teachers, a master gardener and a school principal. These interviews indicate that there were many positive effects of working in the garden. According to the researchers, the children had received lessons in moral development, enhanced their daily academic curriculum, gained pleasure from watching the products of their labour flourish, and had a chance to increase interactions with their parents and other adults. In addition, the children learned the value of living things, plus the anger and frustration that occurs when things of value are harmed out of neglect or violence.

The literature presented here reinforces the value of the idea of connecting nature with each child's educational curriculum and learning. We began this chapter with that idea quoting from Liberty Hyde Bailey, a late nineteenth-century United States advocate of gardens for children. We close the chapter with a similar idea found in a quote by a nineteenth-century contemporary of Bailey. Jose Martí, the nineteenth-century Cuban revolutionary, expressed a similar idea – to connect nature with a child's education and learning activities – quite simply:

> *"Y detras de cada escuela un taller agricola ...*
> *donde cada estudiante sembrase un arbol."*
> [And behind every school is found a garden ...
> where every student plants a tree.]
>
> (Martí, n.d., Cuba, on the cover
> of a Cuban student garden journal)

Chapter 4

Model garden-based education programmes: best practices and best products

During the course of this study several individual programmes were identified for a close review of how GBL was being used within the framework of basic education. The location of those programmes around the world is shown in *Figure 4.1* and they are listed in the *Appendix*. They cover a cross-section of developmental stages and represent a variety of approaches to incorporating a garden within the educational curriculum of the school or programme. Many of the case studies were completed using a standard survey format. In the text that follows, we examine the responses from selected sections of those surveys. These surveys, coupled with recent site visits and years of observation of the GBL movement, form the background for the later discussions of best practices and products, impacts, outcomes and future directions.

In attempting to gather information for this document a survey was developed and sent to representatives of garden programmes in schools and community settings around the world. This survey was coupled with site visits by the authors and interviews via e-mail and telephone. The response to mailed surveys sent to developing economies was small despite strategies to facilitate a response. Gathering information in the developing world is challenging and a comprehensive study would require time and resources beyond the scope of this document. We do feel, however, that the insights we did gain allow us to make some generalizations about the practice of GBL world wide.

In addition to the case-study sites listed, there are a number of sites across the United States and around the world that serve as major models of GBL on a broader scale or in a niche sense. These include the 4-H Children's Garden at Michigan State University; the Carolina Children's Garden; the Life Lab Garden at the University of California, Santa Cruz; Adopt a Garden programme at the STVC in Ethiopia; the Spiral Garden in Toronto; the Cuban Association of

Agriculture and Forestry Professionals (ACTAF) and other garden sites in Cuba; and a variety of other programmes that use the garden as a classroom, teaching tool, curriculum, and/or a food and fibre source. In some cases these gardens are also used for therapy, creative inspiration, motivation, and thoughtful reflection – rare commodities in the formal education systems of many developed countries.

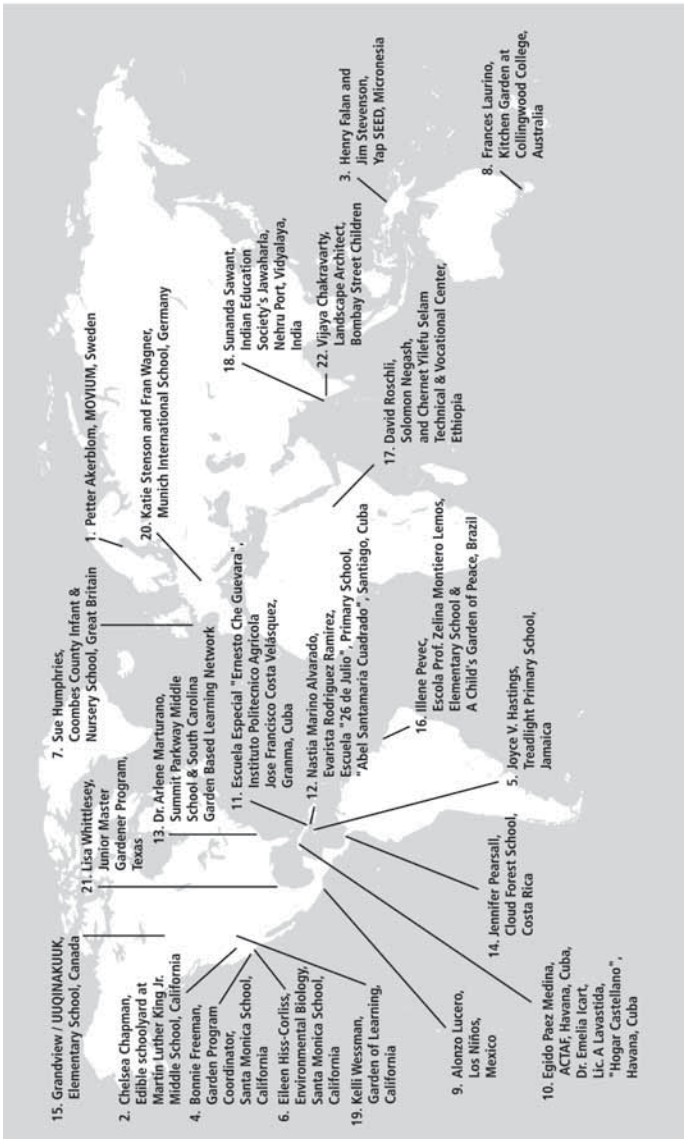
An analysis of the case-study sites listed above combined with historical observations of GBL and a review of the literature resulted in the identification of a set of 'core uses' for GBL. These 'core uses' are identified within the context of formal education as well as in a broader community context. The analysis also resulted in the identification of a set of critical 'best practices and products' which can serve as an agenda for action in organizing an effective GBL programme. These practices and products are at one level essential to an effective and sustainable programme and at a deeper level hold the key to strengthening basic education in any setting, whether it be in rural eastern Africa or inner New York City. Finally, GBL offers one effective strategy for implementing the educational reforms identified over the ages but implemented in only rare pilot programmes and seldom mainstreamed.

The 'core uses' are summarized in *Boxes 2* and *3* with a few descriptors of how the use may be applied within and beyond basic education.

It may be useful to consider the way GBL is used in the context of the broader society, outside the classroom. It seems clear that this practice makes contributions beyond those of basic education, and it may be that the contributions outside formal education are equally important to the growth and development of a healthy society.

GBL is a very diverse practice, one that cannot be prescribed but must be adapted for each school/community setting. The 'best practices' we describe here are key elements that should be considered in any setting and adopted as appropriate. They were collected from schools and garden programmes around the world and reflect ideas for developed and developing economies. The 'best products' (see later) provide detailed and concrete samples of how these practices can be implemented and present ideas and examples of methodology, scope and sequence in curricula planning, unit/lesson plans and ideas for scheduling within the school calendar.

Figure 4.1 Garden-based learning programmes around the world – survey and study sites



4.1 Best practices

The review of model programmes in developed and developing economies has provided some important insights into the practice of GBL. The lessons learned point to a collection of best practices in two arenas. The first and most important arena involves organizational considerations that must be addressed initially before the curriculum is identified and a garden setting is considered. The second arena involves operational considerations. These are the practices essential for effective, sustainable implementation of the garden experience.

4.1.1 Organizational considerations

The first step in the establishment of effective programmes in GBL is the development of an understanding, appreciation and acceptance of the pedagogy. For educators, administrators and parents this requires an introduction to the philosophy and history of GBL along with an explanation of how this fits into effective contemporary education. It is also important to point out the fact that GBL can allow for the implementation of many of the educational reforms called for today. We have provided a discussion of these elements in the early chapters of this document. If this step is successful what will follow is a long-term commitment of support for the effort. The next step is the detailed planning, with an emphasis on developing a significant connection with the community, and a plan that is focused on long-term sustainability of the site and curriculum. The final organizational step is the curriculum selection or development.

Box 2. Core uses for garden-based learning in basic education

A review of the responses from GBL programmes in developed and developing countries show many similarities in basic motivations for using the garden as an instructional tool. In virtually all settings the garden is viewed as a tool of multiple uses.

Academic skills

- To support core academic training, particularly in science and maths – real world hands-on experiences
- Enrichment of core curriculum in language arts through introduction of new learning landscapes
- To support standards-based education in countries with national or regional education standards

Personal development (mental and physical)

- To add a sense of excitement, adventure, emotional impact and aesthetic appreciation to learning
- To improve nutrition, diet and health
- To teach the art and science of cooking with fresh products from the garden or local farms
- To re-establish the celebratory nature of a shared meal

Social and moral development

- To teach sustainable development
- To teach ecological literacy and/or environmental education
- To teach the joy and dignity of work
- To teach respect for public and private property

Vocational and/or subsistence skills

- To teach basic skills and vocational competencies
- To produce food and other commodities
- For subsistence consumption and trade

Life skills

- To teach about food and fibre production
- To engage children in community service and environmental care
- To involve students in lessons of leadership and decision-making

Box 3. Core uses of garden-based learning beyond basic education

Community development

- Gardens often serve as a focal point for community dialogue, capacity building, and partnerships
- Gardens often organize individuals for action – for water delivery, co-operatives and transportation

Food security

- Gardens can address hunger at the individual, family and community levels through planning, growing and sharing
- Gardens can be the starting-point for teaching and developing food policy

Sustainable development

- Gardens are an appropriate arena to introduce children to the interconnections that link nature to economic systems and society*

Vocational education

- Gardens represent a historic and contemporary model for developing vocational skills in agriculture, natural resource management and science

School grounds greening

- Gardens provide practical productive strategies to transform sterile school grounds into attractive and productive learning centres
- Hands-on activities in outdoor classrooms make learning more interesting while demonstrating other benefits such as decreased absenteeism and discipline problems
- "... enriching students' outdoor learning environment reduces anti-social behavior such as violence, bullying, vandalism, and littering."**

* The 1992 United Nations Conference on the Environment and Development states that "education is critical for promoting sustainable development."

** "Transforming school grounds", *Greening school grounds*, New Society Publishers.

Practitioners must begin with strategic planning for short (three to five-year) and long (five to 10-year) horizons. These plans must include a vision, mission, core values and strategic statement of how GBL fits into the overall instructional strategy of the school or programme. Does it meet the school and community expectations for producing competent and capable youth? Does it meet other broader community goals related to food security, environmental preservation or restoration, and vocational training? The core values of the programme must be articulated and should include concepts such as: learn by doing, hands-on instruction, child centred and student directed (participatory democracy), inquiry based, gender equity, inclusive, etc. Another core value that is evident in the educational philosophy of Cuba is that they identify education about the natural world and food as one of the requirements to creating a truly 'cultured child'.

The planning must also specify a realistic annual operating plan which should include a budget and realistic goals in terms of academic performance, student attitudes, leadership development and community engagement. The plan must address sustainability and strategies for start-up. Marcia Eames-Sheavly (1999) at Cornell University has captured some of the best thinking along these lines in the publication entitled *Sowing the seeds of success*. In California, the Center for Ecoliteracy also produces an excellent publication for creating school gardens as outdoor classrooms. Their publication *Getting started* talks about many of the guiding principles we outline above: garden purpose, administrators, connecting to the classroom, theme gardens, community involvement, a student-centred environment, etc.

The plan is best developed with the involvement of school administrators, community leaders, parents, and students. This engagement is critical. It ensures understanding, recognition and support of GBL as an appropriate and necessary element of basic education. It also ensures that these stakeholders understand and can articulate the importance of this pedagogical approach. Without this level of understanding and support throughout the educational community, the practice cannot be mainstreamed into the educational bureaucracy and will have a short timeline of sustainability, despite short-term success.

Once the planning is completed (or concurrently if staff, time and energy permit) attention can turn to curriculum considerations. One of the first decisions in this arena is whether GBL will be integrated into all core subjects using thematic instruction or some other integration strategy. If this is not the case, then the GBL instruction must become one of the core subjects, such as science, environmental education, or a core garden class that addresses content standards at various grade levels. There are successful examples of both approaches and the local planning team described above must make the final decision on what approach is most effective in their setting. Other important considerations for the curriculum include ensuring a high degree of organization, while remaining flexible and not dependent on a teacher with a high degree of garden knowledge.

Another curriculum consideration that appeared important was the use of real-life learning in which authentic learning experiences are provided. One example of this would be teaching based on the food cycle where children are directly involved: (a) planting and/or growing a living organism; (b) use of a growing medium (soil, water, range land, etc.); (c) stewardship of plants and/or animals, harvesting of crops or products; (d) productive use or consumption of products, recycling of by-products; and (e) extensions to different levels of plant production in the community (nurseries, farms, forests, etc.). The curriculum must adhere to the core values identified in the planning process and must also identify its own additional values. Those that seem important in case studies are activities that include a sense of fun and adventure, engaging all senses, and using garden technology that is appropriate and sustainable (an example of which is the non-mechanical drip irrigation used in Adopt a Garden programmes in Ethiopia).

In the developed world, and to a lesser extent the developing economies, the experiential learning cycle seems to be the curriculum strategy of choice for GBL. This is where students are allowed to construct their own knowledge through research, discussion, exploration and application. The application phase of this cycle may occur in the school or community, but is most powerful when students apply what they have learned in the family home and/or community. This offers one of the great opportunities for developing economies where children can apply what they have learned about growing food and good nutrition in their own backyards. This was the strategy employed by the

Land-Grant Universities in the United States as they attempted to bring about earlier adaptation of agricultural innovations. In the developing world there is still a reliance on the more didactic system on lecture and drill. One of the repeated warnings in the literature about the effective use of GBL is that it cannot be a forced add-on, practised on an occasional or seasonal basis, but instead must be developed through a thoughtful process, and included on a daily basis. Robin Moore at North Carolina State University states that "... children (future consumers and participants in democracy) must interact daily with an educational environment containing a diversity of living ecosystems. Gardening in the primary grades is proposed as one of the most feasible pedagogical approaches for ensuring this type of daily learning experience ...".

4.1.2 Operational considerations

Once organizational considerations are addressed then attention turns to operational details that include issues such as the physical site, teaching strategies, community connections, food-system linkages and school grounds greening.

One of the first operational considerations is the growing medium of the garden. The size and scale must be appropriate to the curriculum or learning objectives. There is considerable variability in practice with regard to garden size. Some suggest that a large-scale garden (e.g. half acre or one-fifth hectare) is best. Others suggest that container gardening or raised beds can have the same impact as the larger garden experience. In our view gardening in the earth, exposed to the natural environment, with a garden plan that allows multiple plant species, is probably the best model. However, raised beds, container gardens or indoor 'grow-labs' provide valuable practical alternatives when other options are not available. In the ideal world the garden space would also include a complete horticultural environment, including native plants, fruit trees, vegetables, traditional medicinal and/or ceremonial plants and fibre plants. A question that must be answered early in garden development is: "Will the garden be organic, IPM (integrated pest management) or conventional?" Most school gardens attempt to manage the garden without the use of synthetic pesticides or herbicides. They do, however, often use

synthetic fertilizers in combination with compost. In working with children and volunteers, the safest alternative is probably organic. In settings where there is a large student body working the garden, as at Selam in Ethiopia, a labour-intensive organic system of gardening seems most appropriate. Related to garden scope and scale are the concepts of composting and crop rotation. When size and scale permit, composting is always a powerful learning experience which closes the loop of the food cycle or growing cycle. Crop rotation also teaches a collection of scientific concepts in one simple activity.

A second operational consideration is the identification of effective teaching strategies. This is closely related to curriculum but has more to do with day-to-day pedagogical practices in the garden. An initial strategy here is to involve the designation of children as garden co-ordinators (working with adult mentors or coaches) who manage the garden and products from the garden. At Selam, in Ethiopia, this practice engages children in a form of vocational education as they manage large garden tracts, oversee the processing of significant harvests and prepare the products for consumption in two restaurants open to the public on the school grounds. Another successful teaching strategy involves active engagement of the students in the garden on a daily basis. The educational experience also appears richest when students plan, plant, harvest, and prepare a meal or snack from the garden. In non-food gardens some other activity can replace the food preparation (e.g. flower arrangement, wood gathering, etc.).

There exists a large collection of unique operational teaching strategies for GBL from around the world. Ideas that weave drama into the garden through the use of food, or insect puppets, music (recordings from the Banana Slug Band in California), and plays or skits are some examples. Other teachers use theme gardens which focus on student identified themes, such as insects (butterflies), food (pizza or bread), historical or cultural gardens.

While the practice of GBL is evolving, there is no formal pre-service education for prospective teachers. A considerable amount of in-service instruction is provided in developing economies through organizations such as Evergreen (Canada), LTL (United Kingdom), AHS and NGA (United States).

4.1.3 Developing economies

Much is to be learned about best practices from sites throughout the world. Consequently, we were interested in the lessons to be learned from those who practise GBL in developing countries. In exploring GBL in developing economies, we looked at programmes in Brazil, Costa Rica, Cuba, Ethiopia, India, Jamaica, Mexico and Micronesia. In general the programmes reflect the challenges faced by other facets of education and industry within these communities, such as the lack of adequate physical resources and shortage of technical expertise. Both conditions could be significantly addressed by linking GBL efforts in the developed and developing world. Despite these challenges there are amazing examples of GBL occurring in developing economies. It is informative to mention a number of exemplary programmes.

In Ethiopia, the STVC in Addis Ababa has one of the best GBL programmes we have seen. Elementary and high-school students are engaged in on-site gardening. Selam also provides training and technical materials and support for other schools interested in garden development. The goals are focused on food production, vocational training, and environmental education, but staff also see an increase in self-confidence and self-worth of the students. At the STVC, students use garden products in two on-site restaurants open to the public. One restaurant features traditional Ethiopian cuisine and the other an international menu. Students are thus involved in all aspects of the food cycle from production through consumption and on to recycling. This is clearly a model that could contribute ideas to the movement in developed countries, and especially California, where there is a trend towards using GBL to teach the entire food cycle.

Cuba is a country where education is highly valued and where GBL is a part of the culture. In the words of one Cuban educator, the goal of Cuban education is "to create the most cultured children in the world". The definition of 'cultured' here includes an understanding and appreciation of the food cycle and its importance to the family, community, and country. Children and others who work in the school gardens are seen both as a means to achieve food security, and recipients of knowledge important to being a well-educated person. Among the values central to the school gardens is that students should

learn and work. Expressed in another way: *Aprender con la mente y con las manos* [Learn both with the mind and hands]. In cases where schools do not have adequate space for gardens, students will travel to nearby community gardens that serve as sites in which these children can learn and work.

Youth *Pioneros* (or Pioneers) are a key component to Cuban education. This is the out-of-school, non-formal programme to which a remarkable number of children (2 million) continue through secondary school. The *Pioneros* programmes are also operated at camps where students learn about nature, ecology and agriculture. In every case the garden is used as a learning/work site and is designed to establish the cultural value associated with working and learning. In this sense the use of the school garden in basic education contributes to reaching a prime objective of Cuban education – linking learning to work. The *Pioneros* programme also has interest circles composed of students, teachers and other collaborators. One example would be the Urban Agriculture Interest Circle. This group works in agricultural sites in Granma Province developing medicinal plant gardens, flower gardens and kitchen gardens. Some students have even produced a recipe book on medicinal plants, condiments and even wines. Thus, in addition to producing food, learning about nature and agricultural production, students test out recipes and also write and produce material for larger audiences, thereby linking garden work to more academic learning.

In addition to these programmes, Cuba has specialized institutes like the Instituto Politécnico Agricola Jose Francisco Costa Velasquez that is dedicated to agricultural education and seeks to connect agriculture with basic education for youth aged 14 and over. There is a major emphasis on agricultural and environmental literacy as they attempt to teach sustainable agriculture to produce healthy and adequate supplies of vegetables and livestock. In this setting like all educational landscapes across Cuba, there is an effort to ensure that learning and work are directly linked. One of the greatest challenges for Cuba in these efforts is the lack of adequate technical expertise to support school garden programmes. This is similar to the situation faced in other developing economies.

In Cuba, special education students from pre-school ages to those of university age are provided special schools that work to develop the abilities

of each student. Of these 26 schools throughout Cuba, some are residential while others offer programmes from 8 a.m. in the morning to early evening. In each case, the goal is to develop the abilities and skills of these students so that they can contribute and be productive. Gardens and agriculture are important components of some of these schools and provide for developing educational and vocational abilities. Again, the focus is on learn/work. Two examples are highlighted: the Hogar Castellana in Havana and the Escuela Especial 'Ernesto Che Guevara' in Bayamo, Granma.

The Hogar Castellana, Havana. This is a special education school of psychotherapy that provides care and learning programmes for 205 students from 4 years of age to adults. Students who attend include those with Down's syndrome and other types of mental and even physical disorders (e.g. blindness and deafness). Of these, 53 currently participate in agricultural programmes that begin with a focus on learning about plants to more advanced work in planting, cultivating and harvesting crops. Throughout the school the focus is on the development of manual skills. In addition to agriculture, skill development in arts and crafts, cooking and maintenance work is emphasized. In all cases the vocational training is combined with intellectual skill development. For example, as students learn to harvest crops, they also learn to count. The goal of the school is to help develop the abilities of the students so that they are capable of functioning outside the school in daily life. To date over 200 students have gone through the agricultural programme. The ultimate goal for the agricultural education programme is to equip the students with enough skills so that they can work in neighbourhood gardens and urban agricultural projects. The school, which is administered by the Ministry of Health, works with the Ministry of Agriculture and ACTAF to ensure that the agricultural skills and resources are appropriate. To date the agricultural programme has built and operated seed and plant nurseries, outdoor gardens, and hydroponics greenhouse gardens. Teachers work with students who spend five hours a day doing gardening work.

Escuela Especial 'Ernesto Che Guevara'. This school is located in Reparto Antonio Guiteras, Bayamo in the province of Granma. This special school provides agricultural training for 190 children who reside at the school. The approach here is to help develop the work skills needed through agricultural programmes while also producing the food necessary to provide an adequate

diet for students, teachers and workers. The support staff includes 20 teachers, 24 pedagogical aides, two agricultural workers along with eight specialists. Before students work to plant, cultivate and harvest crops, they participate in technical workshops that seek to develop basic agricultural production skills. Students learn and then practise skills related to gardening, composting, harvesting, as well as skills needed to attend to animals. The kitchen garden is also a work area for the students. From September to June, students work 12 hours per week on a rotation of 15 days at the school with three days of rest. A major outcome of this programme is the production of the food needed for the school (*auto consumo*). In addition, the programme develops vocational skills through its attention to the learn/work approach.

The effective use of GBL with physically and mentally challenged children has also been demonstrated in India. For the first time, in 2001, five challenged participants took part in India's National Children's Science Congress using skills and knowledge they had gained while working in a gardening programme at the Sanjivani Deep School of the Paraplegic Foundation. Vijaya Chakravarty, a landscape designer working at the school, discovered that jobs related to gardening, such as soil preparation, digging, watering and harvesting were therapeutic and contributed to significant changes in the knowledge, skills and behaviour of these children.

Gardens have also been developed to address other issues and possibilities. Again, we have much to learn from practitioners in the so-called developing countries throughout the world. What follows are a few summaries of promising developments and approaches.

4.1.4 Food security, nutrition, health

In the garden settings we investigated in developing economies, the production of food was often a key factor in the design of the educational programme. Growing food for the students and their families was an end in itself and a practical way of making school (and education) a valued asset in the community. Teaching the community how to grow their own food in an environmentally sound manner was also viewed as an important step towards

sustainable development. The incorporation of fresh vegetables into the diet, and learning about food safety, points to GBL as an effective tool for nutrition and health education.

4.1.5 Urbanization, sustainable development and early education for democratic participation

Mary Chambliss, the acting administrator of the United States Foreign Agricultural Service, indicates that "the urban population in developing countries is expected to double to nearly 4 billion by 2020." Roger Hart notes in his book *Children's participation* that when families of developing economies leave the land for urban life, there is a tremendous interruption in the child's informal learning about the environment. In order for these citizens to make appropriate decisions that will contribute to sustainable development, they will have to have access to education and experience with environmental issues. Hart, Robin Moore, Gary Nabhan and others have repeatedly called for, in Hart's words, "everyday enjoyment of natural environments close to home – wild commonlands, gardens, ponds, city farms, or schoolyards." Hart also suggests that "as they [children] develop they should also have gradually expanding opportunities to be directly involved in developing these places and caring for them." This speaks directly of developing a child's active democratic participation in the governance of their communities. In the case studies we explored in Brazil, Costa Rica, Cuba and Mexico, interest and practice in issues around environmental education and sustainable development were clearly evident, and the opportunity to involve children in the planning, design, construction, management and monitoring of such activities would be an appropriate next step.

In an informal programme in Bombay, India, designed to introduce children to the world of plants, landscape designer Vijaya Chakravarty indicates that "... our children are from an urban background and many of them live under flyovers and in densely-packed slums – this exposure to nature is very stimulating."

In Ethiopia, the Ethiopian Social Rehabilitation and Development Fund (ESRDF), working with a number of local and international partners, recently

sponsored Ethio Forum 2002. This forum was designed for poverty reduction through community driven restorative development. Ethiopia is the second most populated nation in sub-Saharan Africa with over 60 million inhabitants. Over 50 per cent of that population is under 20 years of age. Because of the large youth population in Ethiopia, the Ethio Forum organizers place a considerable emphasis on youth development and include an eight-day training programme for community workers from around the country on 4-H and FFA, two models of youth development with an emphasis on education in agriculture and the environment. Out of this workshop four regional plans were developed. Of those, one involved the development of the Wilbur Primary School Garden in Gambella. This plan expressed multiple objectives including: (a) to increase recognition of youth as a valuable community asset and engage teenage boys and girls in school garden activities; (b) to bring attitudinal change in the field of agriculture and leadership skills; (c) to train youth in agricultural skills, soil conservation, and laboratory (science) skills; (d) to provide a market orientation; and (e) to mobilize local and international resources and materials to support the school garden project on a pilot basis through 4-H/FFA youth development.

Other plans that emerged from this training included a community-based afforestation Project in Akaki Woreda, soil and water conservation in Goncha Woreda, and family planning through 4-H youth development.

4.1.6 Vocational education

This element of GBL is a more visible component in developing economies and varies significantly in design and intensity. In settings such as the STVC, the GBL activities are part of a developmental continuum of education and experience moving the student towards knowledge and skills that will make them immediately employable. In the Garden of Peace in Brazil, the goal is to expose children to the 'value, dignity, and fun of labour'.

4.1.7 Recruitment for formal education

In developing economies specifically at Los Niños in Mexico and the Garden of Peace in Brazil, the GBL projects are seen as vehicles for developing

a relationship with parents and children, a first step in directing them to formal education. In the words of Vijaya Chakravarty, working with children in India: "We also trained children from ARAMBH, an informal school for slum children – many of whom have never gone to a regular school. Our programmes are used to motivate and enthuse children into joining the educational system."

4.1.8 Educational enrichment in science, language arts, etc.

The identified contributions to basic education are numerous and speak to a general enrichment of the existing curriculum. Key points as expressed by three practitioners illustrate the approaches:

- The Zelina Monteiro Lemos Elementary School in Brazil uses gardening in order to make "basic education come alive, to have content and meaning, and to expand the scope of vision".

- The Los Niños programme in Mexicali, Mexico provides "for practical environmental education that moves and touches people".

- The Cloud Forest School in Costa Rica applies "concepts covered in the classroom in a very practical way".

4.1.9 Children's participation, self-confidence/self-esteem

In reviewing the reported contributions of GBL, a great deal of discussion is heard about the opportunity for children to improve their self-confidence and self-esteem through successful experiences in the garden, to see tangible results of their efforts, to provide support for their families through the growing of food, and to participate in community service. In many cases, GBL experiences build a capacity in children that is then shared with families and community members.

4.2 Best products

This text is designed to articulate the philosophical and historical foundations of GBL and to highlight some examples of GBL around the world. To detail a curriculum, educational strategy, lesson plans and related practical strategies of launching a GBL programme is beyond the scope of this document. Nevertheless, the products detailed below coupled with the resources (*Appendix*) and references listed can provide the level of detail necessary for programme development and delivery. Most of the products listed are from the Western world, but it is our hope that this document will generate additions to the list from around the world.

Growing classroom/garden-based science. This is a teacher sourcebook for hands-on science and nutrition education for grades 2 to 6. It is a year-long science curriculum made up of a collection of indoor and outdoor experiential activities taught within the context of a garden laboratory. The curriculum is a product of LLS Program (contact www.lifelab.org or at (1) 831-459-2001).

GrowLab – activities for growing minds. The NGA in the United States is a premier resource for ideas, activities, and products that make for effective GBL. Their newsletter, *Growing ideas – a journal of GBL*, is full of inspirations to enrich basic education through thoughtful review of existing programmes and new publications of interest to teachers and non-formal educators. Their GrowLab Indoor Gardens make GBL practical in any season and provide ideal conditions for growing plants through a full life cycle. Their web site is the passport to all of their GBL resources (contact www.kidsgardening.com or at (1) 800-538-7476).

Junior master gardener (JMG). This is an innovative 4-H youth gardening programme with an extensive collection of activities designed to teach science, environmental education, leadership, and life skills. Individual and group activities are supported by a JMG youth handbook and a teacher/leader guide. Group activities can be held with a school class or after-school programme, home school or any group interested in youth gardeners. The programme can be accessed via the Web(www.jmgkids.com).

Nutrition to grow on. This curriculum has two main objectives: (a) to teach upper elementary schoolchildren and their care-givers the importance of making healthful food choices and the ways to do so; and (b) to improve children's preferences for fruits and vegetables by giving them an opportunity to work with the land and grow their own produce. The curriculum can be obtained from the CDE (contact www.cde.ca.gov/cdepress or at (1) 800-995-4099).

Project Food, Land and People (FLP). This curriculum contains over 50 lesson plans for grades pre-K-12. It covers all aspects of food and fibre production and consumption. It also weaves environmental concepts into each lesson. It is in use throughout the United States and in several other countries. Many of the lessons are also available in Spanish. FLP can be reached at their United States headquarters in San Francisco (contact www.foodlandpeople.org or at (1) 415-561-4445).

Teams with intergenerational support (TWIGS). This is a 125-page curriculum package that consists of 30 field-tested lessons that focus on connecting gardening with healthy food choices. Lessons promote increased awareness of the wide variety of vegetables and fruits, increased knowledge of their nutritive value, and increased willingness to taste through planting and harvesting a vegetable garden. Written for teachers, after-school care-providers, youth agency staff and volunteers, the curriculum is flexible and emphasizes hands-on activities from kindergarten to sixth grade. Suggestions are also included on recruiting community collaborators from teens, college students and seniors to partner with teams of youth participants in programme activity. The curriculum can be obtained by contacting the author, Marilyn Johns, in California (contact mjjohns@ucdavis.edu or at (1) 650-726-9267).

Garden of learning. This is a management plan for effective, sustainable school gardens. The programme offers a plan to operate and sustain a school garden with modest resources. It is made up of four essential elements: system, curriculum, materials, and training/consultation. The system is described in the *Garden of learning owners manual*, which provides a detailed framework to organize and operate school gardens for grades K-6. The curriculum includes more than 50 weekly activity

plans designed to integrate with classroom studies in science, maths, English, arts, social studies, nutrition and environmental education, whilst also getting the garden planted, mulched, weeded and fertilized. The materials include sample newsletters, press releases and grant applications. It also provides information on how to raise funds and build business partnerships. The Garden of Learning also conducts training for staff and parents and provides ongoing consultation for member schools. Information can be obtained from the author Kelli Wessman (at (1) 530-622-2309); no web site is available.

Guide for supporting California state standards through garden-based education. This is a guide for classroom teachers and school administrators (principals and school board members) who want to gain a general understanding of how a school garden can fit into their educational goals. It demonstrates that state standards can be strongly supported through GBL activities. The guide also provides an easy way for educators to identify garden-based activities in each core subject area appropriate to second to sixth grade levels. It also enables educators to focus their programme in one or more of the 'seed-to-table' content areas: gardening, nutrition, cooking, waste management and food systems. It uses nine different sets of instructional materials to provide teachers with ideas for a variety of materials that they can use to meet their needs while addressing state standards. The guide can be obtained from the CDE (contact www.cde.ca.gov/cdepress or at (1) 800-995-4099).

The utilization of GBL in developing and developed countries can contribute to basic education and to community development. However, its future is precarious not simply because of limited resources but also because there is not an accepted framework within which to apply the pedagogy. A partnership with schools and programmes between developing and developed economies could contribute to a more rapid expansion of the practice. This is being attempted on a limited basis by individual schools/programmes and on a more broad scale by organizations in the United States. These include programmes such as the NGA, the JMG Program, and 4-H. Organizations which work in the international arena, such as UNICEF, FAO, AID, WHO and the World Bank, could facilitate an expanding dialogue on the role that

GBL can play not only in strengthening basic education, but also in supporting global food supply, health and sustainable development.

The future of GBL in a more general sense is not easy to predict. One key element is the future of outdoor and environmental education. If the knowledge, appreciation, and application of environmental education can be infused into the practice of working teachers and introduced into the preparation of new teachers, then it has an opportunity to become a mainstream practice within our educational framework. If the environmental education were to become a permanent fixture within the schooling framework (much as athletics are currently viewed) then there might be a move to hire specially trained environmental educators (like athletic coaches) who will design and deliver the curriculum, which could easily include a garden. A similar relationship may evolve with experiential education or PBL. If this pedagogy becomes a mainstream educational practice, then gardens will certainly continue to expand as a vehicle to easily implement PBL at the pre-school and elementary levels. We made the point earlier in this document that many of the educational reforms currently being promoted around the world can be implemented through GBL.

Chapter 5
Impacts, outcomes and future directions

Earlier chapters of this document looked at the collection of work that surrounds GBL, and several specific studies conducted in this arena were cited. In this chapter, however, we take a broader view of GBL in an attempt to identify some of the results of the practice, as well as some trends and needs in the future.

Impact indicators are the specific information or evidence that can be gathered to measure progress towards programme goals (Cornell University). Impacts of GBL on basic education have not been examined critically except in a few cases such as the Monterey Bay Science Project where Life Lab gardens were used to assist teachers in developing a constructivist, inquiry-based approach to teaching science and language. Further study is needed in order to point to impacts such as improvement in science education or greater understanding of ecological cycles. This will require garden programmes establish specific goals for their efforts. The outcomes of GBL are observable in the many different settings described throughout this document. Outcomes are the things that occur as a result of having conducted the programme. They can be intended or unintended, positive or negative, and relevant or irrelevant. The outcomes cited are predominately based on anecdotal evidence and there is little research that demonstrates a clear cause-and-effect relationship such as that which has been demonstrated with broader environmental education research as in the *California student assessment project – the effects of environment based education on student achievement*. This study, reported by the SEER in March 2000, suggests a methodology that could be applied (and some would suggest has already been applied) to GBL.

In many settings around the world a portion of the school day has been devoted to GBL. Resources (teacher time, school budget, land, school volunteers, etc.) have been redirected from traditional classroom instruction

to a more experience-based activity that takes place outdoors or in classroom 'growlabs'. The number of students involved in such activities has not been carefully studied; however, in the United States the NGA is developing plans for a national study of the garden movement in schools. In California, the CDE is currently surveying all schools under their jurisdiction to determine the level of garden activity. Outside the United States the movement is less well defined, or takes on more of a school grounds/greening perspective. In Canada, Evergreen has studied and recorded the experience of six schools that participated in a school ground naturalization project, many of which have included garden development. The outcomes they record are in school grounds transformation (e.g. change in area covered by asphalt and grass). They do, however, note some related behavioural changes in the school and community culture that are a part of our summary finding of outcomes: increased eco-literacy, improved sense of school as a community, etc. In Vancouver, Canada, the challenges of school gardens can be seen where a rising interest in establishing school gardens has surpassed the ability of the school district to fund grounds personnel to supervise and/or maintain such projects. The interest of schools exceeds the capacity of the school board to respond positively, so they have placed a moratorium on all new school gardens.

In developing countries the picture is more variable. In Cuba, school gardening, while not studied in the formal sense, can be observed as pervasive, as the garden experience exists in almost every educational setting where it is an accepted value within the school and community. In Ethiopia, Ghana and other African countries the use of school gardens and their contribution to basic education varies tremendously. At the STVC in Addis Ababa, the garden is a central part of the educational experience, and is used to enhance academic performance, teach natural resource conservation (restorative development), develop vocational skills, and allow youth and families to produce nutritious food for personal consumption. In South America there are excellent examples of GBL that share the outcomes stated below, but there is no pervasive movement. A cover story in the Audubon Society's November 2001 issue of *Audubon* describes a growing interest in schoolyard ecology, but the goal here seems to be focused on ecological literacy and conservation. The case studies we looked at in Brazil demonstrated similar

outcomes to those listed below, however these are small-scale activities even though they are locally important programmes.

The outcomes observed that support basic education occur in schools or programmes that follow the 'best practices' identified in the previous chapter. Those outcomes include shifts in teaching practice towards a greater use of experiential education (e.g. project-based and hands-on learning). They also make greater use of outdoor school areas for instruction, an important consideration for schools with minimal physical infrastructure. There are also positive outcomes that improve and expand academic skills. These include an increase in environmental education (ecological literacy), enhanced use of the scientific process, and improved understanding of scientific principles. Outcomes were also observed that contributed to a greater appreciation for the environment and concern for human impact on that environment. Related to this latter outcome was an increased interest in food and fibre production. There were also a set of outcomes related to school community relationships with an improved sense of community within the school, and a greater positive interaction between the school/programme and community. Finally, for students, there is an increased sense of self-esteem and a consensus that these children of the garden are a more cultured group of students.

GBL also generates outcomes that represent challenges for the school or programme. Such outcomes usually occur when the best practices noted earlier are either ignored or only given superficial attention. When that happens, outcomes emerge that create problems for garden development and/or maintenance. There can also be challenges related to heavier workloads for teachers or programme staff and a distraction from core curriculum objectives or standards-based instruction.

When we look at GBL in developed or developing economies the outcomes are similar and their contribution to basic education can be significant if the programme is developed and implemented using the best practices identified. As with any innovative curriculum introduction, if there is not a structured process for planning and implementation then the system is destined for marginal outcomes, minimal impacts and eventually failure. Unfortunately this has been a pattern in many individual school gardens where the concept,

content and implementation are the product of a few individuals, and they do not have the support of the larger educational community.

5.1 Some directions for the future

For the existing programmes in GBL in Australia, Canada, Europe and the United States, there are a few trends that seem to illustrate future directions. These trends, and some needs, are summarized below.

5.1.1 Educational integrity

In the developed economies, GBL is viewed by some as a more effective strategy for basic education. However, to accept this idea requires a general improvement of the educational integrity of the practice. There is a need for an overall educational strategy statement and implementation guide for GBL that articulates the advantages of the pedagogy and makes the connection between the practice and various proposals for educational reform (experiential education, emotional intelligence, etc.). Such guidelines exist for environmental education and agricultural education and could serve as a template for GBL. A strong emphasis on improved academic performance in schools within some countries has meant that GBL must be tied to the standards and benchmarks in core subjects to attain credibility within the educational community. Some curricula, such as the JMG Program, have already established the tie to national standards. There is a large body of knowledge that suggests that science education can be improved though use of an applied, hands-on curriculum. If the garden can be 'marketed' as a learning laboratory in a credible fashion, similar to the LLS Program based in California, then the emergence of school gardens could have a significant impact on elementary science education.

There is also a need for more research on the impacts of GBL on student academic achievement, environmental attitudes and self-esteem. Another area of research that might contribute to the understanding of GBL may be an analysis of the experiences of unique educational environments such as the schools of Reggio Emilia and the Waldorf Schools, as well as individual sites of exemplary educational innovation such as the Coombs County Infant and

Nursery School in the United Kingdom. Each of these incorporates the child's outdoor environment as a garden of learning.

Some of the insightful responses to the question "what does GBL contribute to basic education?" also offer some opportunities for further practical research. Each of the three illustrative responses below creates more questions about the depth and breadth of such outcomes. For example: (a) the Garden of Learning in California believes gardening "brings basic education to life in living color"; (b) the JMG Program, Texas, is concerned over "how gardening makes learning real"; and (c) the Munich International School (Germany) feels gardening "inspires learning and creativity in all subjects. The [children's] joy is self-evident and the learning experiences are not soon forgotten."

5.1.2 Garden maintenance

For schools and programmes with a significant investment in garden infrastructure (physical site, equipment, plant material, etc.) there is a growing realization that a garden co-ordinator or strategic plan (e.g. Garden of Learning) must be in place to effectively engage these resources as educational tools. Relying on overworked teachers, custodians, ground-keepers or transient volunteers is not a sustainable strategy. The garden must be viewed as an integral part of the educational plan for the school (e.g. as a classroom) and financed accordingly as a part of the overhead of operations. If this is not the case, then long-term sustainability is in jeopardy and the garden becomes a burden to the creative energies of staff, parents and community volunteers.

5.1.3 Educational linkages

School gardens and GBL in some settings (those following best practices identified above) seem to lead to a new sense of community at the school. This encourages greater participation by parents and community members, not unlike athletics, but perhaps in a more nurturing, less competitive environment. This is another rich area for research, and a University of California Davis study is currently attempting to analyse parent participation in school gardens.

5.1.4 Food cycle and nutrition connections

Increasingly school gardens are being used as vehicles to teach the food cycle, nutrition, and culinary science. In California's Edible School Yard at Martin Luther King Jr Middle School, and Australia's Kitchen Garden at Collingwood College, there is a serious investment in using the garden to change the attitudes and eating practices (thus nutrition) of students. At the same time these schools are attempting to develop a new or renewed cultural respect for food, the land that provides it, and the way we enjoy it as a family or community. This new emphasis or identification of food, and its origins as a cultural imperative to be understood and appreciated by children, is not only a developed world phenomena, but is also found in less affluent economies such as Cuba. In many schools in California there is a growing movement to connect the school garden with the school cafeteria (school food service), and with local farms that produce the food. The United States Department of Agriculture (USDA) and CDE are actually providing small grants to initiate such projects (such as Crunch Lunch), and members of the state legislature in California are exploring legislation to institutionalize such garden grants.

5.1.5 School grounds greening

Many schools are attempting to recapture an element of the natural environment on their school grounds. The reasons for schoolyard greening are many and articulated in an excellent new publication by the Green Teacher entitled *Greening school grounds*. Whatever the reason for the growing interest in school grounds greening, the garden seems to be one of the most practical strategies for achieving a more natural environment. Evergreen, a Canadian-based non-profit environmental organization, has published a study of six Canadian schools with school ground naturalization initiatives. The study identifies the strategies and outcomes of the naturalization experience.

5.1.6 International linkages

Many gardens are used to grow the traditional food of a variety of cultures. This emphasis on cultural diversity has led a number of programmes to establish international linkages for the exchange of ideas, seeds and, hopefully, students.

There are exciting opportunities for the established school gardens of the developed economies to partner with the developing world school gardens to support their growth. The NGA in the United States has perhaps the best database for global children's gardens and supports efforts to expand this network.

The authors hope that a new action develops and grows in the international arena. There is an urgent need for the practitioners of GBL in both the 'developed' and 'developing' worlds to learn from one another. People in all parts of the world are doing incredible work and the lessons learned, the impacts felt, and the outcomes revealed need to be shared with one another. If the GBL practices are to grow the connections between and among the many players have to be enhanced.

The electronic medium of the Internet can meet part of this challenge. But, only a part! The resources listed in the *Appendix* include a number of web sites and listservs that can be accessed for information and interchange. Unfortunately there are many parts of the world that do not have the luxury of telecommunications and computer connections.

The challenge is for an international broker to take on the challenge and accelerate the trend of mutual learning. That broker of information will have to use a mix of approaches to communicate in addition to the Web. Paper documents and video-cassettes filled with information can be effectively used to communicate. Just as powerful can be the use of audio-cassettes and radio that can efficiently reach most parts of the world. But who will take on that challenge? It may be that FAO through IIEP, the sponsors of this work, have to consider this new challenge. Or, is it an opportunity?

Chapter 6
Conclusions

Although this document is not a recipe or blueprint for creating a GBL programme, the hope is that the models, the lessons and the approaches included will energize practitioners and policy-makers to do more. It is the hope of the authors that this manuscript has provided worthwhile ideas for creatively and productively linking garden-related work to learning and education.

The practice of GBL is a global phenomenon. In some settings it is the educational curriculum and in others it supports or enriches the curriculum. This study takes a quick look at the pedagogy and offers some observations that can be useful to practitioners, educational administrators, and researchers. The contributions to effective use of GBL have come from developing and developed economies. In the developed world the resources to support a garden of learning are often more readily available. However, the practices, ideas and strategies being used in the developing economies can also make a significant contribution to GBL. A unique opportunity exists to further investigate GBL globally and to initiate an exchange of ideas and resources that can strengthen the practice in all settings. This is a role for an organization with a global perspective and connections.

There is no universal model of GBL that can be applied to every community. Each culture or community must design a plan that addresses the needs of its learners and educators. Hopefully, the design process will engage youth at each step in a developmentally appropriate way, as suggested by Roger Hart in *Children's participation.*

Any model should also incorporate the best practices identified here. GBL applied while using the best practices can contribute to basic education in any society in several ways. Academic performance, ecological literacy,

school environment and culture, community linkages, nutrition and health, and vocational education, as has been demonstrated, can be impacted. The practice of GBL, like most pedagogy, relies on some key concepts of instruction to be effective. As has been detailed, hands-on learning and integrated, interdisciplinary instruction can be used with GBL. However GBL also makes a unique contribution not replicated in other pedagogies. It engages the student in a stewardship relationship with other living organisms and teaches not only the science of life but also the interconnected nature of the web of life and how everyday actions can have profound effects on the long-term health of the system.

GBL can perhaps make its greatest contribution in both developed and developing economies by providing a path into ecological literacy. 'Sustainable development' is a great challenge that continues to lie before us. Such a development is hampered by the great urban migration of the past half-century and the even greater urban/consumer mentality that has crept into even the most rural communities on the globe. GBL can create a greater sensitivity and appreciation for life and a deeper understanding of the interconnectedness of all living organisms.

School gardens have evolved through the ages, changing with the philosophies of our education systems and the values developed by various cultures. It seems reasonable to expect that our current ideals of educating children through experiential means, inculcating a sense of ecological awareness and connection with their land, and recognizing the unique potentials of every child, could be practically realized through the stable establishment of school gardens. As Arlene Marturano, co-ordinator of South Carolina Garden-Based Learning Network, aptly states: "All children can experience success in a school garden" (Marturano, 1999, in Sealy, 2001).

In the developed world children are increasingly addicted to technology. Their world is filled with monitors for television, video games and computers. Their daily schedule is programmed and they are absorbed in a virtual reality that sometimes isolates them from their biological or ecological roots. This virtual world is real and will impact future generations in ways that we are still discovering. However, technology alone cannot satisfy all human needs and desires. If we listen to educational philosophers of the past and present such

as Jose Martí, E.O. Wilson, David Orr, and Wendell Berry, we learn that there must be a link to nature and nurture in our everyday life. Can we take every child into the wilderness? Maybe, but only occasionally! Can we take every child into the garden? Most certainly and daily!

Again, good planting and harvesting!

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Appendix
Resources in garden-based learning

There is a wealth of material available to support GBL. The resource topics range from basic gardening, children's gardens, school gardening, school grounds greening, food security and nutrition through environmental education, experiential education and project-based learning. Articles that focus on various aspects of the garden as a learning tool appear monthly. The intent in this Appendix is not to provide a comprehensive list of resources, but to offer a few key sources that might be useful in a more targeted search for tools to enhance GBL. The hope is that through this, initial document a global dialogue will be established to expand the resource base so that GBL can be assessed and implemented in a manner that contributes to basic education in any cultural setting. Hopefully, those reading this study will contact the authors to add their name, organization or resource to the list.

Organizations

American Horticultural Society
7931 East Boulevard Drive
Alexandria, VA22308
Tel: 703-768-5700
Toll free: 800-777-7931
Fax: 703-768-8700
Web site: www.ahs.org

Center for Ecoliteracy
Zenobia Barlow
Executive Director
2522 San Pablo Ave.
Berkeley, CA 94702
Tel: 510-845-4595

E-mail: zenobia@ecoliteracy.org
Web site: www.ecoliteracy.org

Cornell University's School Garden Program
Marcia Eames-Sheavely
Extension Support Specialist
College of Agriculture and Life Sciences
Dept. of Fruit and Vegetable Science
134-A Plan Science Bldg
Ithaca, NY 14853-5908
Tel: 607-255-0599

Evergreen – Canada
355 Adelaide St. West, 5th Floor
Toronto, ON M5V 1S2
Tel: 416-596-1495
Web site: www.evergreen.ca

Food and Fiber Systems Literacy Project
Department of Agricultural Education
448 Agricultural Hall
Oklahoma State University
Stillwater, OK 74078-0484
Tel: 405-744-8036
Web site: www.food-fiber.okstate.edu

Food, Land and People
Presidio of San Francisco
P.O. Box 29474
Tel: 415-561-4445
Web site: www.foodlandandpeople.org

Junior Master Gardener Program –
USA and California
Susan Gloeckler
669 County Square Drive, Suite 100

Ventura, CA 93003
Tel: 805-662-6943
Fax: 805-645-1474
E-mail: sygloeckler@ucdavis.edu
Web site: www.jmgkids.com

Junior Master Gardener Program –
International
JMG Kids
1515 Emerald Plaza
College Station, Texas 77845
Tel: 800-JMG-KIDS
Web site: www.jmgkids.com

Learning through Landscapes
3rd Floor, Southside Offices
The Law Courts
Winchester S023 9DL
United Kingdom

Life Lab Science Program – USA
1156 High Street
Santa Cruz, CA 95064
Tel: 831-459-2001
Fax: 831-459-3483
E-mail: lifelab@zzyx.ucsc.edu
Web site: www.lifelab.org

MOVIUM – Center for the Urban Environment – Sweden
Peeter Akerblom, State Extension Specialist
Box 54
Alnarp, Sweden SE-230 53
E-mail: peeter.akerblom@movium.slu.se
Web site: www.movium.slu.se

National FFA Organization
P.O. Box 68960
Indianapolis, IN 46268-0960
Tel: 317-802-5334
E-mail: jarmbruster@ffa.org
Web site: www.ffa.org

National Gardening Association
1100 Dorset Street
Burlington, VT 05403
Tel: 800-863-5251
Web site: www.kidsgardening.com

North American Association for Environmental Education – USA
410 Tarvin Road
Rock Spring, GA 30739
Tel: 706-764-2946
Fax: 706-764-2094
E-mail: @naaee.org

Web sites

(Many of the web sites cited here were selected from the California Foundation for Agriculture in the Classroom's *Teacher Resource Catalog*).

American Botanical Society
www.herbalgram.org

Botanical Society of America
www.botany.org

California Foundation for Agriculture in the Classroom
www.cfaitc.org

Center for Agroecology and Sustainable Food Systems
zyx.ucsc.edu/casfs

Children's Gardening
www.hort.vt.edu/human/Children'G.html

Common Ground Urban Garden Program
celosangeles.ucdavis.edu

Corn World
www.ohiocorn.org

Cotton's Journey
www.cottonsjourney.com

Easy Garden
www.easy-garden.com

Entomological Society of America
www.entsoc.org

Garden Gate Magazine
www.gardengatemagazine.com

Garden in Every School Project
www.cde.ca.gov/nsd/nets/g_index.html

Gardens for Growing People
www.svn.net/growpepl

The Great Plant Escape
www.urbanext.uiuc.edu/gpe

Growing Seasons
www.growingseasons.com

Historic Tree Nursery
www.historictrees.org

Insect Lore
www.insectlore.com

Internet Gardening
www.learning.lib.vt.edu

Junior Master Gardener Program
www.jmgkids.com

Kids CORNer
www.ohiocorn.org/kids

KIDSGARDEN
www.kidsgardening.com

Let's Get Growing!
www.letsgetgrowing.com

Life Lab Science Program
www.lifelab.org

National Arbor Day Foundation
www.arborday.org

National Gardening Association
www.garden.org
www.kidsgardening.com

Pumpkin Circle
www.pumpkincircle.com

Seeds of Change Garden
www.mnh.si.edu/garden

Shelburne Farms
www.shelburnefarms.org

Sid's Home and Garden Showplace
www.sidsgreenhouses.com/www/newsltr/

Worm Woman
www.wormwoman.co

Printed materials

Resource catalogues / Guides

University of California
agriculture and natural resources catalog
Communication Services

6701 San Pablo Ave., 2nd Floor
Oakland, CA 94608-1239
Tel: 510-642-2431
Toll Free: 800-994-8849
Web site: www.anrcatalog.ucdavis.edu

Resources for garden-based education 2002 Catalog
Gardens for Growing People
P.O. Box 630
Point Reyes Station, CA 94956
Tel/fax: 415-663-9433
E-mail: growpepl@svn.net
Web site: www.svn.net/growpepl

Acorn naturalists
Tel: 800-422-8886
Web site: www.acornnaturalist.com

2002 teacher resource guide: a guide to educational materials about agriculture
California Foundation for Agriculture in the Classroom
2300 River Plaza Drive
Sacramento, CA 95833-3293
Tel: 916-561-5625
Fax: 916-561-5697
E-mail: cfaitc@cfbf.com
Web site:www.cfait.org

Periodicals

Green teacher – Canada
95 Robert Street
Toronto, ON M5S 2K5
Tel: 416-960-1244
E-mail: greentea@web.net
Web site: www.greenteacher.com

Science and children
National Science Teachers Association
1840 Wilson Blvd
Arlington VA 22201-3000
Tel: 703-243-7100
E-mail: s&c@nsta.org
Web site: www.nsta.org

Newsletters

Cream of the crop
California Foundation for Agriculture in the Classroom
2300 River Plaza Drive
Sacramento, CA 95833-3293
Toll Free: 800-700-AIT
E-mail: cfaitc@cfbf.com

Growing ideas
National Gardening Association
180 Flynn Avenue
Burlington VT 05401
Tel: 800-538-7476
E-mail: eddept@garden.org
Web site: www.garden.org

Books

(Many of the books cited here were selected from the California Foundation for Agriculture in the Classroom's *Teacher resource catalog.*)

For teachers and administrators

Center for Ecoliteracy and Life Lab Science Program. *Getting started: a guide for creating school gardens as outdoor classrooms.* To order this publication write to Life Lab Science Program or Center for Ecoliteracy (see addresses above).

Hancock, J.M. *Biology is outdoors: a comprehensive resource for studying school environments.* 142 p. J. Weston Walsh.

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Ford, M. 1999. *My day in the garden.* Greenwillow Books.

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Gibbons, G. 1984. *The seasons of Arnold's apple tree*. Harcourt Brace Jovanoich.

Glaser, L. 1992. *Wonderful worms.* Milbrook Press.

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Lavies, B. 1993. *Compost critters.* Dutton's Children's Press.

Lindhberg, R. 1987. *The midnight farm.* Dial Books for Young Readers.

Marzollo, J. 1995. *Sun song.* Harper/Collins.

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For intermediate schools

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_____. 1991. *The amazing potato book*. Addison-Wesley Publishing Company, Inc.

_____. 1993. *The amazing dirt book.* Addison-Wesley Publishing Company, Inc.

Burn, D.L. 1994. *Cranberries: fruit of the bogs.* Carolrhoda Books, Inc.

Caduto, M.J.; Bruchac, J. 1996. *Native American gardening: stories, projects and recipes for families.* Fulcrum Publishing.

Demi. 1997. *One grain of rice.* Scholastic Inc.

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For middle schools

Caduto, M.J.; Bruchac, J. 1996. *Native American gardening: stories, projects and recipes for families.* Fulcrum Publishing.

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