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LEARNING FIRST:
A RESEARCH AGENDA FOR IMPROVING LEARNING IN LOW-INCOME COUNTRIES

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Naturally, all errors of fact and interpretation are the sole responsibility of the authors, and are not intended to represent the views of the above individuals or the Center for Universal Education at the Brookings Institution or any other organization.

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PREFACE

In 2011, the Center for Universal Education (CUE) at the Brookings Institution spearheaded the development of a common policy agenda on global education entitled *A Global Compact on Learning: Taking Action on Education in Developing Countries*. The report recommended a call to action for a diverse group of international stakeholders to come together to work toward achieving quality education for all. As a part of this larger policy agenda, CUE works with various scholars and organizations to address the many issues within the scope of the Global Compact on Learning.

The Research Task Force on Learning (RTFL) was formed in September 2011 and worked from December 2011 to December 2012 to develop a research agenda on learning as a specific outcome of the Global Compact on Learning. It consisted of a group of experts collaborating on a research agenda for learning for all children and youth in developing countries. By dividing the task force into five distinct research teams - each with their own research area - the RTFL sought to contribute to larger efforts within the global education sector to build an evidence base on learning.

Dan Wagner served as chair of the task force, and is the lead author of this report. Katie M. Murphy and Haley De Korne served as research assistants to the RTFL, and are coauthors of the report.

This paper builds on numerous ideas and findings of five research teams and without their efforts this paper would not be possible. The focus and members of each research team are:

1. Basic literacy, numeracy and the transition to higher-order skills: Jessica Ball, Rangachar Govinda and Scott Paris;
2. Information and communications technologies: Mohammed Bougroum, Enrique Hinostroza and Shafika Isaacs;
3. Conflict and emergency situations: Bidemi Carrol, Jacqueline Hayden, Susy Ndaruhutse and Mary Pigozzi;
4. Informal and nonformal education: Pia Britto, Moses Oketch and Tom Weisner; and
5. Assessment, monitoring and evaluation: Anil Kanjee, Nirmala Rao and Yusuf Sayed.

We would like to express our appreciation to the members of the Research Task Force on Learning for their substantial and thoughtful work throughout the project.

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LEARNING FIRST:
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EXECUTIVE SUMMARY

Parents, educators, government ministers and policymakers in all contexts and countries around the world are concerned with learning and how to improve it. There are many reasons for this, but none is more important than the fact that learning is at the heart of success at the individual, community and global levels. Learning First is the title of this report, with the strong implication that learning should be the foremost goal of education policies worldwide.

The present review seeks not only to explain why this is the case but also focuses on what we need to know—that is, what research is needed—in order to improve learning in the decades to come, particularly among those children most in need. This question is addressed in the following six sections.

1. **Learning Goals and Research.** The first section begins with a historical synopsis of international education goals put forward in 1990 at the World Conference on Education for All in Jomtien (Thailand), in 2000 at the Education for All conference in Dakar, and later in 2000 as a part of the UN Millennium Development Goals for 2015. In 2011, the Center for Universal Education at the Brookings Institution published *A Global Compact on Learning: Taking Action on Education in Developing Countries*, which stated that there is a "global learning crisis—which affects children and youth who are out of school with limited learning opportunities and those who are in school but not learning the skills they need for their futures." The present review of learning research in low-income countries follows from that report. The overall purpose is to explore the most pressing learning issues today that require further research attention in the years to come.

2. **Learning Definitions and Contexts.** This section reviews how the field of education has defined *learning* over the years. Here, learning is defined as *a modification of behavior due to experience*—such as in knowledge, skills, attitudes and values. Three main principles of effective learning are suggested: individual active involvement, social participation, and meaningful engagement. As a way to emphasize the importance of learning contexts, three individual stories—*Illa*, a four-year-old Quechua-speaking girl in Peru; *Pawan*, an eight-year-old primary school student in urban India; and *Rachida*, a young illiterate woman in rural Morocco—are provided in order to better explain the importance of learning as a culturally specific phenomenon. These stories help to illustrate a more general learning *framework*, encompassing the relationship between two dimensions

of learning—its *processes* and *contexts*. A discussion follows concerning the need to *disaggregate* learners and their learning contexts—between countries and within countries—as a way to overcome frequent and simplistic generalizations about how the "average" child learns.

3. **Global Change and the Contexts of Learning.** This section considers the issue of global change on how learning and learning contexts are being transformed around the world. For example, researchers need to pay more attention to the impact of migration on children's learning and on educational systems more broadly. In each instance of translocation, children confront the challenges of adapting to a new environment that may include different languages, dialects or cultures within the nonformal learning contexts of daily life. Similarly, in formal education contexts, student migrants have to cope with contrasts in culture, lifestyle and language of schooling, and demonstrate skills and achievement that may vary dramatically with their culture of origin. Other changes due to globalization include increased multilingualism in schools, growing overcrowding in classrooms, inability to keep up with teacher training, changes in intergenerational learning, and the growing importance of 21st-century skills. Based on these observations, it is suggested that learning contexts and needs should be understood as a *shifting target*.

4. **Five Domains of Research on Learning.** Much of what we know today about learning and quality education is focused on limited contexts, structured and teacher-directed learning processes, and a restricted set of school-based skills. Much more research on learning is needed. In response, this section explores five domains in learning from early childhood through adolescence, highlighting available research and knowledge gaps: (1) literacy, numeracy and higher-order skills; (2) information and communications technologies; (3) conflict and emergency situations; (4) nonformal education; and (5) learning assessment.

   To make progress, it is argued that a *pro-poor* research agenda is needed—one designed to reach those most in need. In low-income countries, and especially in marginalized communities in those countries, the research available is often not the research that is required. It is no longer sufficient to extrapolate from a set of findings in a few locations in relatively wealthy countries to widely varying contexts and populations. Local research needs to play a greater role in the development of the next learning research agenda.

5. **Learning: A Proposed Research Agenda.** The broad imperative to improve learning for all children is one of the great challenges of the 21st century. However, there are many uncertainties as to how to achieve this goal. This section begins with a set of nine core elements for learning research, derived from the research domains in section 4.[1] These elements represent a set of component parts for a deeper and broader research initiative that is sensitive to local actors and contexts:

   a. *Learning transitions*. Given the changes that every child undergoes across schools and other learning transitions, more needs to be known about how, and to what degree, knowledge and skills transfer across these contexts.

   b. *Formal inputs*. The acquisition of cognitive skills, such as reading, does not "just happen." Structured learning experiences are needed, along with sufficient time on task to learn and task-appropriate materials.

   c. *Informal inputs*. Much learning takes place informally and in unstructured ways, whether between parent and child, with peers, on computer screens and so forth. These inputs (and interactions) are not only an essential part of child development, but they also represent a larger set of contexts for learning.

   d. *Local contexts and local learning*. When resources are limited, there is a natural pressure

to push for simpler "one-size-fits-all" solutions. More needs to be known about how local adaptations between processes and contexts can maximize learning impact.

e. *Gender and ethnolinguistic diversity*. Girls in low-income countries have made dramatic gains in school enrollment and in achievement, but in minority ethnolinguistic groups they have not fared nearly as well. A major challenge in the coming years will be how to use assessment evidence to better tailor first- and second-language approaches for children at different ages in different contexts.

f. *Globalization and changing economies*. Learning must be understood in contemporary changing contexts. In this world of change, research must reconsider the role of nonformal education, technical and vocational training, and online learning and open educational resources.

g. *Assessment*. Research on learning will inevitably involve assessments of one kind or another to determine which approaches to learning have the greatest impact. Matching the type of assessment to particular policy purposes will remain a major challenge.

h. *Stakeholder roles*. Stakeholders come in many varieties—from families and community-based organizations to teachers, school principals, and regional school inspectors, to ministers of education and multilateral agencies. Each has vested interests in children's learning, but they may not (and often do not) share the same set of priorities.

i. *Cost and cost-benefit*. Information on the costs of educational research and innovation is seriously lacking and needs attention. A major challenge is how to justify the worth of additional investments, and to deliver results in a timely way.

Further, by building upon a detailed research review, a set of 19 priority areas for research are described, as related to reaching current and future international educational goals.

a. Near-term research priorities [2]

i. *Enhancing readiness for schooling*. Learning outcomes are more likely to fall below desired levels among children whose home environments are not well equipped to promote optimal language development, socioemotional support, early literacy and numeracy, and motivation to attend and learn in school. Research needs to study interventions capable of determining factors that would prepare young children for successful transitions to school and assess education trajectories across time.

ii. *Language of instruction and reading in early grades*. Young children in poor areas of low-income countries are often in classes where they do not have mastery of the language of instruction in the classroom. Research is needed to examine the costs, benefits, practical feasibility, and long-term learning and literacy outcomes of language education approaches in different contexts.

iii. *Instructional practices for reading and math*. A new generation of assessments has shown that children's reading and mathematics levels in low-income countries are very low. One of the limitations of such assessments is that they do not necessarily give solid guidance for instruction. Research is also needed on the ways that teachers instruct children in reading and math, and how much time is required.

iv. *ICTs and learning*. Many claims are made about the impact of information communication technologies (ICTs) on learning, but relatively few have received adequate research attention. Research is needed

both on types of platforms (mobiles, smart phones, PCs, tablets) as well as in stand-alone and interactive (Internet-based) modalities. Further, studies are needed to consider learning content software that is appropriate for poor children at differing ages.

v. *Nonacademic skills and learning.* In conflict, postconflict and emergency situations, there are "survival" and social skills that children need to develop that differ in many ways from school-based basic skills; yet research on the former is fragmented or nonexistent. A further gap is in the foundational knowledge about linkages that may connect basic and nonacademic skills.

vi. *Early childhood development (ECD) program participation and parental motivation.* Research is needed on why parents do (and do not) enroll children in ECD programs, what parents' expectations are from ECD programs, and how parents define early learning and school success. Also, increased attention is needed to understand the transition from pre-reading to reading skills during the ECD to primary schooling.

vii. *Nonformal "bridge" programs.* There is a major risk of dropping out—particularly among girls—toward the end of primary schooling. This problem is particularly severe in the poorest parts of low-income countries, and among ethnolinguistic minority groups. Research is needed to better understand how some countries have developed "bridge" programs that help get school dropouts back into school.

viii. *International goals that support local learning needs.* It is difficult to achieve a consensus on international indicators of learning outcomes that are relevant to poor populations in low-income countries. Even with the likely advent of new international learning goals, research will be needed to understand whether goals (and indicators) will advance learning in local settings.

b. Medium-term research priorities

i. *Improving teacher ICT competency for learning.* More needs to be known about teachers' skills and methods of ICT deployment in the classroom, especially in low-income countries where technical support and infrastructure may be quite limited. Videotaping of classroom teaching using specific types of ICTs would be an important step.

ii. *Inclusive curricula and peace education on learning in postconflict zones.* In postconflict situations, numerous peace education and peace-building curriculum models are led by nongovernmental organizations (NGOs) in low-income countries, but relatively little has been externally evaluated for learning impact. Research would focus on developing a typology for curricular interventions, and then use rigorous techniques to determine how effective these approaches are for learning outcomes.

iii. *Family support for learning in conflict situations.* Poor nutrition and sanitation, trauma and stress, linguistic and cultural marginalization, exposure to violence, and parental depression are all factors than can affect children's learning. The role of parents and consistent caregivers in supportive environments is seen to be critical for the promotion of children's learning, but research on critical factors that can promote learning through family support is lacking.

iv. *Learning consequences of technical and vocational education and training (TVET).*

Research is needed on the ways that TVET supports workplace and higher-order skills in low-income countries. Evidence is needed on basic skills competencies of TVET students; the impact of low basic skills on TVET learning; how TVET curricula and pedagogy supports (or fails to support) higher-order skills; and on the relative importance of general work readiness skills as compared to particular technical skills.

v. *Measuring the impact of assessment practices on learning*. Teacher assessment practices in classrooms are known to affect learning outcomes (e.g., in high-stakes tests). Relatively little is known about increased assessment practices among children from poor and marginalized backgrounds. Research would focus on selected schools in diverse contexts, and findings would be related to testing outcomes over a specified number of years.

vi. *Teacher competency and classroom-based assessments*. Formative classroom-based assessments seem to have the strongest short-term impact on improved learning outcomes. Research is needed to determine teachers' current understanding, attitudes and practices of assessment; and what kinds of professional development or preservice training will enhance teachers' abilities to use assessments to improve their students' learning.

c. *Crosscutting research priorities*

i. *Accountability at the community level*. Over the past decade, accountability in education has increasingly referred to how communities can hold national and local officials more responsible for the delivery of learning to children. Local stakeholders are increasingly interested in children's learning, and so may offer powerful leverage on the ground if they can provide and apply research evidence to influence policy.

ii. *Transparency of learning evidence*. There are many consumers of information about learning. For example, most parents are interested in knowing for their own children the most likely outcomes of school attendance. What will the child learn, in what language, and with what results? What type of evidence do these parents have available? Further research might include the production of "consumer reports" for schools that are specifically designed to answer the kinds of questions that parents (and children and communities) might have about the value of schooling.

iii. *Cognitive and noncognitive variables in learning achievement*. Much of the work on predicting school achievement has focused on the use of cognitive tests. Increasingly, there has been a growth of interest in noncognitive assessments, such as in the child's persistence, ability to delay gratification, and curiosity. Research on how to define and measure these types of behavior is still in its beginning stages, and would be of considerable value.

iv. *Role of incentives*. Most societies assume an inherent incentive to learn in school that is based on the normally positive consequences of more schooling. Yet children (and their parents) may vary significantly in attitudes toward schooling, and thus the learning that is supposed to take place in schools. There are many ways to consider the roles that incentives can play in learning, and more in-depth research among poor populations is warranted.

v. *Cross-sectoral collaborations for learning*. Learning takes place in all of life's domains and is certainly not bound by

school walls. Many youth who have left their formal education may be involved in both structured and informal learning in other sectors, such as health and agriculture—two large and significant sectors with trained and knowledgeable workers. Learning research at the intersection of these and other sectors is essential.

6. **Conclusions: Learning to Make a Difference.** This section focuses on how to best make a difference with the research tools and funding available. If an assumption is made that about $2 billion will be needed in the next three to five years to improve learning in low-income countries,[3] then a conservative research and development (R&D) budget estimate of 5 percent would allow for funding of research of $100 million. A classic budgetary question follows: If research funds are provided, how do we spend them? Several subquestions include:

   a. *Is there a different way of thinking about learning research in low-income countries?* Several types of responses are possible. *First*, pro-poor initiatives must be able to defend the notion that improving the learning of *all* people is a critical and worthwhile endeavor. *Second*, research priorities for learning need to take seriously how increasing diversity transforms learners, contexts and learning outcomes. *Third*, researchers and policymakers will need to accept improved disaggregation of populations and contexts.

   b. *Are there learning research efforts worth the investment?* In the present review, and summarized in section 5, a set of nine core elements and 19 research priorities were described. These ranged from studying better instructional practices for reading, and the use of new technologies for learning, to the learning consequences of technical and vocational education and training.

   c. *How might a research program on learning be implemented?* Scientific research in most fields is typically undertaken by institutions of higher education. Yet in the field of education and development, much of the current learning research is applied research of the decision-driven variety, undertaken mainly by international NGOs. The time is right to draw in universities from both countries that belong to the Organization for Economic Cooperation and Development (OECD) and low-income countries, along with NGOs to assure scientific engagement over the long term.

   d. *Are there serious impediments in carrying out such a learning research agenda?* Among the most plausible are conceptual failure, human resources limitations, and lack of follow-through and transparency.

   e. *Is learning research worth $100 million?* Increased funding can help to resolve a variety of critical research issues, and could revolutionize the interest in making innovation work in low-income countries. It would also create important opportunities for multi-institutional partnerships as well as the training of a new generation of research specialists.

The broad imperative to improve learning for all children is one of the great challenges of the 21st century. The stakes are high. Substantial investments in education will undoubtedly be made over the coming years. Will they be used effectively to help the most disadvantaged? The answer may well be determined, at least in part, by a learning first research agenda. Learning that matters, that is tailored to children's needs and to the contexts where they grow up, and that can be understood by stakeholders at the local level, is the learning that needs renewed attention and a robust research effort. Putting learning first is one of the most important ways to address human development, education and global poverty.

Annexes

Annex A reviews boundary constraints, generalization and comparability of research findings as related to research on learning in global and cross-cultural contexts. Annex B provides three composite stories that call attention to critical learning issues during early preschool, primary and postprimary years, along with a research proposal "sketch" for each. Annex C lists the abbreviations commonly used in the paper.

1. LEARNING GOALS AND RESEARCH

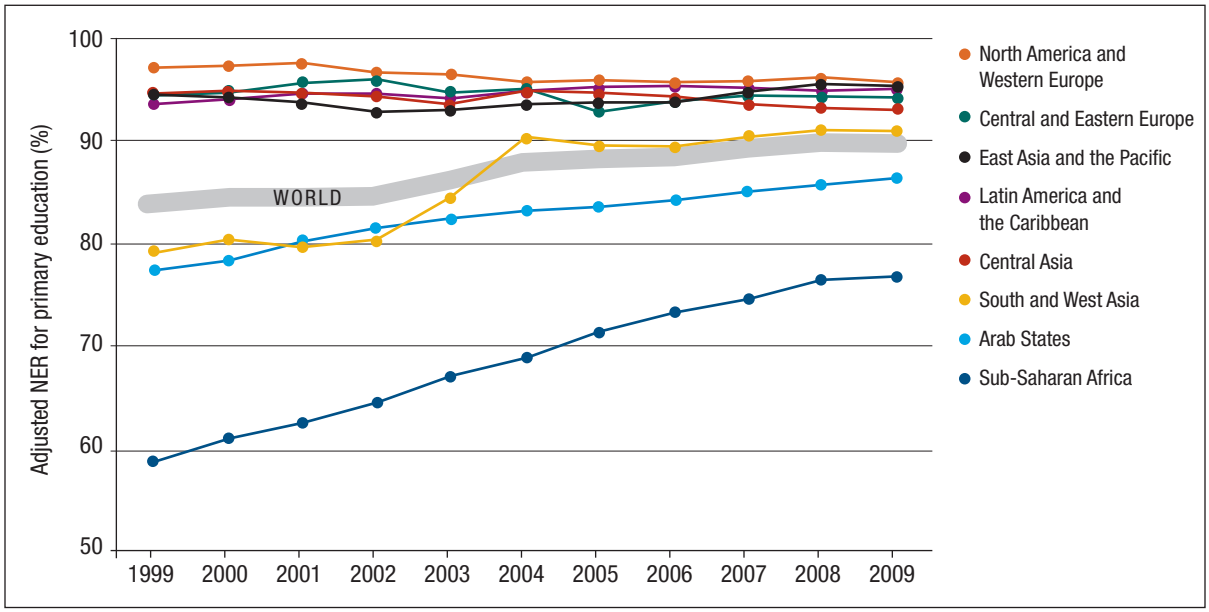
Parents, educators, government ministers and policymakers in all contexts and countries around the world are concerned with learning, and how to improve it. There are many reasons for this, but none is more important than the fact that learning is at the heart of success at the individual, community and global levels. Some might say that this has been true since the Industrial Revolution (or longer)—yet few would deny that the need to improve learning is among the most important goals in the world today. The present review seeks not only to explain why this is the case but also focuses on what we need to know—that is, what *research* is needed—in order to improve learning tomorrow, particularly among those children most in need.

Learning First is the title of this report, as it suggests that learning should be the foremost goal of education policies worldwide. Also, the choice was derived from a recently announced initiative of the United Nations called *Education First*.[4] The distinction, as will be seen below, is an important one. Ever since the development of modern public education, education has been a shared policy goal. Indeed, getting all children into school has been a key international policy goal. In the discussion that follows, it is argued that access to schooling—while very important—is not enough. *Learning*—and how to improve it—should be our fundamental international educational goal.

1.1 International Goals

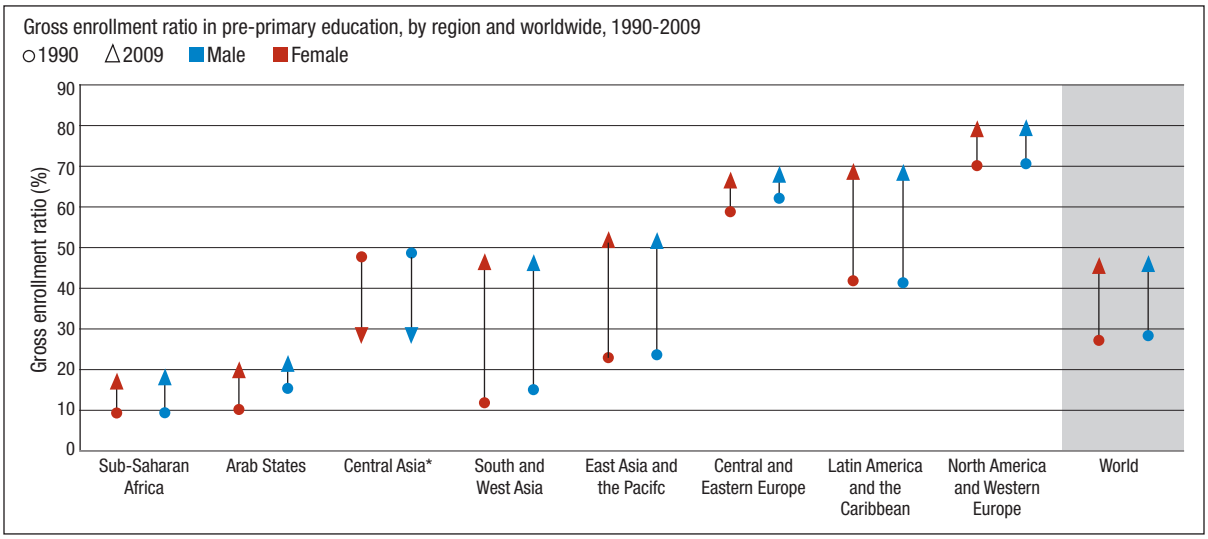
The World Conference on Education for All in Jomtien (Thailand) was a watershed moment in international

Figure 1.1. Adjusted net enrollment rate for primary education by region, 1999 to 2009



Note: East Asia and the Pacific and South and West Asia: UIS estimates based on data with limited coverage for the reference year, produced for specific analytical purposes.
Source: UNESCO Institute for Statistics, 2011, p.10.

Figure 1.2. Change in gender parity in primary completion rates by region, 1999 to 2009



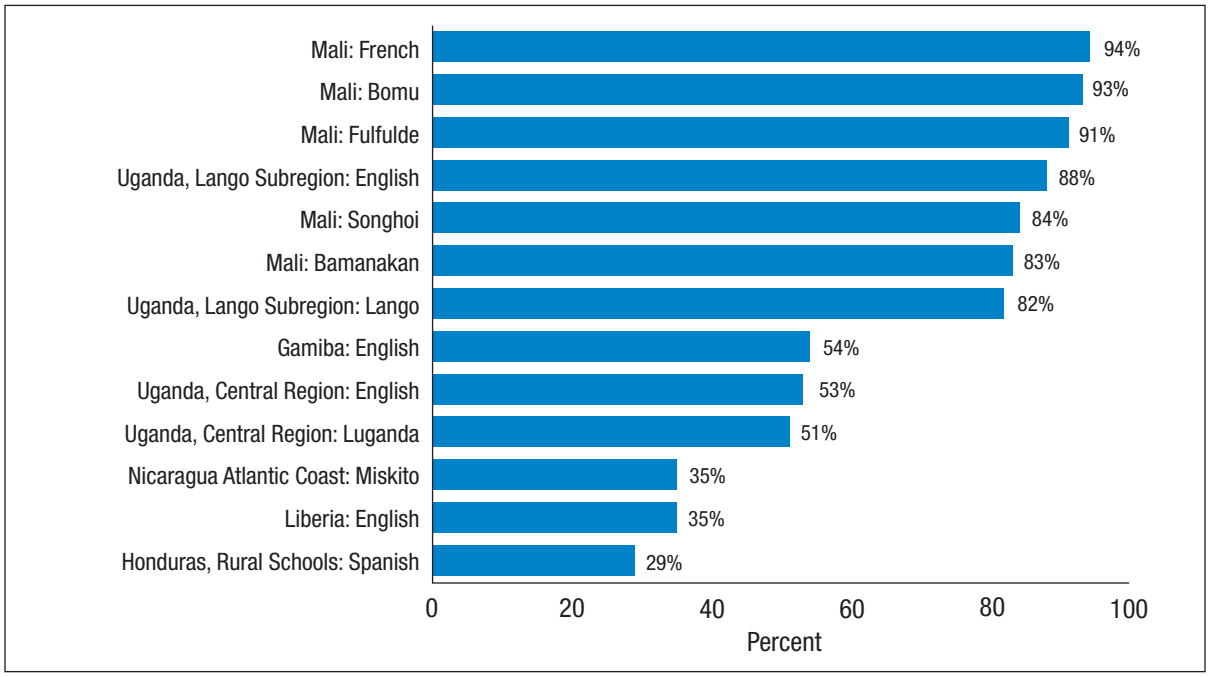
Note: *1990 data for Central Asia refer to 1991
Source: UNESCO 2012, p.28.

education and development. Held in 1990, the conference embraced two key challenges: first, to significantly increase access to education of children in poor countries; and second, to promote the *quality of learning* in education. A decade later, at the Education for All (EFA) conference in Dakar in 2000, these same two challenges were enlarged in a more detailed list of six education targets.[5] They were reinforced again in the UN Millennium Development Goals (MDGs) for 2015, where universal primary education was made the second of eight major goals.[6] These global efforts led not only to substantive increases in international development assistance to education but also to greater attention in the broader public arena regarding the importance of children's learning on a global scale.

Consequently, during the past two decades since the Jomtien Conference, major progress in educational development has been made in low-income countries.[7] In sub-Saharan Africa, for example, primary school enrollment has climbed from under 60 percent to nearly 80 percent, putting millions of additional children in school (figure 1.1), and girls' access to education increased, particularly in South and West Asia (figure 1.2). The impressive accomplishment of putting more children in school—and many from poor communities—resulted in a number of unintended consequences. In short order, there appeared a greater need for more infrastructure and supplies (e.g., better-functioning schools, adequate textbooks) and more trained teachers. With the rapidity of growth in enrollment, it became difficult to support a parallel growth in the number of qualified teachers, to maintain reasonable class sizes, and—most relevant to the present discussion—to assure that children had access to high-quality learning experiences.

Even before the Dakar conference in 2000, it was manifestly clear that the quality of education was a serious concern in low-income countries. For example, a World Bank national household survey in rural Bangladesh found that three years of schooling had approximately zero value in terms of learning achievement.[8] In other words, the effort of getting

Figure 1.3. Percentage of children who cannot read a single word, 2008-2009



Source: Adapted from Gove & Cvelich, 2010. p. 10.

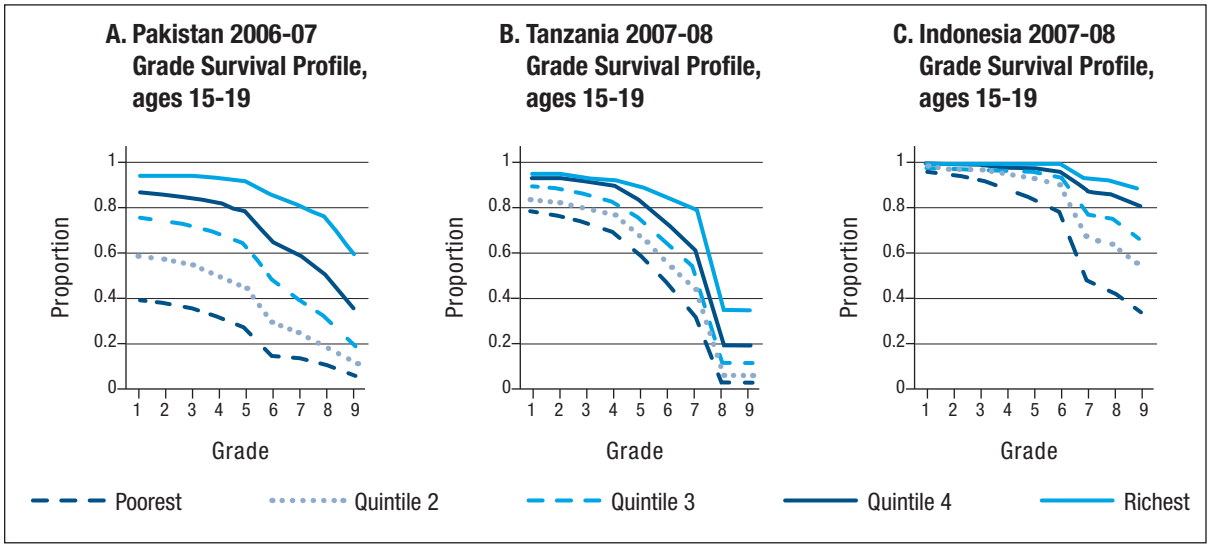
kids into school had little or no payoff with respect to educational gains. That was in 1999. Today, after nearly 15 years of substantial investments in education development, new studies are appearing with the same basic result: in many countries, children cannot read a single word, even after multiple years attending school (figure 1.3), while the rate of school failure among poor youth remains very high (figure 1.4).[9] Clearly, the Jomtien goals to promote the quality of learning need increased attention.

1.2 The Global Learning Crisis and a Research Response

In 2011, the Center for Universal Education published *A Global Compact on Learning: Taking Action on Education in Developing Countries*, which stated that there is a "global learning crisis—which affects children and youth who are out of school with limited learning opportunities and those who are in school but not learning the skills they need for their futures."[10] The report goes on to say that there are "three priorities to improve learning for all children and youth, including those out of school: (1) help children get an early start on learning in life, (2) ensure that basic literacy and numeracy are learned in school, and (3) equip young people with relevant skills for their lives and livelihoods."

These three priorities, coupled with other policy discussions concerning the future of the UN MDGs *after* 2015, provide the basis for renewed efforts on improving learning. However, it is one thing to set goals and another to know how to achieve them. This is not just a standard-setting exercise—such as how many children can read in second or third grade (as important as that goal might be). Rather, the questions addressed in this review are: *What* does "can read" mean in instrumental and measurable terms? *How* would one reach such a goal in terms of the knowledge resources required?

Figure 1.4. Comparison of youth aged 15–19 years who have completed a given grade, by income quintile, various years



Source: Adapted from World Bank, 2011, p. 18.

More broadly, *why* is so little learning taking place in so many countries, and what are the barriers that seem to prevent better learning. In this review, the question is asked: *what research would be necessary over the coming decade to realize the goal of improving learning in poor communities in low-income countries?*

Research and researchers have an important role to play. The importance of rigorous, empirical evidence for innovations in social programming has been well established in recent decades.[11] It is not by accident that the most innovative and competitive firms in the private sector spend 5 to 10 percent of their resources on research.[12] Research not only provides new paths to innovation but can also reduce wasted investments in time and resources on methods that no longer work. As just one example, for decades international agencies have been collecting information on national "literacy rates." These data have been used for a variety of policy purposes, ranging from the need for more adult literacy programs to programs that would address children's reading. We now know that such literacy rate data in many countries are rough estimates that have been misleading for policy analysis.[13]

Given that massive resources have been expended in relatively wealthy countries that belong to the OECD trying to address issues of learning and schooling, it is not a big surprise that there is much more to be understood in the poorer, low-income nations of the world. With persistent poverty, poor governance and increased globalization, there is growing concern that children in the poor nations will inevitably fall further behind if they do not have the basic learning skills that will enable them to learn more of what they need to know.

1.3 The Structure of This Review

Following the introduction, section 2 provides a review of how the field of education has defined *learning* over many decades, and suggests some implications for contemporary education and development. Contexts

for learning are given special attention, along with the notion of disaggregated sample populations. Section 3 reviews the issue of global change—including demographics, migration, multilingualism and other topics—which has an impact on contexts for learning in a changing world.

In section 4, five research domains in learning, from early childhood through adolescence, are explored.[14] Each of these domains was analyzed for relevant research on learning and in terms of further research. Section 5 addresses the question of what we need to know to make a difference. A list of core elements is provided, followed by a set of recommended research priorities. In section 6, concluding remarks are provided on how to best make a difference with the tools and resources available.

Annex A reviews boundary constraints, generalization and comparability of research findings as related to research on learning in global and cross-cultural contexts. Annex B provides three composite stories that call attention to critical learning issues, along with a research proposal "sketch" for each.

1.4 Limitations

This review is about learners and learning. A first limitation of this review is that it is focused primarily on the individual learner; teachers and educational systems—topics of great importance—are considered only as they make an impact on learners and learning. A second limitation concerns geographical coverage: the review targets research that is particularly relevant to low-income countries, and therefore does not seek to be balanced or representative in terms of worldwide coverage. Third, the review is primarily concerned with research on children's learning before primary schooling, during the primary school age range, and the beginning of postprimary years (early adolescence); relatively little attention is given to children and youth within secondary schooling and postsecondary education. Fourth, the focus is on the poorest communities in low-income countries, even though it is recognized that not all communities in such countries are poor. Finally, this review takes the point of view that focusing on the poor in low-income countries has both scientific and policy merits.

2. LEARNING DEFINITIONS AND CONTEXTS

Everyone—and certainly every parent—agrees that learning is fundamental to a child's life course. Yet there is considerable debate as to what learning really means, and whether it means the same thing for people who live in quite different cultural contexts. This section explores these issues and suggests a framework within which such matters can be better understood.

2.1 Learning: What Is It?

Learning is a word that has meant different things to different people over the years. Learning has made its way into the English language in a multitude of ways: institutions of learning, learned individuals, learned helplessness and experiential learning. Indeed, comprehensive reviews of learning's many definitions are too numerous to list, especially when taking into account cultural and linguistic variations of the term and its meanings in local situations. Nonetheless, from its 19th-century origins in the social sciences, *learning is defined most commonly as a modification of behavior due to experience*—such as in knowledge, skills, attitudes and values.[15]

Research on human learning has changed significantly over the years. Modern cognitive psychologists, beginning in the 1970s, sought to better understand how *conceptual* changes take place, how students integrate knowledge from multiple sources, and how humans successfully *ignore* irrelevant information. Recently, neuroscientists have helped to pinpoint parts of the brain that are associated with learning activities; for example, revealing how young infants *unlearn* various linguistic patterns through innate probabilistic processes, allowing them to become native speakers of the dominant language(s) in their environment.[16] Thus, there is much that is universal about human basic processes of learning, including language, perception and memory.[17] Further, learning develops in age-related differentiated ways in the individual: from early learning (e.g., habituation) in infancy to, say, collaborative learning in childhood and adolescence.[18] Cognitive research clearly suggests important commonalities in learning in human beings the world over. At the same time, there is great variation across individuals and societies as to how, when and where learning takes place; what is learned; and the ways that societies recognize and support (or fail to support) what are said to be important learning outcomes.[19] Further, since this review is focused on the relationship between what is known about learning and what can be achieved from a policy perspective, it is particularly important to focus on those sociocultural dimensions of learning that are more susceptible to change.

A helpful way to think about learning is through three main principles of effective learning, derived from a substantial body of research:[20]

- *Individual active involvement*. Learning is optimal with the active and constructive involvement of the learner.
- *Social participation.* Learning is also a social activity, and participation in social activities, with appropriate environmental support, is central for effective learning.
- *Meaningful engagement*. People learn best when they participate in activities that are understood and meaningful, perceived to be useful in real life and culturally relevant.

Thus, in addition to the basic definition of learning as a change or modification of behavior, it is important to bear in mind the individual processes of engagement and contexts of social relevance that enhance learning processes.

2.2 Learning in Three Stories: Illa, Pawan and Rachida

In international education and development, the use of the term "learning" has often been understood in terms of measured *outcomes* of learning. Given the emphasis on learning as a change of behavior, it is not surprising that outcomes on student assessments (e.g., scores on tests such as PISA or EGRA[21]) collected across time and populations represent one of the most prominent ways that learning is understood by the public and by policymakers. Yet test outcomes provide only a narrow window on what constitutes learning.[22] Indeed, a global research agenda on learning must take into account the localized, limited and problematic nature of test outcomes as well as concrete ways to improve learning opportunities.[23]

In the present analysis, there is a need to consider two broad dimensions of learning: (1) how learning varies in different *contexts*; and (2) the nature of how learning takes place, its *processes*. The term *context* is used here in the ethnographic sense, as a conceptualization that is as specific as possible in local terms. As such, reading contexts can be understood generally (as in a classroom in Western schools), but also with substantial local specificity, as will be seen further below.[24] The term *process* refers to the types of cognitive practices or skills that are deployed to achieve a particular learning goal, whether consciously or unconsciously.

Three brief stories help to illustrate this perspective. The first concerns Illa, a Quechua-speaking four-year-old, living on the outskirts of mountainous Cuzco, Peru. Her story is a typical one for families in Peru that seek to maintain traditional values but are also looking for future opportunities for their children. Illa is bright and expressive, having developed strong oral competencies in Quechua through interaction with her parents and extended family. As yet, she knows only the limited Spanish that she has overheard when her parents take her to the marketplace to sell the blue potatoes from their steeply positioned plot of land about a 45 minute bus ride from central Cuzco. Illa's story is familiar to those who are aware of the millions of minority-language children in poor families across the world today.

From a learning perspective, the arc of Illa's life will depend greatly on her educational opportunities. Her parents want her to carry on with their traditional values and her native language of Quechua as well as going to school, and maybe even university. To achieve this goal, Illa will need to develop competencies in Spanish that are much more extensive than those of her parents, cousins, aunts and uncles. She will need to learn to comprehend, speak, read and write Spanish at an academic level—the gateway to formal education and the world beyond her village. To achieve these learning goals, the pathways available to Illa are few, but they will likely include one of the bilingual preschool programs that have sprung up in Cuzco and its surrounding areas. There is one such preschool in a nearby village to where Illa's family lives. The preschool is operated with Quechua as its principal language of instruction, but Spanish as a second language is used daily in songs and stories, along with beginning literacy. Illa's parents, along with many friends and neighbors, are counting on this early contact with Spanish as a way for their children to "do better" when they get to primary school.

Illa's story is an important one for learning researchers. Current evidence suggests that large numbers of Quechua children will likely drop out before completing secondary school.[25] How can learning research make a difference for Illa and her compatriots? The answer(s) will likely lie in a combination of effective parental, curricular, motivational and evaluative

supports to her learning over the preschool, primary and secondary years. Illa is one very important focal point for research and investment—populations of children growing up within minority-language communities that have a long history of poor learning in schools.

The second story relates to a young Indian boy named Pawan, who is eight years old and growing up in a middle-class, well-educated family in Mumbai, India. Each night his mother or father take turns reading to him in Hindi, as they have done nearly every night since he was two years old. His parents are rarely together at home on weekday evenings, as they work extra hours at a local call center, trading evenings with one another. More recently, Pawan goes to his uncle's home nearby to "play computer" in the later afternoon. Computer games in Hindi and in English have made an impression on him, as he learned to match the letters and sounds of words and sentences in educational games. With more time, practice and nurturance, and with his parents' strong support, he has now entered a private primary school. Though only in second grade, he is well on his way to becoming a part of the upwardly mobile and literate society of India. This story represents a second focal point—children of relatively modest means but with schooled and upwardly mobile parents who are ambitious for their children. Though not the poorest of the poor, they nonetheless represent one of the fastest-growing segments of the lower and lower-middle classes in developing countries.

The third story takes place in rural Morocco. Rachida, who recently turned 18 years of age, is engaged to be married to a local carpenter. She has labored hard since early childhood—taking care of her four siblings and a chronically ill father who is unable to help financially. Her main chore, besides caretaking, is to bring in firewood from the surrounding hillsides to her small village in the foothills of the Middle Atlas mountains. Her native language is Amazigh (Berber), though she went to the local *kuttab* (Islamic school) for two years and learned how to recite Quranic verses, and to read and write rudimentary Arabic. She also learned spoken dialectic Arabic from daily interactions with neighbors. Beyond regular household and firewood duties, she also has to handle a range of contacts between the outside world and the home. Such activities vary. On some days, the mailman arrives in her neighborhood with letters; Rachida helps to deliver each to the addressee in her neighborhood, knowing simply by the type of handwriting or script used, along with the name listed, to whom and where each letter should be distributed.

Once a month, the "electric man" arrives to collect money for the family's monthly charges; Rachida handles this affair with just a question or two, drawing money from an earthenware jar kept in the kitchen, and doing mental arithmetic to figure out what remains to be paid. She can also switch effortlessly between the several parallel currencies in use—dirhams, francs and rials (a base-five system). Rachida has become known for her ability to negotiate the lowest possible prices in the souk. To those of her social class, as well as to those higher up on the social scale, Rachida is a young woman worthy of respect. Her story represents a third focal point, that of young women who have missed the opportunity to go to school and will soon be mothers caring for children who are likely to go to school. Though accomplished in everyday life skills, what role will these women play in the learning and schooling of their own children?

What is the relationship between these three seemingly disparate stories? There are two relevant linkages. First, each actor—Illa, Pawan and Rachida—may be seen as *normal active learners*—that is, functioning within the expected norms of behavior for their

particular age and social context, and motivated to seek new information with the various skills they possess. Second, each has a real possibility of success, if this is defined as making a serious contribution to themselves, their families, and their communities. Illa may well make it into a good school in Cuzco, and go on to secondary and postsecondary education. Pawan will, in great likelihood, become educated and economically successful, because his parents provide him with a rich literate environment replete with books and digital media. Rachida will continue to function intelligently in her village, though largely illiterate.

All humans learn—everywhere and all the time. This is in our human DNA. But learning takes many different forms, and, as noted above, can be enhanced by the principles of active involvement, social participation and meaningful engagement. Of primary concern is how learning occurs in these highly specific and contrasting contexts. Further, while learning must be understood within a cultural context, whether in rural Peru or North Africa or urban India, commonalities across cultures may be found as well. For example, some contexts are designed explicitly for formal learning, such as in schools across the world today. Other contexts (most, in fact) are not consciously designed for learning—such as at home where children interact with family members and other children, streets marked by visual signs, stores and markets filled with distinct smells, sounds, and material goods. These informal learning contexts also have an important impact on learning. One concern, then, is how to conceptualize learning in a way that helps to achieve particular policy goals (e.g., early grade reading) without missing or misunderstanding the diverse contexts in which learning occurs in everyday life.

The three stories also offer examples of distinct types of learning processes. It is possible to observe something of how learning occurs and is being deployed. Illa is in a particularly vulnerable learning context: without near-term inputs in productive Spanish (e.g., in the preschool), she will most likely be destined to a Quechua-only context, putting her at risk for school failure in primary or secondary school. In the case of Pawan, at age eight, he has only begun his formal schooling pathway, but he has had intensive informal inputs from his parents, at his uncle's house, and in a very literate environment at home and school (a formal context, that also includes informal computer-based learning processes).[26] His learning can be characterized as reciprocal and scaffolded learning, with his parents engaging Pawan in interactional dialogue.[27] In Rachida's case, her skills were learned both through informal and unstructured processes, including self-learning, observation and peer interaction. She also learned Arabic skills through structured learning and memorization processes through her local *fkih* (Quranic teacher). At the same time, Rachida's learning experiences mainly occurred in distinct nonformal learning contexts, as the Islamic *kuttab* (while highly organized) is not part of a formal public school system. Rachida's learning would likely show up as quite low on any international assessment of learning outcomes.

In sum, the learning experience of Illa, Pawan and Rachida has taken place in nonformal and formal contexts, and in highly structured and unstructured (informal) ways. One way to improve learning for all children is to better conceptualize both the contexts and processes of learning, in a comprehensive learning framework.

2.3 A Framework for Learning

A useful way to think about the spectrum of where and how learning takes place is through a learning framework that considers the wide variety of possible

learning experiences, and locates areas that merit further research and policy planning. This framework, described below, encompasses the relationship between different learning processes and learning contexts along two dimensions. Learning processes consist of the cognitive and noncognitive behaviors or skills that occur within individuals as acquisition occurs. These processes may be strongly influenced by (1) a highly structured pedagogical-curricular approach in formal school contexts; (2) a relatively unstructured and informal context where learning takes place without guided instruction; or (3) somewhere in between these two extremes on a continuum.[28] Considering learning processes and contexts within this framework provides a useful way to examine learning in the global educational landscape. Each of the four areas below represents the intersection of both processes and contexts for learning.

A. *Formal contexts—highly structured processes.* School directors, ministers of education and most international agencies view the classroom as the main example of this learning area. Teachers, teacher training, curricula, and textbooks are the tools to be deployed to improve learning. Development goals and budget allocations have largely focused on these mostly measurable aspects of schooling, such as attendance, access and persistence in school. A large majority of research on learning has been undertaken within this learning area.

B. *Nonformal contexts—highly structured processes.* Nonformal education (NFE) refers to both government-sponsored and nonstate forms of education. These include preschools and other early education programs, private schooling and tutoring outside school hours, independent school programs, and youth literacy programs for school dropouts. NFE institutions represent a variety of learning contexts, some of which may be very similar to formal schools in terms of regulation, government control, certifications, and so on; others may occur outside controlled, classroom context, as in Illa's preschool or Rachida's Quranic school. Because these programs often use highly structured educational approaches or learning processes, and yet are not subject to the systematic regulations often found in formal schools, NFEs typically fit into learning area B.[29] Nonetheless, as with area A, most types of NFEs are designed to play a structured, specific role in learning for children at different ages. One recent review found that the largest growth in education in the coming decades will likely be in what is now termed "shadow education," and includes private tutoring, after-school classes, and specialized private schools.[30] Also included in area B is the provision of technical or vocational education, sometimes part of the formal school system, but also often part of the NFE system.[31]

C. *Formal contexts—unstructured/informal processes.* Informal learning also occurs in formal contexts. A growing body of global research indicates that much of the learning inside schools and classrooms is not directly teacher-driven but rather is informal, and unrelated to the structured discourse organized by the school, teacher or curriculum.[32] Recent observational studies of time use have shown that a substantial fraction of class time, especially in poor and under-resourced classrooms, entails children interacting with other children.[33] In OECD countries especially, the growing use of mobile phones in the classroom represents a clear example of informal learning in formal contexts.[34] In addition, whether or not teachers are present and engaging in instructional activities, many students will learn from interacting with their peers; of course, what they learn may not be what the schools wish them to learn.[35]

D. *Nonformal contexts—unstructured/ informal processes.* Informal learning processes occur in many nonformal contexts. Whether learning takes the form of parental speech during the informal bilingual language interactions of Illa, Pawan's bedtime reading, or in Rachida's experiences in the souks of rural Morocco, it is clear that learning is taking place in many ways and settings.[36] This learning area is meant to represent the multitude of learning contexts that exist in everyday life, whether facilitated by parents or engaged in with peers, or simply a result of the flow of events in a young person's life. It is probably fair to say that this learning area contains most of a child's daily waking hours of active learning. Yet it is also the case that the research literature in this area, especially in low-income countries, is the least well developed.[37]

The learning framework outlined above helps provide a broader way of thinking about clusters of specific settings—the *where* and the *how* of learning. Its purpose here is to signal the places and forms that learning takes, and to highlight areas that have largely been overlooked (or understudied) by researchers. Although labeled here as four different areas, it is important to note that these need to be seen as dynamic influences on children's learning that overlap and/or intersect in complex ways.[38] In other words, these areas are not independent of one another, nor are they immune to changes across culture and time. Further, the learning framework should be seen as a function of diverse cultural, environmental, and social influences across the individual life span and multiple generations.[39]

2.4 Learning In and Out of School

All learning takes place under a single cranium—it is impossible to fully separate learning in school from learning not in school—or structured learning from informal learning.[40] For far too long, the study of learning and learning outcomes has been confined to the school arena, ignoring the many other inputs and interactions taking place. As noted above, most of a child's waking hours are not spent in school; and there are many millions of children who are not enrolled or have dropped out of school. Thus, there are real opportunities for utilizing this out-of-school time with the types of learning—and the interactions among them—that can support learning and development.

Still, if one asks a policymaker how to improve learning, the solutions nearly always revolve around the "black box" of school, not learning outside school. This is not surprising, of course, since policymakers typically have control of relatively fixed school budgets (primarily weighted by teacher salaries) that seriously limit their ability to make new investments of any kind. It remains a major challenge, therefore, to work on outside-of-school interventions, even when potential solutions become clear. Only evidence-based research findings that can create a robust knowledge base, and demonstrate a strong return on investment, will likely to be able to break through such institutional barriers. Programs that can find synergies between formal and nonformal contexts are likely to have substantial payoffs.[41]

2.5 The "Average" Child

Taking into consideration the learning framework outlined above, it is no surprise to find that many Western-trained researchers have a relatively normative concept of child development. In wealthy countries today, it is often assumed that the "average" child grows up with parents who can read and write, with multiple books in the home, and multimedia available via the Internet. This average child typically starts to come into contact with written language about the

age of three years (or earlier), beginning with what has been termed the preliterate skills of scribbling and storybook reading.[42] Subsequently, this child is socialized for certain kinds of formal learning through numerous years of attendance in school, reinforced by parents who support their child's learning. On average, this child will do well on international assessments.

Of course, it is obvious that *most* children are not "average" children, and that there are huge variations (i.e., robust tails on the normal curve) in learning achievement across and within wealthy countries. A normative picture of learning in industrialized countries leaves out most children in today's world, and especially those in low-income countries. When children "fail" in the Western school systems, education specialists may look for innovative ways to intervene, and there are often resources to undertake such efforts.[43] In low-income countries, by contrast, there may be too few inputs in the environment (e.g., literate parents, books, newspapers, etc.), low family self-esteem for effective learning in the home,[44] and/or too few children who attend sufficient numbers of years of schooling to master the curriculum.[45] The complexity of relationships of variables can be daunting, and for this and other reasons it is essential to resist the temptation of large normative analyses, and to support smaller units of analysis and population samples.[46]

2.6 Disaggregation of Learners and Contexts

Simple contrasts between "rich" and "poor" countries, or "literate" and "illiterate" people—as if we know what this means in stereotypical ways—no longer seem tenable in today's world. For example, even the poorest families in low-income countries are today increasingly invested in the importance of education and learning. Nor can it be assumed that parents in poor settings are "illiterate"; many have now gone to school for a number of years, even in the poorest communities. Further, language attitudes in low-income countries have begun to change with increased globalization—international languages, especially English, are now viewed by many students and their parents as a key family goal toward economic advancement.[47] Attitudes toward women and opportunities for girls' schooling have also changed, as evidenced by their huge gains in their education in the last decade.[48]

Large cultural changes are taking place in today's world of learning, so that the dichotomous distinctions cited above become more uncertain and inaccurate. Such temporal changes pose serious challenges to contemporary efforts to engage in comparative and cross-cultural research. What is needed today, and urgently, are better and more up-to-date methodological tools that are able to disaggregate learners and their learning contexts—both between countries and within countries. For example, if mothers in a research study are shown to have variations in their literacy skills, then conclusions based on "maternal literacy" will need to be more nuanced than previous bivariate categorizations.[49] Further, learning assessments used in low-income countries that are based on norms developed, say, in OECD countries may be problematic in a number of ways that will not only bias results but may also be misleading to policymakers.[50]

In sum, disaggregation is not only about the specificity and sensitivity of local description. It is also about understanding relationships between variables, and ways that evidence on learning can eventually be reaggregated to respond to policy and planning needs.[51] It is also about complexity, and the kinds of global transformations that pose challenges to research on learning both today and tomorrow.

3. GLOBAL CHANGE AND THE CONTEXTS OF LEARNING

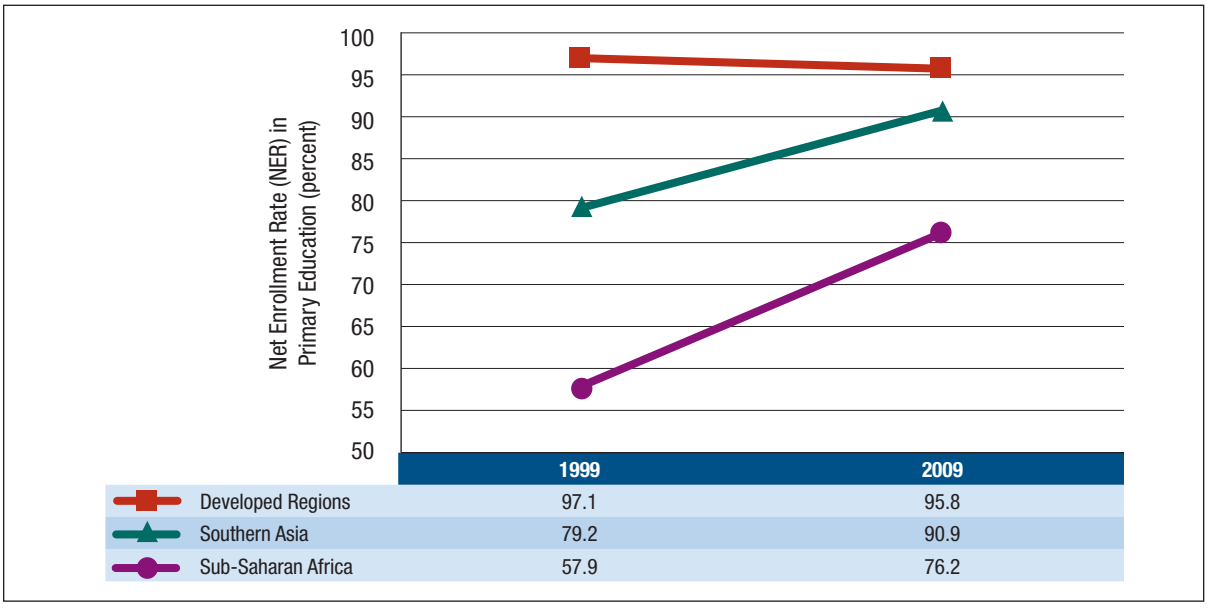
Economic globalization, migration within and across countries, and the diffusion of information communication technologies are among the many contemporary changes on a global scale that have profound implications for learning.[52] In this section, these and other major transformations are considered, along with their direct and indirect effects on learning. Learning, it is concluded, cannot be understood as a single immutable concept, but is rather a moving target that requires constant attention and updating.

3.1 Demographic Change, Migration and Urbanization

National and international migration, along with significant changes in age cohort patterns, have led to demographic shifts that are having an impact on the diversity of the world's classrooms. In the period from 1990 to 2010, the number of international immigrants increased by nearly 60 million people worldwide, with over 200 million people living outside their country of origin by 2010.[53] Internal migration within countries is much higher than documented international migration rates, and occurs most notably as part of urbanization, as rural families search for labor opportunities in cities.[54] The broad trends of global migration are massive, and are continuing to expand.

Although migration research often focuses on changes in the labor market, the implications for children's learning, and for educational systems more broadly, are often overlooked. In each instance of translocation, children confront the challenges of adapting to a new environment that may expose them to different languages, dialects or cultures within the nonformal learning contexts of daily life. Similarly, in formal educational

Figure 3.1. Change in enrollment rates (1999-2009) in developed countries, South Asia (including India) and sub-Saharan Africa



Source: Adapted from: UNSD, MDG Report 2011. (http://www.devinfo.info/MDGInfo2011).

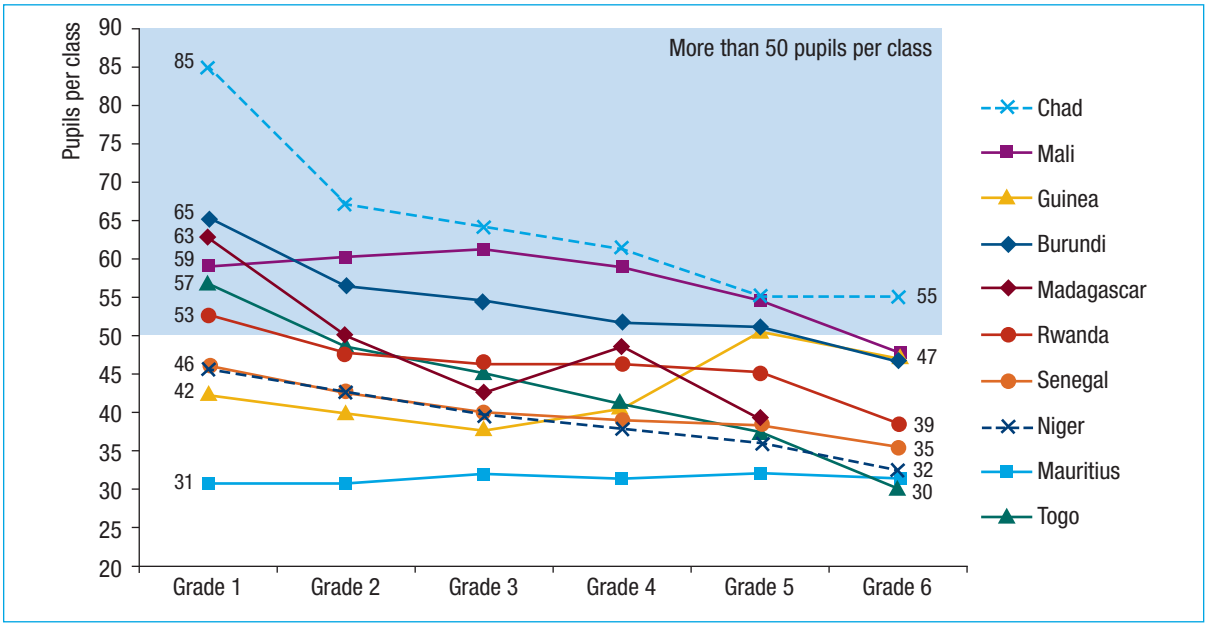
contexts, student migrants must cope with contrasts in culture, lifestyle and language of instruction, and demonstrate skills and achievement that may vary dramatically from their culture of origin.[55] Curricula that assume cultural and linguistic common denominators among students and teachers may not be aligned with the diversification of student populations, and may provide little support to teachers as they try to meet the needs of students whose cultural and linguistic backgrounds are significantly different from their own.

Even in contexts where population shifts are less evident, such as indigenous communities that were once isolated, there has been an influx of cultural contact through government and social sector intervention and communication technologies—what might be now termed "information migration."[56] Imported pedagogies and learning aides may influence structured processes of learning in school, while the presence of new cultural and multimedia materials in homes and communities may have an impact on children's informal learning. These processes of multicultural interaction and their impact on children's learning remain poorly understood, particularly in communities that are experiencing a substantial increase in contact with "outside" cultures.[57] In this sense, the phenomenon of complex, multicultural communities and classrooms is a growing reality throughout the world.

3.2 Increased Enrollment in Schools

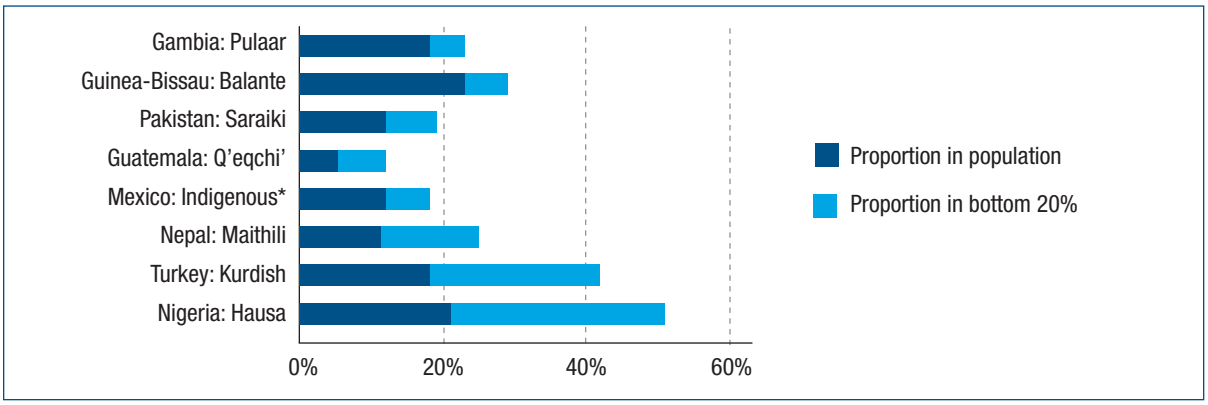
As the goal of universal primary education has seen considerable success, the number of students in schools is growing and adding to classrooms that were, in many cases, already overcrowded.[58] The large numbers of enrolled students in primary school—especially in Africa and Southern Asia—is illustrated in figure 3.1.

Figure 3.2. Average primary-level class size by grade (single-grade classes only)



Source: Adapted from: UNESCO Institute of Statistics (2012). (http://www.uis.unesco.org/Library/Documents/ib9-school-teaching-resources-sub-saharan-africa-data-collection-education-2012-en.pdf)

Figure 3.3. Percent of selected language groups in the bottom 20 percent of the education distribution, in selected countries



Note: The 'bottom 20%' is the 20% of 17- to 22-year-olds with the fewest years of education.
* The indigenous language category in Mexico consists of those who speak indigenous languages only and do not speak Spanish.
Sources: UNESCO-DME (2009).
Adapted from UNESCO, 2010, p. 152.

Increased enrollment is a major achievement, but it has also come with a downside. The numbers of qualified teachers have not kept pace with enrollment, nor have classrooms or textbooks, all to the detriment of the quality of schooling.[59] This is especially true in the poorest contexts. For example, only 8 percent of students in the North Eastern Province of Kenya have access to their own mathematics textbooks, compared with 44 percent of students in the capital, Nairobi.[60]

The rapid increase in primary school enrollment has also led to increased class size, such as 59 pupils per teacher in Ethiopia, 60 in Bangladesh, 120 in Malawi and even 145 in Nigeria.[61] As highlighted in figure 3.2, large classrooms are particularly prevalent in early grades, during a critical time in a child's cognitive and social development. The effect of large class size (i.e., pupil-to-teacher ratios greater than 40:1) on student learning remains inconclusive,[62] although several important studies suggest that the quality of the learning experience for students significantly declines as the number of students per class increases.[63]

3.3 Multilingual Classrooms and Education

Improving the quality of education in classrooms where children come from diverse language backgrounds has been an acknowledged challenge and subject of research for decades.[64] Many nations were formed out of multiple linguistic and ethnic groups, and recent processes of migration, as noted just above, have increased the proximity of children from linguistically varied populations. This is so even in countries with a single or focal national language policy. In low-income countries, poor enrollment, retention and educational attainment of marginalized ethnolinguistic groups (see figure 3.3) is particularly evident, where implicit policies (of language, ethnicity, economic or social status, gender, etc.) lead inexorably to the fewest years of formal schooling and lowest achievement outcomes.[65]

How does one avoid a one-language-fits-all approach in education? Given the economies of scale, in

addition to political pressures from dominant cultural groups, there are no easy answers.[66] Recognizing students' varied intellectual and linguistic skills is one important approach to tailoring education to what a child already knows.[67] Education practitioners in an increasing number of countries have attempted to take a more inclusive approach to children's home language and culture through policies of multilingual education based on a child's mother tongue.[68] Clearly, schooling is more effective if it is relevant to children's lives outside the classroom, and it is improved when they acquire initial literacy in a language they understand.[69] Further attention is needed on structured learning processes and attitudes that promote high-quality multilingual learning environments in formal education, with awareness of the diverse potential resources that children have acquired informally, in both the home and the community.

3.4 Home and School Transitions

The development of social relationships, language, literacy, and personal and cultural identity serve as important foundations for intellectual development. With globalization, and increased school access for children in poor countries, the transition between home and school is becoming an important part (in terms of time and effort) of most children's learning experience.[70] Research within classrooms suggests that a student's ability to learn in a new context is challenged when there is a significant cultural and social discordance between the home and school environments.[71] One consistent finding is that a teacher's supportive and respectful attitude toward the student's home language and culture can facilitate positive attitudes toward school and improved learning conditions.[72] Furthermore, greater continuity between early childhood development (ECD) and primary school also has positive consequences, particularly if the following characteristics of institutions are supported:[73]

- *Participatory:* Families, community partners and school leaders share decisionmaking, maintain open communication and use evaluation information to improve educational programming.
- *Holistic:* Children's needs are considered and responded to holistically, including health, education, and social well-being.
- *Linguistically, culturally and developmentally appropriate:* Educational services are designed to respect and respond to children's home language, culture, and developmental level.

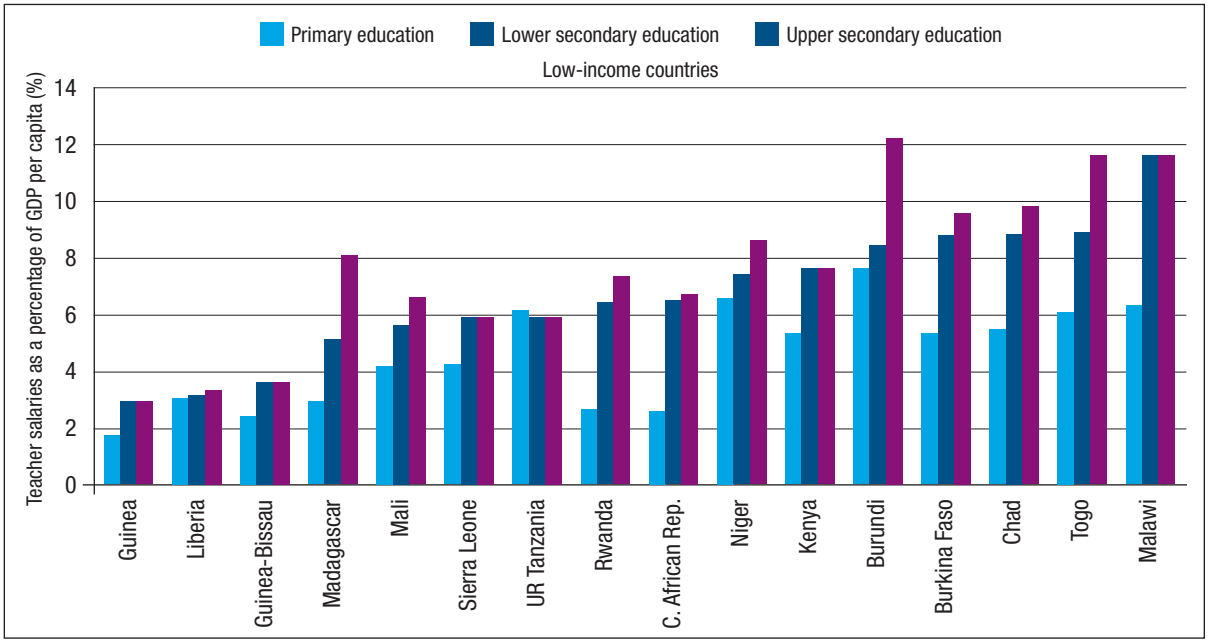
While transitions are typically located at key moments in a child's academic trajectory—such as the beginning of school or when advancing from one level of schooling to another—children in diverse societies may be faced with a wide variety of culture-specific transitions.[74]

3.5 Teachers and the Quality of Instruction

As enrollment and class size have grown in many countries, teachers have found it increasingly difficult to facilitate student learning, provide appropriate instruction, and simply manage student behavior.[75] In research on "successful" education systems (e.g., Canada, Cuba, Finland and South Korea), an important common factor is "high esteem" for teaching as a profession, exemplified by competitive recruitment, rigorous training and professional development support.[76] This is in contrast to many low-income countries, where the teaching profession—once highly esteemed and well paid—is seeing decreases in salary relative to other professions, and where a teaching certificate may be easier to acquire than other higher education degrees.[77]

Research suggests that it is difficult to recruit and maintain highly competent teachers when the profession as a whole is undervalued and under-resourced. Primary school teachers, for example, often get paid

Figure 3.4. Teachers' salaries in primary, lower and upper secondary education by average GDP per capita in selected low-income countries



Source: UNESCO Institute for Statistics, 2011, p. 70.

less than half the salary of those teaching in secondary schools (see figure 3.4). Further, in an international comparison of secondary mathematics education, only 62 percent of children were taught by teachers deemed "well qualified" by their country's criteria.[78]

As has been true for decades, the quality of the teacher remains the single best predictor of students' academic success.[79] Teachers remain at the forefront of educational success and are an essential resource in achieving broad development goals.[80] However, as noted, teachers also face classrooms that are rapidly changing, and, as a result they may have had little or no training relevant to these changes.[81] Shifts in the composition of the student population result in more mixed classrooms (by language, skill, age). And, the advent of new technologies—while offering potentially valuable options for learners—poses serious training problems for teachers.[82] Finally, the sheer growth in numbers of primary school students has lead to major recruitment campaigns that have, in turn, led to large numbers of underqualified teachers in primary schools (table 3.1). In sum, the training and ongoing professional development of teachers is a growing challenge.

3.6 Intergenerational Learning

Families and parents clearly play a crucial role in informal learning.[83] However, diverse factors in an era of increased globalization—such as economic uncertainty, war, famine, disease, climate change, migration, parental divorce, widowhood and premature death (e.g., from HIV/AIDS)—may place a substantial burden of childcare on single parents, elderly family members, nonparental relatives, older siblings and peers.[84] In addition, global economic pressures may require parents to work long hours outside the home, making them less available as caregivers and resources

Table 3.1. Total number of primary and secondary school teachers by region, 1990, 2000 and 2009

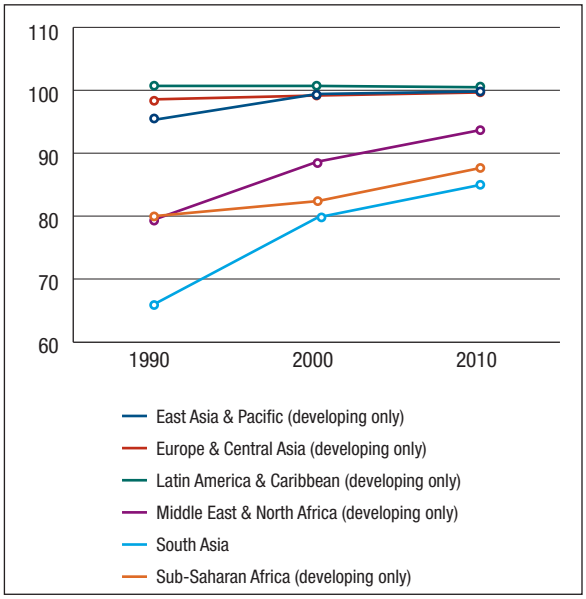
Region	Primary Education					
	In thousands			Total growth (%)		
	1990	2000	2009	1990-2000	2000-2009	1990-2009
Arab States	1,156	1,597	1,981	38.1	24.1	71.4
Central and Eastern Europe	1,445	1,325	1,137	-8.3	-14.2	-21.3
Central Asia	248	324	327	31.1	0.8	32.1
East Asia and the Pacific	8,842	10, 126	10,203	14.5	0.8	15.4
Latin America and the Caribbean	2,388	2,761	2,981	15.8	8.0	24.8
North America and Western Europe	3,132	3,501	3,711	11.8	6.0	18.5
South and West Asia	3,401	4,042	5,067	18.8	25.4	49.0
Sub-Saharan Africa	1,631	2,037	2,924	24.9	43.5	79.3
WORLD	22,243	25,714	28,332	15.6	10.2	27.4

Source: UNESCO Institute for Statistics, 2011, p. 57.

of informal learning for children. Indeed, intergenerational learning today may differ in important ways from behaviors observed in the past. For example, the increase in girls' access to schooling has led to a dramatic increase in women's literacy in recent years (see figure 3.5), an impact that has already begun to have significant consequences for children's learning and health outcomes.[85]

Increased schooling among youth and young adults has led to them becoming resources for learning and language, especially in rural communities. They can have a considerable impact on sibling learning in the home, and can serve as translators between languages (e.g., for medical prescriptions).[86] Intergenerational exchanges (whether intentional or not) constitute a prime source of informal learning for children. Contemporary changes across generations are forcing a reconsideration of the informal opportunities for learning in and out of school.

Figure 3.5. Changing landscape of women's literacy, 1990-2010. Ratio of young, literate females to males (% ages 15-24)



Source: World Bank, Gender Statistics (http://datatopics.worldbank.org/gender/topic/education). (Data source: UNESCO Institute for Statistics.)

3.7 Twenty-First Century Skills and Changing Economies

Demand for labor skills is changing in today's globalized world.[87] It has been argued that "developing economies will be challenged to raise the capacity of secondary education systems and find ways to provide vocational training to new workers entering the labor market as well as to midcareer workers who lack the skills for 21st-century employment."[88] But 21st-century skills are not easily defined. According to the OECD, these may be thought of as "soft skills" that are valued in the global labor market (see table 3.2).

Although it may be difficult to define 21st-century skills, it is even more challenging to know how to teach them in formal contexts and through structured learning processes, even in wealthy countries.[89] Schools typically focus on curricula and textbooks that are mandated by ministries of education, whereas the soft skills mentioned above are mostly fostered by professions, businesses, and in everyday social interaction. Thus, while teachers may be trained to teach academic skills that will be measured for further educational advancement, they are rarely prepared (or encouraged) to teach 21st-century skills.[90] The mismatch between the skills that are prioritized in formal schooling and those that are valuable in the labor market may have important consequences. For example, research on youth employment in sub-Saharan Africa has revealed persistent trends indicating that schools are not adequately preparing students for the labor force.[91] Overall, these findings reveal an increasingly tenuous connection between the knowledge and skills that are emphasized in traditional schools and the real-world economic requirements of the labor market.[92]

3.8 Learning in Changing Societies

Learning is not static. Learning contexts and needs represent a constantly shifting target that reflects a variety of social, political, economic and technological changes that make an impact on the individual learner as well as institutions (e.g., schools) that are designed for formal instruction. The simple fact that students arrive at school with widely varying backgrounds and resources for learning is a serious challenge for teachers as well as learners, and for education systems. These changes may put at risk those children who are most in need of catching up with their better-resourced peers. But change can also bring opportunity, such as increased access to mobile technologies and open educational resources. Overall, societal changes will require new ways of understanding learning and how to best promote appropriate solutions for the future.

Table 3.2. OECD's definition and selection of competencies

Category	Rationale	Needed Competencies
1. Using tools interactively	• Keep up-to-date with technologies • Adapt tools to own purposes • Conduct active dialogue with the world	• Use language, symbols, and texts interactively • Use knowledge and information interactively • Use technologies interactively
2. Interacting in heterogeneous group	• Deal with diversity in pluralistic societies • Importance or empathy • Importance of social capital	• Relate well to others • Cooperate, work in teams • Manage and resolve conflicts
3. Acting autonomously	• Realize one's identity and set goals in a complex world • Exercise rights and take responsibilities • Understand one's environment and how it functions	• Act within the bigger picture • Form and conduct life plans and personal projects • Defend and assert rights, interests, limits, and needs

Source: OECD 2005.

4. FIVE DOMAINS OF RESEARCH ON LEARNING

Much of what we know today about learning and the quality of education is focused on (1) a very limited representation of the contexts where learning takes place, (2) structured and teacher-directed learning processes, and (3) a restricted set of school-based skills. Relatively little research has been undertaken on learning in low-income and under-resourced environments.[93] Therefore, this paper calls for a much more robust research effort on learning focused on children living in poor communities, whether in or out of school.

Five priority domains for research were chosen to better explain how current knowledge can advance understanding of factors that facilitate improved learning outcomes for children in low-income countries. While recognizing that there are ongoing scholarly debates about such significant issues, an attempt is made to identify within these domains what is known about learning—from preprimary through postprimary school ages—in low-income countries based on current evidence.[94]

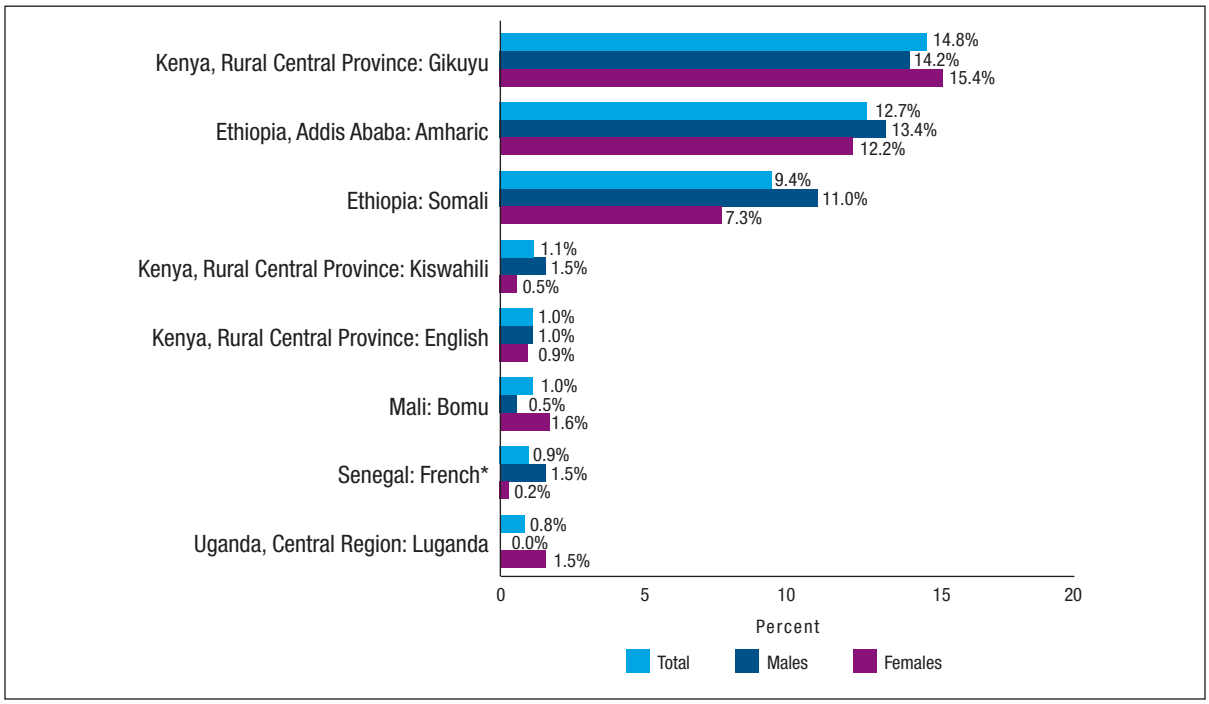
4.1 Literacy and Numeracy

Literacy and numeracy are universally desired outcomes of education, and are typically the focus of explicit, structured learning strategies and inputs in formal education. They also hold a central place in both the EFA and MDGs for 2015.[95] These skills typically emerge well before schooling begins, and continue to develop and adapt across the life span in a wide variety of informal and unstructured situations. Indeed, they begin in many learning contexts, manifested from early language interactions and childhood games to bargaining and daily shopping. In these contexts, children learn to discriminate sounds in their mother tongue, one of the reasons why phonological and orthographic awareness at an early age are essential foundations for beginning reading.[96]

At the same time, children around the world do not have equal opportunities to develop early literacy and numeracy skills. Ample research, especially from Western countries, has shown the importance of parents' storybook reading to children from the ages of three and four years, with children typically learning to recognize environmental print, beginning to rhyme words and play language games, and starting to scribble and write. These emergent literacy practices are common in "well-supported environments"[97] for learning that are typical before the start of formal schooling in high-income countries and among middle-class families in low-income countries.[98]

Substantial research has shown that primary-school-aged children in well-supported environments acquire five cognitive component skills that are essential for becoming a competent reader between the ages of 6 to 10 years: the alphabetic principle, phonemic awareness, oral reading fluency, vocabulary and comprehension.[99] By contrast, children in "poorly supported environments," especially in low-income countries, often lack one or more of these components—leading to serious problems in their learning to read.[100] Recent research in these contexts has shown that many primary school children in the early grades cannot even read a single word in their mother tongue (figure 1.3), nor read with comprehension (figure 4.1).[101] In addition, many children simply do not have enough *time on task* to learn basic skills.[102] One consequence of such low levels of literacy is that many of these children drop out of primary school or never make it to secondary school. The recognition of the low quality of reading achievement, even in school-going children, has been a major impetus for several current learning initiatives.[103]

Figure 4.1. Percentage of students reading with at least 80% comprehension in Grade 2, 2008–2010*



Source: Adapted from Gove & Cvelich, 2011, p. 14.)
* Senegal French assessed in grade 3.

In terms of numeracy (including basic arithmetic skills), the trajectory is not the same as in reading. During the preschool years, children universally seem to develop a counting-based understanding of number, which provides them with a powerful but limited tool for learning about addition and subtraction and developing a familiarity with larger numbers. Cross-cultural research has shown relatively little variation in children's developing mastery of the universal features of number.[104] With age, however, children's mathematical skills are increasingly mediated by language, symbol systems, and cultural tools that vary across cultures, and are therefore increasingly sensitive to the formal inputs from school instruction. In poorly supported environments (and especially without schooling), children often demonstrate limited mastery of mathematical competencies beyond everyday skills. Further, mathematics that is taught in schools in poor communities is often learned in a rote memory fashion that can work against the development of analytic skills (e.g., probabilities).[105]

In low-income countries, large numbers (even the majority) of the poorest populations may come to school not knowing the language of instruction (LOI) in the classroom. On the one hand, this inadequate learning context requires practical solutions that confront political realities—such as the need for proficiency in national and official languages, and an education system's ability to adapt to new languages and new literacy practices. On the other hand, there are the cognitive realities of how children learn to read—such as curricula that build upon the language(s) that a child already understands.

4.2 Information and Communications Technologies

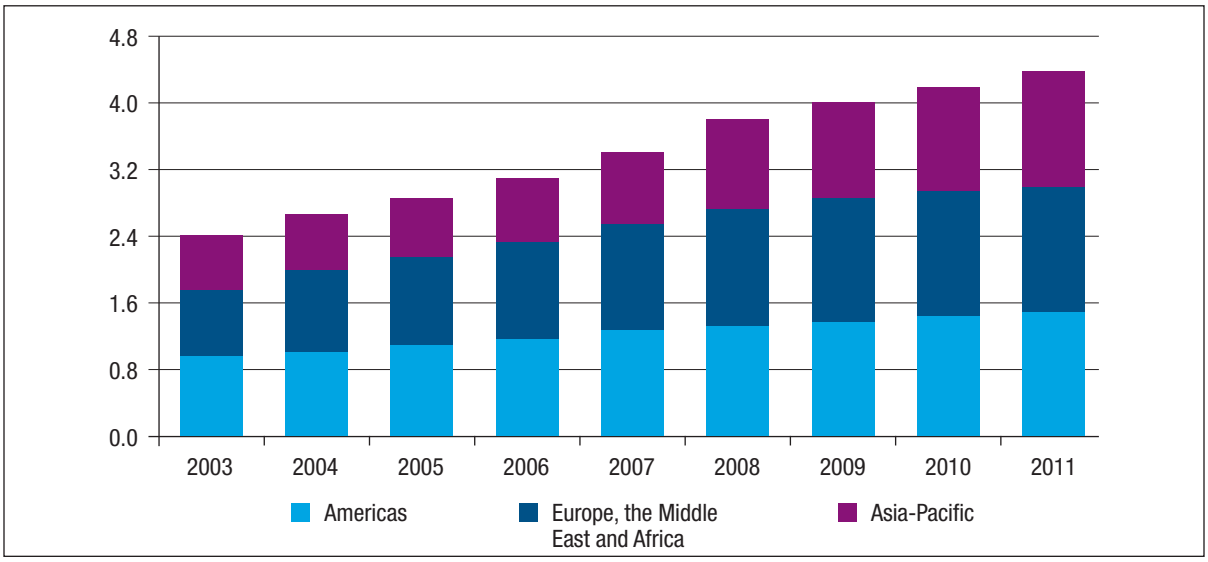
Information communication technologies (ICTs) include the Internet, mobiles used at home, informal ICT-based games and programs that provide support for learning science and mathematics in (and out of) the school. Increasingly, even in the world's poorest countries, interest in the use of ICTs for learning is growing dramatically. Indeed, there has been steep growth in spending on ICTs across the globe (see figure 4.2), and this growth will inevitably have a serious impact on the contexts and processes of learning.

Many of the current ICT-for-learning efforts, even if deemed to have been successful in terms of reaching the "end user," are not sufficiently focused on learning among diverse and marginalized populations in low-income countries.[106] It is variously estimated that less than 5 percent of ICT investments globally have been invested on poor and low-literate populations.[107] For example, the vast majority of software and Web content (mainly in major languages such as English, Chinese, Russian, French, Arabic and Spanish) is of little learning use to many millions of people due to limitations of language and literacy levels of the users.

What would more accessible ICT-based learning tools look like? First, it is clear that ICTs have been used in education for a much longer time than is usually thought, namely, going back to the days of distance education through radio, and including the intensive use of radio in basic education over the past several decades.[108] Of course, the revolution in new technologies—based on the rise of the personal computer, the Internet, mobile phones and other handheld devices—has captured both the imagination and funding for a variety of new efforts in ICT for learning. It is clear that user-friendly and multilingual ICT-based products are increasingly gaining the interest of the poor—with mobile phones being one key example (see figure 4.3).

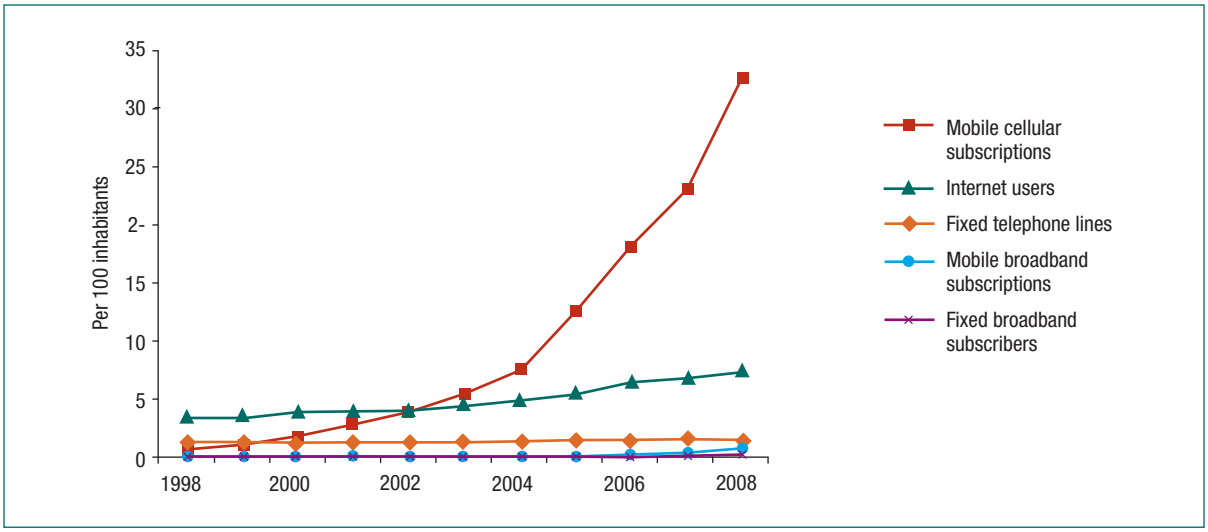
In the area of early reading, for example, one project in Kenya is using real-time information collection for EGRA assessments, through the use of new mobile

Figure 4.2. Global ICT spending by region, 2001-2011 (in U.S.$ trillions)



Source: Adapted from WITSA, 2008.

Figure 4.3. Growth of mobiles and ICT in Africa, 1998-2008



Source: Adapted from ITU, 2009, p. 1.

technologies; in South Africa, another project is using mobiles for informal mathematics learning.[109] Further, a project with a substantive evaluation component, developed multilingual software in India and South Africa to facilitate literacy learning in both primary schools and among youth in out-of-school programs, with the results showing dramatically enhanced engagement in learning.[110] More important, this latter project demonstrated the utility of developing software that corresponds to the interests of mother-tongue learners. At the international level (from OECD countries), recent surveys on the informal use (in home, for leisure, etc.) of ICTs found that there was a positive effect on science scores, but a second study showed potentially negative effects with the poorest learners.[111] While the evidence is currently mixed on the learning impact of ICTs generally, focused research with well-tailored implementation plans is beginning to show the broad power of ICTs on learning.[112]

There is also growing evidence that the way that ICTs are utilized is also changing the nature of learning processes. Observational studies indicate that young learners actively interact with Web sites, message boards, social media and so on; and when a choice is made available, they typically prefer social interaction on the Internet or mobile phones when compared with listening passively to an instructor or reading a textbook.[113] Others have found that reading skills themselves are affected in important ways by continuous interaction with Web-based literacy activities.[114] In other words, ICTs are changing the ways that learning takes place and what gets learned, not just standard learning outcomes.

It is fair to say that the dramatically increased interest in ICTs and learning has not as yet fostered a sufficient scientific research base.[115] Indeed, there has been a troubling tendency to overstate the predictions and findings on outcomes. Some of the best-known initiatives—such as One Laptop Per Child or the Hole in the Wall—have been found to be lacking in empirical research support.[116] To date, ICT-for-learning resembles other areas of educational reform—a fairly

long initial period of trial and error, followed by slow, incremental change as the research base develops. It is important to keep in mind that the rapid changes in ICTs over the past decade have made the evaluation dimension unusually difficult. Often, by the time an evaluation study is under way or completed, the ICT platform (phone, tablet, computer, or software) may have changed sufficiently for the study to no longer be of serious relevance.

There is little doubt that ICTs will increasingly be deployed for education in developing countries, but what does this mean for learning? First, it acknowledges the key difference between making computers, the Internet and handhelds *available* versus identifying strategies to achieve defined learning *outcomes* through the use of ICTs. Many initiatives have made hardware "solutions" available to schools but the lack of learner-appropriate content (and other problems) have led to little in the way of learning impact.[117] Second, it is important to distinguish between formal and nonformal learning contexts; much of the use of technology is outside school, and this will likely continue for some time to come. Third, there is growing evidence that the ways children and youth utilize new technologies is changing, with engagement and collaboration becoming a new hallmark of what are called 21st-century learning skills.[118] Given the large investments that are now flowing into the ICT for learning area, it is urgent to build a stronger evidence base.

4.3 Conflict and Emergency Situations

Conflict and emergency situations inevitably lead to the disruption of normalcy or lack of stability due to natural or human-made disasters and violence targeting schools and educators.[119] These events often result in interruptions or distortions in caregiving arrangements and the formal education of children. For children living in such situations, learning does not cease to occur; yet the *contexts* and *processes* of learning, as described earlier in this review, inevitably shift. In many cases, the shift is toward nonformal contexts—such as learning in informal settlements or refugee camps, at home, on the road to exile, or in impromptu classes. Informal learning processes often shift toward observation, peer learning, and intrafamilial and intracommunal interactions.

In cases where no formal education systems previously existed, the intervention of international organizations or NGOs may involve transitions to learning contexts and learning processes that were previously unfamiliar to the child—such as refugee education programs that create nonformal education classes for unschooled children. In such exceptional situations, established learning systems may be disrupted or removed, and new ones may be introduced. Each can cause discontinuous processes in learning for children.

In 2011, the UNHCR reported that 42 million people were forcibly displaced worldwide, approximately half of whom were children under the age of 18 years.[120] Yet these numbers only include a portion of the total children affected by conflict, fragility and emergency situations—it does not include the millions of children who are subject to broken learning systems due to natural disasters, climate change or economic crises.

It is clear that children do continue to learn in conflict and emergency situations. But, *what* children learn, or do not learn, is an area of utmost importance. On a global or regional scale, what children learn is critical for international peace and stability; at the individual level, learning has an impact on the child's future capacity to contribute to his or her community and gain meaningful employment.

Strategies for promoting children's learning in emergency and conflict situations—perhaps even more so than in "ordinary" situations—should be holistic in nature, and thus include health, nutrition, safety and protection services.[121] Research indicates that intense, frequent or prolonged experiences of stress during childhood—often due to exposure to violence, neglect, poverty or abuse—can have an impact on the neurological architecture of the brain, with long-term repercussions for the child's future health and cognitive development.[122] Various initiatives show promise when they are developed and facilitated by skilled practitioners, though the effects of these programs have yielded mixed results, particularly when they are not culturally appropriate.[123]

Learning processes can also be interrupted by a lack of nurturing, stable and consistent caregiving environment, yet this reality is often underappreciated in emergency education programs.[124] While the presence of a consistent caregiver may not always be found in situations of conflict and emergency, learning strategies should aim to strengthen and nurture relationships between the child or adolescent, peers and caregivers by building upon existing informal learning processes, and finding ways to transition children into the formal schooling system.

Current geopolitics and climate change suggest that conflict and emergency situations are unlikely to disappear in the foreseeable future.[125] Further, while important support programs exist to help children in extreme situations, very few of these have substantial evidence-based programs that consider learning outcomes.

4.4 Nonformal Education

Nonformal education programs, as noted above, are expanding rapidly. Part of this growth stems from a recognition of what should be counted as "nonformal" in education—such as ECD programs, technical and vocational education and training (TVET), and private tutoring (table 4.1).[126] The rapid rise in enrollment in ECD programs (public, private and faith-based) for young children indicates that many parents are showing an increased awareness of early learning for school success.[127] The broader expansion of NFE is also due to an increasing recognition that—in spite of the growth of universal enrollment in primary schooling—many children (the majority in the poorest countries) are not able to enter into secondary schooling.[128]

Table 4.1. Proportions of children age 3–16 years receiving private tutoring by income quintile, rural India (2007–2008) and rural Pakistan (2010)

Income Quintile	Proportion of Children Receiving Tutoring	Expenditure on Tutoring per Child (Indian/Pakistani rupees per month)
India		
1=poorest	18.1	68.9
2	20.0	70.4
3	21.1	72.8
4	25.2	75.5
5=richest	31.8	90.2
Pakistan		
1-poorest	5.5	287
2	9.6	233
3	14.0	241
4	19.9	292
5=richest	27.6	352

Source: Adapted from Bray and Lykens 2012, 15.

Research also has shown that instructional hours in school are often far less than those intended (and programmed) by the educational system. It is important to understand this and other shortcomings in formal

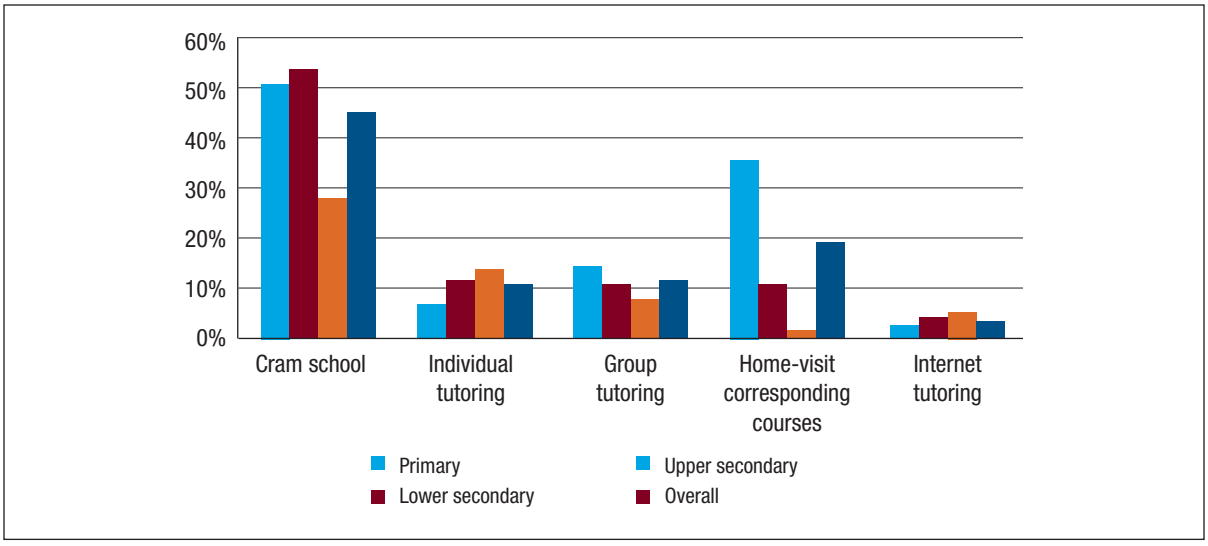
education provision in order to understand some of the drivers of nonformal education. In one recent study, it was found that there were huge losses in high-quality instructional time for children in rural Ethiopia, not just from loss of schooling hours (government schools were nonoperational for about 25 percent of the days of the school year) but also due to teachers being "off task" (i.e., not directly working with the pupils) more than half the time.[129] As a consequence, it is not surprising that this study found that more than one-third of pupils in 3rd grade could not read. In a parallel fashion, it was found that, despite national education policies, there is great variability in teachers' actual use of the mandated LOI in classrooms, resulting in highly significant differences in children's language mastery by region and by instructor.[130]

NFE programs play multiple roles vis-à-vis the formal education system: (1) *complementary* (enrichment beyond schooling), (2) *compensatory* (making up for missed learning experiences in school) and (3) as an *alternative* to schooling (multigrades and mobile classrooms).[131] They are also potentially more adaptive to the learning needs of the most disadvantaged children. In South Korea, for example, "shadow education" opportunities across the education spectrum have been found to be related to its growing competitiveness among the top nations on international educational assessments (figure 4.4).[132] With the rapid growth and diversity of NFE programs, there is a need to better understand how they fit into the broader set of learning opportunities for children and youth.

4.5 Learning Assessment

Assessment has been an integral part of education since the beginning of schools. Today, policymakers, school directors, teachers and parents all have a vested interest in how well children learn. In OECD countries, assessments are now widely used at the national and international levels to gauge comparative levels of learning. In low-income countries, a parallel movement is taking place: the practice of national learning assessments has grown steadily over time, such that usage has more than doubled over the past 15 years (see figures 4.5 and 4.6), while the participation in

Figure 4.4. Types of "shadow education" in Korea, 2010



Source: Bray & Lykens, 2012, p.31., published by UNESCO.

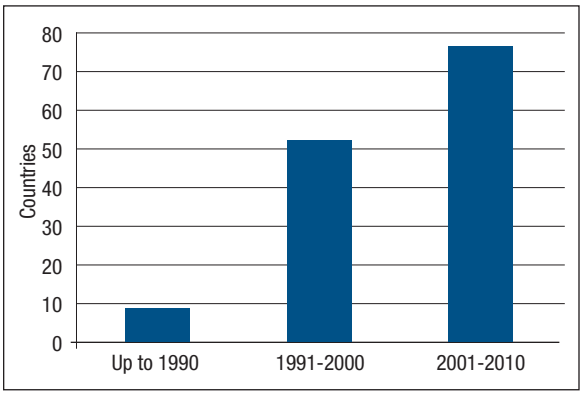
Figure 4.5. Growth in use of national assessments of learning (1995–2006)

Source: Adapted from Benavot & Tanner 2007, p. 6, published by UNESCO.

international assessments is also growing in recent years.[133] This rise in the use of assessments—and educational systems that depend on them[134]—poses both opportunities and challenges for low-income countries. Among the opportunities is the increased ability to make evidence-based judgments both within and across countries.[135] The challenges can be substantial as well, as all assessments include real costs in time and resources.[136]

Assessments have a variety of different purposes.[137] For example, there are small, sample-based studies, household surveys, large-scale educational assessments and national examinations (see figure 4.7), each with different goals and data outcomes. Such tools can serve to improve the quality of education, both as an outcome (summative) or ongoing (formative) assessment.[138] Small-scale (and small sample) hybrid assessments (e.g., EGRA) are designed for what has been called "smaller, quicker, cheaper" (SQC) assessments that can be used in more localized (e.g., local language) contexts, with relatively less concern for international comparability.[139]

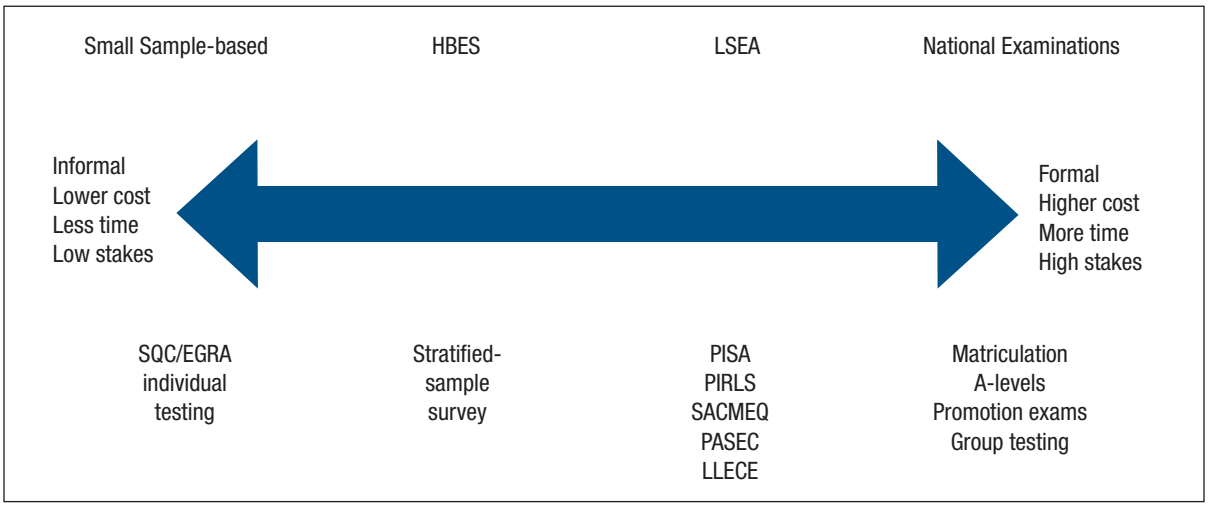
Figure 4.6. Developing countries in large-scale international assessments



Source: Adapted from Lockheed (2010), p. 513.

Learning assessments are used across the age spectrum, from early childhood through adulthood. Yet the most common form of assessment is used to follow

Figure 4.7. Assessment continuum*



Source: Adapted from Wagner, 2011a, p. 45, after Kanjee, 2009). [published by UNESCO]
* Ranging from SQC hybrid assessments to LSEA and National Examinations. HBES refers to Household Based Educational Surveys; LSEA to Large Scale Educational Assessments.

students from one schooling level to the next (in particular, primary to secondary school). These often take the form of high-stakes examinations where large numbers of students (especially from poor communities) are forced to exit from the school system.[140] Such high-stakes tests may also result in unintended consequences, such as "washback" effects—a narrowing of the curriculum as teachers prioritize content and activity formats that appear on the test.[141]

What kinds of assessments can assure that the poorest communities are supported, rather than defeated, by them? This is not an idle or idealistic question. From the beginning of modern public schooling in France, Alfred Binet (the famous testing expert) was asked to determine which students had an "aptitude" for learning, and which did not. Those who did not score above a certain cut-off point were excluded from schooling altogether. The tradition of assessment-for-exclusion "triage" must be turned on its head, such that inclusion is the goal and consequence. Assessments should be designed to assure the quality of educational systems, rather than to filter out students.

4.6 Emphasizing a Pro-Poor Approach

The research issues raised in the context of the domains discussed above illustrate the need for greater knowledge about a wide array of learning contexts and processes. They also suggest the importance of a *pro-poor* research approach—one designed to reach those most in need in the poorest communities.[142] In low-income countries, and especially marginalized communities and households in those countries, it must be recalled that the research available is often not the research that is required—due in large part to problems of generalization and boundary constraints.[143] In other words, it is simply no longer sufficient to extrapolate from a set of findings in a few locations in relatively wealthy countries to widely varying contexts and populations elsewhere in the world. Local research needs to play a greater role in the development of the next learning research agenda.

5. LEARNING: A PROPOSED RESEARCH AGENDA

This review takes as a given that research is essential for progress to be made toward achieving international goals for learning and education. But how to design a research agenda is neither an easy nor trivial task. In building a knowledge base in any field, one must think about the missing pieces of essential information. A three-way knowledge space has been suggested for such purposes: First, there are what have been called the "*known knowns*: the things we know we know"; second, the "*known unknowns*: the things we know that we do not know"; and third, the "*unknown unknowns*: the ones we don't know that we don't know."[144] It is useful to consider such distinctions when contemplating a research agenda on learning.

Clearly, there is a great deal known about learning (the *known knowns*), at least in some settings. It is also the case that much eludes our ability to conceptualize new challenges (the *unknown unknowns*). Still, there is a sufficient baseline of evidence for a set of *known unknowns* to be the focus of pursuing new research directions.

5.1 Elements for Creating a Learning Research Agenda

Nine core elements, described below, follow from the notion of *known unknowns* (or research gaps) that are needed in order to improve learning for children in poor communities in low-income countries. Based on the present review, these elements represent a set of component parts for a deeper and broader research initiative that is sensitive to local actors and contexts:[145]

a. *Learning transitions.* Learning is a continuous process across the life span, from birth onward. Yet schooling is discontinuous, with important breaks between home and multiple levels and varieties of schooling. Given the changes that every child undergoes across these learning transitions, more needs to be known about how, and to what degree, knowledge and skills are transferred.[146]

b. *Formal inputs.* The acquisition of cognitive skills, such as reading, does not "just happen." Children without adequate inputs of language, training, books and other materials typically will not learn to read. Structured learning experiences are critical, along with sufficient time on task to learn and task-appropriate materials. Greater attention is needed on how to optimize, in local contexts, the structure and sequencing of such inputs.[147]

c. *Informal inputs.* Much learning takes place informally and in unstructured ways, whether between parents (and relatives) and children, with peers, on computer screens and so forth. Not only are these inputs (and interactions) essential parts of child development, but they also represent a larger set of contexts for learning. Further, such informal inputs provide new opportunities to both reinforce and complement (and possibly contradict) what is taught in formally structured learning contexts.[148]

d. *Local contexts and local learning.* When resources are limited, there is a natural tendency to push for simpler "one-size-fits-all" solutions. Simplicity has its merits, especially in terms of making policies and programs understandable to a broader public. The downside is that "mismatches" (between skill samples and population samples) are likely to be the result. Thus, much more needs to be known about how local adaptations between processes and contexts can maximize learning impact.[149]

e. *Gender and ethnolinguistic diversity.* Over the past two decades, girls in low-income countries have made dramatic gains in school enrollment, participation and achievement. However,

girls and boys from minority ethnolinguistic groups have not fared nearly as well. On the matter of mother-tongue reading, however, there has been a growth in attention and research, especially with the use of EGRA reading assessments. A major challenge in the coming years will be how to use assessment evidence to better tailor first- and second-language approaches to reading for children at different ages in different contexts.[150]

f. *Globalization and changing economies*. Globalization and economic changes have led to increased migration, more heterogeneous classrooms, and greater use of new ICTs. Learning must be understood in these changing contexts, even as such transformations accelerate the demand for new forms and contents of learning. Research on learning must also adapt, for example, by making greater investments in understanding nonformal education, technical and vocational training, and online learning and open educational resources.[151]

g. *Assessment*. Research on learning will inevitably involve assessments of one kind or another to determine which approaches to learning make the most sense, and how much is actually learned—whether locally or on a larger scale. Matching the type of assessment to particular policy purposes will remain a major challenge. There is also the question of what kinds of assessments can assure that the poorest communities are supported by assessments, rather than defeated by them. The use of learning assessments will continue to grow, but what skills and behaviors should be assessed? As the post-2015 MDG plans take shape, the challenge of balancing global norms with local ones will be a major research challenge.[152]

h. *Stakeholder roles.* Stakeholders come in many varieties—from families and community-based organizations to teachers, school principals and regional school inspectors, to ministers of education, industry and multilateral agencies. Each have vested interests in child and youth learning, but they may not (and often do not) share the same set of priorities. Research needs to consider these different perspectives, and to provide evidence that can satisfy potentially diverse sets of interests.[153]

i. *Cost and cost-benefit*. Information on the costs and benefits of educational innovation and change in low-income countries is seriously lacking. A major challenge is how to justify the "worth" of additional investments in research and innovation, and to deliver results in a timely way. Impact evaluations can help, as rigorous specification of resources may be part of the research design. In an economic climate of limited resources, cost and cost-benefit questions, and that of the costs of scaling up, will require substantial new research attention.[154]

5.2 Priorities for a Learning Research Agenda

To prescribe a research agenda on any topic is hazardous—in part because the state of play in research changes constantly, but also due to the diverse interests of multiple stakeholders, including the research community itself. Nonetheless, based on the present review, it is possible to suggest a number of priority areas for future research, particularly with regard to reaching current and future international educational goals.

Below we list a set of research priorities that, taken together, constitute an initial research agenda on learning. The priorities should be seen as opportunities to fill gaps in the current knowledge base in order to reach those in need as well as to attain international educational goals.[155]

a. *Near-term research priorities:*

   i. *Enhancing readiness for schooling*. Learning outcomes are more likely to fall below

desired levels among children whose home environments are not well equipped to promote optimal language development, socioemotional support, early literacy and numeracy, and motivation to attend and learn in school. Research would employ interventions capable of determining factors that would prepare young children for successful transitions from home to school and assess education trajectories across time. Interventions might include improving parental (adult) literacy, parenting education, provision of literacy/mathematics learning materials with guided participation and varieties of ECD programs.[156]

ii. *Language of instruction and reading in early grades.* Young children from poor households and marginalized communities are often in classes where they have minimal mastery of the language of instruction in the classroom. As noted above, there are increasing numbers of classrooms where multiple mother tongues are spoken in a single classroom, and where the teacher has limited competence in one or more of these languages. Research is needed to examine the costs, benefits, practical feasibility, and long-term learning and literacy outcomes of language education approaches in different contexts. One important ongoing constraint in comparing bilingual education models is that instruction in either a child's mother tongue (L1) or the second language (L2) may be provided with quite varying degrees of teacher and curricular competence; and research comparisons must be studied under conditions of scale, something rarely done.[157]

iii. *Instructional practices for reading and mathematics.* A new generation of assessments has shown that children's reading and mathematics levels in low-income countries are much lower than previously thought.[158] One of the limitations of such assessments is that they do not necessarily give solid guidance for improved pedagogy. Also, research is needed on the ways that teachers instruct children in reading and mathematics, and how much time is required for skill acquisition.[159] Longitudinal studies would provide an improved understanding of children's reading and mathematics skills, and the role that teacher quality plays in producing improved outcomes.

iv. *ICTs and learning.* Many claims are made about the impact of ICTs on learning, but relatively few have received adequate research attention. This is of particular concern due to the significant attention and investments currently being made in this area. Research is needed both on types of platforms (mobile phones, smart phones, computers, tablets) as well as in stand-alone and interactive (Internet-based) modalities. Further, studies are needed to consider learning content software that is appropriate (including language-appropriate) for poor children at differing ages.[160] Finally, there is a need to better understand the role of the increased use of digital technology in children's learning of basic skills for school success.

v. *Nonacademic skills and learning.* In conflict, postconflict and emergency situations, there are survival and social skills that children need to develop that differ in many ways from school-based basic skills; yet research on the former is fragmented or nonexistent. A further gap is in the foundational knowledge about linkages that may connect basic and nonacademic skills. Both qualitative and quantitative research is needed on the various ways that basic skills (e.g., reading) interact with nonacademic coping skills (e.g., negotiation and problem solving). Further, in postconflict situations, we need to understand how to accelerate learning for children and youth who may have missed out on multiple years of schooling, and what kinds of psychosocial supports are necessary.[161]

vi. *Early childhood development (ECD) program participation and parental motivation*. Research is needed on why parents do (and do not) enroll children in ECD programs; what parents' expectations are from ECD programs; and how parents define early learning and school success. Results would have substantial implications for informing the design, curriculum and settings for ECD programs and also for increasing young children's participation in low-income countries. Research is also needed to understand the transfer from pre-reading to reading skills during the ECD to primary schooling transition.

vii. *Nonformal "bridge" programs*. In spite of substantial progress in improving primary school enrollment, there is a major risk of students dropping out—particularly among girls—toward the end of primary schooling. This problem of educational "wastage" is particularly severe in the poorest parts of low-income countries, and among ethnolinguistic minority groups. Research is needed to better understand how some countries have developed "bridge" programs that help school dropouts (or stopouts) to return into school, and in what ways learning can be accelerated so that basic skill acquisition enables the child to catch up with their peers.[162]

viii. *International goals that support local learning needs*. It is difficult to achieve a consensus on international indicators of learning outcomes that are relevant to poor populations in low-income countries. Even with the likely advent of new international learning goals, research will be needed to understand whether goals (and indicators) will advance learning in local settings. Research is needed to provide operational definitions to any new learning goals, to link them to assessment measures that can be utilized over time, and that will support children's learning in and out of school.

b. *Medium-term research priorities:*

i. *Improving teacher ICT competency for learning*. For nearly two decades, investments have been made to improve the "technological literacy" of teachers, whether in OECD or developing countries.[163] What is much less clear is how these investments may have affected learning achievement. More needs to be known about teachers' skills and methods of ICT deployment in the classroom, especially in low-income countries where technical support and infrastructure may be quite limited. Further, teachers may be able to take advantage of emerging learner-centered and content-rich ICT-based multimedia resources.[164] Videotaping of classroom teaching using specific types of ICTs would be an important step.[165] Findings would be central to future teacher professional development programs in low-income countries.

ii. *Inclusive curricula and peace education on learning in postconflict zones*. In postconflict situations, numerous peace education and peace-building curriculum models are led by NGOs in low-income countries. The majority of these efforts have been insufficiently evaluated for learning impact. Research would focus on developing a typology for curricular interventions, and then using rigorous techniques to determine how effective these approaches are for learning outcomes.

iii. *Family support for learning in conflict situations*. In conflict situations, poor nutrition and sanitation, trauma and stress, linguistic and cultural marginalization, exposure to violence, and parental depression are all factors than can affect children's learning. Having parents and consistent caregivers create a supportive environment for the promotion of children's learning is crucial, while research on other critical factors to promote learning is sorely needed. Both qualitative methods and quasi-experimental designs

would be helpful to better understand the factors that can improve learning.

iv. *Learning consequences of technical and vocational education and training.* TVET is designed to offer job-focused skills in specific contexts. In high-income countries, TVET typically assumes that basic literacy and numeracy skills have been adequately acquired. In low-income countries, such an assumption is problematic and, in many cases, is unlikely to be met. Research is needed on the ways that TVET supports workplace and higher-order skills in low-income countries. In particular, evidence is needed on: basic skills competencies of TVET students; the impact of low basic skills on TVET learning; how TVET curricula and pedagogy supports (or fails to support) higher-order skills; and on the relative importance of general work readiness skills as compared with particular technical skills.

v. *Measuring the impact of assessment practices on learning*. Teacher assessment practices in classrooms are known to affect learning outcomes (e.g., in high stakes tests).[166] However, relatively little is known about the impact of increased assessment practices among children from poor and marginalized backgrounds. Interviews and observational methods would focus on selected schools in diverse contexts, and findings would be related to testing outcomes over a specified number of years.

vi. *Teacher competency and classroom-based assessments*. Formative classroom-based assessments seem to have the strongest short-term impact on improved learning outcomes.[167] Additional research is needed to determine teachers' current understanding, attitudes and practices of assessment; and what kinds of professional development or preservice training will enhance teachers' abilities to use assessments to improve their students' learning. More needs to be known about how to introduce formative assessments into the classroom, while taking into account resource and capacity constraints in low-income settings.

c. *Crosscutting research priorities:*

i. *Accountability at the community level.* Over the past decade, accountability in education increasingly refers to how communities can hold national and local officials more responsible for the delivery of learning to children. Examples from Pratham in India and Uwezo in Africa have shown how evidence gathered can put pressure on the effectiveness of educational delivery by governments.[168] Local stakeholders are increasingly interested in children's learning and school outcomes, and so may offer powerful leverage on the ground if they can provide and apply research evidence to influence policy. Further research is needed on both the methods of data collection by NGOs as well as on best mobilization techniques.

ii. *Transparency of learning evidence.* There are many consumers of information about learning (especially school-based learning). For example, most parents are interested in knowing for their own children the most likely outcomes of school attendance. What will the child learn, in what language, and with what results (certificate and/or to which next school)? What types of evidence do these parents have available? How could parental views change with the input of further evidence?[169] Further research in this important area might include the production of "consumer reports" for schools that are specifically designed to answer the kinds of questions that parents (and children and communities) might have about the value of schooling. Impact studies should be undertaken to understand the consequences of such interventions. Similar work on other

types of data transparency, designed for various consumers, would be desirable.

iii. *Cognitive and noncognitive variables in learning achievement*. Much of the work on predicting school achievement—in both OECD and low-income countries—has focused on the use of cognitive tests (e.g., early reading and math) and seeing how results on such measures at one age or grade affects later scores or school participation. Increasingly, however, there has been a growth of interest in noncognitive assessments, such as in the child's persistence, ability to delay gratification and curiosity.[170] Such factors may be relevant as well to low-income countries even if the terms and concepts may vary. Clearly, every child develops attitudes in relation to education and learning. Research on how to define and measure such noncognitive variables is still in its beginning stages, and would be of considerable value.

iv. *Role of incentives*. Incentives to learn seem, from a cognitive perspective, peculiar. Much of the research on learning suggests (as noted above), that humans begin learning instinctually at birth, and constantly thereafter. While true overall, what is to be learned becomes a matter of choice or opportunity, and that is where incentives play an important role. Most societies assume an inherent incentive to learn in school that is based on the normally positive consequences of more schooling. Yet, as noted in the noncognitive discussion above, children (and their parents) may vary significantly in attitudes toward schooling, and thus the learning that is supposed to take place in schools. In conditional cash transfers research, for example, much has been made of the effectiveness of payments to families for the attendance of their children in school.[171] Still, there are many ways to consider the roles that incentives can play in learning and more in-depth research among poor populations is warranted.

v. *Cross-sectoral collaborations for learning*. Learning is most often thought of as an education sector activity. However, as noted above, learning takes place in all of life's domains, and is certainly not bound by school walls. One clear implication is that many youth who have left their formal education may be involved in both structured and informal learning in other sectors, such as health and agriculture. These two large and significant sectors require trained and knowledgeable workers, yet relatively little research has been undertaken on how learning (say, literacy and numeracy) affects productivity in the two sectors.[172] Conversely, even less is known about how these occupations (perhaps undertaken as youth apprenticeships) impact learning. Learning research at the intersection of these and other sectors offers a substantive and important terrain for further research.

5.3 Key Focal Points as Targets for Research

The three stories of Illa, Pawan and Rachida recounted earlier in this paper were not selected by chance.[173] They represent three challenging, age-related focal points of the current learning crisis: early childhood, primary school age, and postprimary learning. As represented here, these examples also track key populations in low-income countries—groups that will need to be studied and supported in the coming years. Along with the core elements for research, and the proposed priorities for research, the stories provide an additional way to think about the development of a research agenda for improving learning. Thus, Annex B provides a more in-depth sketch for research in these three specific areas. There remains, however, the important question of *how* new research directions will be implemented, a topic addressed in the following section.

6. CONCLUSIONS: LEARNING TO MAKE A DIFFERENCE

Learning, like life, is complex. Learning is not only *what* we do every day in our lives; it is also central to what we do as productive human beings personally and at work. Improving learning, then, is among the most important activities in which people, policymakers and governments should invest.

Also, whether in business, technology, health or education, research is the backbone for much that is innovative and productive in the world today. Five to 10 percent of revenues of the top private sector firms are spent on R&D. Thus, if an assumption is made that about $2 billion will be needed in the next three to five years in low-income countries to improve learning from preprimary through postprimary education,[174] then the estimated R&D cost would lead to about $100 million to $200 million for research over this same period—let us say $100 million, to be conservative.[175] Nonetheless, to make a difference, and especially to put *learning first*, will require serious consideration of such a research investment.

6.1 How Should You Spend $100 Million on Learning Research?

There are many constraints (and complaints) on spending for research, even in wealthy countries. Justification for conducting research in poor countries can be more challenging. Some obvious questions arise. For example, in the realm of scientific evidence there is always the question of how much evidence is enough. If research shows that X leads to Y in rural India, can one assume that the same relationship will happen in Guatemala or Uganda? Second, how does one know (ever) if the research will have a payoff worth the investment? Third, if the first two points are addressed positively, how would such a research effort be implemented? Here, we turn to these and related questions regarding any proposed research agenda:

a. *Is there a different way of thinking about learning research in low-income countries?* Several types of responses are possible. First, pro-poor initiatives must be able to defend the notion that improving the learning of *all* people is a critical and worthwhile endeavor. Second, research priorities for learning need to take seriously how increasing diversity transforms learners, contexts and learning outcomes. Third, researchers and policymakers will need to accept improved disaggregation of populations and contexts, instead of thinking in generalized terms at the national or international levels.

b. *Are these learning research efforts worth the investment?* In the present review, and summarized in section 5, a set of nine core elements and 19 research priorities were set forth. These priorities ranged from studying better instructional practices for reading, and the use of new technologies for learning, to the learning consequences of TVET and cross-sectoral research collaborations. Each of these proposed areas is worth more time, energy and financing if one accepts the basic argument of this review. In addition, reviews of other learning domains would no doubt lead to additional areas for further work. The point is not to come up with a perfect list but rather to support a set of priorities that have a clear basis for being at or near the top of need-to-know issues in learning.

c. *How might a research program on learning be implemented?* Scientific research in most

fields is typically undertaken by institutions of higher education. Yet in the field of education and development, much of the current learning research is applied research of the "decision-driven" variety, undertaken mainly by international NGOs.[176] While useful and important, much of this work is subject to relatively tight fiscal constraints that focus most resources on delivery of services (rather than research).[177] At present, relatively few universities are substantially engaged in learning research in low-income countries. If substantial funding were provided to support R&D in learning, the time would be right to draw in universities (and university-based researchers)—from both OECD and low-income countries, in partnerships, along with NGOs—not only to build requisite expertise but also to assure scientific engagement over the long term. The training of graduate students and other specialists in relevant fields is a key component of what needs to be accomplished in an increase of research on learning.

d. *Are there serious impediments in carrying out such a learning research agenda?* Of the numerous impediments to such an agenda, three seem most plausible:

   - *Conceptual failure.* Research involves a clearly defined problem, agreement on the hypotheses to test, and a proper design of the study. Failure to provide these elements will put any R&D initiative at serious risk.

   - *Human resources limitations.* Individuals and institutions need a multiplicity of capabilities to carry out complex research. In-depth, well-maintained and multiyear collaborations between local and international researchers are essential in order to engage top researchers and research institutions, and to enable the kind of longitudinal studies required to answer some of the key research topics described above.

   - *Lack of follow-through and transparency.* The results of many international applied research projects do not see the light of day due to limitations in the funding and follow-through from implementation agencies. In addition, the transparency of data sets and methods of data collection is critical both for research credibility and for capacity building.

e. *Is learning research worth $100 million?* In today's world, nearly $2.5 trillion is spent annually on public education, with an estimated $25 billion spent annually in low-income countries.[178] Over a three-year period, the $100 million (about $30 million per year) research investment relative to total public education costs of low-income countries would be about 0.1 percent. Carefully managed and targeted, these funds could help resolve critical education issues. Such funding could also revolutionize interest in making innovation work in low-income countries. Further, it would create important opportunities for multi-institutional partnerships as well as the training of a new generation of research specialists.

6.2 Putting Learning First

The broad imperative to improve learning for all children is one of the great challenges of the 21st century. The stakes are high. Substantial investments in education will undoubtedly be made over the coming years. Will they be used effectively to help the most disadvantaged? The answer may well be determined, at least in part, by a *learning first* research agenda. Learning that matters, that is tailored to children's needs and to the contexts where they grow up, and that can be understood by stakeholders at the local level, is the learning that needs renewed attention and a robust research effort. Putting learning first is one of the most important ways to address human development, education and global poverty.

ANNEX A: BOUNDARY CONSTRAINTS: METHODOLOGICAL CONSIDERATIONS FOR CROSS-CULTURAL RESEARCH ON LEARNING

There is a large and diverse empirical research base in the area of human learning. However, much of the available research is substantially limited by *boundary constraints* of various kinds. Most prominent among these constraints is the limited ability to generalize from findings in one population context to other distinct population contexts. Similarly, research methods may vary greatly between one set of studies and another, making it difficult to discern whether the findings vary due to the methods or to other factors. These are, of course, classic problems in the social sciences, but they must be seen as part of the challenges in understanding and applying research evidence on global learning to poor populations that are seldom studied.

A.1 Skills and Population Sampling

As noted above, learning is so ubiquitous and so varied that its presence, like some nuclear particles, can only be measured with complex instruments that provide an accurate estimation of attributes while simultaneously detecting changes over time. In education, these instruments are learning assessments. As with any assessment, research takes time and money. Further, if the assessment needs to be representative of an entire population of a country, and for multiple countries in a comparative framework, then time and money will likely expand significantly. Up to the present, time and cost have been controlled by delimiting the range of *skills* that would be assessed (the *skills sample*), and by constraining the *population* that would be included (the *population sample*). These two forms of sampling need to be understood in terms of technical and statistical requirements, as well as policy requirements and outputs.

It is widely accepted that humans learn by sampling their environment, beginning with built-in senses from birth onward. Clearly, no infant, child or adult could possibly survive by taking in the totality of information available in the environment. In other words, human systems are designed to discriminate in order to sample for information that will be effective in handling learning challenges. Indeed, parenting and socialization that effectively prepares a young child to adapt, learn and survive involves exposing the child to the range of situations they will encounter in their lives. Not all these learning environments may be positive, but exposure to them will be important. When it comes to scientific research in general, and learning research in particular, humans also sample their informational environment, whether in educational institutions or via word of mouth or, increasingly, via Internet search engines, such as Google. The relevance of this relatively simple observation should not be underestimated, since one of the most vexing problems in learning research and evaluation is how to generalize from one sample population to another, or, just as important, from one research study to another.

All research on learning depends on the sampling of a finite set of skills, and knowledge of the contextual situations in which they occur. Skills sampling can be done in the traditional paper-and-pencil fashion, increasingly through online methods (e.g., the Program for the International Assessment of Adult Competencies by the OECD), or orally between the child and a testing enumerator (as in EGRA). In designing learning research and evaluation strategies, the choice of contextual and demographic variables (e.g., age, year of schooling, gender, SES), the selection of skills to be assessed, and the type of research methodology are highly complex decisions. Each option is tied to a set of assumptions and compromises, and the selections included in the final research design will

influence the validity, reliability and practical feasibility of the chosen approach.[179] Furthermore, research designs need to be responsive to dynamic changes over time, and as expectations of literacy, numeracy and higher-order skills adapt to changes in social and economic environments, the measurement methods must also adapt to align with evolving educational goals.

Population sampling also matters. For example, roughly 95 percent of the world population today resides outside the United States, while nearly 95 percent of scientific publications on psychological development are based on American population samples.[180] Other studies have shown that, in the U.S., research on psychological development is about 80 percent on "majority" ethnic groups (European origin), though these groups account for only about 50 percent of the current U.S. population.[181] These are not unique occurrences. Global research on learning parallels the findings above, since much of the research reviewed here is constrained in important ways by scientific data sets and research studies drawn from population samples living mainly within middle- to high-income countries.

The area of population exclusions is more problematic. Gender has been a leading factor in school nonparticipation in low-income countries, although significant progress has been made in recent decades. Nonetheless, in the poorest countries, girls continue to be less present in school than boys, both at the point of primary and postprimary school entry. The systematic exclusion of girls in poor low-income countries usually results in lower participation in schooling among adolescent girls, along with depressed scores on national assessments relative to boys.[182] Similar trends show differences in national assessments when comparing rural and urban areas in low-income countries. In some low-income countries, the difficulty of literally tracking down nomadic children can make their inclusion onerous to authorities.[183]

Language variation across ethnic groups exists in nearly all countries. Many of these groups—sometimes termed ethnolinguistic minorities—are well integrated into a national mix (such as Switzerland) but at other times may contribute to civil strife. Often, social and political forces try to help resolve differences, usually including policy decisions that result in a hierarchy of acceptable languages to be used in schools and governance structures. In such situations, whether in OECD countries or low-income countries, it is not unusual for children who speak minority languages to be excluded from learning research and assessments. This may be particularly accentuated in regions where civil conflict or economic distress leads to substantial cross-border migration, where immigrant groups (and their children) are treated as transients, and where children are provided with little or no schooling. As noted above, differences by language, and increasing multilingualism, are among the most challenging aspects for improving learning in schools.

In sum, both skills and population samples vary, as do the learning processes (structured and informal) that individuals deploy and the contexts (formal and nonformal) in which they take place.[184]

A.2 Methodological Credibility

Research that can be converted into policy depends on its credibility—which means that well-trained scientists and experts can achieve a consensus on the merits of a particular set of findings, even if they might disagree with the interpretation of such findings. The two most often-cited components of learning science are validity and reliability.

The validity of any learning measurement tool or test is determined by the degree to which skills can be credibly linked to the conceptual rationale for the test. For example, do questions on a multiple-choice test really relate to a child's ability to read, or to the ability to remember what he or she has read earlier? Validity can vary significantly by context and by population, since a test that might be valid in London may have little validity in Lahore. A reading test used effectively for one language group of mother-tongue speakers may be quite inappropriate for children who are second-language speakers of the same language. With respect to international large-scale educational assessments, there have been a number of critiques of content validity around the choice and appropriateness of test items, given their application to local cultures and school systems.[185] While much learning research takes the form of quantitative testing, qualitative and ethnographic methods can also contribute, particularly with respect to cultural variation. Indeed, a number of the research studies proposed above would seem to require qualitative approaches given the uncertainty about learning processes in diverse contexts and the need to observe transitions between contexts.

Reliability is often measured in two quantitative ways. Generically, reliability refers to the degree to which an individual's results on a test are consistently related to additional times that the individual takes the same (or equivalent) test. High reliability usually means that the rank ordering of individuals taking a given test would, on a second occasion, produces a very similar rank ordering. A second, and easier, way to measure reliability is in terms of the internal function of the test items—do the items in each part of an assessment have a strong association with one another?[186] Of course, reliability implies little about the validity of the instrument, wherein agreement must be reached concerning the relevance of the instrument for educational outcomes. When seen in a qualitative perspective, reliability would be achieved when context-sensitive ethnographers, for example, agree on a set of observations of learning processes that they have independently gathered in a particular context.[187]

Considering that learning occurs in nonformal areas as well as formal ones, learning research cannot be limited to the sophisticated psychometric methods developed for formal learning sites, such as schools. Similarly, highly structured learning processes (guided by teachers) may be relatively easy to observe and monitor in the classroom, while informal (less-structured) learning may be more difficult to determine and to measure.[188]

A.3 Comparability of Learning Outcomes across Contexts

Comparability is central to global education data collection, such as the large-scale data collection carried out by the UNESCO Institute for Statistics (UIS). Nonetheless, if comparability is the primary goal, less attention is paid to the local and cultural validity of the definitions and classifications of learning, and therefore the data may become less meaningful and potentially less applicable at the ground level. This is a natural and essential tension between universalistic *etic* and context-sensitive *emic* approaches to measurement, and it is particularly relevant to marginalized populations.[189]

Can both comparability and context sensitivity be appropriately balanced in learning research? Should countries with low average scores be tested on the same scales with countries that have much higher average scores? If there are countries (or groups of students) at the "floor" of a scale, some would say that the solution is to drop the scale to a lower level of

difficulty. Others might say that the scale itself is flawed, and that there are different types of skills that could be better assessed, especially if the variables are evidently caused by race, ethnicity, language and related variables that lead one to question the test as much as the group that is tested. Yet having different scales for different groups (or nations) seems to some to be an unacceptable compromise of overall standards.

To the extent that comparability can be achieved (and no learning assessment claims perfect comparability), the results allow policymakers to consider their own national (or regional) situation relative to others. This seems to have most merit when there are proximal (as opposed to distal) choices to make. For example, if a neighboring country in Africa has adopted a particular bilingual education program that appears to work better in primary school, and if the African minister believes that the case is similar enough to his or her own national situation, then comparing the results of, say, primary school reading outcomes makes good sense. A more distal comparison might be to observe that a certain kind of bilingual education program in Canada seems to be effective, but there may be more doubt about its application in a quite different context in Africa. But proximity is not always the most pertinent feature; there are many cases (e.g., the United States and Japan) where rivalries between educational outcomes and economic systems have been a matter of serious discussion and debate over the years.[190]

The key issue here is the degree to which it is necessary to have full comparability in learning outcomes, with all individuals and all groups on the same measurement scale. Or if a choice is made to not "force" the compromises needed for a single unified scale, what are the gains and losses in terms of comparability? Can international goals (and statistics) be maintained as stable and reliable if localized approaches are chosen over international comparability?[191] The way this question has been answered has led to situations where some low-income countries, while tempted to participate in international learning assessments, nevertheless hesitate due to the appearance of very low results, or the feeling that the expense of participation is not worth the value added to decisionmaking at the national level.[192]

In the end, global research on learning requires some form of comparability, but not necessarily in identical ways. For example, international and regional assessments are aimed specifically at cross-national comparability, while hybrid assessments are more focused on local contexts and increased validity. Hybrids offer some kinds of comparability that large-scale assessments do not, such as among marginalized populations or younger children. Which types of comparability are most important depends on the policy goals desired, as well as timing and cost considerations. As in comparative education more generally, cultural context will determine whether and when research findings are deemed credible.[193]

A.4 Evidence Uptake: Who Is This Research For?

Policymakers, ministers of education, community leaders in rural villages, teachers, parents and education specialists should be held to account for what and how children learn. Until today, educational specialists and statisticians in most countries (and especially in low-income countries) have been the primary "guardians" of learning processes and their importance for school and economic success. This restricted access to knowledge about learning is due, at least in part, to the complexities of the science of learning. But it is also due to insufficient knowledge—and at times

erroneous beliefs—among both parents and children about the importance (or lack of importance) of learning and schooling for life's chances.[194]

Today, it is more important than ever before to involve multiple stakeholders in education decision-making and in learning. Public interest in children's learning and school achievement has grown in many countries due in part to globalization, but also to the influence of international agencies, efforts of NGOs, greater community activism and parental interest. Some of the recent Pratham and EGRA field studies have involved strong community engagement that has led to significant government take-up of empirical findings.[195]

This type of multilevel information exchange is another way of speaking about accountability and expectation. Whose problem is it if a child, teacher, school, district or nation is not performing at a given level of learning? Indeed, how are such expectations even built? Whose expectations should be taken into account? Knowledge about the importance of learning—and how it can be achieved in formal and non-formal settings, and in structured and informal ways —has the potential of breaking new ground in policy development, community and family participation, and local ownership.

A.5 Choosing a Research Approach

Research can take many forms and can have multiple approaches. This is not just a matter of methodological choice (e.g., quantitative vs. qualitative) or disciplinary training (e.g., economics vs. anthropology), though these two dimensions often get the most attention. Rather, in trying to address how research can improve learning, it is also important to understand three broad (and sometimes overlapping) approaches that continue to channel researchers' efforts, each of which has been utilized extensively in the study of education and development:[196]

- *Knowledge-driven research.* This approach is most commonly seen in doctoral dissertations, where the researcher usually follows in the footsteps of previous scientists, in order to elaborate on a particular theory, hypothesis or knowledge unit. Hence, knowledge-driven research is of the sort that is found in many scientific journals that seek to build up the knowledge base around particular topics. A good example from the present review is the role of phonics in reading, where much of the research has been undertaken in OECD countries and in laboratories that explore the psychometrics of reading skill acquisition.

- *Decision-driven research.* Many implementation projects in development set aside some funds (or find external funding) for "what works" research. Thus, a project such as a preschool intervention program would seek to know, for example, whether the program itself was implemented properly (classrooms available, teachers and children present, etc.), and whether, say, learning outcomes tracked the instructional inputs provided (e.g., a national language use in the classroom).

- *Context-driven research.* In holistic culture-specific work, researchers (especially ethnographers) focus on the special characteristics of particular contexts. The goal is to understand the unique relationships between factors that occur in particular cultural context, rather than the sampling of common elements that might occur between contexts or ethnographic settings. A good example of this approach would be the in-depth understanding of the three stories reviewed (in Peru, India, and Morocco). Each of these is a unique case, and unique within the country setting—to draw crosscutting learning parameters across these settings would likely limit credible conclusions.

A.6. Multimethod Approaches and Boundary Constraints

A multidisciplinary and multimethod approach to improving learning in low-income countries and marginalized communities is not *scientifically* more difficult than similar research done in wealthier communities. However, given where most of the scientific (human and fiscal) resources are located, it can be much less convenient for those with the advanced training needed to do the work. That fact, among others, is why so much remains to be known about learning in low-income countries. Multiple methodologies will need be brought into play, and debated. Limits (or boundary constraints) will be invoked as to why generalizations can, or cannot, be made.

ANNEX B: RESEARCH PROPOSAL SKETCHES BASED ON THREE LEARNING STORIES

Three composite stories—in Peru, India and Morocco—were presented in order to call attention to critical learning issues during early preschool, primary and postprimary years.[197] In order to bring these key stories into clearer focus, we provide below a research proposal "sketch" for each.[198] The central learning questions are elaborated, along with a strategy for research engagement that would enhance our understanding of how to improve learning. Naturally, there are many possible research approaches within each setting. These sketches should be taken as hypothetical only, as instantiations of both research questions and possible research designs.

B.1 Illa in Peru: Early Childhood Learning in Multilingual Marginalized Communities

Story synopsis. Illa is a Quechua-speaking four-year-old, living on the outskirts of mountainous Cuzco, Peru. Illa is bright and expressive, having developed strong oral competencies in Quechua through interaction with her parents and extended family. As yet she knows only the limited Spanish that she has overheard when her parents take her to the marketplace to sell the blue potatoes from their steeply positioned plot of land.

Research questions. Illa's story is familiar to those who are aware of the millions of minority-language children in poor families across the world today. To achieve her learning goals, the upward pathways available to Illa are limited. With family help, she might gain access to a bilingual preschool program in the Cuzco region, where she would have access to Spanish as a second language. Still, the question remains as to how effective this preschool program will be in helping her to achieve literacy in Spanish and Quechua, and transition to further education opportunities.[199]

Research design. There have been numerous studies on the effectiveness of preschool programs, ranging from cost-effectiveness work to the use of bilingual programs to the type of language inputs (see section 4.4). This study would initially utilize ethnographic and survey methods (using local informants) to investigate whether children like Illa would be put into bilingual preschools, and if not, why this would be the case. The main focus of the research would center on the Quechua (L1) and other skills that Illa brings to the preschool, and the Spanish (L2) and other skills that she will learn in the preschool. This two- to three-year longitudinal study would build on a growing number of studies that have studied learning and transfer of language, reading and other skills in the age period between four and seven years in multilingual settings.

B.2 Pawan in India: Primary School Children Learning through ICTs

Story synopsis. Pawan is eight years old and growing up in a middle-class, well-educated family in Mumbai, India. Each night his mother and father take turns reading to him in Hindi, as they have done nearly every night since he was two years old. Pawan goes to his uncle's home nearby to "play computer" in the later afternoon. Though only in second grade, he is well on his way to becoming a part of the upwardly mobile and literate society of India.

Research questions. The use of mobile technologies in low-income countries like India has seen exponential growth. Research is needed to better understand the design of strategies for connecting in-school and out-of-school learning. In the case of India, and of

children like Pawan, it is already evident that they will be users of ICTs in general, and mobile devices in particular, throughout their years in primary school. This study would first investigate current usage of mobile devices and the use of social media. A second focus would be in the use of off-the-shelf self-tutoring software on mobiles that is beginning to grow in India, to better understand effectiveness with respect to ordinary school instruction.

Research design. Initially, this study would gather information on the changing nature of the use of mobiles (handsets, as well as smart phones and tablets). Further research would allow a contrast between mobile use in urban and rural areas of India (Mumbai vs. surrounding areas). In the second year, researchers would introduce a controlled intervention study that would compare samples of primary school children's use of mobiles, and a focused intervention of mobile-based educational content in an RCT design. Results would provide a new window on the role that mobiles play in promoting learning both in and out of school.

B.3 Rachida in Morocco: Youth Learning in Nonformal Education

Story synopsis. In rural Morocco, and 18 years of age, Rachida is engaged to be married to a local carpenter. Her native language is Amazigh (Berber), though she went to the local *kuttab* (Islamic school) for two years and learned how to recite Quranic verses, and to read and write rudimentary Arabic. She also learned spoken dialectal Arabic from daily interactions with neighbors.

Research questions. There are many regions of the world where youth (and girls in particular) have received little or no education, especially if they are from ethnolinguistic minority groups, as is Rachida. One question that needs serious attention is how NFE programs can provide services that will enable young women to learn work-related skills that can help her support a growing family. In Rachida's region of Morocco, NGOs have begun programs that foster literacy in Arabic that build on her command of Amazigh and dialectal Arabic. Questions of relevance to Morocco would include the following: What are the near-term consequences of women's literacy programs on work opportunities? What are the affects of a neoliterate woman on the home life and socialization of young children in low-literate societies? What are the consequences of Rachida learning to be literate in Arabic as a young adult, when much of her home life will be conducted in Amazigh?

Research design. A three-year study is proposed that would focus on young women like Rachida in rural areas of Morocco where NFE programs are currently under way. Pre- and post-testing would take place to assess the impact of the NGOs' literacy program on individual skills. Surveys would be used, on an individual basis, to collect information on attitudes toward literacy, toward further employment, and toward the education and language socialization of children (even for those, like Rachida) who do not yet have a family. Participants in these NFE programs would then be tracked for at least 24 months (during and after completion of their literacy program) to evaluate both the economic and social effects of the program.

ANNEX C: Abbreviations Used

CBO	community-based organization
ECD	early childhood development
EFA	Education for All
EGRA	Early Grade Reading Assessment
GMR	Global Monitoring Report (UNESCO)
ICT	information and communications technology
L1, L2	first language (mother tongue), second language
LOI	language of instruction
LSEA	Large-Scale Educational Assessment
MDGs	Millennium Development Goals
NFE	nonformal education
NGO	nongovernmental organization
OECD	Organization for Economic Cooperation and Development
PISA	Program for International Student Assessment
R&D	research and development
RCT	randomized control trials
SQC	small, quicker, cheaper (approaches to assessment)
TIMSS	Trends in International Mathematics and Science Study
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UIS	UNESCO Institute for Statistics
USAID	U.S. Agency for International Development

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ENDNOTES

1. The core elements in this section are substantially abbreviated in the executive summary. See the full text for further details.
2. The research priorities in this section are substantially abbreviated in the executive summary. See the full text for further details.
3. The Global Partnership for Education campaign goal is for $2.5 billion for education over the next three years: www.globalpartnership.org.
4. See http://www.globaleducationfirst.org.
5. The six goals of Dakar EFA Framework for Action were early childhood care; compulsory primary school; ensuring learning needs for all; adult literacy; gender disparities; and quality of measurement of learning outcomes (UNESCO 2004, 28).
6. United Nations (2000). For a recent policy review of the institutional agency roles in defining and selecting skills as part of EFA, MDGs and the Global Monitoring Reports, see King (2011).
7. For a definition and list of low-income countries, see the World Bank, http://data.worldbank.org/about/country-classifications/country-and-lending-groups#Low_income.
8. Greaney, Khandker and Alam (1999).
9. Gove and Cvelich (2010). Figure 1.3 shows reading levels at end of second grade or later, while other research (e.g. Greaney, Khandker and Alam 1999) shows very low reading skills even at the end of primary schooling (see below). Figure 1.4 shows the failure of students to "survive" in school up to grade 9, indicating (at least) a cumulative lack of learning of school-required skills.
10. Brookings' Center for Universal Education (2011, 6). A recent World Bank education strategy paper also supports a major emphasis on learning (World Bank, 2011).
11. Boruch and Rui (2008).
12. This is research and development as a percentage of revenue. See http://www.booz.com/media/file/sb61_10408-R.pdf. A much smaller fraction is spent by national ministries of education in low-income countries.
13. Wagner (2011b). See also the work of LAMP by UNESCO, which has been trying to improve data collection on literacy rates (UIS 2009).
14. These five domains resulted from a selection process that involved a variety of stakeholders that helped to create the Brookings Global Compact on Learning Research Task Force (see the acknowledgments for more detail). Each of the domains resulted in a separate paper that informed the section 4 of this review.
15. For a discussion of Johann Friedrich Herbart (1776–1841) and the origins of learning theory, see the historical overview of behaviorism, gestalt and cognitive psychology given by de Corte (2010). By contrast, economists tend to view learning as a phenomenon reflected in an individual's rational choices, which change in response to a product's perceived value, increases or decreases in the market price or availability of alternatives.
16. Kuhl (2010).
17. Considerable cross-cultural research has shown that there are both universal and cultural specificities in human memory, from childhood to adulthood (Wagner and Paris 1981).
18. On constructivism and socioconstructivism, see Vygotsky (1978), Brown, Collins and Duguid (1989) and De Corte (2010, 41).
19. Thanks to L. Crouch for helping to clarify this distinction.
20. These principles were summarized by Vosniadou (2001), based on a comprehensive review of prior research, and adapted here. Additional principles she included are also relevant: relating new information to prior knowledge; being strategic;

engaging in self-regulation; helping students learn to transfer; taking time to practice; understanding developmental and individual differences; and creating motivated learners.

21. On PISA, see OECD (2006); on EGRA, see Gove and Wetterberg (2011).

22. For further broad reviews, see Bransford, Brown and Cocking (2000) and Dumont, Istance and Benavides (2010).

23. One might ask what the difference is between an "opportunity" and a "context" for learning. The distinction we draw here is that the former is often perceived as something where learning *would happen* if only the child were given a chance (e.g., if textbooks were available, or a teacher is present in a classroom). Opportunity to learn (e.g., DeStefano and Elaheebocus 2009) is often made as a link to a desirable policy goal (there should be more textbooks; there should be a teacher). Abadzi (2009) has described the importance of instructional time loss in poor communities. In other words, opportunity can be operationally defined based on empirical outcomes. By contrast, we define *context* as one of the myriad places or settings where learning may or may not occur, with no preordained sense that learning will take place if only certain structured elements are in place. See Benavot (2012) for a recent review on test outcomes and policy development in developing countries.

24. On learning contexts, Schneider and Stern (2010, 84) state that "good learning environments: stimulate learners to be mentally active; address prior knowledge; integrate fragmented pieces of knowledge into hierarchical knowledge structures; balance concepts, skills and meta-cognitive competence; provide expedient structures in the environment that help learners to develop well-organised knowledge structures; and present information adequately for efficient processing in the human mind given its inherent limitations for processing."

25. United Nations (2009)

26. Wagner (2011a) terms this a "well-supported environment."

27. See Vygotsky (1978) and Rogoff and Lave (1984) on scaffolded learning. This type of intimate learning engagement is what specialists term the optimal learning process for children.

28. See Sayed, Kanjee and Rao (2012).

29. It is important to note that not all NFEs would fit neatly into area B. E.g., BRAC schools (in Bangladesh) or the Escuela Nueva model schools (in Colombia) are designed to include more informal, unstructured learning processes, yet may also receive state support in terms of regulation, oversight and certification (characteristics of area C).

30. Bray and Lykins (2012).

31. Oketch (2007).

32. "*Informal learning* takes place in homes, playgrounds, museums, among peers and in other settings where a designed and planned educational agenda is not authoritatively sustained over time" (Bransford, Brown and Cocking 2000, 216), cited by de Corte (2010); italics in the original.

33. DeStefano and Elaheebocus (2009); Britto, Oketch and Weisner (2012).

34. Foehr (2006).

35. Topping (2005).

36. Bransford, Brown and Cocking (2000) call this *implicit* learning, where "information is acquired effortlessly and sometimes without someone being aware of having acquired it"; cited by de Corte (2010).

37. With the advent of new early reading measures (Wagner 2011a), there is beginning to be a growth of work around the home determinants of reading, much of this focused on what has been called "literate environments," building on early work

by Hess and Halloway (1984), Wagner (1993), and more recently field studies in Malawi, Ethiopia and Nepal (Dowd 2011).

38. Western-trained education specialists have often studied within a universalistic methodology in psychology and linguistics, epitomized by such major thinkers as Piaget and Chomsky. This has led to a tendency to view research findings as representative of larger truths. It is argued here that such tendencies must be to some extent resisted, especially when the focus is on population samples that vary from the social science norm. More discussion on this issue is provided in Annex A.

39. See Bronfenbrenner (1979); his "ecological model" was developed principally for American specialists, but the basic concept of nested layers of actors is one that can be fully understood by the international specialists.

40. In the larger learning literature, especially beginning in the work of Vygotsky, there is reference to collaborative learning, group learning and so on. In this review, the focus is on individual learning. Thanks to A. Benavot for his view on this matter.

41. Probably the best-known and most researched area of synergy is between ECD programs and primary schooling.

42. Ferreiro and Teberosky (1982); Sulzby and Teale (1991). Ball, Paris, and Govinda (2012). Additionally, as noted further below, there are increasing technological inputs ranging from Sesame Street television to tablet-based games.

43. Failure happens to nearly half the minority students in large urban systems in the United States; Losen (2008, 1).

44. See the classic work on "cultural capital" by the sociologist Bourdieu (1986). As noted elsewhere, many parents in low-income settings are highly motivated to send their children to school, and they do so. What is less well understood is the responses of parents to the poor performance and high dropout rates that result from children that do not succeed well in their studies.

45. Carnoy (1999); Arnove and Torres (1999). Thanks to A. Benavot for pointing out that there also misaligned curricular contents, for marginalized groups and minorities, that are age inappropriate, in the wrong language, and so forth.

46. This is one of the critiques made of accountability studies that utilize randomized controlled trials (RCTs) to assess the impact of a single (or small set of) variables(s) to measure outcomes. The multivariate nature of education, for example, means that both proximal and distal variables may be at work, making simple RCT-based studies more difficult to interpret.

47. E.g., see Babson (2010) and Chick (2002) on the changes in language attitudes in South Africa. There is also growing evidence in numerous countries on the role of English as a second language, even in rural areas where its use may be of little value.

48. UNESCO (2010).

49. See LeVine et al. (2011).

50. See Wagner (2011a); and Annex A.

51. In terms of improving research design, disaggregation in poor communities would, at the very least, try to provide a more nuanced breakdown of local variables, rather than those coming from a Western source. Thus, as in the example of "literacy" and "illiteracy," one would want to know what kind(s) of literacy, and what levels of skill, and (ideally) how such skills are used. Further, thanks to M. Jukes who suggested several other examples: (1) The way that adults and children interact differently around the world—what implications for effective pedagogy and learner-centered approaches? (2) How is information passed

on in the community, and how does this affect pedagogical approaches, such as oral language culture (how do you incorporate the strengths of this in the classroom rather than trying to replace it?). (3) How do you respect different levels of autonomy of young adults around the world?. (4) How do you build on natural cooperativeness among children in different parts of the world? Admittedly, a breakdown of variables that is overly nuanced can entail substantially more effort, and can lead to conceptual confusion. The point here is that conceptual bias and simplicity, when based on nonlocalized norms, will inevitably lead to less valid estimates of learning and its correlates.

52. Friedman (2005); Warschauer (2004).
53. Department of Economic and Social Affairs, United Nations, official statistics, http://esa.un.org/migration/p2k0data.asp.
54. UNDP (2009); International Organization for Migration (2010); Skeldon (2012).
55. Yoshikawa and Kalil (2011); Suárez-Orozco, Rhodes and Milburn (2009).
56. For general discussion, see Warschauer (2004).
57. As A. Benavot (personal communication) points out, there are also family migrants (from the same community or an extended family) who return to their homelands and convey ideas and images of foreign cultures; they may also do so through email or over the phone, or through other means. These sources of informal learning may be especially valued, in part because of the migrant's ability to bridge or "translate" aspects of different cultures.
58. Ahmed and Arends-Kuenning (2006).
59. Hanushek (1995); Michaelowa (2001); UNESCO (2005).
60. UNESCO (2011).
61. UNESCO (2009).
62. Benbow et al. (2007); Hattie (2005); O'Sullivan (2006). Recent work in the U.S. found little major effect of class size (see Bill & Melinda Gates Foundation 2010), but it must be kept in mind (as per section 4 below) that generalization from culture-specific datasets is always problematic.
63. Finn and Achilles (1999); Angrist and Lavy (1999); Smith and Glass (1979).
64. Banks (1993); Banks and Banks (2009).
65. Smits, Huisman and Kruijff (2008).
66. Ladson-Billings (1995); Osborne (1996).
67. Britto, Oketch and Weisner (2012); Hélot and Laoire (2011); Hornberger (2003). In section 2, this was termed "meaningful engagement."
68. Ball (2010); Benson (2004); Gove and Cvelich (2010).
69. Research in the Philippines showed that children taught through their home language scored higher in both mathematics and English than comparison classes who were taught through the media of English and Filipino (Walter and Dekker 2008, 2011), while a separate study found that grade 1 children taught science in a familiar language made fewer content errors overall, and transferred their knowledge to perform on par with English-instructed peers when tested in English (while students instructed in English performed more poorly overall and were not able to transfer knowledge when tested on the concepts in a familiar language) (de Guzman 2005). For further studies, see Heugh (2006) and Walter and Dekker (2011).
70. Britto, Oketch and Weisner (2012).
71. Anderson-Levitt (2003); Dachyshyn and Kirova (2008); Johnson and Welsh (2000); Moll (1990); UNESCO (2003, 14).
72. UNESCO (2006, 93–95).
73. Mangione and Speth (1998). For a broad discus-

sion of African childhood transitions, see Nsamenang and Tchombe (2011).

74. Ball, Paris, and Govinda (2012).

75. Relatively few examples point to effective strategies used to foster students' learning in large-size classrooms, and such examples typically are situated within highly structured, homogenous learning contexts and facilitated by highly trained instructors. For example, Stigler et al. (1982) found that large class sizes in Taiwan and Japan had little impact on the quality of learning. Also see Sahlberg (2011) on the Finnish example.

76. UNESCO (2005, 52).

77. Chaudhury et al. (2006).

78. Akiba, LeTendre, and Scribner (2007, 380). See also the work of SACMEQ/IIEP, where assessments found that many teachers in Africa had fewer skills than they needed in order to effectively teach their own curriculum (UNESCO-IIEP 2010).

79. Akiba, LeTendre, and Scribner (2007); Barber and Mourshed (2007); Heyneman and Loxley (1983); Rivkin, Hanushek and Kain (2005).

80. Jourdan et al. (2008).

81. Hargreaves (1994).

82. Darling-Hammond (1996); Ball, Paris, and Govinda (2012).

83. Henderson and Birla (1994); Forget-Dubois et al. (2009); Ball, Paris, and Govinda (2012).

84. Maynard and Tovote (2010); Nsamenang (2011).

85. See LeVine et al. (2011) for a discussion of the effect of maternal literacy on health outcomes.

86. Wagner (2010a). See also the work of Save the Children in their Literacy Boost program (Dowd 2011).

87. Levy and Murnane (2007).

88. Dobbs et al. (2012, 69).

89. There is an overlap between the current drive for *21st-century skills*, oriented specifically toward the workplace, and the education domain of *higher-order skills*, that is, one based on taxonomies of cognitive tasks (from low-complexity tasks of simple comprehension to higher-complexity tasks of application and critique). See Bloom et al. (1956); Pellegrino and Hilton (2012). Also, higher-order skills encompass meta-cognition, interpersonal abilities (self-regulation, motivation) and intrapersonal skills (cross-cultural communication, teamwork). See Ball, Paris, and Govinda (2012); Marzano (2001). In an OECD adult survey currently under way, one skill is defined as "the ability to use technology to solve problems and accomplish complex tasks, . . . [including] the cognitive skills required in the information age—an age in which the accessibility of boundless information has made it essential for us to be able to work out what information we need, to evaluate it critically and to use it to solve problems." OECD is currently conducting the Program for the International Assessment of Adult Competencies, which comprises 26 countries, none of which are developing ones; see http://www.oecd.org/. Finally, language skills, too, are part of the communications repertoire needed in global economies and a tool for higher-order teamwork and collaboration. Always a sign of social status in wealthy countries, multilingual competencies have become a key to economic advancement in developing countries. A recent survey in India found that being bilingual in English (vs. not speaking English) resulted in an increased hourly wage of 34 percent for men, and being even partially bilingual resulted in a 13 percent increase (Azam et al. 2010, reported by Wang 2012).

90. In a recent World Bank report, Wang (2012, 23) states that "PISA claims that it assesses students' skills and competencies to fully participate in and contribute to a successful modern society. TIMMS, on the other hand, measures students' achieve-

ments in mathematics and science in school. Yet neither of these assessments assesses important skills that are critical to success in the contemporary global economy—namely, communication, leadership, and teamwork."

91. In 8 of the 13 countries studied, the average duration of the school-to-work transition was five years or longer, "suggesting young people in these countries are faced with substantial labour market entry problems upon leaving the school system." Guarcello et al. (2007, 29).

92. There is little question that OECD countries, with their rapidly growing service and information economies, are moving toward soft 21st-century skills, and away from rote learning and memorization skills that has characterized traditional schooling systems worldwide. Rote learning and memorization have often been anecdotally blamed for the poor quality of schooling in poor countries. Reviews of this issue are given by Wagner (1983, 1993). Whether this change is accomplished through learning in schools or through informal learning in everyday home and work activities will be answered in the coming years. Pellegrino and Hilton (2012, 5) state that educational attainment in the United States is crucial for such skills, and further note that "development of the full range of 21st century competencies within the disciplines will require systematic instruction and sustained practice. It will be necessary to devote additional instructional time and resources to advance these sophisticated disciplinary learning goals over what is common in current practice." The question of how, when, or whether (especially when basic skills levels remain unmet) such 21st century skills should be prioritized in schools in low-income countries remains another challenge for further research.

93. Some have estimated that this represents less than 5 percent of research on the psychology of learning. See Annex A and Arnett (2008).

94. As noted above, the brief reviews in section 4 are based in part on more substantive and in-depth reviews in the RTFL domain-specific papers; see the acknowledgments and further citations in the notes below.

95. Learning outcomes are more explicit in the EFA goals than in the MDGs.

96. Ball, Paris, and Govinda (2012); Adams (1990).

97. See Wagner (2011a, 71–72). "Well-supported environments" are those where children typically grow up in educated families, go to good schools with experienced teachers, and have a variety of text (and computer-based) materials in their homes. "Poorly-supported environments" are those where children typically have parents with little or no education, have few literacy resources available, have teachers who do not know much about teaching reading, or speak a language at home that is different from that taught in school.

98. Ball, Paris, and Govinda (2012).

99. Snow, Burns, and Griffin (1998); National Reading Panel (2000). Of course, there are also variations on the extent to which each of these component skills come into play, that may vary by (among other things) orthography and spelling-sound correspondences. See Gove and Wetterberg (2011); and Wagner (2011a).

100. Wagner (2011a); see the note above. Also, recent research is increasingly drawing attention to the home learning environment, such as "reading habits in the home," as being critical factors in support of reading acquisition in low-income countries (Dowd 2012).

101. See the work on EGRA described by Gove and Wetterberg (2011); Gove and Cvelich (2011); and Piper and Korda (2009).

102. In one recent study in Kenya, Piper and Mugenda (2012, 4) report from an observational study that 2nd-grade children in their project were only able

to see printed material for about 3.6 minutes per day, on average.

103. See CUE *Global Compact on Learning*, the United Nations' *Education First*, and USAID's *All Children Reading* initiatives, respectively, at http://www.brookings.edu/events/2011/06/15-education-compact; http://www.unesco.org/new/en/education/resources/education-first/; http://www.allchildrenreading.org.

104. On universals, see Gelman and Gallistel (1978); Ginsburg, Klein and Starkey (1998); and Baroody and Dowker (2003). Also see some cultural variations in the work of Miller et al. (1995).

105. See Wagner (1983), on rote memorization and learning. For work on Early Grade Mathematics Assessment (EGMA), see Rubens and Crouch (2009) and RTI/USAID (2012); also see https://www.eddataglobal.org/documents/index.cfm?fuseaction=showdir&ruid=5&statusID=3. When compared with reading, mathematics nonetheless accounts for nearly 20 percent of weekly time in grades 1 through 5, according to Benavot (2008).

106. According to Hinostroza et al. (2012), government ICT policies often tend to use a "one-size-fits-all" strategy that limits attention to diversity.

107. Wagner and Kozma (2005).

108. See Hinostroza, Isaacs and Bougroum (2012) on interactive radio instruction.

109. See Pouezevara and Strigel (2011) on Kenya; and Nokia's project on mathematics and mobiles in South Africa, www.momath.org. Neither has as yet been substantially evaluated, however.

110. See Wagner, Daswani and Karnati (2010) for the Bridges to the Future Initiative project in Andhra Pradesh, India. Actual learning gains were only marginally significant due to the very limited nature of the intervention's time on task for learners.

111. The PISA results are from Spiezia (2010); the second study, also conducted on OECD data, is by Pedro (2011).

112. Clark and Mayer (2011).

113. See Hinostroza, Isaacs and Bougroum (2012) for an overview. See also Tolani-Brown, McCormac and Zimmermann (2009); and Wagner, Day and Sun (2004).

114. Leu et al. (2009).

115. In an oft-cited, but now somewhat outdated, review on ICTs and education in American schools, Cuban (2003) found that the impact of information technologies on educational improvement was overrated.

116. Cristia et al. (2012); DeBoer (2009); Hinostroza, Isaacs and Bougroum (2012); Nugroho and Lonsdale (2010).

117. See the earlier discussion of OLPC.

118. See section 3.

119. Carrol et al. (2012).

120. UNHCR (2011). Further, the average time of displacement is very long—about 17 years.

121. See Burde (2012) for a recent analysis of effects in conflict situations.

122. Shonkoff (2010); Shonkoff, Boyce and McEwen (2009).

123. See Carrol et al. (2012).

124. Brazelton and Greenspan (2001).

125. See Kaplan (1994) for an early, and prescient, review of the impact of ethnicity and climate change on possible conflict situations.

126. Britto, Oketch and Weisner (2012). See also Bray and Lykens (2012); in table 4.1, even among the poorest populations in India and Pakistan, private tutoring is increasingly common.

127. Britto, Oketch and Weisner (2012). Up until fairly recently, ECD programs have been viewed in many low-income countries as a program for wealthy families, because there has been little subvention by government sources. This may be changing with greater public awareness of the role that ECD programs play in healthy child development (Engle et al. 2007). Given the relatively high cost of private ECD programs (relative to low-cost public schools), it may be useful to prioritize poor communities to receive ECD to help in, e.g., early reading.

128. See Muskin (1997) for a study on informal learning in Côte d'Ivoire.

129. DeStefano and Elaheebocus (2009, 13) also report that "students who reported having missed school the previous week had reading fluency rates half those of the students who said they had not missed school. . . . By itself, student self-reported attendance explains 35 percent of the variation in a schools average reading fluency." See also Benavot and Gad (2004) on a range of developing countries.

130. See Ball, Paris, and Govinda (2012); also, Muthwii (2004), in Kenya and Uganda; and Commeyras and Inyega (2007) in Kenya.

131. Britto, Oketch and Weisner (2012); Engle et al. (2007). As noted in the previous section on post-conflict situations, compensatory approaches could also consider research on accelerated learning programs in schools.

132. Bray and Lykens (2012).

133. International large-scale assessments are defined by Lockheed (2012) as including international large-scale assessments that meet the above three criteria are regularly carried out by the International Association for the Evaluation of Education Achievement (e.g., PIRLS), the OECD (e.g., PISA), the Laboratoria Latinoamericano de Evaluacion de la Calidad de la Education or LLECE (e.g., TERCE) and the Southern and Eastern Africa Consortium for Monitoring Education Quality, or SACMEQ.

134. See Sayed, Kanjee and Rao (2012) for a discussion of assessment and educational systems. See also Kamens and McNeely (2010).

135. Chromy (2002); Greaney and Kellaghan (2008).

136. Broadly speaking, the costs include (1) opportunity costs (what could be accomplished if a particular assessment was not done); (2) human resources (including training of highly skilled staff); and (3) actual budget costs ("total cost of assessments"). On the third type, see Wolff (2007).

137. Sayed, Kanjee and Rao (2012). See Wagner (2011a) for a review of assessment use, particularly in developing countries.

138. Sayed, Kanjee and Rao (2012); Black et al. (2004); Wiliam 2011.

139. Wagner (2010b); Wagner, Babson and Murphy (2011) argue that international assessments, for low-income countries, may not be worth the relatively high costs, and relatively long time delay, when compared with SQC type assessments (e.g., in Pratham's work in India; see Annex A).

140. Sayed, Kanjee and Rao (2012, 10).

141. Ying (2010); Koretz (2008).

142. For a recent review on "pro-poor" international research, see Harttgen, Klasen and Misselhorn (2010), who used demographic and health surveys in 37 developing countries to analyze inequality and poverty. In the area of pro-poor approaches to ICTs and education, see Wagner (2009).

143. See Annex A for further discussion of the limitations on generalizing from data collected in quite different contexts, as well as what are termed "boundary constraints" on the ability to extrapolate findings to other societies.

144. Rumsfeld (2012, 1).

145. It would be interesting to prioritize these core elements, and perhaps map them across different countries or contexts. We have not sought to do so, but thank A. Benavot for suggesting this as an interesting topic for future work.

146. See sections 3.3, 4.1 and 4.4.

147. See section 4.1.

148. See sections 3.6, 4.2 and 4.4.

149. See sections 3.4 and A.1.

150. See sections 3.2, 4.1 and 4.5.

151. See sections 3, 3.7, 4.2 and 4.4.

152. See sections A.2, A.3 and 4.5.

153. See sections 2.5 and A.4.

154. See sections 3.4, 4.1 and 4.5, A.1. Researchers—and those that fund research—often talk about research projects as if the discrete use of scientific techniques will naturally lead to their extension or scaling up to many contexts. This has sometimes happened, such as with preschool intervention programs or microloans. For the most part, however, it is not easy to apply research findings in one setting, and find that the results can be applied more generally—even if that is the precise goal of the initial research. Thus, the issue of how and when to scale up should be, whenever possible, part of the original research design.

155. Most of the research ideas are derived and adapted from the domains in section 4.

156. Recent work has emphasized the importance of more timely (quicker) data gathering so that ECD programs can be optimized quickly enough to make a difference while children are still in ECD programs (Wagner 2011a).

157. Thanks to L. Crouch for pointing out the instructional/curricular competence and scale issues. New research has begun to appear based on EGRA and EGRA-related tools for assessing and supporting L1 and L2 reading acquisition in various countries, including Vietnam, Bangladesh, Thailand and India (see Pinnock 2011). Also see initiative as part of the initiative *All Children Reading*; http://www.allchildrenreading.org.

158. See earlier discussion of EGRA, EGMA (Gove and Wetterberg 2011) and SQC assessments (Wagner 2011a), as well as the work of Pratham and Uwezo.

159. Some recent evidence suggests that reading instruction is quite limited in poor schools in Kenya (Piper and Mugenda 2012).

160. The notion of a 10 percent set aside for R&D in this area has already been proposed in an Infodev/World Bank publication; see Wagner (2005).

161. Thanks to L. Crouch for the idea on accelerated learning, and C. Beggs on the importance of psychosocial support.

162. As in India's "bridge" program in Andhra Pradesh state; see Wagner, Daswani and Karnati (2010). With the advent of quicker assessment methods (e.g., EGRA), research is required to better explain how remediation can return more children to school. In addition to remediation, parallel research could use similar assessment methods to better identify children at risk of dropping out (essentially "risk-reduction programs"), which are prevalent in OECD countries but much less so in low-income countries. Low-cost assessments designed for low-income countries now make detection and prevention much more possible.

163. For an overview, see Wagner and Kozma (2005); and Hinostroza, Isaacs and Bougroum (2012).

164. See Wagner, Daswani and Karnati (2010) on multilingual resources for teaching and instruction in India (and more recently in South Africa).

165. See Stigler et al. (1999), on a video-based, cross-national analysis of pedagogical styles in TIMSS. This research engaged teachers from multiple countries to assess teacher performance from their own and other countries on pedagogical

competencies. The present proposal would be to expand this technique to ICT for learning contexts.

166. Sayed, Kanjee and Rao (2012, 10).

167. Sayed, Kanjee and Rao (2012); Wiliam et al. (2004).

168. See Bhattacharjea, Wadhwa and Banerji (2011); and Uwezo (2011).

169. See Banerjee and Duflo (2011, 88) on a study in several countries that showed how parental beliefs of the expected incomes related to their children's schooling affected their attitudes about keeping their children in school. In countries like the U.S., the publication of school (and even classroom) outcomes is becoming more commonplace, especially with the rise of "choice" and "charters" in American education.

170. A recent best-seller in the U.S. called *How Children Succeed* (Tough 2012) suggests that such behavioral measures are more powerful and reliable predictors of school success than cognitive factors; see also Heckman (2011). Historically, McClelland was one of the first social scientists to undertake cross-national studies of behavioral dispositions toward education; he developed survey assessments for "achievement motivation" which were found to predict income across a wide number of countries (McClelland 1961).

171. On the Progressa (now Opportunidades) project on incentives for schooling in Mexico, see Behrman, Sengupta and Todd (2005). See also, Banerjee and Duflo (2011).

172. For one interesting study on the impact of literacy on productivity in agriculture, see Jamison and Moock (1984).

173. See section 2.

174. The Global Partnership for Education has a campaign goal of $2.5 billion over the next three years; $1 billion is a conservative estimate. See http://www.globalpartnership.org/finance-and-funding/replenishment/.

175. As noted further below, this 5–10 percent figure refers to the new investment funding of the GPE, not on the much larger figure of public expenditures already in place in low-income countries.

176. See Annex A.5.

177. For example, work on early grade reading has been undertaken by the Research Triangle Institute, Save the Children, and others; while some of this work has led to research on instruments, much has been on implementation of assessment systems. Another example of a decision-driven NGO is the International Institute for Impact Evaluation (3ie), which specializes in experimental RCT design studies; a major contribution of 3ie is its focus on transparency of methods and competitive framework for funding.

178. UIS (2004), cited by http://www.worldometers.info/education/.

179. See Braun and Kanjee (2006); Wagner (2010b).

180. Arnett (2008).

181. Ibid.

182. In the SACMEQ regional assessment in 6th grade, undertaken in 2007, Saito (2011) found that averaged over 15 African countries boys generally outperformed girls in mathematics, while girls outperformed boys in reading. However, national differences in gender disparities varied widely in both reading and math.

183. UNESCO (2010).

184. There are also those stakeholders who do the sampling. Whether policymakers, psychometricians, or local teachers, all come to the task of sampling skills and populations with their own experiences and points of view. Choices about which skills to sample, among which populations, languages, and in which contexts, also add poten-

tial bias to an already complex set of sampling issues. In order to address such biases, researchers can use such methods as: tailored sampling and subsample designs; matching samples; oversampling of marginalized populations; and mixed methods designs.

185. Sjoberg (2007) claimed that some test items deviated substantially from the stated PISA goal of evaluating competencies for the workforce. Howie and Hughes (2000) found that the TIMSS covered only a very small fraction (18 percent) of the curriculum of science in grade 7 in South Africa, while as much as 50 percent in grade 8.

186. This is inter-item reliability (measured by Cronbach's alpha statistic).

187. "Team ethnography" has become increasingly used in education research in the U.S. and Europe (cf. Blackledge and Creese 2010; Bartlett and García 2011).

188. The use of randomized control trials (RCT) is seen as one important way to increase credibility of research findings, by comparing interventions with control groups. Recent reviews by Kremer and Holla (2009), Banerjee and Duflo (2011) and Bruns, Filmer and Patrinos (2011) assert the importance of this methodology for improving research designs in international development work. Other work (e.g., Burde, 2012) has begun to describe the limitations of the RCT approach in such settings.

    Another credibility issue is what constitutes a "sizable" impact. Traditional statistics emphasizes, through inferential statistics, the notion of a "significant" difference. In international development interventions, some prefer the use of "effect size" as a way of measuring impact, because "effect size" it is a way of quantifying the size of the difference between two groups. For example, with work on EGRA reading assessments, the effect size (moving from 1 to 5 words per minute on an oral reading fluency test to, say, 30 words per minute is not only significant, but may also have a very large effect size, indicating a large difference in mean scores. However, the credibility of this large impact also depends on the nature of the assessment itself. EGRA's use of words per minute seems to be a very malleable score, especially because many children in poor communities do so poorly at the outset of using this measure. With other measures, such as reading comprehension, the research evidence suggests a much longer gradient to achieve a high effect size. See Paris and Paris (2006) for an overview of skill measurement trajectories. A related critique of EGRA concerns the prevalence of "floor effects" on statistical results, especially on correlations between key variables; see Hoffman (2012), who also provides a broad-based critique of EGRA's use in low-income countries.

189. "Emic" approaches are those that are consciously focused on local cultural relevance, such as local words or descriptors for an "intelligent" person. "Etic" approaches are those that define "intelligence" as a universal concept, and try to measure individuals across cultures on that single concept or definition. Some also see this as one way to think of the boundary between the disciplines of anthropology (emic) versus psychology (etic). See Harris (1976).

190. Stevenson and Stigler (1982). In a more recent example, closer to present purposes, senior officials in Botswana were interested in knowing how Singapore came to be first in mathematics (Gilmore 2005).

191. Translation of international LSEAs remains a problem, as it often uncertain whether an equivalent translated item will have the same statistical properties as an indigenous word chosen independently. See Hambleton and Kanjee (1995) for a discussion on translation issues in international assessments.

192. See Greaney and Kellaghan (1996) for a useful review of this issue. Others may participate because they do not want to be viewed as having "inferior" benchmarks to those used in OECD countries. It should be noted that donor agencies often play a role in this decision-making by supporting certain assessments as part of a "package" of support for evaluation capacity building.

193. See Steiner-Khamsi (2010) for a discussion on comparability in comparative education.

194. Much evidence suggests, from many societies, that poor communities underestimate the value of learning and schooling. See Stevenson and Stigler (1982) for a comparison of parental beliefs in the U.S., China and Japan.

195. See Bhattacharjea, Wadhwa and Banerji (2011) on India; and Piper and Korda (2009) on Liberia. Though solid research is lacking to date, there has been considerable attention to the Uwezo initiative, in several African countries, that has adapted a version of Pratham's community mobilization and accountability approach. See http://www.uwezo.net/index.php?c=38; and Pratham (2012), http://pratham.org/file/Pratham%20Annual%20Report.pdf.

196. See Masters (1984); and Wagner (1986). Of course, these broad approaches are not mutually exclusive.

197. For the more detailed stories, see section 2 for Illa, Pawan and Rachida. These stories are "composites" based on information garnered from numerous sources. They do not represent any particular person.

198. Some of the ideas in these research sketches are adapted from the domains reviewed in section 4.

199. Most Quechua-speaking (or ethnolinguistic minority) children would not have access to a bilingual preschool program. The example here is chosen primarily to suggest greater research attention to L1 and L2 learning in the important transition years before and during primary school.

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