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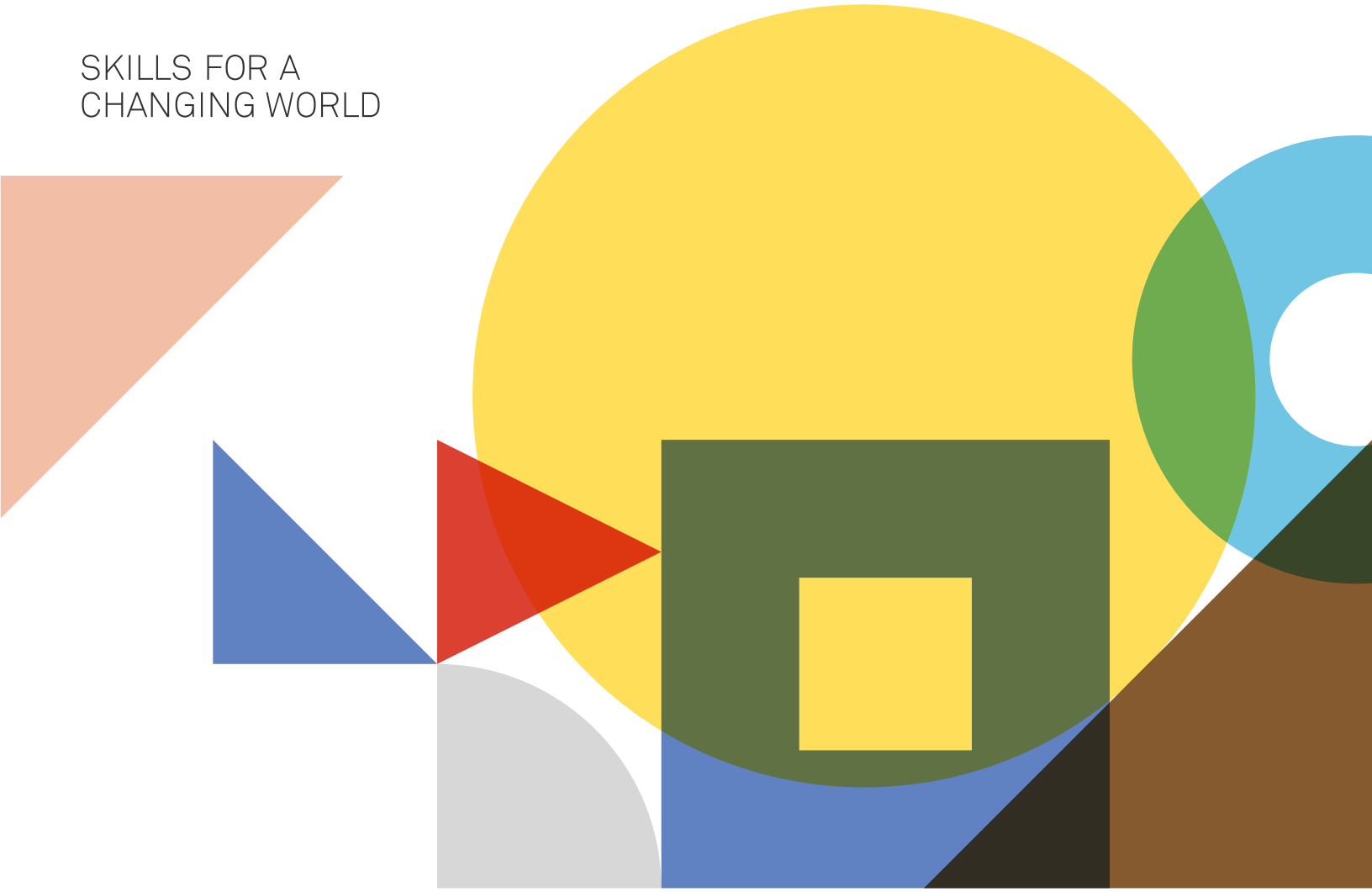

June 2018

Technical Report

Breadth of Learning Opportunities

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Acroynms

BOLO	Breadth of Learning Opportunities
CEMASTEA	Centre for Mathematics and Science and Technology Education
CREFAL	Centro de Cooperación Regional para la Educación de Adultos en América Latina y el Caribe
CUE	Center for Universal Education
EI	Education International
IEA	International Association for the Evaluation of Educational Achievement
ISCED	International Standard Classification of Education
KEPSHA	Kenya Primary School Headteachers Association
KICD	Kenya Institute of Curriculum Development
KISE	Kenya Institute of Special Education
KNEC	Kenya National Examination Council
KNUT	Kenya National Union of Teachers
LLECE	Latin American Laboratory for Assessment of the Quality of Education
LMTF	Learning Metrics Task Force
MELE	Measure of Early Learning Environments
MELQO	Measuring Early Learning Quality and Outcomes
MoE	Ministry of Education, Kenya
N-LAMP	National Learning Assessment Mapping Project
NORRAG	Network for International Policies and Cooperation in Education and Training
OECD	Organisation for Economic Co-operation and Development
PIRLS	Progress in International Reading Literacy
PISA	Programme for International Student Assessment
SACMEQ	Southern and Eastern Africa Consortium for Monitoring Educational Quality
TALIS	Teaching and Learning International Survey
TIMSS	Trends in International Mathematics and Science Study
UIS	UNESCO Institute for Statistics
ZNUT	Zambia National Union of Teachers

Structure of this report

This technical report describes the tool development process for the Breadth of Learning Opportunities (BOLO) initiative undertaken from 2016-2017 by the Center for Universal Education (CUE) at Brookings and Education International (EI). The initiative engaged teachers, policymakers, and researchers to develop tools to systematically identify the breadth of learning opportunities of which children and youth are exposed in an education system. This report describes the technical aspects of the BOLO project at a sufficient level of detail to allow for review, and potentially replication, of the implemented procedures and technical solutions to challenges and issues that arose.

This technical report is part of a package of documents, which includes the overview report, the most recent version of the tools, and summaries of tool piloting in Kenya and Mexico. Therefore, this report does not report the results from the tools. The documents can all be accessed online at the Brookings Institution website.

There are five sections in this report:

- *Breadth of Learning Opportunities project overview:* provides background on the project rationale, the project timeline, and contributors to the BOLO pilots and tool development.
- *Tool development:* describes the design and development of the tools.
- *Piloting the tools:* gives details of the operational procedures for the sampling and population definitions, contextualization of tools, and tool administration procedures.
- *Alignment pilot data cleaning procedures:* covers the methods used in data cleaning and preparation, including the data cleaning steps and recommendations for revising the tools.
- *Tool development issues:* describes recommendations for tool revisions emanating from the pilots.

The conclusion summarizes the learning from the process of developing and piloting the tools, as well as future use for the tools and the general concept of alignment.

BOLO: A brief overview

Despite global commitment to high-quality education for all, education systems may be focusing narrowly on certain subject areas, such as literacy and numeracy, rather than on the entire breadth of skills students need to succeed in work and life, which includes competencies such as collaboration, critical thinking, and problem solving. Education ministries have acknowledged the importance of breadth of skills for quality education, and have begun recognizing these skills in their policy statements (Care, Anderson, & Kim, 2016). However, implementing these policies remains a challenge. While narrow education provision may not be intentional on the part of educators, attempts to broaden delivery may be restricted by the fact that teachers need to follow the national curriculum and high-stakes assessment policies (Hegarty, 2017).

The BOLO approach provides tools for policymakers, practitioners, and researchers to examine the opportunities that students have to learn a broad range of skills and domain areas within curricula, assessments, teacher supports, monitoring, and school resources. As the name suggests, the BOLO approach is not about assessing learning outcomes, but inputs and processes.

The primary concern for the BOLO approach is alignment of policies and practices throughout the education system. The BOLO tools are created to be administered to several levels of education stakeholders—policymakers, school administrators, and teachers—to ascertain if the policies proposed at the governmental level are indeed acted upon at the school level. If they are not acted upon, the BOLO tools provide additional information, which might help users identify restrictions to breadth of learning, such as high stakes assessments focusing only on literacy, numeracy, and science, or narrowly defined subject areas. The BOLO tools, however, do not propose any policy solutions to address restricted learning opportunities, nor do they suggest that alignment of policy and practice should be an education system's primary goal. Rather, the tools are intended to generate dialogue both within and across the different levels of the education system. They can help highlight potential areas of concern, but any actions addressing such

concerns need to be considered in light of the education system's context.

Project timeline

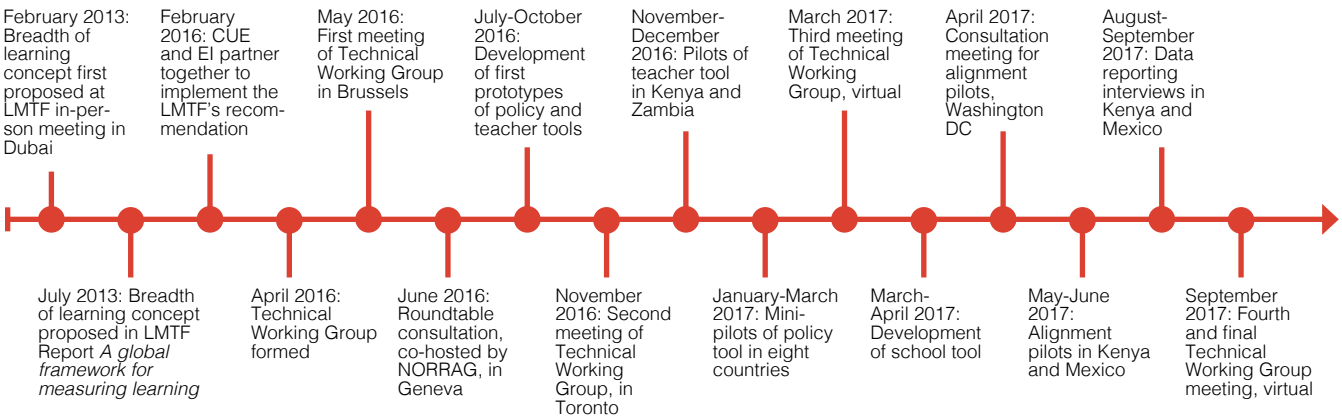
Figure 1 provides a general overview of the project timeline. The BOLO concept was first discussed during the second in-person meeting of the Learning Metrics Task Force (LMTF), in February 2013. The LMTF was a multi-stakeholder collaboration, led by the UNESCO Institute for Statistics (UIS) and CUE, which worked to improve learning outcomes for children worldwide by specifically focusing on strengthening assessment systems and the use of assessment data. The LMTF officially recommended BOLO in the July 2013 report *Toward Universal Learning: A Global Framework for Measuring Learning.*

In spring of 2016, CUE and EI partnered together to act upon the LMTF's recommendation. The two organizations recruited a diverse group of experts to form the Technical Working Group, which met twice via video conference prior to the first in-person meeting hosted by EI in Brussels in May 2016 to develop a framework and parameters for the tools. CUE and the Network for International Policies and Cooperation in Education and Training (NORRAG) then co-hosted a consultation on the side of a larger event on learning assessment led by NORRAG in June 2016. Between May and November, CUE and EI worked on the policy and teacher tools, respectively. In November, People for Education hosted a small in-person meeting of the working group to provide feedback on the draft tools in Toronto, Canada. It was at this meeting that the group decided to add a school tool to the two existing tools.

In August 2016, EI began piloting the first version of the teacher tool in Zambia and Kenya. CUE coordinated mini-pilots of the policy tool in eight countries in January 2017. The Technical Working Group met virtually in March 2017 to review results from the mini-pilots, and a small group met in Washington DC in April 2017 to evaluate the school tool draft, review results from the teacher tool pilots, and prepare for pilots of the full toolkit, which are termed "alignment pilots." After further revisions to the tools in May, organizations in Kenya and Mexico led the alignment pilots through June. CUE and the school tool development team reviewed results in June and July, and then presented those results back to stakeholders in Kenya and Mexico in August and September as part of the data reporting interviews. Last, in September, the Technical Working Group had its final meeting virtually to discuss the results of the pilots and next steps for the tools and BOLO as a whole.

Figure 1

BOLO project timeline



Participation

The Breadth of Learning Opportunities initiative was a collaborative effort among members from different organizations that have contributed to the effort in various ways at different phases of the project, including: a technical working group, participants in teacher tool development, school tool developers, mini-pilot coordinators, and alignment pilot coordinators.

Technical Working Group

CUE and EI convened an international technical working group to identify research and existing tools that could inform the BOLO framework. The group comprised individuals from eight countries, all with experience developing or implementing tools to measure curriculum implementation, school quality, or related areas (see Table 1 for group members). Over the course of three in-person meetings and workshops between May 2016 and April 2017, the technical working group identified relevant research and existing tools that assess various levels of the education system from the classroom to national policy, participated in virtual and in-person meetings during the development process, and participated in consultations for review of BOLO products.

Table 1

Technical working group members

Rachel Bolstad	New Zealand Council for Educational Research
David Cameron	People for Education, Ontario, Canada
Sergio Cárdenas-Denham	CREFAL, Mexico
Inés Cruzalegui	Secretariat of Innovation and Quality in Education, Argentina
Anil Kanjee	Tshwane University of Technology, South Africa
Joyce Kinyanjui	ziziAfrique, Kenya
Carina Omoeva	FHI 360, USA
Sharon Ritchie	Frank Porter Graham Institute at UNC Chapel Hill, USA
Claire Scoular	University of Melbourne, Australia

Teacher tool development participants—Education International

EI coordinated development of the teacher tool directly with two teachers' unions (see Table 2) in order to ensure teachers were able to provide input to the BOLO toolkit. EI worked with the Zambia National Union of Teachers (ZNUT) to develop a tool at the primary level and the Kenya National Union of Teachers (KNUT) to develop a tool at the secondary level. Representatives from both unions were involved in discussions about selection of items, item ordering, and tool administration. The unions then led initial pilots of the tools and drafted reports on the process.

Table 2

Teacher tool development participants

Christopher Yalukanda	Zambia National Union of Teachers
Gideon Kalale Bulwani	
Mildah Hanengeta Nyirongo	
Newman Bubala	
Lucy Barimbui	Kenya National Union of Teachers
Jedidah Rutere	
Hesbon Otieno	
Wilson Sossion	
Martin Henry	Education International
Kristel Bergmans	
Stephane Ponsard	
Rocio Nieto	

School tool development team—FHI 360

The school tool development team (see Table 3) at FHI 360 developed a school-level measurement tool to complement the existing policy and teacher tools and to inform understanding of education system alignment. FHI 360 supported work on an enumerator guide, data entry interfaces, data cleaning, and basic descriptive analysis for all three tools. The team worked with CUE and EI to ensure the school tool was well-aligned with the existing tools, wrote an enumerator guide, and created a data entry interface and codebook to facilitate collection of data during the pilots. After the pilot studies, the team merged and cleaned the data, analyzed the viability of the triangulation of the tools, and recommended changes to items based upon the analysis.

Table 3

School tool development team

Carina Omoeva	FHI 360
Rachel Hatch	
Celeste Carano	

Mini-pilot teams

The mini-pilots tested the feasibility of the initial version of the curriculum policy tool prior to the alignment piloting of the set of BOLO tools. The process was facilitated by a non-governmental consultant in each of the countries (see Table 4). Each of the consultants, whether acting individually or as a team, reviewed and completed the initial version of the BOLO policy tool; contacted and coordinated input from education ministry officials and other relevant experts to aid tool completion; collected feedback on tool items; and produced a report summarizing findings from the pilot and feedback on the items, including their own recommendations. Based on the feedback and recommendations from the mini-pilot teams, the policy tool was revised and informed the development and structure of the BOLO tools.

Table 4

Mini-pilot teams

Argentina	Andrés Delich Natalí Saransky Marianela Giovannini	Organización de Estados Iberoamericanos, Argentina
El Salvador	Pauline Martin José Rubén Merino Iglesias Erika Ivonne Mestizo Briseyda Elizabeth Hernández	Central American University, El Salvador
Kenya	Joyce Kinyanjui Aruna Ramakrishnan	ziziAfrique
	Joan Kamau	Kenya Institute of Curriculum Development (KICD)
	Martha Odundo Evelyn Owoko Dorah Kitala	Ministry of Education
Pakistan	Saba Saeed Afzal Ahmad	Idara-e-Taleem-o-Aagahi (ITA)
	Aurangzeb Khan Muhammad Ayaz	Department of Elementary and Secondary Education, Khyber Pakhtunkhwa
Palestine	Mohammed Matar	The Palestinian Commission for Mathematics (RAFA'H)
	Wahid Jubran Ibrahim Itewee Mohammad Suboh Amani Shehadeh Amal Abu Hejleh Isam Abu Kahlil	United Nations Relief and Works Agency for Palestine Refugees (UNRWA)
Rwanda	Eugene Ndabaga	College of Education, University of Rwanda
Tunisia	Chedia Belaid Mhirsi	Independent Researcher
Zambia	Anna Murru Carl Beel Maimuna Ginwalla	VVOB Zambia
	Mahuba Hazemba	Ministry of General Education

Kenya alignment pilot team – ziziAfrique

The alignment pilot team in Kenya (see Table 5) first met with the education ministry to brief officials on the pilot and its objectives. They obtained approval from the ministry and other relevant agencies to participate in the pilot before entering into formal contracts with the various staff. The team then held a full-day localization workshop to introduce government stakeholders to the project and adapt the tools to the Kenyan context. At the workshop, the policy tool was completed, and the group selected a sample of schools to visit from four counties: Nairobi, Kajiado, Nakuru, and Machakos. More details on the alignment pilot in Kenya can be found in the section "Piloting the tools".

Table 5

Kenya pilot team

Joyce Kinyanjui	ziziAfrique
Sara Ruto	
Aruna Ramakrishnan	
Amina Sharbaidi	Centre for Mathematics, Science and Technology education (CEMASTEA)
Joan Kamau	Kenya Institute of Curriculum Development (KICD)
Flora Malasi	Kenya Institute of Special Education (KISE)
Janeanne Kiviu	Kenya National Examination Council (KNEC)
Ali Hussein Abdi	Kenya National Union of Teachers (KNUT)
Idris Aden	
Ephantus Njoroge	Kenya Primary School Headteachers Association (KEPSHA)
Darius Mogaka	Ministry of Education
Esther Onyango	
Loice Kimani	
Martha Odundo	
Samuel Gichuhi	
Serah Mwirigi	Thogoto Teacher Training College

Mexico alignment pilot Team – CREFAL

The alignment pilot team in Mexico (see Table 6) facilitated implementation and administration for the three BOLO tools in three states: Aguascalientes, Michoacán, and Oaxaca. The team contacted the education ministry in each state to discuss the piloting of the BOLO tools with policymakers, and then chose a variety of primary and secondary schools to visit. More details on the alignment pilot in Mexico can be found in the section "Piloting the tools".

Table 6

Mexico pilot team

Sergio Cárdenas-Denham	Centro de Cooperación Regional para la Educación de Adultos en América Latina y el Caribe (CREFAL)
Francisco Cabrera-Hernández	
Roberto Franco-Alba	
David Sánchez-Valdez	

Tool development

This section provides a brief description of the framework and content of the tools, as well as the process undertaken to develop the BOLO tools for policymakers, school heads, and teachers. The tool development process took 14 months, from April 2016 to June 2017, during which the framework and content of the tools were defined, reviews of existing tools were conducted to inform the development of BOLO tools, and tools were created. Each of these steps are described in detail below. The piloting of the tools and analysis of the data for tool revision are described in "Piloting the tools" and "Alignment pilot data cleaning procedures," respectively.

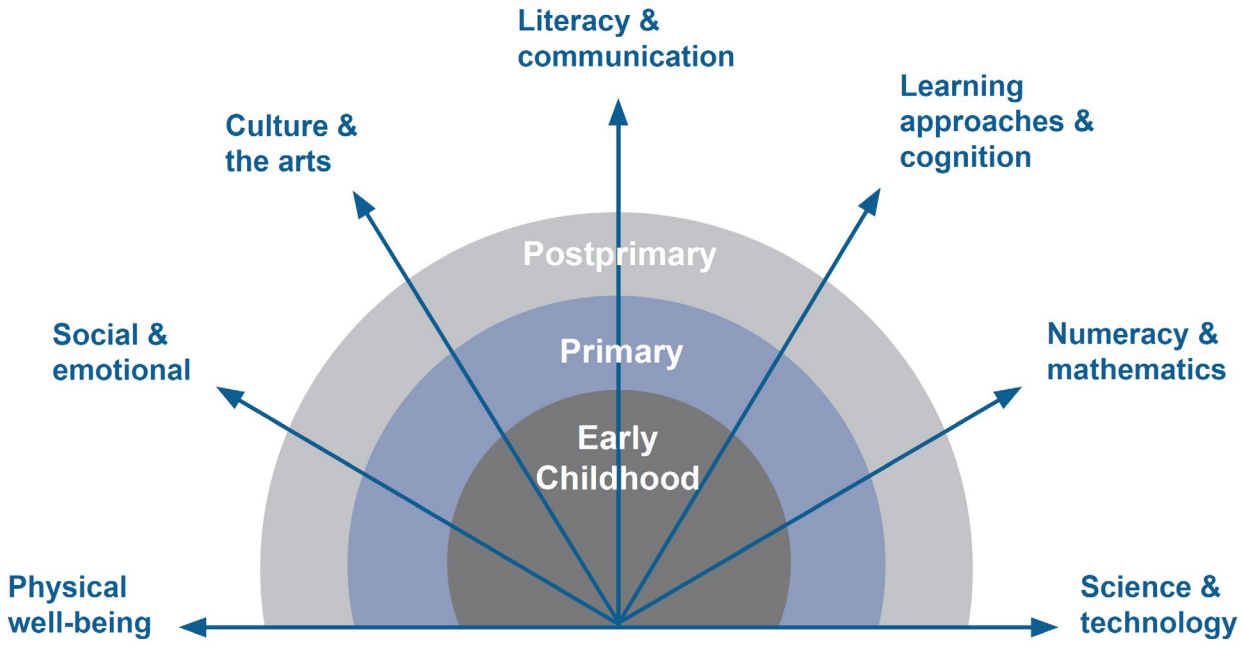
Defining the framework for the tools

The intention of the BOLO tools during the development phase was for countries around the world to be able to use the tools to examine the opportunities that students have to learn a broad range of skills and learning areas. Therefore, the LMTF Seven Domains of Learning (Figure 2) were used as the operational definition of "breadth," as it is a framework developed in consultation with stakeholders in more than 100 countries. The LMTF framework describes learning domains at the early childhood, primary, and post-primary levels, and since the BOLO tools capture curriculum and teacher perspectives, it was determined that specific grade levels should be proposed for data collection. The International Standard Classification of Education (ISCED) (UNESCO Institute for Statistics, 2011) was used to define the education levels, as it is familiar to most national education ministries. The ISCED classifies the education system into levels, from ISCED 0-8, and two are of particular importance for this project: ISCED 1, or primary education; and ISCED 2, or lower secondary education. The final year of each of these ISCED levels was selected for curriculum review, because this year represents the culmination of learning over the course of the educational level and often aligns with large-scale assessments or examinations.

The purpose of using the LMTF framework is not to imply that all countries should have only the domains and subdomains included therein, but rather to establish a common framework for mapping national

Figure 2

The Learning Metrics Task Force Seven Domains of Learning



Source: Toward Universal Learning: What Every Child Should Learn. Brookings Institution and UNESCO Institute for Statistics, 2013.

curricula and policies. All countries are likely to have a distinctive set of learning domains in their national curricula and policies, but often there is no explicit rationale for the distribution of learning domains or whether certain domains are either emphasized or understated. This common framework for mapping the domains can serve as a structure or starting point for policymakers to gather a coherent account of their national curriculum and a potential for benchmarking with other countries of interest.

The tools can be applied to ISCED levels beyond 1 and 2, but it was decided that the alignment pilots would focus on these levels, and specifically the last grade in these levels, for two reasons. First, limiting the scope to two levels would make the pilot more manageable, especially as ISCED 0 (or early childhood education) is often overseen by a separate agency than the ministry of education. Second, because the last years of schooling in ISCED 1 and 2 typically are subject to assessment and examinations. These topics are covered significantly in the BOLO tools. We would expect that end-of-cycle assessments would likely restrict curriculum offerings in these years, and thus they would serve as a good base upon which to examine BOLO's central concept of alignment.

To frame the content for the policy tool, the following levels first were identified as key forces within the formal education system impacting students' learning opportunities: national (or system-level, in countries where policy is made at the sub-national), school, and classroom. Next, for each level, potential sources of evidence for the tools, including system-wide goals, policy guidelines, and system-wide curriculum, were identified. For school and classroom levels, evidence such as teacher practice, physical resources, timeta-

bles, student logs, and textbooks were also identified. The importance of other factors such as parental and societal expectations was acknowledged but was determined to be outside the scope of this project. In addition, three target grade levels for the tools were determined: early education (specifically preschool or preprimary), end of primary education, and end of lower secondary education. However, if a country had a specific policy question that required data at different grade levels, the tools were designed to be flexible enough to capture that information.

Key research questions for each tool were outlined to define the content to be included in the tools and to provide a starting point for developing the items. The key research questions at the policy level included:

- Of the LMTF Seven Domains of Learning, what are the domains that are covered in the national curriculum?
- Does the education system support all of these learning domains through its policies, including policies for monitoring, examinations, assessments, learning materials, and teacher training?

For the school level, the focus is on how the national curriculum is delivered and experienced, and how teachers are supported to deliver the curriculum. Key research questions at the school and classroom levels included:

- To what extent is the school delivering the national curriculum?
- To what extent is the teacher delivering the national curriculum? What is being taught?
- How are teachers supported in delivering the curriculum?

For more information on the rationale for developing the tools, as well as origin of the idea of breadth of learning opportunities, see the overview report *Breadth of Learning Opportunities: A fresh approach to evaluating education systems.*

Reviewing existing tools

A review of existing literature and tools was conducted to inform the tool development. Existing instruments reviewed included the International Association for the Evaluation of Educational Achievement (IEA) curriculum questionnaires, the Measure of Early Learning Environments (MELE), the National Learning Assessment Mapping Project (N-LAMP), the Jet Education Services teacher interview schedule, the TALIS Teacher Questionnaire, and Danielson's Framework for Teaching Evaluation Instrument. Appendix A provides a list of the selected tools that were reviewed at the national and classroom levels to inform the development of BOLO tools and includes information about the tools, such as the name and the year it was developed, the countries in which the tool has been used, the targeted grade level(s), and a general description of the tool.

Tool medium

The curriculum policy tool was first created in Microsoft Word, and the teacher tool was created in SurveyMonkey. However, feedback from the mini-pilot study on the policy tool indicated that completing this version was complicated and suggested switching to an alternate program. The team decided to use Microsoft Excel, thus the policy tool and teacher tool were each revised to fit in Excel, and the school tool was created in Excel.

The team opted for Excel over other suggested programs, such as SurveyMonkey and Gravic, for several reasons: 1) it allowed for completion of the tool on computer and by hand, making it more flexible as well as safer for participants to use in certain environments; 2) it facilitated alignment between the three tools, enabling post-collection analysis; 3) it is likely easier to access globally than other programs, and thus could expand usage; and 4) it allowed users with computers to auto-populate information throughout the tool, making use easier and reducing user error.

Both alignment pilot coordinators used the tools in Excel, and while they made recommendations regarding issues such as formatting and tool content, they found Excel itself a convenient format to use. The issue of the tool medium may require further exploration and adaptation to each country setting as the tools are used in the future.

Developing the content of the tools

The development of the BOLO tools occurred in multiple phases: initial drafting of tools, piloting of the prototype tools, revisions based on data collected, and piloting of the revised tools. There were, however, variations in the development of each of the three tools, and the specific processes for each are described in detail below. This section describes the process of the initial drafting of the tools, and "Piloting the tools" discusses the mini-pilots, alignment pilots, and the subsequent revisions of the tools based on the data collected.

One thing to note is the order in which the tools were developed. The BOLO tools aim to compare the policies of an education system with its practices, and to be used primarily by policymakers, and thus the first action was to develop a framework for the policy tool, based upon the review of existing tools and advice from the Technical Working Group. Since another crucial concept for BOLO is the alignment of the tools, this framework was the starting point for the drafting the teacher tool. Following pilots of both the policy and teacher tools, the Working Group recommended creating a school tool to enhance data triangulation. The tools were revised, again beginning with the policy tool, then aligning it and the newly developed school tool, followed by alignment of the teacher tool.

Policy tool

The tool was initially developed by using questions from existing resources as possible (See "Reviewing existing tools," and Appendix A), and writing new questions as needed through discussion with the working group. The primary sources for the questions were the TIMSS and PIRLS 2011 Curriculum Questionnaire and the OECD Policy Questionnaire on Curriculum Redesign.

As mentioned previously, the tool was created in Microsoft Word, primarily using tables and yes/no questions. It was divided into three sections: Background Information, Monitoring Procedures, and Curriculum Components. The third section featured a series of tables comparing LMTF subdomains and subject areas for the jurisdiction. The tool was presented to the Technical Working Group several times during its development, to ensure concision, coherence, and relevance of items. The tool was extensively revised following the mini-pilots.

The general framework for the policy tool—sections for background, monitoring, and curriculum, with subjects compared against LMTF subdomains—was used as the foundation for the first draft of the teacher tool.

Teacher tool

The teacher tool was developed by EI with representatives from teachers unions and teachers in Zambia and Kenya, in order to assess the breadth of learning opportunities and resources available in primary and secondary schools in their countries. The intention was to develop a tool that focused on the experience of the teacher and the students in the classroom. Specifically, EI worked with Zambia National Union of Teachers (ZNUT) and 10 primary teachers in Zambia to develop a primary-level teacher tool and with Kenya National Union of Teachers (KNUT) and 10 secondary teachers in Kenya to develop a secondary-level teacher tool. In August 2016, EI visited each country to work with research leads in a workshop format to

develop possible questions to be included in the tool, informed by the key research questions of the project. Although country-specific questions were considered, there was also a focus on the need for the tools to be transferrable to other education systems across Africa and around the world. In some cases, local adaptations were made, as the tool was designed to be global in application but adaptable to local contexts. The development of the tool in each country is described below.

Zambia: The primary schools study

In Zambia, the research team was made up of the research lead from ZNUT, who was also the chair of the Teachers Council in Zambia, and 10 teachers selected by ZNUT from both the urban and rural schools in Lusaka province. To begin the tool development process, the research lead met with EI and developed a set of questions around the LMTF Seven Domains of Learning. The questions were focused on the main domains rather than the sub-domains of the original framework. The purpose of including the teachers in the development process was to incorporate teachers' perspectives regarding the questions that were important and relevant to them, as well as adapting the questions to the Zambian context.

The questions explored for each LMTF domain the reality of what was happening in the classroom as well as the supports that were available for teachers. The tool included questions on a range of topics from learner identity to professional and academic independence, including: curriculum coverage; the teacher's qualification and training to teach the subject; contact time for the subject; relationships between teachers, students and parents; the availability of classroom materials and support; the accessibility of continuous professional development; whether or not this involved external expertise; the quality of room specialization; the support received from the administration; accessibility of technology; resources available for each subject; and the teaching and learning aids available to support instruction. The full list of questions can be found in the ZNUT report *Measuring the breadth of learning in Zambian primary schools*.

Kenya: The secondary schools study

In Kenya, the research team was made up of a research lead from KNUT and ten secondary school teachers who were Deputy Principals or Heads of Department in their schools selected by KNUT from 10 sampled counties from eight regions in Kenya (Table 7). The teachers were responsible for key departments and were experts in their teaching subjects, the secondary school syllabus, and the Kenyan curriculum.

Table 7

Sample counties in Kenya

Region	Counties
Rift Valley	Nakuru Bomet
Eastern	Kyuso Embu
Central	Kirinyaga
Nyanza	Kisumu
Western	Busia
Nairobi	Nairobi
Coast	Kilindini
North Eastern	Garrisa

The teachers participated in a two-day workshop to design and develop the Kenyan questionnaire, and to draft an administration plan for the pilot of the tool. Similar to the process that took place in Zambia, the aim of the tool development process was to create questions that were intended to assess the appropriateness of the breadth of learning opportunities across the seven LMTF domains in public secondary schools in Kenya. The questions were guided by the

following topic areas: qualifications of teachers in their teaching subjects; teaching and learning resources and facilities; time spent teaching and addressing students' holistic development; and professional support provided for effective delivery of curriculum. The full list of questions can be accessed in the KNUT report *Assessment of the breadth of learning opportunities in public secondary schools in Kenya*.

School tool

The school tool was developed by CUE with support from FHI 360 to provide an additional layer of information between the teacher tool and the policy tool. CUE reached out to FHI 360 Education Policy and Data Center for support in March 2017, following pilots of the initial drafts of the policy and teacher tools. FHI 360 created the first draft of the school tool concurrent with CUE's revision of the policy tool, and presented the standalone tool at the April meeting in Washington, D.C. FHI 360 drew upon the initial BOLO framework, and several existing school survey resources, including Uwezo Kenya 2014 Survey Tools, PISA School Questionnaire, SACMEQ III Questionnaires, and TALIS School Questionnaires.

Following feedback from the group, CUE and FHI 360 compared the tools item by item, and adjusted question phrasing, numbering, and formatting to ensure the tools were entirely aligned. Both tools were revised several times during April 2017, and presented to the Technical Working Group and alignment pilot coordinators in May. The school tool was revised further based upon feedback, and this version was used in the alignment pilots. It contained five components: user and school information; grade information; subjects and timetable; information on mandatory subjects; and LMTF domains mapping.

Piloting the tools

This section discusses the three piloting studies that were conducted at different points in the tool development process: the pilots of the localized teacher tools in Zambia and Kenya, the mini-pilots of the policy tool in eight countries, and the alignment pilots of the set of BOLO policy, school, and teacher tools in Kenya and Mexico.

Piloting the localized teacher tools

Having been developed between August and November 2016, the teacher tools were piloted in primary schools in Zambia and in secondary schools in Kenya in December 2016 and January 2017. Each country took a different approach to piloting the tools, and their respective approaches are described below.

Zambia: The primary school study

The teacher tool was administered to 1,019 teachers in lower and middle primary schools in two districts of Lusaka Province. The province was chosen for its proximity to the union headquarters and ease of travel, and nearly all schools within the province were included in the pilot. Ten teachers were selected to be enumerators and trained on topics such as how to respond to potential questions by the participants and how to overcome misunderstandings of tool items. Each of the teacher-enumerators was assigned the task of administering 120 tools between 1 December 2016 and 31 January 2017. The response rate was 1019 out of 1200, or 85 percent. The administration team agreed, after the fact, that the survey was too long and should be shortened, and that there were certain items which could be moved to the school level (Zambia National Union of Teachers, 2017).

Kenya: The secondary school study

The pilot administration team divided Kenya's counties into eight geographical regions, and selected one or two counties in each region for a total of ten counties (see Table 7). Schools were further divided into four categories based on gender (mixed or single

gender), jurisdiction (national, supracounty, county, or subcounty), facilities (boarding schools, day schools, and mixed), and social setting (rural or urban). The team used stratified random sampling to select four schools in each county, including a school falling into each subcategory.

After selecting the schools, the team then adopted purposive sampling to choose heads of department (HODs) and/or subject teachers representing the LMTF Seven Domains of Learning. The administration team left the tools with principals at the selected schools, allowed the principals and HODs to discuss the tools with the entire department, and returned a few days later to administer the tools to the HODs or selected teachers. The sample size ended up being 40 principals and 280 HODs/subject teachers across 40 schools in 10 counties.

Ten teachers were trained in the administration of the tools in October 2016. The pilot was carried out across the sample from January 2017. In at least one school per county, the administration team conducted interviews with HODs/subject teachers while they completed the tool. The tools were completed by hand, and the data was digitized later through entry into SurveyMonkey.

The pilots and interviews revealed a need to shorten the tool, which was taken into consideration when developing the school tool. The system of completing the tool by paper and then electronically inputting data later worked well, and also influenced the alignment pilot (Kenya National Union of Teachers, 2017).

Mini-pilots of initial policy tool

The overall purpose of the mini-pilot was to learn how the potential users of the Breadth of Learning Opportunities curriculum tool perceived the tool and whether the tool would provide useful information to policymakers. A draft BOLO curriculum policy tool was sent to contracted coordinators (Table 4) between January and March 2017 in eight countries (Argentina, El Salvador, Kenya, Palestine, Pakistan, Rwanda, Tunisia, and Zambia) to complete the tool and provide feedback.

Completion of the tool took from one day in team workshops to two weeks for individual coordinators. Completion time was inversely correlated with level of government support, partly because the additional human resources provided by the government enabled faster completion of the tools, and partly because of the governments provided the most updated and relevant documents. The coordinators typically started by reviewing the LMTF domains, the ISCED levels, and the tool, and then searched for the right documents to complete the tool. The process of completion was circular – coordinators would fill in a portion, find another document, fill in another few questions, and go back and forth.

All coordinators found the tool to be valuable in diagnosing opportunities and bottlenecks for breadth of learning opportunities. They also mentioned that the tool would be useful for teachers, for regional collaboration, and for work with textbook publishers. There was some concern that the participants interpreted the LMTF domains as normative, that the tool would suggest specific domains be present in policy documents, as opposed to an analysis of breadth generally. As such, a clearer rationale and purpose for the tool were deemed necessary.

In general, coordinators found the initial version too long and the formatting not easily understood. Based on the general and specific feedback, the policy tool was revised to address issues of clarity regarding the items, as well as take into consideration recommendations for structural and content improvements. The revised policy tool also was used as a model to develop the school level tool for school heads and teachers, so

the tools were aligned across the different levels of the system.

Alignment pilots of the set of BOLO tools

The alignments were undertaken by ziziAfrique in Kenya and the Centro de Cooperación Regional para la Educación de Adultos en América Latina y el Caribe (CREFAL) in Mexico between May and August 2017. The overall purpose of the pilot was to implement the newly developed set of BOLO tools to measure the learning opportunities students are exposed to, both in the national curriculum and in school practices. Specifically, the scope of work entailed that ziziAfrique and CREFAL apply the policy, school, and teacher tools together to examine the scope of the surveys, the processes used to collect data, and the utility of the collected data. The pilot process was intended to examine alignment across all three tools and to obtain feedback on how users perceived them, on the appropriateness of items, and on the administration of the tools.

The pilot consisted of three main steps: 1) localization of tools; 2) administration of tools; and 3) data visualization feedback interviews. Each country partner was provided with generic versions of the policy and school tools, with the understanding that the tools would need minor amendments through the localization process so that the tools would respond to the context of each country and state or province where the pilots were being conducted.

Each pilot site undertook the process in a slightly different way. On the one hand, Kenya's education system is centralized, with a single curriculum for the entire country, and thus coordination with the national government was of primary importance. The pilot coordinators had existing buy-in with both the government and teachers unions due to the previous BOLO pilot as well as past involvement with the Learning Metrics Task Force, and thus began the process by bringing together a group of researchers, civil society actors, and government officials to examine and localize the tools. The group then worked together to implement the tools across several counties. This model of involving the main actors in the beginning appeared to work well in Kenya.

Mexico's education system, on the other hand, is decentralized. There is a national curriculum set by the federal ministry, but each state has flexibility in terms of how it chooses to implement the curriculum. Thus the pilot coordinator localized the tools through a desk review, and then sought out connections with local government officials and teachers unions to implement the tools. The coordinator used its status as a research group to gain access to officials, school administrators, and teachers, although it was also denied access in some circumstances as the pilot deadline was short and there was little time to create the buy-in already extant in Kenya. There was also, however, no need to seek extensive access to the federal education ministry; this allowed the coordinator more flexibility in administering the tools.

The sample, process, and preliminary results for each country are described below.

Kenya

In Kenya, the pilot process involved: localization of the tools, administration of the tools and post questionnaire interviews with respondents, input of raw data into electronic template, data checking and cleaning, and a report summarizing the entire process. The tools were piloted between May 30, 2017 and June 16, 2017. The tools were first localized and then they were piloted sequentially starting with the policy tool followed by the school and teacher tools. The Excel-based tools were printed and filled in by hand. Each of the activities are discussed separately.

Sample description

In Kenya, the pilot was conducted in a total of 30 schools, 16 primary and 14 secondary, in four counties: Kajiado (35 percent of schools), Machakos (35 percent), Nairobi (7 percent), and Nakuru (24 percent). These counties were selected based upon their proximity to Nairobi and economic, social, and cultural diversity. Table 8 details the number of policy, school, and teacher tools that were completed at each ISCED level. Seventy-seven percent of all sampled schools were public, and 37 percent of the sample, the largest single group, were public mixed day schools. Ten percent of the total schools cater for learners with disabilities, and one school only admitted learners with disabilities.

Table 8

Number of completed tools in Kenya

	Primary	Secondary	Total
Policy Tool	1	1	2
School Tool	16	13	29
Teacher Tool	64	57	121

Localization of tools

Localization of the tools took place on May 31, 2017. Ten participants from various organizations, including the Ministry of Education (MoE), Kenya National Examination Council (KNEC), Kenya Institute of Special Education (KISE), KNUT, Kenya Institute of Curriculum Development (KICD), and ziziAfrique, took part in the process of localizing the tools. The process of revising the tools and terms to the Kenyan context took about one day, including time spent familiarizing the participants to the tools and objectives of the project.

Administration of tools

A team of 12 from various organizations, including MoE, KNEC, KNUT, KICD, KISE, Centre for Mathematics and Science and Technology Education (CEMASTEA), Thogoto Teacher Training College, Kenya Primary School Heads Association (KEPSHA), and ziziAfrique completed the policy tool. Some of the same participants in the localization of tools were part of the team who completed the policy tool. The team worked in pairs to complete the policy tool, and then one pair's version was randomly chosen to serve as the official tool for the alignment process.

Eight enumerators drawn from MoE, KNEC, KICD, KNUT and ziziAfrique collected data for the school and classroom level tools. These enumerators were trained using the enumerator guide (developed by FHI 360). There were two versions of the school level tool, one for secondary school and the other for primary school. The secondary school tool was administered to headteachers of 13 schools while the primary school tool was administered to headteachers in 16 schools, for 29 respondents. Four teachers were selected to complete the tool, with care taken to select teachers who teach different subjects (especially at the secondary level). The tool was administered to 121 teachers.

Once all the tools were completed, three of the enumerators collected the paper responses and entered them into the Excel-based data entry template.

Feedback interviews

Two separate interviews were conducted, one after the completion of tools to gather feedback regarding the tools (post-questionnaire interviews) and the other after data were analyzed to gather feedback regarding the visualization of the data (data reporting interviews).

The purpose of the post-questionnaire interviews was to gather information on topics like item difficulty, flow of topics, understanding of terms, concepts and items, timing, familiarity and comfort regarding topics, possible concerns, and perceptions regarding goals of the tools and the study. The coordinator interviewed 14 respondents who had taken part in the piloting of the tools. The respondents included:

- Six completers of the policy tool
- Two primary school teachers
- Two secondary teachers
- Two primary school heads
- Two secondary school heads

The second round of interviews were conducted to gather feedback on the way that data from the BOLO pilot were presented, as well as the ways in which this information would be useful at the ministry and school levels. The interviews took place in September 2017, with 43 people participating, many of whom had been part of the pilot. Interviewees included:

- Ten teachers, one deputy headteacher, and one headteacher from two urban primary schools. Eight of the teachers, the deputy headteacher, and the headteacher had participated in piloting the school and teacher tools.
- An official from KICD who had participated in piloting all the BOLO tools.
- Approximately 30 MoE Quality Assurance and Standards Officers who are also chairing several Curriculum reform panels at KICD. Two officers participated in the piloting of all the BOLO Tools.

Specifically, two separate heat maps were used to portray the data collected regarding questions about the LMTF domains as represented in subjects, and potential factors limiting breadth of learning. After presenting the interviewees with the heat maps, associated keys, and shown how to interpret the maps, questions were asked to generate feedback regarding how the data were presented, as well as potential usefulness for the respondents. For examples of the heat maps, see Appendix C.

Perspectives regarding challenges and recommendations for revisions to tools and data visualization, as well as future use are provided in the section "Tool development issues."

Mexico

In Mexico, CREFAL chose three states in which to conduct the pilot: Aguascalientes, Michoacán and Oaxaca. These were chosen according to their educational systems, student's performance, and socioeconomic context, with the hope of grasping some of the Mexican public education system's heterogeneity. The CREFAL team began by translating the tools into Spanish, changing terms to fit the Mexican context as necessary, and then reached out to education ministry officials in each state. Together, CREFAL and state officials selected schools in which to administer the school and teacher tools. The schools were selected to capture a variety of different socioeconomic and cultural contexts.

Sample description

The Mexico pilot included six policy questionnaires (ISCED 1 and 2 levels for each state), 29 school questionnaires, and 68 teacher questionnaires, averaging just over 2 teacher surveys per school, with responses split roughly equally between ISCED 1 and 2. Of the three states in which the pilot was conducted, Aguascalientes represented 28 percent of the schools visited, and Michoacán and Oaxaca each were each 36 percent. Table 9 details the number of policy, school, and teacher tools completed at each ISCED level.

Table 9

Number of completed tools in Mexico at each ISCED level

	ISCED 1	ISCED 2	Total
Policy Tool	3	3	6
School Tool	15	14	29
Teacher Tool	32	36	68

Localization of tools

The contextualization consisted primarily of deskwork revising the questionnaire concepts and terms. The questionnaires were then translated into Spanish, taking into account the terminology of the Mexican context. This process required two researchers with experience in English to revise the tools, enumerator guides, data codebook, and associated materials, and then to translate all the materials. Once the toolkit was translated, the Spanish version was reviewed by a third researcher, who provided final comments and adjustments before initiating the pilot phase.

Administration of tools

Once the tools had been localized, CREFAL's team contacted the authorities at the public education ministry in each of the three states chosen for the pilot. The team briefed the education officials on the objective of the BOLO pilot and arranged appointments at their local offices to administer the policy tool. One official from each of the three states participated in the policy component, and in every case, the consulted public entity was in charge of all or of a significant part of the public education policy in the state. Following the administration of the first tool, the team worked with the officials to select a group of primary and secondary schools to be visited in each state.

The coordinating team then traveled to the schools granted access by the ministry officials to administer the tools to the school heads and teachers. In Oaxaca, however, access to schools was influenced by the teachers' union, which did not grant access for the study. Therefore, the CREFAL team decided to use informal networks to contact teachers and principals to interview them outside of the schools. This issue was not encountered in Michoacán and Aguascalientes, and the coordinating team was able to gain access to principals and teachers using official approval.

Feedback interviews

Similar to Kenya, two rounds of interviews were conducted, one set of post-questionnaire interviews and another set of data reporting interviews.

As with the pilot in Kenya, the postquestionnaire interviews were intended to gather information on topics such as item difficulty, flow of topics, understanding of terms, timing, familiarity and comfort regarding topics, possible concerns, and perceptions regarding goals of the tools and the study. The primary topics identified during the interviews were time of completion, wording of specific items, and imprecise instructions. The coordinator interviewed nine pilot participants for the post-questionnaire interview:

- One state policymaker
- Two primary school principals
- Two secondary school principals
- Two primary school teachers
- Two secondary school teachers

The data reporting interviews to gather responses to presentations of the BOLO pilot data took place in August 2017, and 13 people participated in the feedback reviews. Interviewees included:

- One national policymaker
- One state policymaker
- Six teachers
- Three school directors
- Two district supervisors

After a short explanation from the interview team, all respondents were able to grasp the concept of the heat maps and started pointing out discrepancies between policy, administrator, and teacher perceptions. Stakeholders said that they found the maps very useful and were able to ask relevant questions using the data presented. The national policymaker felt that a larger study would be useful covering more states, but using the new 11 domains of Nuevo Modelo Educativo (New Education Model, the latest curriculum reform Mexico launched in 2016) in place of the LMTF Seven Domains of Learning.

More in-depth perspectives regarding challenges and recommendations for revisions to tools and data visualization, as well as future use, are provided in the section “Tool development issues.”

Alignment pilot data cleaning procedures

This section introduces the datasets produced from the BOLO alignment pilots conducted in Kenya and Mexico in 2017 and describes the data cleaning procedures and orientation to datasets. The pilots are described in detail in “Piloting the tools,” and tool development is described in the section “Tool development”. This section intends to demonstrate how the data from the full BOLO toolkit was compiled and compared, with the expectation that toolkit users would follow similar steps in attempting to align the data from the three tools.

Data merging and cleaning

In both Kenya and Mexico, after the paper-based tools were filled out by the respondents, multiple Excel-based data entry tools were completed by members of the research team. Data were imported from these Excel spreadsheets and appended in Stata. For the policy tool, the cleaned system- and subject-level data was merged based on level, and, in the case of Mexico, also on region. There were no unsuccessful matches in the merge for either country. For the school tool, the cleaned school- and subject-level data was merged based on level, “schoolcode”, and grade. For the teacher tool, the cleaned teacher- and subject-level data was merged based on level, “schoolcode”, grade, and link. There were no unsuccessful matches in the merge for either tool in either country. Table 10 identifies the variables for linking the tools.

Table 10

Identifying variables for linking tools

	Kenya	**Mexico**
Policy Tool	level	region; level
School Level Tool	schoolcode; level; grade	schoolcode; level; grade
Classroom Level Tool	link; schoolcode; level; grade	link; schoolcode; level; grade

Variable names and labels, as listed in the codebook and labeling tabs of the data entry tools, were applied across all datasets. To note, if an entry was blank or nearly blank, where there was limited or no identifying information and missing all responses, the variable was dropped from the dataset. In addition, we checked for duplicate entries, though these were not an issue with the BOLO pilot data.

The following were the most common types of cleaning revisions to variables:

- Adjusting the variable type to string or numeric, as appropriate.
- Cleaning up the contents of key identifying variables, such as region, school name, school code, and subject area code, so that data could be matched and compared within and across datasets.
- Cleaning up instances of missing or extreme values that appeared to be data entry errors. Fortunately, there did not appear to be patterns to extreme responses—the issues looked to be one-off cases. For example, a school in Kenya was reported to have 1,528 students in the target grade, which is much higher than other schools and very high given the number of teachers in the school. In this case, the data point was replaced as missing, so it does not bias analysis results.

Missing data

As part of the data cleaning process, a missing data analysis was conducted. Missing values did not follow a clear pattern resulting from one school or one enumerator, so it does not appear that there is a single source for the missing values. Appendix B includes tables for each of the tools with the percentage of responses missing for key variables where a response was required (i.e., not questions conditional on previous responses or questions where a blank response was valid). In general, the percent of missing data was small; however, the tables show that missing data was sometimes an issue in both countries, and that some questions were more prone to missing data than others.

Triangulation of data

Given that the focus of the BOLO approach is alignment of policies and practices throughout the education system, we were interested in examining how teacher and school perspectives on the curriculum aligned with the responses of government officials and policy makers. Preliminarily, triangulation of data on the common items across each of the tools was conducted to explore alignment in responses across the three levels of policy, school, and classroom. Items were compared for general background questions and subject background questions in each country. The percent agreement in terms of the responses to individual questions was examined in pairs: school versus classroom level; school versus policy level; and classroom versus policy level. In addition, the percent agreement across all three tools was also calculated.

Kenya

Table 11 shows the general background questions that align across each of the tools that were completed in Kenya. The percent agreement across all three tools was very high (between 96 and 100 percent) for most of the background questions. The exception

was the item regarding whether the education ministry offers (or has provided) specialized training in the curriculum, where the alignment between school and policy responses was 66 percent.

Table 12 shows the subject background questions that align across each of the tools. The average percent responses aligned varied depending on the questions. The percent agreement was much lower, ranging from six to 65 percent for questions regarding monitoring the teaching of subjects and 54 to 85 percent for questions regarding formal training for teachers for subjects. On the other hand, the percent agreement for responses regarding mandatory centrally provided exams and required teaching materials were high (98-100 percent).

Mexico

Triangulation of data from Mexico indicated that the average percent of responses aligned for general background items (Table 11) varied depending on the question. For example, the percent aligned was 69 percent for the question on academic-and non-academic tracks; 46 pecent for the question on school schedule; and 46 percent for the question on training. Similarly, there was variability in percent aligned for the subject background items (Table 12). When looking across responses from all three levels of policy, school, and classroom, the percent responses aligned was low, ranging from 10 to 33 percent for questions regarding monitoring, mandatory centrally provided exams, and formal training. The responses were much more aligned for the questions regarding teaching materials (61 percent for ISCED 1 and 81 percent for ISCED 2).

Table 11

General background item comparison

The checkmarks denote inclusion of the item in the tool, and thus use of the item for ascertaining system alignment within data analysis.

	Variable name		
Question text (usually taken from policy survey, often varies slightly by survey)	**Policy Dataset**	**School Dataset**	**Teacher Dataset**
Are students separated into academic and non-academic tracks (e.g. technical and vocational school) at this ISCED level?	✓	✓	✓
Is the school schedule mandated by [EDUCATION MINISTRY] organized by weeks?	✓	✓	✓
How many weeks are in the school year at this ISCED level?	✓	✓	
Policy: The [EDUCATION MINISTRY] offers specialized in-service training in the curriculum for: SCHOOL HEADS School: Has the [EDUCATION MINISTRY] ever provided you with specialized training in the curriculum currently in use in [NAME OF TARGET SCHOOL LEVEL]?	✓	✓	

Table 12

Subject background item comparison

The checkmarks denote inclusion of the item in the tool, and thus use of the item for ascertaining system alignment within data analysis.

	Variable name		
Question text	**Policy Dataset**	**School Dataset**	**Teacher Dataset**
1. Does the [EDUCATION MINISTRY] monitor the teaching of this subject, i.e., do official coaches or inspectors visit schools to observe instruction or review lesson planning for this subject?	✓	✓	✓
2a. Are there mandatory centrally provided exams for this subject?	✓	✓	✓
2b. If there are mandatory centrally provided exams: Do exam results have consequences for teachers?	✓	✓	✓
2c. If there are mandatory centrally provided exams: Do exam results have consequences for learners?	✓	✓	✓
5. Does the [EDUCATION MINISTRY] provide required teaching materials (textbooks, workbooks, etc.) to the teachers for this subject?	✓	✓	✓
6. Does the [EDUCATION MINISTRY] provide formal in-service training for teachers for this subject?	✓	✓	✓

To summarize, in both Kenya and Mexico, the average percent of responses aligned varied depending on the questions. Based on the pilot data, it is difficult to ascertain the reason for misalignment or alignment—whether the answers reflect reality or were a function of the tools. For instance, low agreement in the degree to which the LMTF domain "Physical well-being" is taught within the subject of physical education could mean that the policy's intended curriculum is not being implemented at the classroom level. It could also, however, be a result of how the items were written and interpreted by the respondents at the different levels, or some combination of reality and tool confusion. The pilots did provide some indication as to which items were more difficult to answer. Some response options, particularly the "Major/Minor/None" distinction in the LMTF domains section, caused consternation, and terms such as "Monitoring", or the "consequences" which teachers might face following central exams, were not interpreted uniformly by respondents. More research will be necessary to unpack this issue before it can be said that the tools clearly demonstrate alignment or misalignment.

Tool development issues

This section presents some of the issues, challenges, and recommendations that arose during the tools development and piloting phases of the project that should be considered if moving forward with revising the tools for future use.

Issues from alignment pilot data cleaning process and recommendations

Below are some of the central issues that arose during data cleaning. Future rounds of BOLO tools may want to consider addressing these issues through adjustments to data collection tools, enumerator training, and data entry approaches.

Issues

Key identifying variables, especially region and school code, required cleaning. School codes, for example, were not always entered in the same way in the teacher and school tools. Similarly, in some cases, enumerators documented state names in very different ways within and across the tools. In many cases, a lower level geographic area was noted, and these had to be mapped back to the states.

Different subjects were not always coded in the same way within and across tools. In many cases, differences are likely due to data entry issues (for example, the coding of English as physical education instead of reading in one school). In other cases, data entry clerks may have been unsure what the most appropriate code was, as with pastoral programs in Kenya,

which were coded most often as religion, but at times as math or social studies.

The LMTF domains questions required cleaning in a few instances where the yes/no response about subdomain coverage was not recorded in the data entry interface in the first cell of a set of subject-cells, and so the information did not auto-populate for all subjects. In these cases, this information—which was supposed to apply to all subjects—was not documented for all subjects. Where this occurred, the information was applied to all subjects during cleaning. There were also select instances where the yes/no subdomain variable had been missed. Depending on whether a major or minor focus was subsequently indicated or left blank, the yes/no subdomain variable was updated appropriately.

Recommendations for future tool use

It may be useful to have a master list of key identifiers, including region, district, school name, and school code, for enumerators to reference in future tools. It may also be helpful to emphasize the importance of documenting this information uniformly during training. Future tools could consider incorporating codes within the tools and data entry tools to indicate (a) refusal to answer a question, (b) if respondents do not know how to answer, and/or (c) when an answer does not apply. These different codes would help distinguish these types of responses from data that is truly missing and could provide insight into why survey entries are sometimes incomplete.

Challenges and recommendations from alignment pilots

Perspectives from feedback interviews in Kenya and Mexico provided information on challenges and recommendations for revising the tools and implementation process, as well as how the data are portrayed.

Kenya

The main challenges when implementing the tools had to do with understanding and using the LMTF domains as the framework for the tools, administrative challenges, and relevance of tools for all school populations, namely those with disabilities. There were several related issues regarding the use of LMTF domains, including the fact that the definitions of the domains and subdomains were difficult to keep in mind when answering the questions, especially given that respondents were used to thinking about subject areas rather than the specified LMTF domains. Relatedly, identifying whether a domain or subdomain was covered in a subject in a major or minor way was a challenge, especially for the enumerators. Given that the definition of major and minor were not clear, the enumerators defined them as they saw fit. This meant that the administration and implementation of the tools were inconsistent. Finally, the tools were piloted in a couple of special needs schools; the current tools do not take into consideration the needs of these learners, such as the fact that the learners in these schools are organized around the type and level of disability, rather than academic tracks.

Recommendations fell under two categories: 1) suggested revisions for the tools, and 2) considerations for use of tools in Kenya. With regards to revisions, there were recommendations to pre-write the list of mandatory subjects prior to implementing the tools, in order to save time and have consistency across respondents. In addition, there were suggestions to include relevant learning domains for learners with disabilities. When considering whether and how the tools might be useful, recommendations were made that the tools should be used regularly to improve the delivery of the current curriculum. In addition, findings should be shared with the schools, so that they

can identify areas for improvement in their teaching and learning. Finally, it was recommended that all education stakeholders be involved in completing the tools to allow for better analysis of the curriculum and subject areas.

Mexico

Similar to Kenya, teachers and principals answering the questions struggled with understanding the LMTF domains, and found the definitions of the domains and subdomains difficult to follow and to remember. A small proportion of the participants did not entirely grasp the domains and subdomains as defined by the LMTF, and thus used their own general concepts in answering the items. They also felt that the instrument was too long, and that the instructions were repetitive, hard to read, and difficult to follow, and that many terms were not clear. In some cases, this led to respondents reaching the LMTF section only to state that all subjects would be "major" in order to avoid answering in detail. The "major/minor/none" scale was also deemed difficult to comprehend, which led to other respondents answering uniformly across all subjects.

Recommendations from the pilot fell into two broad categories: questionnaire revisions and process suggestions. For the questionnaire, recommendations included reorganizing the questionnaire to bring the LMTF domains section forward, aggregating items and removing some background information, and altering the "major/minor/none" scale. There were also recommendations to add items which would have been helpful in the Mexican context, such as including sociodemographic variables for teachers and principals, or asking if a school professional belongs to a professional teachers' service. For the process of administering the tools, recommendations included ensuring enough time for data collection to develop contacts with school officials, taking school size into consideration when defining the number of schools to visit, evaluating political context in each jurisdiction in advance of localizing the tool and planning administration, and revising the ISCED 2 questionnaire for teachers who teach one to two subjects only.

Conclusion

The BOLO approach to developing tools is distinctive in several ways. First, it simultaneously sought input from teachers, school administrators, policymakers, and researchers and triangulated their inputs to develop tools useful to all stakeholders. Second, it was piloted in two countries in Africa and Latin America, where in the past the majority of cross-national curriculum studies have origins in high-income, OECD countries. Third, the tools are intended for localization and are therefore not designed to be internationally comparable.

The results from the BOLO policy, school, and teacher tools can be combined to generate a picture of the breadth of learning opportunities in the education system at the national and classroom levels. Education ministries and other actors can use this information to inform curriculum reform or review efforts or to examine the implementation of the existing curriculum. However, these tools are not accountability mechanisms. They are designed to shed light on relevant issues and pose specific questions to explore and to inform action, particularly by national officials, on how the system is operating and where there is and is not alignment. By reviewing the strengths and challenges in the system, from the national to local levels, this information can help to fine-tune policies that seek to provide broad learning opportunities.

The BOLO tools are intended to contribute toward improving learning outcomes in a wide array of domains by giving educators a means to analyze their education system. Ultimately, the tools should inform government interventions that seek to increase the breadth and depth of learning in their constituencies. By making the BOLO tools freely available online, the authors hope that policymakers, teachers, researchers, and others will use and continue to revise and improve upon them.

Appendix A: Selected tools for review at the national and classroom levels

This appendix provides a list of the selected tools that were reviewed at the national and classroom levels to inform the development of BOLO tools. The table includes information about the tools, such as the name and the year it was developed, the countries in which the tool is used, the targeted grade level(s), and a general description of the tool. If the tool is available online, it is incorporated in the references.

National Level Curriculum Questionnaires			
Tool Name/Year	Countries Used	Grade Level	Description
TIMSS & PIRLS Curriculum Questionnaire (2011)	Australia, Austria, Azerbaijan, Belgium (French), Botswana, Bulgaria, Canada, Chinese Taipei, Colombia, Croatia, Czech Republic, Denmark, England, Finland, France, Georgia, Germany, Honduras, Hong Kong SAR, Hungary, Indonesia, Iran, Ireland, Israel, Italy, Kuwait, Lithuania, Malta, Morocco, Netherlands, New Zealand, Northern Ireland, Norway, Oman, Poland, Portugal, Qatar, Romania, Russian Federation, Saudi Arabia, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Trinidad and Tobago, United Arab Emirates, and United States	Grades 4, 8	Collects background information from participating countries on curriculum content (mathematics, science or reading, as appropriate), language(s) of instruction, school organizational approaches, instructional practices, student monitoring arrangements, and teacher education (Mullis, Martin, Minnich, Drucker, & Ragan, 2012).
LLECE UNESCO Curriculum Questionnaire	Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Honduras, México, Nicaragua, Paraguay, Peru, Dominican Republic, Guatemala, and Uruguay	Grades 3, 6	Document analysis and observation tool that collects data on disciplinary, instructional, and assessment practices as well as content coverage in literacy and mathematics.

FHI 360 Education Policy and Data Center N-LAMP			Gathered meta-data on national assessments from publicly available online sources to determine the extent to which the LMTF Seven Domains of Learning are reflected in learning assessments and exams. To gather this data, they mapped school subjects to the LMTF domains as shown on page 8 (Cheng & Omoeva, 2014).
IEA Civic Education Across Countries Case Study Questions (1999)	Australia, Belgium (French), Bulgaria, Canada, Chile, Colombia, Cyprus, Czech Republic, Denmark, England, Estonia, Finland, Germany, Greece, Hong Kong SAR, Hungary, Israel, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovak Republic, Slovenia, Sweden, Switzerland, and United States		Study describes tool, which included 15 policy questions developed in 1994. These questions directly relate to organization (priorities and goals) of programs as well as with a focus on teachers and students (**Civic education across countries**, 1999).
Classroom Level Teacher Surveys			
Tool Name	**Countries Used**	**Grade Level**	**Description**
TIMSS Teacher Questionnaire (2015)	Not specified	Grade 4	Tool collects data on teacher academic and professional background, classroom resources and materials, instructional practice, and attitudes toward teaching (IEA, 2015).
Surveys of Enacted Curriculum Teacher Survey for English, Language Arts, and Reading	Not specified	Grades K-12	Survey tool that collects data on what content is taught and how it is taught. It also collects data on teacher opinion and beliefs, readiness to teach the content and readiness to instruct special groups of students (Wisconsin Center for Education Research).

OECD TALIS Teacher Questionnaire	Australia, Belgium (Flanders), Canada (Alberta), Croatia, Chile, Cyprus, the Czech Republic, Denmark, England, Estonia, Finland, France, Iceland, Israel, Italy, Japan, Korea, Latvia, Malaysia, Mexico, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Singapore, the Slovak Republic, Spain, Sweden, United Arab Emirates (Abu Dhabi), and the United States	Grades 1-5	Explores the school learning environment and working conditions. The questions in the TALIS survey focus on five areas that relate to school and team leadership, opportunities for professional development and teacher education, appraisal of and feedback to teachers, and teachers' beliefs and feelings regarding the school climate (OECD, 2012, 2014).
MELQO MELE Teacher Survey	Colombia, Kenya, Nicaragua and Tanzania (mainland Tanzania and Zanzibar)	Preprimary (ages 3-5)	Survey tool that provides an adaptable module containing seven domains important for quality in pre-primary settings—play, pedagogy, interactions, environment, personnel, parent and community engagement, and inclusiveness. The module consists of a classroom observation tool, teacher and supervisor interviews, and a short parent or caregiver survey. It collects data on teacher academic and professional background and experiences, curriculum, and contact with other sectors (UNESCO, UNICEF, The Brookings Institution, & The World Bank, 2017).

Jet Education Services Teacher Interview Schedule	South Africa	Grades 3, 6	Asks teachers questions related to the following: their knowledge of national curriculum content, monitoring and evaluation procedures; interest in participating in professional development and on which topics; time spent doing direct teaching across various phases of content delivery; and average time spent completing various tasks during the week. Additional questions relate to lesson planning, work schedules, content coverage in learning materials, and a document analysis instrument for assessments.
National Education Assessment	Bhutan	Grade 6	Tool collects data on student ability to access schooling and attitudes toward learning in history, science, English, and mathematics.
Framework for Teaching Evaluation Instrument	United States	Grades K-12	A rubric that focuses on four domains, which include planning and preparation, the classroom environment, instruction, and professional responsibilities. Each of the four domains includes subdomains that further examine: teacher knowledge; classroom culture, interactions and management; teacher practice and content delivery; assessment practices; and teacher reflection and communication with parents and larger community (Danielson, 2013).

Appendix B: Missing data analysis

The tables below consist of the percentage of responses missing for key items in which a response was required. The data is drawn from the alignment pilots in Kenya and Mexico. "Variable name" is the label utilized in data merging and analysis, "variable label" is a short sample of text from the question to aid in identification, and the final two columns display the percent of data missing from the Kenya and Mexico pilots. To conserve space and because there was little missing data after cleaning, LMTF domains variables were excluded from the missing data summaries.

Table B1 reflects the amount of missing data from the policy tool, Table B2 from the school tool, and Table B3 from the teacher tool. Each table includes a section on system-level variables and a section on subject-level variables. This reflects the basic organization of the tools, and the method selected for data reporting (see Appendix C for examples).

Table B1

Policy tool: Missing data on key mandatory variables, subject and system levels

System-level variable name	Variable label	Kenya % missing	Mexico % missing
user_2	2. Name of lead committee/team member	0%	0%
user_3	3. Position of lead committee/team member	0%	0%
user_4	4. Affiliation of lead committee/team member	0%	0%
user_5	5. Phone of lead committee/team member	0%	0%
user_6	6. Email of lead committee/team member	0%	0%
sys_1	1. What is the [EDUCATION MINISTRY] term for this ISCED level?	0%	0%
sys_2	2. What grades are included in this ISCED level?	0%	0%
sys_3	3. Which grade is the final grade of this ISCED level?	0%	0%
sys_4	4. When was the curriculum for this ISCED level last officially revised?	0%	0%
sys_5a	5a. Are students separated into academic and non-academic tracks (e.g. technical…	0%	0%
sys_6	6. What are the requirements to register as a school with the [EDUCATION MINISTRY]	0%	0%
sys_7a	7a. Is the school schedule mandated by [EDUCATION MINISTRY] organized by weeks?	0%	0%
sys_8	8. How many weeks are in the school year at this ISCED level?	0%	0%
sys_9	9. How many days is the typical school week at this ISCED level?	0%	0%
sys_10	10. How many instructional hours are in a typical school week at this ISCED leve…	0%	0%

sys_11	11. What is the [EDUCATION MINISTRY]'s mandated class size range (if this is man...	0%	0%
sys_12	12. What is the minimum level of education required to become a teacher for each...	0%	0%
Subject-Level variable name	Variable label	Kenya % missing	Mexico % missing
tt_m_hpw	Mandatory subjects: hours per week	6%	0%
tt_m_code	Mandatory subjects: subject code	0%	0%
sub_1	1 and 7. Does the [EDUCATION MINISTRY] monitor the teaching of this subject?	0%	4%
sub_2_a	2a and 8a. Are there mandatory centrally provided exams for this subject?	0%	2%
sub_4	4 and 10. Does the [EDUCATION MINISTRY] require that teachers complete a certain…	0%	2%
sub_5	5 and 11. Does the [EDUCATION MINISTRY] provide required teaching materials…	0%	2%
sub_6	6 and 12. Does the [EDUCATION MINISTRY] provide formal in-service training for teachers…	0%	4%

Table B2

School tool: Missing data on key mandatory variables, subject and system levels

System-level variable name	Variable label	Kenya % missing	Mexico % missing
country	Country name	0%	0%
region	Cleaned region name	0%	0%
schoolname	4. What is the name of the school?	0%	0%
schoolcode	5. What is the school code for the school?	0%	0%
level	School level/ISCED level of interview	0%	0%
grade	Grade level of interview	0%	0%
sch_1	1. What is the position of the person interviewed for this question-naire?	0%	0%
sch_2	2. Phone	0%	0%
sch_3	3. Email	0%	18%
sch_6	6. What region is this school in?	0%	4%
sch_7	7. What district is this school in?	0%	0%
sch_8	8. What is the educational jurisdiction for this school, i.e., what [COUNTRY-SPE…	3%	0%
sch_9	9. Is your school in an urban or rural area?	0%	0%

sch_10	10. What is the ownership of the school?	7%	0%
sch_12	12. According to your [NATIONAL SES LEVELS], approximately what percentage of le…	7%	0%
sch_13	13. In the last 5 school days, how many days has the school had electricity for…	3%	0%
sch_15	15. Has the [EDUCATION MINISTRY] ever provided you with specialized training in…	0%	0%
grd_1_a	1a. At your school, are students separated into academic and non-academic Pathwa…	3%	4%
grd_2	2. How many classes are there within this Standard/Class?	0%	0%
grd_3	3. How many learners are in this Standard/Class?	3%	4%
grd_4	4. Of the total learners for this Standard/Class: How many are girls?	7%	11%
grd_5	5. How many teachers teach this Standard/Class?	0%	7%
grd_6	6. Of the total teachers for this Standard/Class: How many teachers are women?	3%	7%
grd_7	7. Of the total teachers for this Standard/Class: How many are permanent teachers…	3%	7%
grd_8	8. Of the total teachers for this Standard/Class: How many meet or exceed the mi…	0%	7%
grd_10_a	10a. Is your school schedule organized by weeks (i.e., do you operate on a weekl…	0%	0%
grd_11	11. How many weeks are in the school year at this Standard/Class level?	0%	0%
grd_12	12. How many days is the typical school week at this Standard/Class level?	10%	0%
grd_13	13. How many instructional hours are in a typical school week at this Standard/Cl…	0%	0%
Subject-level variable name	Variable label	Kenya % missing	Mexico % missing
tt_m_hpw	Mandatory subjects: hours per week	11%	5%
tt_m_code	Mandatory subjects: subject code	0%	2%
sub_1	1. Does the [EDUCATION MINISTRY] monitor the teaching of this subject?	2%	5%
sub_2_a	2a. Are there mandatory centrally provided exams for this subject?	11%	6%
sub_3	3. Are there national, regional, or school-wide competitions held for this subject	4%	8%
sub_4	4. What is the average class size for this subject?	4%	3%
sub_5_a	5a. Have any teachers for this subject received any formal in-service training...	4%	13%

sub_6	6. Has the school provided formal opportunities for teachers to learn from other...	0%	5%
sub_7	7. Do teachers for this subject follow [EDUCATION MINISTRY] supplied materials...	0%	7%
sub_8_a	8a. What is the ratio of textbooks or workbooks to learners for this subject?	3%	4%
sub_9_a	9a. Besides textbooks or workbooks, are adequate subject-specific learning materials...	4%	3%

Table B3

Teacher tool: Missing data on key mandatory variables, subject and system levels

System-level variable name	Variable label	Kenya % missing	Mexico % missing
country	2. Country name	0%	0%
schoolname	4. What is the name of the school?	0%	0%
schoolcode	5. What is the school code for the school?	0%	0%
level	School level for which the questionnaire is being completed.	0%	0%
grade	3. What standard/class level does the teacher teach?	0%	0%
ti_3	3. What is your gender?	4%	0%
ti_1_a	1a. What standard/class do you teach?	2%	0%
ti_1_b	1b. How many classes do you teach at [grade(Q3)]?	5%	1%
ti_2_a	2a. What is the highest level of education you have achieved?	2%	4%
ti_4	4. Are you a permanent teacher (not temporary, contract, or student teacher)?	6%	7%
ci_1	1. What is your average class size?	1%	0%
ci_2_a	2a. At your school, are students separated into academic and non-academic tracks	0%	0%
ci_3	3. How many days do you teach in a typical school week?	0%	0%
ci_4	4. How many hours do you teach in a typical school week in [grade (Q3)]?	0%	0%
ci_5_a	5a. Is your class schedule organized by weeks? (e.g., do you go by a weekly time...	0%	0%
Subject-level variable name	Variable label	Kenya % missing	Mexico % missing
tt_m_hpw	Mandatory subjects: hours per week	39%	7%
tt_m_code	Mandatory subjects: subject code	0%	0%

sub_1	1. Does the [EDUCATION MINISTRY] monitor your teaching of this subject?	38%	0%
sub_2_a	2a. Are there mandatory centrally provided exams for this subject?	41%	8%
sub_4_a	4a. Did you receive any pre-service training for this subject?	55%	0%
sub_5_a	5a. Have you received any formal in-service training or professional development...	56%	5%
sub_6	6. Have you had the opportunity to learn from other teachers of this subject in...	54%	1%
sub_7	7. Do you follow [EDUCATION MINISTRY] supplied materials when teaching this subject?	49%	0%
sub_8_a	8a. What is the ratio of textbooks or workbooks to learners for this subject?	56%	1%
sub_9_a	9a. Besides textbooks or workbooks, are adequate subject-specific learning materials...	52%	0%

Appendix C: Heat map templates

As mentioned in “Alignment Pilots of the Set of BOLO Tools,” the data from the alignment pilots of the three tools were displayed to respondents in feedback interviews through heat maps. Below are two examples of the heat maps, each related to ISCED 1. Information is pre-populated at random to provide readers an understanding of how the heat maps function. Each heat map has a key to help readers interpret them.

Figure C1

Key to LMTF domains heat map

Color Shaded:	Signifies:	Policy Calculation	School/Teacher Calculation:
	Major representation of the subdomain	Marked as "Major"	3 criteria: 1) Majority of answers are "Major"; 2) Plurality of answers is tie between "Major" and "Minor"; 3) Plurality of answers is tie between "Major" and "None", and "Minor" is greater than 0.
	Minor representation of the subdomain	Marked as "Minor"	5 criteria: 1) Majority of answers are "Minor"; 2) Plurality of answers is "None", and "Major" and "Minor" are equal; 3) Plurality of answers is tie between "Minor" and "None"; 4) Plurality is tie between "Major" and "None", and "Minor" equals zero; 5) "Major", "Minor", and "None" are equal.
	Minimal representation of the subdomain	NA	Majority of answers are "None"
	No representation of the subdomain	Not marked	Not marked by any respondent.
	Not applicable (for example, no teachers of this subject answered the questionnaire, or the subject is one which schools/teachers teach but policies do not require)		

Figure C2

LMTF domains heat map (ISCED 1)

Figure C3

Key to subject and systems heat map

Color Shaded:	Signifies:
	Over 2/3 of respondents noted this answer
	Between 1/3 and 2/3 of respondents noted this answer
	Between 0 and 1/3 respondents noted this answer
	No respondents noted this answer
	Not applicable (for example, no teachers of this subject answered the questionnaire, or the the question was not asked of the policy level)

Figure C4

Subject and systems heat map (ISCED 1)

			English			Mathematics			Physical Education			Science			Social Studies		
			Policy	School	Teacher	Policy	School	Teacher	Policy	School	Teacher	Policy	School	Teacher	Policy	School	Teacher
Monitoring	Yes, the [EDUCATION MINISTRY] monitors the teaching of this subject once per year.		100%	6%	22%	100%	6%	21%	100%	8%	22%	100%	6%	18%	100%	6%	20%
	Yes, the [EDUCATION MINISTRY] monitors the teaching of this subject multiple times a year.			63%	36%		63%	33%		83%	36%		63%	36%		63%	36%
Central Exams	Yes, there are mandatory centrally provided exams for this subject.		100%	100%	73%	100%	100%	71%		17%	8%	100%	100%	68%	100%	100%	76%
	Yes, the mandatory centrally provided exam results have consequences for teachers		100%	100%	76%	100%	100%	71%		17%		100%	100%	73%	100%	100%	76%
	Yes, the mandatory centrally provided exam results have consequences for learners.		100%	94%	78%	100%	94%	74%		8%		100%	94%	73%	100%	94%	78%
Other Assessments	Please mark other assessments and examinations for which the [EDUCATION MINISTRY] has a formal policy.	Class assessments	100%		80%	100%		76%	100%		3%	100%		75%	100%		80%
		School assessments	100%		80%	100%		76%	100%		3%	100%		73%	100%		80%
		Regional examinations			36%			43%			6%			41%			40%
		National and/or regional competitions	100%	100%	73%	100%	100%	74%		33%	3%		100%	68%		100%	71%
Teacher Training	Yes, the [EDUCATION MINISTRY] provides all required teaching materials (textbooks, workbooks, etc.) to the teachers for this subject.		100%	69%	58%	100%	69%	64%	100%	33%	17%	100%	69%	57%	100%	69%	58%
	Yes, the [EDUCATION MINISTRY] provides formal in-service training for teachers for this subject.		100%	63%	53%		81%	62%		17%	6%		75%	64%	100%	56%	53%
	Yes, the school provided formal opportunities for teachers to learn from other teachers of this subject in the past year.*			100%	80%		100%	74%		58%	6%		100%	73%		94%	80%
	Yes, the teachers for this subject follow [EDUCATION MINISTRY] supplied materials when teaching this subject.*			100%	80%		100%	74%		100%	53%		100%	73%		100%	80%

*Note: Question was only asked at the school and teacher levels.

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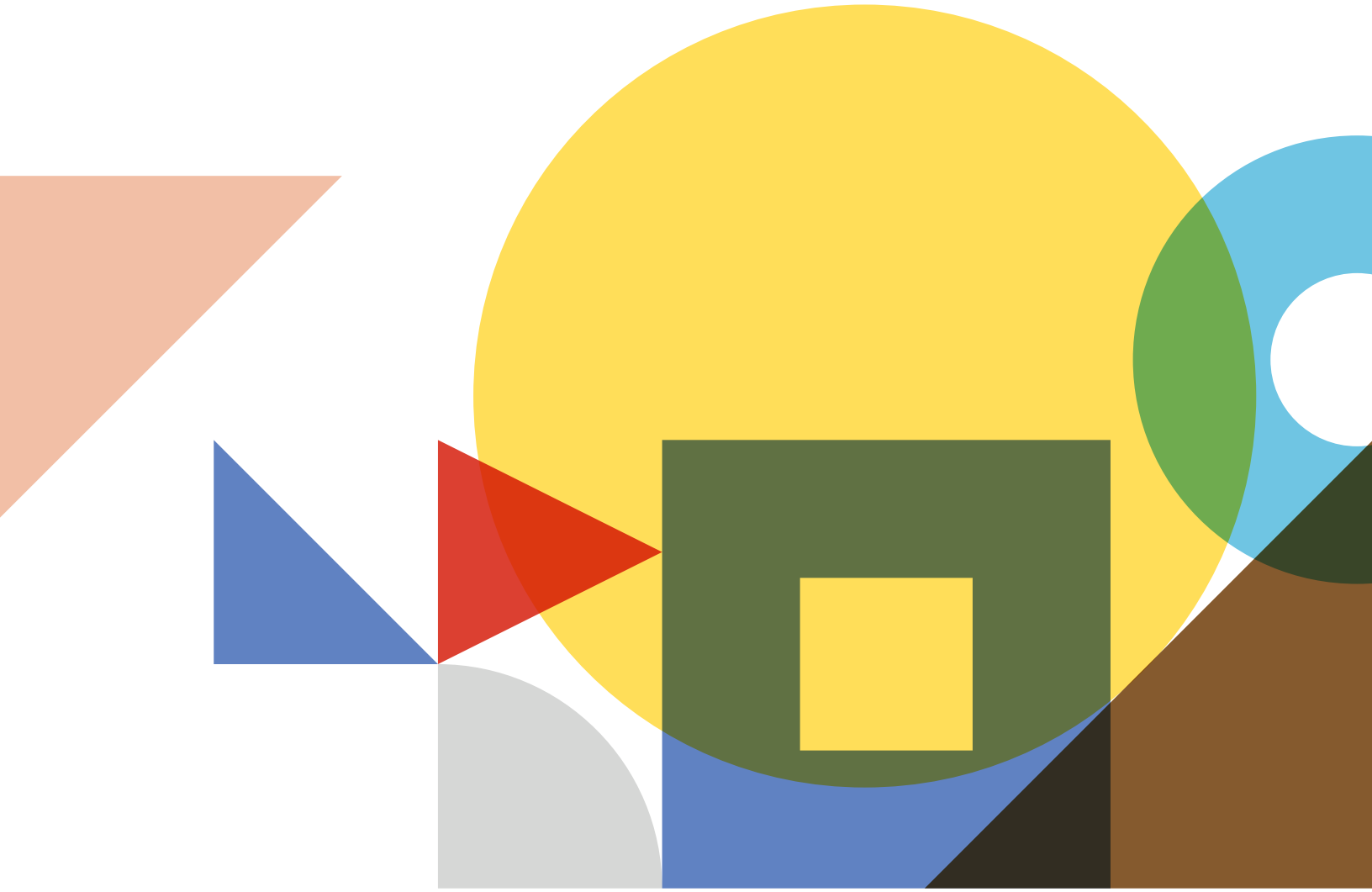

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