## ORIGINAL ARTICLE

**WILEY**

# Measures of learning and teaching material availability and use in sub-Saharan Africa and other low-income countries

## Nicholas Read

ICON4ED Ltd, 6 Turner Drive, Oxford, United Kingdom

**Correspondence**
Nicholas Read, ICON4ED Ltd, 6 Turner Drive, Oxford, United Kingdom.
Email: nick.read@icon4ed.com

## Abstract

This article reviews the accuracy and relevance of the national monitoring mechanisms currently used to establish national learning and teaching material (LTM) availability indicators. In many countries, only very basic LTM monitoring requirements are provided. These are not updated regularly and are usually not designed specifically to support effective LTM provision. One of the most disturbing conclusions emerging from recent research is the very widespread lack of investment in the provision of reading books and reading materials for use in schools and the equally widespread lack of usable data on the availability of reading books in relevant languages at any levels in the education systems of most developing countries, particularly in lower primary and pre-school grades. Effective LTM provision requires reliable information on a number of different activities and inputs that must operate efficiently in sequence. This sequence of activities is often referred to as the *Book Chain*. If one of the links in the chain is dysfunctional, then there is a risk that the whole system will function ineffectively or inefficiently—or both! Most countries aim to collect their EMIS data, including LTM-related data, on a national basis by drawing information from every school and then consolidating the data gathered on a sub-district, district, regional and eventually national basis. The combination of large numbers of schools located in different regions, often with radically different facilities and operational environments, with large numbers of titles supplied in differing quantities based on grade level enrolments and supply assumptions and potentially in different languages, is very difficult to manage on a manual basis with non-specialist managers. Investments in more sophisticated computerised information management systems are recommended to ensure that decisions can be made quickly, based on good information, sound future planning and adequate financial allocations to maintain textbook, teachers' guides and other essential hard copy LTM supplies equitably at target levels for every school

and grade level in the country. Although bespoke, computerised information management systems probably represent the way ahead in terms of reliable annual provision of accurate LTM-related data they are expensive and there are immediate changes that can be introduced at low cost which will improve the usefulness of the data collected. In most countries, a review needs to take place to ascertain exactly what data need to be collected, how often, and in what formats different MOE departments require this information. This review should be accompanied by a plan for reducing the duplication of work, district/school administration overhead and data collection methodology.

# 1 | INTRODUCTION

The key role of textbooks and other learning and teaching materials (LTMs) in enhancing the quality of learning is widely recognised and supported by more than 40 years of international research (Read, 2015).[1] This role is especially important in low-income countries where textbooks and other instructional materials can compensate for factors such as large class-sizes, poorly-trained or even untrained teachers, reduced teacher/student contact hours, high levels of illiteracy among parents and a widespread lack of reading materials in homes and schools. However, despite decades of funding by governments and development partners, few low-income countries have been able to establish sustainable systems for the provision of adequate high-quality supplies of textbooks and other instructional materials. As a result, essential LTMs remain in short supply or are inequitably distributed in most developing countries. Although the general conclusion of significant under-provision of essential learning and teaching materials is widely accepted, the country data on which this conclusion is based are often flawed and inaccurate, thereby undermining attempts to determine LTM availability across different countries.

This article reviews the accuracy and relevance of the national monitoring mechanisms currently used to establish national LTM availability indicators. As a rule, most developing countries do not have clearly-defined achievable LTM provision profiles. Only rarely do countries have access to data that enable them to do more than guess the total number and types of national materials supplied and how and where they should be allocated to individual schools, including the projected budgets needed to provide and maintain priority LTMs in the school locations to which they should be delivered. Up-to-date and reliable information on textbook stocks held in schools in usable condition is not available to most Ministry of Education (MOE) management institutions (because it is not systematically collected and maintained and is rarely verified). There is even less readily available information on the extent to which LTM stocks are used in class by teachers and students. If this information is generally unavailable to MOEs, then it cannot be included in the comparative indicators reported by the UNESCO Institute of Statistics (UIS). All countries should have a clear idea of the core textbook, teachers' guide and reading book provision targets for each grade level, the number of students who have access to these materials, and the extent to which the materials are being used effectively in the classroom. Different countries will tend to have different curricula with different LTM specifications and target levels of provision. Accurate comparability of levels of provision between different countries only becomes possible and relevant when the country differences are known and clearly stated.

This review is confined to hard copy print materials—textbooks, teachers' guides and reading books. In many developing countries, there are now broad policies in place that anticipate a shift towards the provision of digital textbooks and reading books to replace hard copy LTMs. In some countries, digital materials are perceived to be in direct competition for funding with hard copy LTMs. In almost all cases, there is inadequate information available on the key digital indicators needed to plan the transition from hard copy to digital requirements or to contribute to realistic estimates of the comparative costs involved. As a result, this review focuses on the monitoring of essential hard copy

material provision to schools, maps the different ways used to measure textbook availability in schools and in the classroom; describes the relative advantages and disadvantages of different approaches to data collection and presentation and proposes improvements based on current conditions.

The most basic information needed to monitor learning and teaching materials includes accurate, comprehensive, reliable and up-to-date information on schools, school locations, and grade level students (number of students at each grade), students with special education needs (and the type of disability) and teacher numbers. Almost all systems use historical enrolment data to purchase textbooks and other instructional materials for the upcoming year and provision needs to be made for rates of grade progression, drop out, etc. There needs to be information on LTM grade level stock levels and condition in schools and sufficient data on the classroom usage of the available materials. There also needs to be information on MOE policies and assumptions, national language of instruction policies and their implications and the numbers of students and teachers using or learning different languages by location and grade level. Finally, there needs to be accurate assumptions for planning purposes, based on sound data analysis of realistic LTM classroom life and annual loss and damage rates. Both classroom life expectations and annual loss and damage rates tend to vary by grade level and urban/rural location and thus need to be taken into account when gathering essential data.

## 2 | COMMON PROBLEMS IN DATA COLLECTION

In many countries, only very basic LTM monitoring requirements are provided. These are not updated regularly and are usually not designed specifically to support effective LTM provision. Many factors influence data collection. For example, many school systems cannot provide regular, annual, comprehensive, reliable and up-to-date lists of schools and their locations (ideally with individual schools GPS coordinates to support easy distribution) with appropriate categorisations. If data on the numbers of schools and their locations are lacking, then one cannot calculate requirements for textbooks. Within this main problem, there are numerous other points to note: schools can also be listed incorrectly—or even simultaneously—as both government and private schools and may be listed under more than one name and belong to more than one administrative unit. Main schools and feeder schools may be confused and some may not be listed at all. Different MOE departments may collect essentially the same data, but in different formats for different purposes. In some countries, enrolment data, for example, may be collected independently by 6 to10 different MOE departments. This increases the administrative overhead of schools and of the MOE, is obviously a waste of scarce MOE resources and signals the need for a more controlled data collection for agreed priority purposes. Grade level student roll numbers are often inaccurate, exaggerated or diminished according to the perceived benefits or disadvantages of inaccurate data recording. For example, exaggerated roll numbers are often used as evidence to justify increased levels of resources, including in LTM supplies and even teacher postings to schools. Student enrolments often vary during the school year because of drop-outs. Moreover, they are typically more volatile in lower grades than in upper grades, although there are common dips in grade level enrolments between primary and lower secondary and between lower and upper secondary grades.

Among the acute problems faced by school systems is the reliability of the different data collection methods; the difficulties and costs of cleaning, checking and verifying the data collected; the stability of grade level enrolments throughout the school year; and the practicalities of delivering on time national school and enrolment data covering all schools according to required national deadlines. Since national data are typically unavailable, donors, NGOs and governments tend to work in isolation, uncoordinatedly, duplicating LTM investments and distribution.

Many school data collection systems are not designed to maintain accurate and up-to-date records of the LTMs supplied to schools and thus stock levels. National LTM management systems may have data on what is supplied to districts, but frequently fail to maintain data on what has been supplied to schools. In 2010, a district level LTM tracking survey in Ghana (Ghana National Education Campaign Coalition [GNECC], 2010) reported among a number of stock recording discrepancies that 29% of English language stock for primary schools supplied to the district could not be accounted for, including a loss rate of 57% for primary English Book 3. Whilst it noted poor record-keeping as a

general problem in the district and commented unfavourably on stock accountability, it failed to record any stock levels in schools.

The widespread absence of well-performed annual stock-taking of LTM stocks within schools and the lack of regular external stock monitoring have several implications. First, it means that real loss and damage rates and actual classroom life assumptions are not as widely known and understood within national LTM management systems and thus are ignored in the process of deciding about supplies. As a result, second, there is a tendency in many countries to assume levels of classroom materials longevity that are likely to be greater than those achievable in practice. This typical outcome is reinforced by MOE budget considerations because longer classroom life leads to reduced procurement quantities and reduced expenditure on learning and teaching materials.

A minority of developing country education systems attempt to specify classroom materials considered essential for the effective delivery of the curriculum and the achievement of specified learning outcomes. These are often referred to as the *Minimum Profile of Learning and Teaching Materials* (MPoLTM) and can include a variable selection of the following types of materials with their typical target levels of provision:

- textbooks—typically 1 per student as the target, although this is not commonly achieved or sustained in practice;
- teacher guides—1 per grade level subject specialist teacher;
- big books for shared reading practice—1 per 5–10 students;
- reading books—1 per enrolled grade level student according to the language of instruction and other curriculum specified languages in each area;
- flash cards—1 per target class per language;
- posters—1 set per target class;
- grammar books—1 per specialist language teacher;
- atlases—1 per 10 students according to level;
- dictionaries—1 per 10 students according to language and level.

This list is indicative only and is not intended to be an exhaustive list of potential LTMs or typical provision targets.

In 2000, Uganda established a Minimum Profile of LTMs to support its new curriculum; however, in 2009 this list was withdrawn as it was no longer affordable. Since this date, only textbooks, teachers' guides and a limited number of reading books have been funded, but without meeting Uganda's own basic provision targets.

Rwanda established a comprehensive Minimum Profile of learning and teaching materials in 2009 and in 2016 this profile is still operational and supports the introduction of its new competency-based curriculum. That said, current budget allocations for LTMs in 2016 and 2017 may not be sufficient for Rwanda to achieve its own target provision rates for any of the specified materials, except for the core textbooks and teachers' guides.

In a recent research study into LTM provision funding in 13 developing countries in the Caribbean, Africa, the Indian Sub-Continent and South-East Asia only 2 were attempting to fund more than just basic textbooks and teachers' guides and none of the 13 countries covered by the surveys were managing to achieve and maintain their own basic provision targets even for the most basic level of textbooks and teachers' guides.

## 3 | READING BOOK PROVISION

One of the most disturbing conclusions emerging from recent research is the very widespread lack of investment in the provision of reading books and reading materials for use in schools and the equally widespread lack of usable data on the availability of reading books in relevant languages at any levels in the education systems of most developing countries and particularly in lower primary and pre-school grades. Failure to provide suitable reading books to schools in adequate quantities is likely to be a major factor in undermining progress towards early literacy, which, in turn, will impact adversely on levels of student achievement in successor grades. Failure to provide reading books to schools

also hinders the development of the reading habit among students and the under-investment in school and classroom libraries inhibits practice in student research skills.

Very few developing education systems provide useful data for planning the provision, availability and use of reading books in different target languages. In practice, very few school systems even provide useful guidance on target levels of provision or methods of usage in the classroom. To this extent most developing education systems and the classroom teachers inside these systems are operating in the dark on the ways in which reading books and other reading materials should be used to best effect in school classrooms. Upgraded information on reading book availability in schools and use in classrooms should be a priority data collection target in all countries.

## 4 | LOCAL LANGUAGES AS LANGUAGES OF INSTRUCTION

Several countries, particularly in SSA, have policies that encourage local languages to be used as LOIs, usually for the first 3 or 4 grades of primary school. Thus, both Nigeria and Kenya have national policies that support the use of catchment area languages as LOIs for primary grades 1–3 with transition to English as the LOI in P4. Although these are national policies in both countries, they are not widely enforced by the responsible MOEs and are widely ignored by individual schools. Perhaps more significant is the lack of reliable data in these countries on the schools using different catchment area languages as LOIs and the number of students affected at each grade level. Under these circumstances publishers do not have accurate information on which to base their print run projections and the tendency generally is towards under-printing rather than over-printing as a result.

In 2016, Uganda approved 12 local languages as LOIs in P1–3 with English as a default LOI in cosmopolitan urban schools where there may be difficulties in agreeing a single LOI out of several competing possibilities. Unfortunately, the currently available data on schools using different LOIs and the grade level enrolments for different languages make it difficult to calculate LTM print runs and the creation of accurate distribution lists. South Sudan probably achieves the current worst extreme of local language difficulty. Current policy is to use 37 local languages as LOIs for pre-schools and P1–3, but there is no local data yet on which schools in which counties will use which languages and the grade level enrolments required for each LOI. Under these circumstances the mismatch between LOI-related LTM supply policies and their implications and the availability of reliable data to support the efficient implementation of these supply policies remains a serious problem in an increasing number of countries, particularly in SSA where the use of multiple languages of instruction in lower primary grades continues to be a growing objective.

## 5 | LTM CLASSROOM LIFE ASSUMPTIONS

Accurate LTM classroom life assumptions are important planning components in the management of LTM provision systems. Clearly, if the LTM management system assumes that overall classroom life for lower grade textbooks is 5 years before replacements are required and yet the actual achievable classroom life is only 3 years, then the costs of effective textbook provision will increase by 40% or there will be 2 years when textbooks are not available in classrooms. Establishing accurate classroom life assumptions and associated annual loss and damage rates requires the maintenance of accurate school stock records across a range of different schools in different urban/rural locations and measuring changing indicators of longevity based on physical production specifications combined with the quality of school materials management and security standards. Once again this is not a widely-practiced discipline within MOEs and in most countries classroom life assumptions are based on little more than guesswork or wishful thinking.

## 6 | DATA COLLECTION ISSUES

All the issues listed above depend for their effective resolution upon the availability of sufficient information, where the key considerations are comprehensiveness, accuracy and timing. Most countries aim to collect their EMIS data, including LTM-related data, on a national basis by drawing information from every school and then consolidating the

data gathered on a sub-district, district, regional and eventually national basis. The two most basic approaches to the information gathering process are self-reporting by head teachers via the completion of EMIS questionnaires by individual schools or by district or sub-district education officers working closely with schools that they know quite well. This is probably the commonest data gathering method. The second approach is direct school surveying by interviewers who visit schools specifically for data collection. The interviewers are often university students who may know neither the schools nor the localities very well.

Where school surveying is the selected methodology there have been examples of surveyors not visiting difficult access schools and submitting fictitious data instead. A solution to this problem is the use of mobile devices for data collection and transmission where school GPS locations are known, which can be used to prove that surveyors have visited the schools concerned. This methodology was successfully used in Rwanda's 2013 national inventory of school ICT hardware and software. The success of this project in Rwanda has encouraged the Rwandan Education Board to use this technology on five subsequent surveys. Rwanda in 2017 are using mobile technology to interview 50,000 teachers to track 'Ghost' teachers within the education system. There are plans to expand the use of this technology to collect school enrolment data from all schools in 2017/2018.

The design of the data collection questionnaire is a critical first issue. Some national EMIS questionnaires can be more than 40 pages long and may pose questions that many head teachers may find difficult or even impossible to answer. Any data questionnaire that requires excessive head teacher time and work to complete is a risk. As a rule the longer and more complex the data questionnaire the higher will be the risks of non or incomplete or inaccurate returns. The most basic school level LTM data required on an annual basis are typically grade level enrolment by gender, grade level stock of specified high priority LTMs (usually core textbooks, teachers' guides and reading books) and loss and damage rates over previous 12 months.

The verification of the data collected to determine the level of accuracy should also be considered as part of the design of a reliable LTM-related data collection system. Most schools and head teachers are conscious that school EMIS data could be used as the basis for MOE decisions that could have an impact on their operational capacity and thus head teachers can be tempted to manipulate the data to their perceived advantage. If the data collection system is well established with easy access to previously collected school data then school data comparisons can provide an indicator of school level accuracies. An alternative approach is by random school data checking visits. Data checking by visits to 5% of national schools should provide a good indication of the accuracy of the data collected although the checking visits should take place according to a schedule that broadly reflects the urban/rural/remote national school distribution pattern

National data collection systems struggle to deliver their data on time every year, usually as a result of delays in returning the data collection instruments by schools by the stipulated deadlines. In this situation, it is recommended that data entry and analysis should always proceed on schedule and that the data presentation should be published with an indication of the percentage data collection achieved. Schools who fail to deliver their data on time can always be chased up and monitored for on-time delivery in subsequent years.

A cheaper and more convenient alternative to national data collection is the design and creation of a sample school survey covering perhaps 5–10% of national schools. The sample should be designed around a pattern that reflects as accurately as possible national patterns of urban, rural and remote schools. It should be noted that sample studies can be used to determine important classroom material indicators within the school system, including loss and damage rates, but it cannot be used as the basis of an LTM management system, which will always require full national coverage of schools.

## 7 | COMPUTERISED LTM INFORMATION SYSTEMS

Effective LTM provision requires reliable information on a number of different activities and inputs that have to operate efficiently in sequence. This sequence of activities is often referred to as the *Book Chain*. If one of the links in the chain is dysfunctional then there is a risk that the whole system will function ineffectively or inefficiently—or both! The

basic links in the textbook chain that determine LTM information requirements are: curriculum and Syllabus Design (including the specification of the grade level *Minimum Profile of Required LTMs* to deliver curriculum objectives); supply assumptions (student/LTM ratios, book life, loss and damage rates, etc.); financing policies (essentially, who pays and how?); pricing (how much control over pricing is required and how is it applied); school management and conservation; usage at home and in the classroom; supervision and monitoring of implementation.

There is a range of different policies and practices that can be applied to each of the links in the textbook chain specified above and these variables will have an impact on LTM information needs and costs and the ease of data collection. The combination of large numbers of schools located in different regions, often with radically different facilities and operational environments, with large numbers of titles supplied in differing quantities based on grade level enrolments and supply assumptions and potentially in different languages, is very difficult to manage on a manual basis with non-specialist managers. Investments in more sophisticated computerized information management systems are recommended to ensure that decisions can be made quickly based on good information, sound future planning and adequate financial allocations to maintain textbook, teachers' guides and other essential hard copy LTM supplies equitably at target levels for every school and grade level in the country.

Effective data management is the basis of proper planning, as well as the key to the proper monitoring of the use of funds and supplies. Standard EMIS systems should be able to provide accurate data on schools, teachers and grade level students, but often they only provide approximate or incomplete data on total textbooks per subject per grade level by school. Most MOEs fail to record textbook supply data by individual schools based on actual orders from schools or on MOE allocations to schools or stock delivered to schools. This is frequently a simple problem of data system design, but where annual school orders, MOE stock allocations or delivered stock are accumulated year on year to form indicative school stock levels, then other factors have to be taken into account. If accurate and well performed annual LTM stock taking is available, then total school stocks will need to be adjusted accordingly. However, this is an unlikely scenario in most countries and most accumulated school stock records will need to be adjusted downwards using realistic classroom life data and annual estimated loss and damage rates. Care is also needed to ensure that stocks of old and redundant textbooks retained in school stores are excluded from school stock records. This is obviously much easier and faster using a computerised system. Core data should include electronic records of at least the orders submitted to distributors (date submitted, book titles, grade level quantities, schools), books delivered to schools, the accumulated inventory of each title in each school in the country and textbook allocations granted by the region (or centrally) to each school and spending on textbooks (either by region or by school).

A good LTM information database should provide the basis for the control of the learning and teaching materials supply processes and annual budget projections to enable MOEs to meet their supply targets. It should provide the basic information on school inventories in order to identify those with high levels of loss and damage. It can be designed to provide a wide range of reports for planning and management purposes according to system needs.

Rwanda has a fully-operational computerised LTM MIS and Namibia has a system in the process of design and development.

## 8 | RWANDA LEARNING AND TEACHING MATERIALS, MANAGEMENT INFORMATION SYSTEM

In 2009, the Rwandan Education Board (REB), with assistance from DFID, BTC and UNICEF, developed a computerised Management Information System (MIS) to look after national LTM provision for all schools in Rwanda. Due to the success of the system after implementation in 2009/2010 three further versions of the MIS were developed. The Rwanda MIS manages national publisher orders, school deliveries, management of stock (lost and damaged, LTM life, student/teacher/subject ratios) as well as providing MOE and donors with financial and other indicators for future budget allocations.

The Rwanda LTM MIS contains comprehensive data on every public, state aided and private school, including all pre-schools, primary, secondary, combined schools (primary and secondary), VTC (vocational technical schools) and

TSS (technical secondary schools). The database also holds all GPS location data on almost every school entered and is provided to publishers on their school delivery forms to facilitate smooth delivery of materials. Individual school enrolment data (boys and girls) are collected and updated annually to the database which enables MOE budgets to be as accurate as possible. The LTM MIS also holds information on teacher employment data by subject; student enrolment data by subject for those grades where elective subjects were specified; procurement budgets; Special Educational Needs (SEN) enrolment data by grade and subject; the LTM Approved catalogue; approved publishers; annual school orders; annual deliveries to schools; LTM technical specification data; target supply assumptions; late deliveries and publisher payment schedules.

The LTM MIS can provide REB with information on individual school LTM stock levels; loss and damage rates per school, sector, cell, district and nationally; book Life projected vs book life achieved; LTM to Student ratios by subject per school, sector, cell, district and nationally; LTM to teacher ratios by subject per school, sector, cell, district and nationally; LTM to subject ratios by subject per school, sector, cell, district and nationally; financial projection system—forecasting future budgets based on projected ratios and successful/unsuccessful deliveries.

From 2009 to 2017, additional tools were developed on the MIS to provide the MOE with the ability to manage a school demand-based supply system and plan and manage the system cost effectively and efficiently. The tools also helped strengthen the links between schools, districts and the MOE and provided the inspectorate with reliable information to undertake school stock inspections. Feedback from these inspections provided the basis for assessing school levels of usage, stock management, loss and damage rates, management practices, levels of conservation which are a key factor in bringing the loss and damage rates in schools under control and thus reducing costs and improving supplies. The MOE is now able to generate reports to provide detailed and customised data split into national, regional, circuit and school's sections.

From 2016, REB has decided to change the model for a school demand- and order-based system to a government supply-based system, which will require enrolment data collection (independent of EMIS, which is not scheduled to provide the information required by the MOE at the time required for LTM allocations), a system to enable REB to allocate LTMs equitably direct to individual schools and monitoring of deliveries—Completed, Incomplete or incorrect deliveries.

The Rwanda LTM MIS is accessed via a website URL. Users are provided with a username and password so that, for example, every school can view its own inventory and place its own orders. Publishers and distributors can download consolidated national and regional orders, print completed delivery certificates for school signature and stamping as the basis for payment claims and view customised order, delivery and payment reports. The MOE can view and monitor the progress of every aspect of the supply cycle. Thus, the MOE is now able to monitor the process of LTM provision from collection of enrolment data, to school ordering/REB allocations, publisher deliveries to distributors and regional distributor deliveries direct to schools.

From 2010 to 2017, USD $47,000,000 (18,000,000 units) have been allocated to schools via a capitation grant and central allocation by government for the procurement of textbooks and supplementary materials in Rwanda. The LTM MIS has firstly been able to track if the money allocated to classroom materials procurement has been spent by schools. In the 4-year period USD1,620,414 of this budget remained unused. Looking closely at the figures it can be noted that of this USD1.6 million underspend USD1,435,628 was not spent in the first year of operation of the LTM MIS. The subsequent 3 years' underspend amounts to only USD184,786. The reason for the large underspend in 2010 resulted from schools and REB not being familiar with the ordering process. When schools received their 2010 order form they did not order up to the budget allocation provided by REB. In subsequent years, a threshold setting was applied within the LTM MIS during ordering that flagged any schools not ordering up to within 10% of their budget allocation. REB could see which schools were not ordering correctly, contacted the schools and provided additional support in operating the ordering process to the affected schools.

Not only was the LTM MIS able to guide and support REB in the allocation and ordering of classroom materials, but the MIS tracked deliveries of ordered books to the schools. Publishers were only paid on schools providing a 'Confirmed Delivery Certificate' (CDC) to REB which was signed and stamped by both publisher and school.

With the delivery data entered on the MIS, the calculation of the success of publisher deliveries to schools was made possible. In 2010, an excess of materials were delivered by publishers to schools and in each of the following 3 years the LTM MIS achieved delivery success rates exceeding 99% of materials ordered. Even more importantly, the REB knew every year the status of its own progress towards meeting its own learning and teaching materials supply targets.

The Rwandan Education Board (REB), having successfully used the LTM MIS since 2009, decided in 2017 to upgrade the LTM MIS for a fourth revision. It is currently being developed to include a 'Supply Based Distribution Model'. The MIS will be able to centrally allocate materials to schools using enrolment data and *LTM:student* class ratios when required.

## 9 | SIMPLIFYING INFORMATION COLLECTION

Although bespoke computerised information management systems probably represent the way ahead in terms of the reliable annual provision of accurate LTM-related data they are expensive and there are immediate changes that can be introduced at low cost, which will improve the usefulness of the data collected. In most countries, a review needs to take place to ascertain exactly what data needs to be collected, how often, and in what formats different MOE departments require this information. This review should be accompanied by a plan to reduce the duplication of work, district/school administration overhead and data collection methodology.

Where there is an objective to provide data which can be used to compare the performance of national LTM provision between different countries, one of the most important variables is the differences in national curricula and in particular in the specified number of required compulsory subjects at different grade levels. For lower primary grades the variation in the number of subjects requiring textbooks can range from zero (Uganda for local language thematic curriculum) to two, four or even eight subjects. When schools provide data on their current grade level textbook stocks as part of annual LTM information returns it is critical that this data is closely linked to official national specifications on the number of required subject textbooks. In practice in most countries certain subjects, typically language and maths, get more priority than other subjects in lower primary grades. Lower primary learning objectives increasingly emphasize the early achievement of literacy and numeracy so the concentration of LTM data on language and maths textbooks is also a national policy option.

The priority is the establishment by all MOEs of the key 'norms' that will apply to their own LTM supply systems. Examples of typical 'norms' are priority LTMs—textbooks, teachers' guides, reading books; number of required textbooks by grade levels; target student:textbook ratios by grade levels; target numbers of reading books per student by grade levels; target/assumed annual LTM loss and damage rates (to be determined by sample studies) and target LTM classroom usage rates (to be determined by sample studies).

Most of the norms listed above are MOE policy decisions and will require little additional work, but they are important so that data returned by schools can be accurately analysed both at a national level and internationally for country comparison purposes. When the norms have been agreed and specified, the annual data collection profile can be agreed. Simple, limited data collection profiles are recommended. These could be an accurate and comprehensive list of schools, grade level enrolments by gender on a specified date, stocks of priority LTMs by grade level (language and maths textbooks could be highlighted within this data if so desired), loss and damage rates by grade level, classroom usage levels by grade level (classroom usage levels, or classroom useage hasn't been explained in this paper, although it is often referred to. It could be simply how often the books are used in class by the teachers and students. I am not sure how much detailed use info can be obtained through '*simple limited data collection profiles*' It was tried in Rwanda but that was not very simple or limited, classroom use (this is something to recommend as part of any survey, or as independently funded research. After all, if the books are not used, or are wrongly used, what is the point of having them? Need to find out if they are correctly used, which requires accurate data collection/observation and very well trained data collectors).

## 10 | CONCLUSIONS

The discussion above demonstrates the complexities and potential problems associated with the collection of national LTM Information needs, which require the collection, verification, analysis and the storage and maintenance of reliable data covering schools, students, teachers, subject options and quantities, price and condition details of the LTMs in schools.

An ideal basic information collection system would also provide some level of usage monitoring and supervision information and the ability to vary target supply ratios as required.

Any information collection system also needs to provide budget projections to ensure sustainability. Most LTM system financing in developing countries is based on arbitrary annual financial allocations rather than financing aimed to ensure that specific LTM supply targets are met on a regular, sustainable and predictable basis, which should also take into full account annual loss and damage rates and school enrolment growth rates. Generally, the MOE staff employed to run LTM an information collection system described above will not be specialists. Under these circumstances a custom-designed computerised LTM data collection system is more likely to provide reliable annual information on schedule than manual systems. Unfortunately, these systems are expensive to design and install and in 2017 very few developing country education systems have invested in computerised LTM information systems. Thus, national LTM information collection remains largely uncoordinated, inaccurate and ineffective in most countries.

The LTM Management system described above has provided the MOE and donors with the capability to manage LTM distribution effectively, on time while maximising the available finances. Accountable delivery has reduced wastage in the distribution process to less than 1% per annum. The MOE can see student/teacher/subject to LTM ratios in schools, districts/regions and nationally. Data has begun to be shared between MOE departments enabling Inspectorates to target poor performing schools or schools that can be highlighted with high LTM wastage levels.

None of this would be possible without computerising the supply chain process. The success of the implementation of a digital supply chain highlights failures elsewhere in the education system.

### NOTE

[1] The notion of 'learning and teaching materials' or LTMs mainly refers to textbooks but also to anxillary materials used by teachers and students such as teacher guides, student books or booklets, supplementary materials, teacher aids, audio stories and any other instructional materials produced for and used in the classroom. The term 'instructional materials' is used as a synonym in this article.

### REFERENCES

Ghana National Education Campaign Coalition (GNECC). (2010). *Tracking survey for textbooks, school uniforms, capitation grants, school infrastructure and teachers*. Accra: Author.

Read, T. (2015). *Where have all the textbooks gone? Toward sustainable provision of teaching and learning materials in sub-Saharan Africa*. Washington, DC: World Bank.