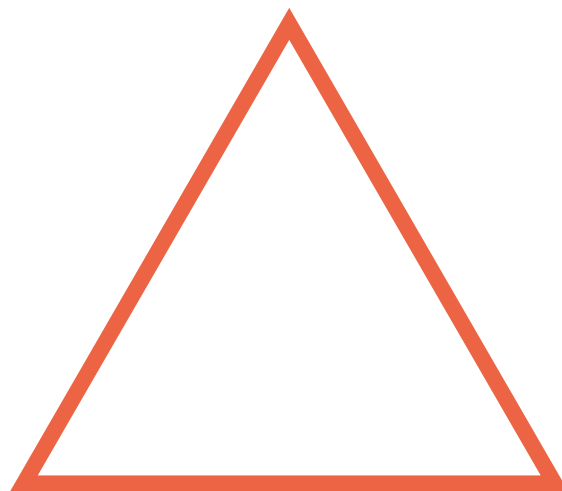


Conducting Surveys of Enacted Curriculum Studies in Low- and Middle-Income Countries:

A Toolkit for Policymakers, Researchers, and Education Practitioners

Curriculum Standards
(prescribed content)



Assessments
(assessed content)

Instruction
(taught content)

Conducting Surveys of Enacted Curriculum Studies in Low- and Middle- Income Countries: A Toolkit for Policymakers, Researchers, and Education Practitioners

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RISE

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Glossary

<i>Alignment</i>	The degree of overlap in the coverage of academic content among different instructional components (such as the curriculum standards, classroom instruction, and assessments).
<i>Alignment tables</i>	Tables showing the topic-level and aggregated overall alignment indices and a breakdown of the sources contributing toward or detracting from perfect alignment.
<i>Coarse grain</i>	SEC analyses that portray relative emphasis on academic content at the more aggregated topic-level.
<i>Cognitive Demand</i>	An expectation of how the learner should be able to think about and what they should be able to do with the academic content they engage with during classroom instruction, in learning materials, and in assessments. Levels of cognitive demand are sometimes referred to as 'performance expectations'.
<i>Content analysis</i>	A process by which subject-matter experts review and describe the academic content embedded in an instructional component (such as curriculum or assessment). In an SEC study this is often referred to as 'coding and rating', where coding refers to the identification of (sub-)topics covered and rating refers to the determination of performance expectations.
<i>Content maps</i>	Three-dimensional figures that visually display the academic content embedded in an instructional component, with topics or sub-topics on the Y-axis, levels of cognitive demand on the X-axis and the amount of emphasis on the Z-axis.
<i>Curriculum standards</i>	The policy document outlining the academic content intended to be covered during the teaching and learning process for a grade or educational cycle. This document is sometimes also called the intended or prescribed curriculum and is the same as the curriculum syllabus or syllabus standards.
<i>Fine grain</i>	SEC analyses that portray relative emphasis on academic content at the more detailed sub-topic level. These underlie the coarse-grain analyses and enable a detailed diagnosis of the sources of misalignment.
<i>Inter-rater reliability</i>	A measure of the extent of agreement in codings and ratings across experts.
<i>Learning objectives</i>	The specified learning goals in the curriculum standards to be achieved as a result of the instruction process. They form the basis for the experts' work of coding and rating curriculum standards. They may be named differently depending on the country context, for example competence, item, etc.
<i>Marginal charts</i>	Tables and bar graphs displaying the two-dimensional counterparts to the content maps (showing (a) the coverage of each (sub-)topic in an instructional component and (b) the emphasis of each level of cognitive demand in an instructional component).
<i>Surveys of Enacted Curriculum (SEC)</i>	An approach for analysing and reporting on the academic content embedded in instructional components.
<i>Taxonomy</i>	A comprehensive subject-level classification document that systematically lists the topics and sub-topics to be covered during an education cycle.

1. Introduction

This toolkit serves as an implementation guide for using the Surveys of Enacted Curriculum to understand the alignment and misalignment of an education system's key instructional components. It reflects lessons learned from applying the methodology in five low- and middle-income countries (LMICs), four of which are in Sub-Saharan Africa while the fifth is in South Asia¹.

1.1 Background

The Surveys of Enacted Curriculum (SEC) is an approach used to analyse and report on the academic content embedded in instructional components (Blank, Porter & Smithson, 2001; Porter, 2002; Smithson 2013). The SEC approach was developed by researchers at the University of Wisconsin who later formed the Center for Curriculum Analysis (CCA)². The approach has been used in the United States for over 20 years to analyse state-level curricula, measure alignment of state-level curricula with national curriculum standards, and implement teacher professional development programmes. More recently, the approach has been used to study educational alignment in LMIC education systems, through a partnership between the Research on Improving Systems of Education (RISE) Programme and CCA (see, for example, Athurra & Kaffenberger, 2022). The SEC have many applications including content and alignment analysis for curriculum, assessments, and instructional materials; curriculum reform design and implementation support; and teacher professional development and support.

1.2 Using the SEC methodology to analyse the alignment of education systems in low- and middle-income countries

Instructional misalignment is common in educational settings. Schools and teachers are expected to complete many tasks, such as completing the prescribed curriculum content and preparing children for high stakes examinations. However, the content that teachers are expected to cover is often poorly aligned across components, and poorly aligned with children's learning needs. SEC offers a way to systematically analyse and quantify the level of alignment and misalignment across components and identify ways to improve alignment for learning.

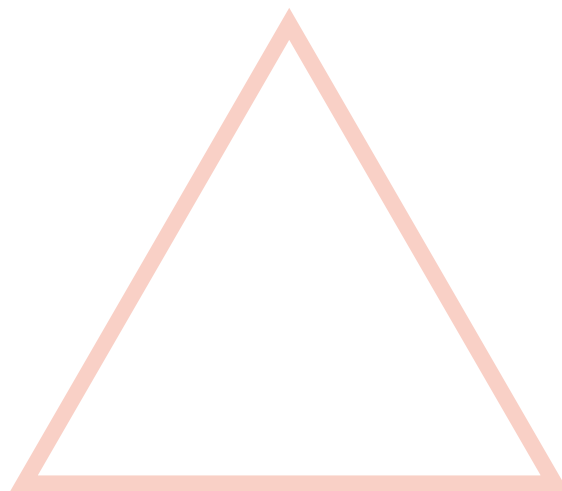
SEC studies conducted in LMICs since 2015 suggest that misalignments between curriculum, classroom instruction, and assessments are commonplace (Atuhurra & Kaffenberger, 2022; Atuhurra et al., 2023; Adeniran et al., forthcoming). Curriculum bodies, assessment bodies, and the producers of instructional materials (e.g., textbooks and teacher guides) often do not coordinate with each other, opening opportunities for different content coverage.

Furthermore, in recent years, many LMICs have conducted curriculum reforms aimed at ensuring children develop and master intended skills and competences during their time in school. Some of the reform approaches that have been adopted include competence-based curriculum, child-centred curriculum, local-language-based instruction, and integrated or thematic-based content reforms (Chisholm & Leyendecker, 2008; Altinyelken, 2010a; Opertti, Kang & Magni, 2018; Rodriguez-Segura & Mbiti, 2022). Many of these reforms however have focused almost entirely on the content of the curriculum standards and do not include associated reforms to other instructional components.

¹ The five LMICs where the SEC methodology has been applied are Kenya, Nepal, Nigeria, Tanzania and Uganda.

² For more details on the Center for Curriculum Analysis (CCA), see <https://curriculumanalysis.org/>. Note that the researchers with CCA originally developed the SEC approach and hold intellectual property rights to the backend data processing procedures for SEC data analyses. For more details, see '3.1.1 Whom to partner with and why?'.

Curriculum Standards
(prescribed content)



Assessments
(assessed content)

Instruction
(taught content)

For example, a curriculum reform may explicitly specify major changes in the approach to learning assessment, such as compelling teachers to adopt continuous assessment for formative purposes, yet the necessary assessment reforms never follow (Altinyelken, 2010a). Furthermore, curriculum reforms are often not accompanied by the effective teacher training and support needed to enable teachers to implement the new curriculum³.

Finally, growing evidence suggests that the prescribed curriculum is often overambitious relative to the typical child's pace of learning (Glewwe, Kremer & Moulin, 2009; Pritchett & Beatty, 2015; Kaffenberger & Pritchett, 2021). For instance, Muralidharan and Singh (forthcoming) find that in Rajasthan, India, the typical child in grade 8 is at a grade 4 curriculum level. Such children are unable to engage meaningfully with grade 8 level instruction.

Improving alignment across instructional components, and alignment with children's learning levels and needs, is critical for improving children's opportunities to learn (Hwa, Kaffenberger & Silberstein, 2020). The lack of a means to identify, quantify, and communicate about misalignment in an education system has been a challenge to improving instructional alignment. The SEC approach addresses this challenge, providing a data-driven, empirical approach for informing instructional improvements.

1.3 Findings from low- and middle-income countries

Since 2015, SEC studies in LMICs have covered five countries. Starting in East Africa and motivated by the need to fill a gap in existing knowledge on the effectiveness of basic education curricula for children's learning, these early studies covered three countries: Kenya, Tanzania, and Uganda. In all three countries, they were pitched at the primary-school level, covered core academic subjects that are examined nationally, and focused on measuring alignment between curriculum objectives, classroom instruction, and end-of-cycle assessments ('primary leaving exams'). The East African studies revealed high levels of misalignments across all three instructional components (Atuhurra & Kaffenberger, 2022).

In 2020, the government of Nepal rolled out an integrated curriculum reform starting in lower primary (British Council, 2020). An SEC study was designed alongside the roll out of this reform with two main objectives. First, to measure how well grade 1 teachers' content coverage in the classroom aligned with the content in the new curriculum; and second, to establish the extent to which the reformed curricula met grades 1–3 children's foundational reading needs. This study echoed one of the key findings from the East Africa studies: teachers tend to spread instructional time in the classroom over many topics to achieve broad content coverage rather than placing deeper emphasis on a few content areas as prescribed in the curriculum (Atuhurra et al., 2023).

In 2022, an SEC study was conducted in Nigeria covering two states: Oyo and Jigawa. It covered primary mathematics and English language for grades 1–6 and aimed to measure alignment across instructional components, including curriculum, assessments, and teacher instruction. It also sought to understand the pace of content progression compared with children's achievement levels and pace of learning as children transition through primary school. This study found low progression on both the prescribed and taught content between grades but good alignment between curriculum standards and classroom instruction (Adeniran et al., forthcoming). Alignment of assessments to curriculum standards and to classroom instruction was found to be good for mathematics but quite low for language and reading.

These studies illustrate the broad range of potential contributions of future SEC studies in LMICs, stretching from uncovering the quality of individual instructional components (e.g., curriculum standards, textbooks, and assessments) to surfacing misalignments between them, and finally diagnosing critical need areas for teacher development and support.

³ Many other examples abound, such as: adopting the local language as the medium of instruction and yet having no appropriate instructional materials developed in the local language prior to the roll-out of the reform; adding new skills and competences into the reformed curriculum when there are no teachers with the requisite expertise to deliver those skills and competences; etc. (Altinyelken, 2010b; Bachore, 2014; Courtney, 2018; Ssentanda & Wenske, 2021).

1.4 Four main uses of the SEC methodology

We foresee at least four key use cases of SEC studies in LMICs.

First, at a national-level, SEC studies can be used to diagnose current levels of alignment and misalignment of academic content across key instructional components. Such empirical evidence that identifies areas of misalignment can inform reform efforts that bring instructional components into better alignment with each other and with children's learning needs. For instance, identifying misalignment between curriculum standards and examinations can inform ways to bring the two into better alignment with each other. Furthermore, identifying areas in which curriculum standards are overambitious and therefore not aligned with children's learning levels can also inform reform efforts to better meet children's learning needs. Because actors from the government agencies responsible for instructional components (such as the curriculum agency, and the examinations agency) are involved in the SEC studies, they see first-hand the results and contribute to the interpretation of results and the identification of possible actions to take. This use case was the focus of the East African studies mentioned above.

Second, the SEC approach can be used to evaluate the implementation of a reform, such as a curriculum or teacher training reform. Results from this type of study can reveal implementation fidelity and inform areas where teachers may need greater support (for instance, to implement a new curriculum as intended). This use case was the focus of the Nepal study mentioned above.

Third, SEC studies can inform the design of training, support, and instructional materials to help teachers better align instruction with the intended content. Teachers are at the frontline of delivering the intended curriculum in the classroom and yet very little is known about the content they deliver once they are in the classroom (the taught curriculum). This knowledge deficiency means that it is difficult to design teacher training and development policies based on actual practice and content coverage in the classroom. Furthermore, it means that future curricular reforms are not informed by what happens in the classroom and therefore are likely to repeat mistakes of past reforms. SEC provides empirical evidence from teacher surveys of the content delivered in the classroom, identifying areas in which teacher instruction aligns well with curriculum standards and where it aligns less well.

Fourth, SEC studies open the possibility of activating teacher-level school-based peer reflection and support group activities that could significantly transform the learning experience in the classroom. Considering the difficult contexts in which teachers in LMICs operate, teachers need to be continually supported to teach better. One broadly available teacher support mechanism is the peer network at the school, which can be sustainably leveraged to facilitate learning. SEC studies can facilitate reflection and peer support for teachers by producing content-rich data visualisations that condense dense academic content into user-friendly maps and charts. Teachers can examine their own content maps, compare their content maps with other teachers, and discuss approaches to effectively cover the prescribed content.

1.5 Document roadmap

This document provides a comprehensive toolkit for conducting an SEC study in LMICs. **Section 2** gives an overview of the SEC approach and provides a brief description of sequential steps involved in conducting an SEC study: (i) generating data; (ii) inputting data; (iii) processing and analysing data; and (iv) interpreting results. **Section 3** then gives detailed, step-by-step instructions for implementing an SEC study. **Section 4** shares lessons learned from conducting SEC studies in LMICs. The document then closes with an **Appendix** that provides a detailed overview of the SEC tools and other resources provided with this toolkit.

2. The SEC Approach: Tools and Methods Overview

This section provides a high-level overview of the inputs and steps involved in an SEC study. Section 3 then provides step-by-step instructions for the implementation of an SEC study.

2.1 Generating data

Two inputs are critical in facilitating the data collection process. The first is commonly referred to as a taxonomy and is a comprehensive and systematically numbered list of all relevant topic and sub-topic areas within a subject or learning area. The second input for data generation are the levels of cognitive demand (sometimes also referred to as performance expectations), which reflect a standard five-level tabulation of what students should be able to do with the academic content embedded in an instructional component. More details on these can be found in '**3.3.1 Comprehensive subject-specific taxonomy and levels of cognitive demand**'.

Using both the taxonomy and the levels of cognitive demand, a group of in-country experts code and rate the academic content embedded in document-based instructional components, such as curriculum standards, assessments, textbooks, or others. The experts code each element of academic content on the two respective dimensions: the sub-topic(s) covered and the level(s) of cognitive demand required. This process generates a dataset of sub-topic level codes (for sub-topics covered) and ratings (for the levels of cognitive demand) which are then collectively used to conduct SEC analyses. To obtain data relating to classroom instruction, teachers are surveyed on their content coverage in the classroom over a specified period (usually one year) using a teacher survey instrument that is built based on the taxonomy and the levels of cognitive demand. For more information on the data generation process, see '**3.4 Convene expert panel to review academic content**' and '**3.5 Survey teachers on content coverage**'.

2.2 Inputting data

The data generated by experts is recorded directly into purpose-built Microsoft Excel workbooks by the experts themselves. The data generated by teachers can either be similarly recorded in purpose-built Excel workbooks, or it can be recorded on paper in the case of paper-based surveys, after which it is entered into Excel workbooks by the implementation lead organisation (for more detail on inputting data, see '**3.6 Conduct data entry, process data, and report**'). Next, this raw data is processed by the lead organisation.

2.3 Processing and analysis of data

The raw data must undergo initial cleaning and quality assurance checks before SEC analyses can be conducted and before the datasets can be forwarded to CCA for further processing. Details of this process can be found in '**3.6.3 Data cleaning and quality assurance**'.

2.4 Interpreting outputs

There are three key outputs from the SEC study. First are the content maps, which are three-dimensional figures that visually display the academic content that is embedded in an instructional component. Second are marginal charts, which are the two-dimensional counterparts of the content maps. These use bar graphs to show the proportion of content allocated to each (sub-)topic and the proportion allocated to each level of cognitive demand. Third are alignment tables, which show the topic-level and aggregate alignment indices. For more details and examples, see '**3.9.2 Content maps and marginal charts**' and '**3.9.3 Alignment tables and indices**'. Alignment indices are reported on a zero to one scale with zero being perfect misalignment (no overlap in content) and one being perfect alignment (perfect overlap in content).

SEC results are *descriptive*, describing the content embedded in instructional components; they are not *prescriptive*, and there is not a ‘right’ or ‘wrong’ set of content that every component should have. Therefore, while an SEC study reports quantitative results, such as content coverage and alignment indices, interpretation is a qualitative exercise. Interpretation must take into account the country context, educational objectives, and other relevant factors. More information on these can be found in ‘**3.9.4 SEC reporting**’.

3. Ten Steps for Conducting an SEC Study

This section provides a detailed explanation and guide for the ten steps that are critical for successfully conducting an SEC study in LMICs. These ten steps can be grouped into three distinct phases.

The initial **set-up phase** involves identifying and engaging with key actors in a partnership that lays the foundation for the study. This phase also includes creating a comprehensive research plan and developing the tools needed. If this phase is done well, it will make the next two phases clear and straightforward and will maximise the value of the study. The flow of the activities in this phase does not need to be sequential as some sub-steps can be conducted concurrently and delays beyond the control of partners may arise. The sections under this first phase are:

‘**3.1 Work with partner(s) to identify objectives**’

‘**3.2 Create a research plan**’

‘**3.3 Develop tools**’

The **desk and field phase** involves undertaking several technical activities that culminate in the generation of SEC datasets. First, the panel of experts conduct their review work of ‘coding and rating’ document-based instructional components. This is followed by surveying teachers on classroom instructional content. Finally, reflective feedback is requested from all participants involved in the study up to this point. In this second phase, the activities generally flow sequentially since each activity informs the implementational quality of the subsequent one. The sections under this second phase are:

- ‘**3.4 Convene expert panel to review academic content**’
- ‘**3.5 Survey teachers on content coverage**’
- ‘**3.6 Conduct data entry, process data, and report**’
- ‘**3.7 Collect item-level student performance data**’
- ‘**3.8 Collect participant feedback**’

The final **analysis phase** relates to data processing and reporting. This phase involves data analysis, output generation, results interpretation, report writing and results dissemination. Some activities in this phase can require significant back-and-forth with study partners, while others are completed in clear sequential stages (for example, interpretation almost always precedes report writing). The sections under this third phase are:

- ‘**3.9 Analyse, interpret and report results**’
- ‘**3.10 Disseminate SEC study findings**’

3.1 Work with partner(s) to identify study objectives

3.1.1 Whom to partner with and why?

While there needs to be a lead organisation in the conduct of an SEC study, implementing an SEC study requires partnerships between several actors.

First and foremost, a lead organisation for the implementation of the SEC study must be selected. Any organisation that plays a role in a country’s education sector, whether from within or outside government, can lead an SEC study. That said, some actors are typically better suited for this role than others.

The lead actor in each of the five LMICs where SEC studies were previously conducted was a non-profit non-government research institute:⁴ a regional civil society organisation in East Africa, a global non-profit in Nepal, and a West African think tank in Nigeria. A common trait among these three lead organisations is their operational independence from the respective countries' governments.

The nature of evidence generated by SEC analyses often leaves non-government institutions well placed to lead the conduct of an SEC study in LMICs as they are perceived as more independent than government actors. Another key advantage that non-government institutions tend to have in LMICs is their ability to mobilise or convene a broad range of sector-wide actors, including from multiple government agencies. That said, an SEC study could also be conducted by a government agency. This would be particularly appropriate if, for example, a curriculum agency wanted to use SEC to inform a curriculum reform, or an assessments agency wanted to use SEC to inform an assessment reform.

Second, the lead organisation should establish a close collaboration with researchers from the Center for Curriculum Analysis (CCA)⁵. Researchers with CCA originally developed the SEC approach and hold intellectual property rights to the backend data processing procedures for SEC data analyses. All SEC studies in LMICs have been conducted in partnership with CCA to implement the study.

Third, the lead organisation brings together a coalition of in-country education actors, a critical step in the successful implementation of an SEC study in an LMIC. The initial activity from which to begin building this coalition is a consultative forum that discusses a draft concept note proposing the conduct and focus of the SEC study. This coalition must include the government institutions responsible for the key instructional components that will be analysed during the study, such as the curriculum body, the learning assessment body and an institution through which in-service teachers can be engaged. Other key actors include educators from universities or teacher colleges, education officials that provide schools with regular support and quality assurance services, and other civil society organisations working in the education sector. As a guiding principle for composing this group of partners, think about actors for whom the study findings will be of great value to their core mandate or those who will be needed to amplify the findings to audiences that could use this evidence for policy making.

3.1.2 Study objectives: what, why, and when?

An SEC study can be designed to inform or achieve a variety of objectives, all targeting the goal of improving instructional alignment and ultimately children's learning. These can include informing curriculum policy reforms, informing assessment and examinations reforms, analysing education system alignment, evaluating the effectiveness of curriculum implementation, informing in-service teacher professional development, and conducting programme implementation evaluation. Clearly, SEC studies have broad applications at national, sub-national, school, classroom and teacher levels. The same data can also be used at a later stage for different objectives or to answer new questions.

The primary objective of the SEC studies conducted in the five LMICs mentioned above has been to establish the alignment between and within key education system instructional components and their alignment with children's learning levels. This objective fits in well with two critical system-level research needs:

- (i) Understanding the alignment of different education system components in order to improve alignment; and
- (ii) Understanding the pace of curricular progression, how this compares with the pace of children's learning (and the extent of curricular over-ambitiousness), and therefore how to improve alignment for learning.

SEC studies in the US have primarily been targeted at establishing the extent of compliance of state-level education curriculum with federal curriculum standards and policies, and informing school improvement efforts.

⁴ SEC studies in Kenya, Tanzania and Uganda were led by Twaweza East Africa (<https://twaweza.org>). In Nepal, the lead organisation was Research Triangle Institute (RTI) International (<https://www.rti.org>). The Nigeria SEC study was led by the Centre for the Study of the Economies of Africa (CSEA) (<https://cseaafrica.org>).

⁵ <https://curriculumanalysis.org/>

3.1.3 Study scope: Academic subjects, geographical coverage, instructional components and time period

Besides the decisions regarding study objectives, another set of crucial decisions during the set-up phase are decisions relating to study coverage. Study coverage includes the selection of subject areas, geographical boundaries, instructional components, and time period within which to complete the study.

The first decision relates to choosing the level of education and the academic subjects to be covered by the study. Primary level mathematics and language literacy may sound like obvious choices for many global education actors, but other priorities may also be part of a given country's agenda. There can be many reasons why choosing the focus for the study can become quite complicated, especially as it must be agreed upon by all partners. These choices should be discussed and decided on through the consultative forum.

Experiences from the first studies in East Africa suggest that this discussion needs to be approached sensitively as justifying the selection of specific academic subjects at a certain education level to a broad group can be a difficult endeavour.

Once the level of education and the academic subjects have been agreed upon, education sub-levels must be selected, which can be another area of differing opinions. Many countries now clearly identify sub-levels such as lower and upper primary. A decision on which sub-levels to cover is critical and needs to be discussed and agreed by the coalition of partners. Considering sub-levels ensures that from the beginning, the study design is relevant to the education policies relating to those sub-levels. For example, the language of instruction policy might be different across lower and upper primary grades. Another key reason for discussing the level and sub-level intricacies at length is the amount of work involved in an SEC study, and therefore the importance of choosing the best study focus from the beginning.

Geographical coverage is a critical aspect to be considered when designing an SEC study. This decision is primarily relevant for the survey of teachers' classroom instruction. It is critical to choose a sample size and distribution that will give insight into the variation in teacher practices in the country or context, while still being realistic in terms of study scope and resources. Lastly, a related and equally critical aspect is whether to survey teachers from public or private schools, or some combination of both.

In East Africa, the studies were designed with the purpose of comparing teacher responses from two districts: one rural and the other urban. In Nepal, surveyed teachers were from seven districts that were supported by RTI for rolling out a new curriculum. In Nigeria, the study covered two states: one in the South and the other in the North.

Other important study aspects that must be decided upon are the instructional components to be covered. Possibilities include:

- Curriculum standards, usually found in the syllabus;
- Instructional support materials, such as textbooks;
- Learning assessments, such as national exams or tests, exams for lower and upper primary, or grade-level exams; and
- Classroom instructional content, which will be obtained from surveys of teachers.

The selection of instructional components will be largely informed by the objectives that have been set for the study.

Finally, the timeframe within which the study must be completed must be agreed upon and must be informed by all the factors discussed earlier. If teachers will be surveyed, it is ideal if the survey can be scheduled to take place towards the end of the school year when teachers have covered the largest portion of the content intended to be taught that year (which is what they will be self-reporting on). Another dimension that informs the selection of the timeframe is that the experts who will be coding and rating the content of instructional components usually have full-time jobs and must manage the SEC work in addition to their regular workload.

3.1.4 Potential pitfalls

Some potential pitfalls under this step are as follows. Following the guidance provided in this subsection should help avoid these pitfalls.

- Setting the group too much work, such as by covering too many academic subjects or too many educational levels or grades, so that it cannot be completed within the necessary timeframes.
- Assuming that one actor's choices (e.g., of academic subjects to cover, educational levels to include, geographic areas to cover) are 'obvious' and therefore failing to thoroughly discuss and agree upon the choices as a group of partnering actors.
- Allocating insufficient time for the completion of coding and rating by the experts, teacher surveys, and analysis and reporting.

3.2 Create a research plan

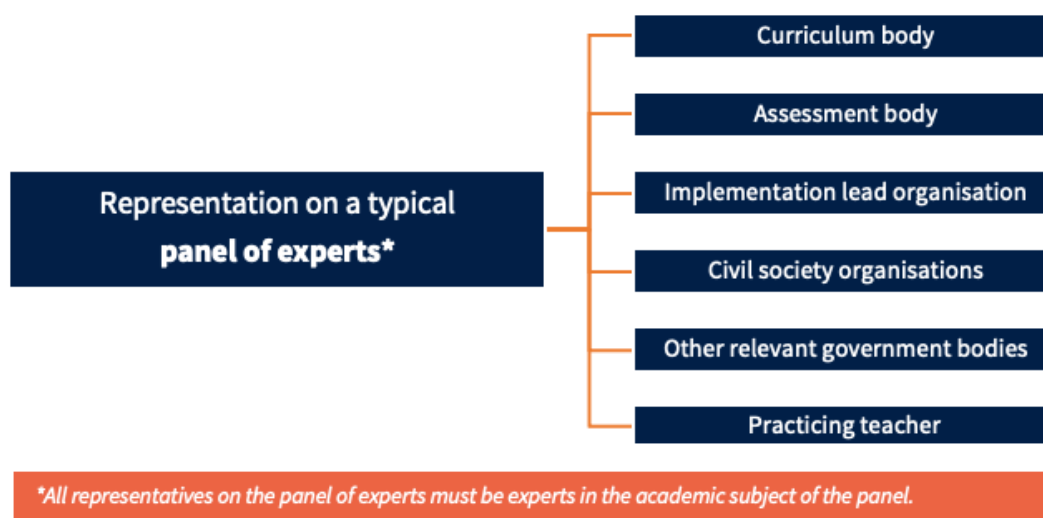
A comprehensive research plan that takes into consideration the key technical and logistical needs of the study is needed to ensure smooth implementation. This research plan involves desk-based work by a panel of experts and field-based teacher surveys.

3.2.1 Identifying and recruiting a panel of experts

A panel of subject-matter experts is required for every subject that will be covered in the study. The primary role of these experts is to review the content embedded in the relevant academic documents and use their expert knowledge and experience to code and rate the content using SEC tools. The panel of experts also adapts a subject-specific taxonomy of topics and sub-topics in the early study stages (discussed in '**3.3.1 Comprehensive subject-specific taxonomy and levels of cognitive demand**'), and it trains teachers on the SEC approach and survey instrument for the teacher survey component of an SEC study.

Given these critical roles, it is important to identify and recruit the most suitable professionals as members of the panel of experts. Each of the institutions with primary responsibilities for the instructional components to be reviewed should be represented on the panel. A well-composed panel of experts achieves three critical features: (i) technical competence of each member, (ii) broad representation of important education sector actors, and (iii) a balanced representation of key stakeholder institutions. A minimum of three experts is required on each academic subject specific panel in the SEC study. At least one practicing teacher should be a part of the expert panel. The composition of a typical panel of experts is shown in **Figure 1** below.

Figure 1: The composition of a typical panel of experts includes representatives from each group.



The lead organisation will enter into a contract with each expert panellist, specifying the terms of reference for their involvement in the study and any payment implications. Typically, the study covers expenses incurred by the expert panel for the purposes of the study (such as travel provisions, if travel is required) and may also need to include compensation or an honorarium for their time.

In practice, identification of members to include on the panel of experts often proceeds without difficulty as the groundwork is laid during the consultative forum meeting when the draft concept note is first discussed. As part of its agenda, the forum can identify a list of relevant actors or institutions from which to source the experts and the lead organisation will follow-up on these potential sources. For example, the relevant curriculum body is an important potential partner and is usually requested to nominate a specific subject expert to join the expert panel for that subject.

Getting the composition of the expert panel right has been one of the most illuminating experiences during the conduct of the first five SEC studies in LMICs. The early studies in East Africa struggled to achieve the broad representation and minimum number requirements for the panel at first attempt. In Uganda, for example, a two-phased recruitment process had to be undertaken to ensure the panels for two of the four subjects covered met the minimum requirement of three experts per academic subject. In Nepal and Nigeria, the selection of panel participants was more straightforward. A key criterion is ensuring the participating experts will be able to allocate the time necessary for their participation in the study.

3.2.2 Critical design choices for each study component

Once the primary objectives have been decided and the relevant instructional components determined, several design choices must be made in relation to the work of the experts as they analyse instructional components. The experts analyse each document-based instructional component, code each element of academic content according to its (sub-)topic, and rate the level of cognitive demand required.

Therefore, one key question here is: “at what item level will the experts code the content in the curriculum standards, assessments, textbooks?” For example, the decision may be made that experts will code the curriculum standards at the level of ‘learning objectives’ (or some other identifier that is relevant for the given curriculum standards), code assessments at the level of ‘assessment items’, and code textbooks at the level of ‘objectives and sample problems’.

Other related questions include which exams (including which year) and which textbooks will be coded and rated. Finally, other key design choices for the conduct of the panel of experts’ work relates to the mode of working (online, in-person or hybrid), how and when the subject-level group discussions will take place and who will moderate or facilitate discussions.

A key design choice for the conduct of the survey of teachers’ instruction relates to whether surveys will be paper-based or online. Paper-based surveys can be conducted in either one centralised venue or at different teacher locations. If paper-based surveys are used, an additional stage of data entry must be included in the project plan. Other choices relating to the survey of teachers include the selection of schools and grades.

An in-depth training on SEC methods is required for both the panel of experts and teachers before they can undertake their respective tasks⁶. Critical design choices for this activity include who will facilitate the training and whether these trainings will take place virtually or in-person. For more details on training, see ‘**3.4.1 Train the panel of experts on SEC methodology**’.

⁶ In previous SEC studies, the expert panel was trained first, and the expert panel then trained the teachers.

Some of the design choices made during the conduct of SEC studies in the five LMICs include coding curriculum standards at “competence” level in Uganda and “performance objectives” level in Nigeria, as these represented the relevant level of academic content delineation in the curriculum standards in these countries. Another design choice included conducting the in-depth training for the panel of experts in Nepal online. In all five countries, teacher surveys were paper-based, and the selected teachers were brought to a centralised venue for purposes of being trained on the SEC methodology and then to conduct the survey. While online versions of the SEC teacher surveys can be administered, each of the five countries chose to use paper-based surveys, largely based on local circumstances of each study (such as internet availability).

3.2.3 Deciding on timelines

Time considerations are crucial for the effective conduct of the critical activities involved in an SEC study.

Subject-matter experts are required to first work alone as they code and rate the content in each document-based instructional component being analysed. After this, experts must come together as a subject panel to discuss their codes and ratings. If some members have not completed their individual coding work by the time of the group discussions, it is advisable to delay the group discussions to ensure experts have completed their individual coding and rating tasks first. Failure to make this time adjustment will compromise the quality of the group discussions while also providing an incentive for the experts who have not completed their individual exercises to just adopt the codes and ratings of other team members, reducing the richness and perhaps even accuracy of the data. Such a scenario will compromise the main objectives of the study.

Surveying teachers’ instructional content is an equally time-sensitive activity. The survey asks teachers to recall and report on the content they have taught during the year.⁷ This means that the survey should be conducted as close to the end of the school year as possible so that teachers have completed most of the planned instruction for the year and will have the taught content fresh in their minds. In the case of online teacher surveys, timelines can also be critical for ensuring the study gets completed. In an LMIC setting, there might be several risks to teachers completing their online survey on time, including limited access to a personal computer and broadband connectivity, which can result in some teacher survey responses being omitted from the analysis entirely.

Another time-sensitive activity when conducting an SEC study is the collection of participants’ reflections or feedback about the value and key lessons learned from the study. One group whose reflections are quite important are teachers who participated in the survey of instructional content. There are two options regarding when to collect reflective feedback from teachers: (i) immediately following the completion of the main survey activities or (ii) a few days after, so that teachers have had time to reflect on the lessons from the study. Either option has inbuilt quality control risks, such as teacher fatigue immediately following completion of the main survey, or teachers having forgotten about what they learnt during the survey if reflections are requested after a significant time gap. Capturing these data from teachers provides both valuable insight into their experience with the SEC approach and lessons learned that can be carried into future SEC studies.

In all but one of the five SEC studies conducted in LMICs, timeline adjustments were made to accommodate experts who failed to meet the initially agreed timelines. The overall effects of these adjustments were delays in the completion of the study. Similarly, all but one of the teacher survey activities were conducted towards the end of the school year, allowing teachers to report on the full year’s content they had taught. The one country exception resulted from schooling disruptions imposed by COVID-19 related school closures.

3.2.4 Identifying the sample for teacher surveys

Building on the earlier SEC study decisions relating to geographical coverage and academic subject coverage (see ‘3.1.3 Study scope: Academic subjects, geographical coverage, instructional components and time

⁷ This does not mean that teachers cannot be surveyed on less than a whole year’s work. When this is the case, the survey tool should be designed with extra care to exclude content areas that are expected to be covered after the survey.

period'), there are four other design aspects that are critical for determining the sample of teachers to be surveyed.

First, both private and public schools are commonplace in many LMICs, and a decision must be made as to whether the sample of teachers involved in the study will be chosen from one or both settings.

Second, the grades to be covered in the teacher survey must be selected, which will have implications for the number of teachers per school. While it is ideal to include teachers from all grades for which the curriculum is being analysed (e.g., if grade 1-3 curriculum standards are analysed, then teachers from grades 1-3 would be surveyed), it is not always feasible due to sample, timing, or budgetary constraints.

Third, the rural/urban distribution of the sample of schools from which teachers are selected must be decided upon, as well as the female/male composition of the teachers, and teachers' years of experience.

Fourth, it is important to determine how the teachers will logistically take part in the study. Often the lead organisation does not have direct access to these teachers and so there is likely to be another intermediary player that will play a key role in accessing and mobilising the teachers to be involved in the survey. Typically, teachers are brought to a central location for training and completing the teacher surveys, which the intermediary actor can help facilitate. Alternatively, teachers may be trained and surveyed at their respective schools. While the school-based option alleviates the need for teachers to travel, it involves a much larger logistical undertaking for the organisation leading the study, which must send representatives to all school locations to train and survey teachers.

In all the five SEC studies in LMICs, teachers were selected from public schools located in both rural and urban districts. In Tanzania and Nigeria, all primary grades were represented in the sample, while only some grades were covered in Uganda and Nepal. In all cases the lead organisation operated in close collaboration with the relevant government body to have access to the target teachers. All studies involved inviting teachers to a central venue where they were trained on the SEC methodology and then surveyed on their instructional content coverage.

3.2.5 Finalising logistics and allocating roles

Conducting teacher surveys requires major logistical operations involving several actors. These actors must operate in a well-coordinated manner, which requires that each understands their role. First, the surveys will likely involve travel to designated venues in different parts of the country. The training and survey activities tend to last more than one day and therefore provisions for an overnight stay are needed for all teachers. The study's lead organisation typically organises these logistics. Field coordinators, typically staff of the lead organisation, are critical for ensuring logistics run smoothly on the ground. If the survey is completed on paper, another critical and time-sensitive task relates to data entry. The lead organisation, again, usually takes responsibility for conducting data entry and quality assurance checks after the teachers have completed paper-based surveys.

Finally, in planning for teacher surveys, it is critical to clarify who will facilitate or deliver which part of the training both in plenary and in smaller subject and/or grade groups (e.g., a lower primary literacy group). Typically, experts on the expert panel, who have received thorough training on the SEC methodology and completed their own coding and rating exercises, conduct the training for teachers.

3.2.6 Potential pitfalls

Some potential pitfalls to be aware of for this step are as follows. Following the guidance provided in this subsection should help avoid these pitfalls.

- Composition of the panel of experts:
 - Having a panel that is dominated by experts from one institution, usually the curriculum department or institute, prevents the necessary diverse views from being included.

- Failure to have a key institution represented on the panel, for example the national assessment body.
- Forgetting to have in-service teachers on the panel or selecting teachers who teach in elite (more privileged) school environments.
- Critical design choices:
 - Failure to allocate sufficient time and staff resources to the completion of the study.
 - Failure to link specific design choices (e.g., choices over which grade-level teachers will be included in the survey) to the main study objectives (e.g., measuring content progression alignment across grades).
- Identifying the sample of teachers
 - Failure to develop a clear sampling frame from which the target teachers are clearly identified, resulting in having the wrong teachers show up at the centralised venue where the training and survey activities are to be conducted. (“Wrong teachers” in the sense that they may be teaching a different subject/grade from the one for which the study is designed.)
 - Leaving it to the field organisers to select the teachers, resulting in an unrepresentative sample of teachers on several aspects.
- Finalising logistics
 - Failure to include the role of facilitating teacher training and survey activities in the contracts for members of the panel of experts.

3.3 Develop tools

Whereas the initial consultative forum sets in motion the work of building partnerships for the study that will bring key actors and stakeholders together, what kickstarts the technical work is the development of key study tools. Critical tools required for the successful conduct of an SEC study include a subject-specific taxonomy, an adapted set of the levels of cognitive demand (typically on a five-level scale), and a questionnaire for surveying teachers’ classroom instruction. Other tools include coding and rating forms used by members of the panel of experts and participant reflection questionnaires.

3.3.1 Comprehensive subject-specific taxonomy and levels of cognitive demand

In this subsection, two tools are discussed: a tool containing the subject-specific taxonomy and a tool outlining the levels of cognitive demand for students.

A subject-specific taxonomy is required for each of the subjects covered in the SEC study. A taxonomy is the systematic classification of all subject-relevant academic content that may be covered by the end of a particular education cycle. This content is classified under broad categories called topics and more specific sub-categories called sub-topics within each topic. As can be seen in **Figure 2**⁸, ‘Whole numbers’, ‘Place Value’, ‘Abacus’, etc. are sub-topics within the ‘Number and Numeration’ topic.

⁸ The full version of this taxonomy along with other taxonomies are provided with this toolkit and can be found via the Appendix.

Figure 2: Excerpt of the mathematics taxonomy for primary school (grades 1 - 6) in Nigeria as developed by the panel of experts under the SEC study in Nigeria.

100	Number and Numeration
101	Whole numbers
102	Place Value
103	Abacus
104	Operations (addition, subtraction, multiplication, division)
105	Fractions
106	Decimals
107	Percentages
108	Ratio and proportion (direct and inverse proportion)
109	Ordering of whole numbers (with inequality symbols)
110	Roman Numerals
111	Ordering of numbers (Fractions)
112	Real and/or Rational numbers
113	Exponents and scientific notation
114	Factors and Multiples
115	LCM
116	HCF

The second tool defines the levels of cognitive demand for students; these represent the type and level of ‘thinking and doing’ that is expected of students engaging with the content being analysed. The SEC approach employs a five-level scale for cognitive demand expectations, representing what learners should be able to do with the content they are learning. As shown in **Figure 3**⁹, the five levels stretch from the least demanding, ‘memorise’ or ‘recall’, to the most demanding, ‘apply to non-routine problems’¹⁰.

Figure 3: Levels of cognitive demand and their illustrative definitions

Level of cognitive demand	Illustrative definition
Memorise/Recall	Recognise, identify, or recall facts, definitions, or formulas
Explain/Perform Procedures	Perform procedures, solve routine problems, do computations, make observations, take measurements
Generate/Demonstrate understanding	Communicate ideas, explain findings from analysis, explain reasoning
Analyse/Conjecture	Make and investigate conjectures, infer and predict
Evaluate/Apply to non-routine problems	Apply and adapt strategies, solve novel problems, make connections

These two tools are critical inputs that inform all subsequent work by the panel of experts and in the teacher surveys. For this reason, developing them and/or adapting standardised versions to the country context is a primary activity that should precede all other technical work in the study. It is important to create these tools correctly from the very beginning to avoid a need for later revisions that will likely compromise the study.

Where the relevant taxonomy already exists, all that is required is to identify and customise it to the study requirements. In this case, customisation might include adopting the relevant topic and sub-topic numbering

⁹ More comprehensive subject-specific tables of the levels of cognitive demand are provided with this toolkit and can be found linked in the Appendix.

¹⁰ Levels of cognitive demand are not synonymous with levels of difficulty. A memorisation problem can be difficult, while an analysis problem could be easy. The levels of cognitive demand represent differences in required thinking, connecting, and doing to complete.

system and aligning the levels of cognitive demand with the five-level SEC scale. Where no taxonomy exists, however, a choice must be made from two possibilities: either developing one from scratch or contextualising an existing taxonomy (such as a standardised one provided by CCA¹¹, or one from another country setting) to fit the study country's educational context.

In all five LMIC studies mentioned above, a country-specific taxonomy did not exist prior to the study. Each study started with the standardised taxonomy provided by CCA, which was then adapted to the particular country context.

It is important that the taxonomy not be developed or adapted based on the curriculum standards. The taxonomy is intended to be comprehensive, covering all topics and sub-topics that *may* be covered during a level of education. It is expected that the curriculum standards will cover a subset of the topics and sub-topics specified in the taxonomy.

Developing a new taxonomy from scratch is a demanding task requiring a broad group of subject and policy experts to discuss and agree on the content that will serve not only as a base reference for subsequent SEC study activities but also as an important tool for facilitating the achievement of a country's education goals. In addition to the panel of experts, other critical actors should be included in this broader group, such as policy makers, university researchers/academics, frontline providers, private sector and industry, etc. Drawing from the broad knowledge and experience of this expanded group of subject experts is critical for surfacing/generating a comprehensive list of the relevant content coverage needs for a specific education cycle.

A relatively less demanding option is to contextualise an existing taxonomy from a different setting. In this case, the group will use their expert subject knowledge and local contextual understanding to adapt (rather than develop from scratch) the existing taxonomy to fit the local educational context. Depending on the subject area and education cycle under consideration, this process might involve dropping, adding, rephrasing, separating, and combining content. In other instances, contextualising a taxonomy can still be quite demanding as is the case for certain subject areas that are highly context-specific, such as social studies, civics, and history. In this case, the existing taxonomy will act as a general guide.

All the five SEC studies conducted in LMICs opted for the adaptation of an existing taxonomy to their country's education setting. The East African studies involved adapting the K-12 taxonomies from the USA to each of the three country contexts. The taxonomy adaptation processes in Nepal and Nigeria made reference to both the K-12 and Uganda taxonomies.

3.3.2 Survey instrument for teachers' instructional content

A large part of the work of developing the instrument for surveying teachers' classroom content is accomplished during the development of the taxonomy. The content part of the survey instrument reflects all topics and sub-topics appearing on the taxonomy. During the survey, teachers will be asked to report on the extent of coverage of each (sub-)topic through a three-step process. First, teachers indicate topics and sub-topics they did not cover during the year. Second, they make an approximate estimate of the amount of time spent on each of the covered sub-topic areas¹². Third, they indicate the 'primary' and 'supporting' level of cognitive demand for each sub-topic they covered in class. Each of these pieces of information are captured in the teacher survey instrument.

Another part of the teacher survey instrument is dedicated to describing the class taught by the teacher. In this part, the teacher reports on various aspects of their class such as class size, subject lessons per week, and

¹¹ This standardised taxonomy as well as the taxonomy adapted to the Nigeria country context are provided with this toolkit and can be accessed via the Appendix.

¹² These estimates are made concrete with labels such as 'slight coverage' for one class/lesson, 'moderate coverage' for 1-5 classes/lessons, and 'sustained coverage' for more than five classes/lessons.

duration of each lesson, the proportion of students with learning difficulties, etc. These variables are important for interpreting the teacher's classroom content coverage decisions.

Finally, other important considerations when developing the teacher survey instrument include clarity of instructions with respect to completing the survey, the level of technical jargon used in the tool (trying to keep this to a minimum), and the amount of time given to teachers to complete the tool. Completing the teacher survey tool in one sitting is a demanding task so it is important to give sufficient time and if necessary, allow for a short break during the survey.

It is recommended that the lead organisation pilot the teacher survey tool with a small group of teachers prior to implementing the full teacher survey. This allows time to make modifications to ensure teachers are able to complete the survey smoothly and correctly.

3.3.3 Other tools: coding and rating forms, and participant reflection surveys

Two other tools are important for the effective conduct of the study. First, coding and rating forms are simple tools designed to facilitate the work of the panel of experts as they review and code and rate the content embedded in various instructional components. To achieve uniformity in item references across experts, a standard coding form is used by all experts as shown in **Figure 4**.¹³ Without this uniformity in item references, it is very difficult to analyse datasets generated from the experts' work.

Figure 4: A sample coding and rating form that is used by each expert during the study.

June 2022: five-day training on coding and rating Practice Session at ASE

Coding Sheet

Rater:

Class:

Instructional component: Curriculum

#	Performance Objective	Topic1	CGD1	Topic2	CGD2	Topic3	CGD3	Comments, Suggestions
1	Learners should be able to state numbers in words	101	C	202	D	212	C	

Second, participant reflection surveys are intended to gather views of all who participated in the study with the key goal of using this evidence to inform and guide more effective implementation of SEC studies in LMICs. Since different categories of participants are involved in an SEC study, the tools have to be customised to the roles the participant played in the conduct of the SEC study.¹⁴ Participants whose reflections are critical include members of the panel of experts, the lead organisation, surveyed teachers, and field coordinators.

3.3.4 Potential pitfalls

Some potential pitfalls under this step are as follows. Following the guidance provided in this subsection should help avoid these pitfalls.

- Failure to understand that the taxonomy is a major input that drives the rest of the SEC study, including the teacher survey.
- Beginning other SEC technical activities such as coding and rating before thorough completion of the taxonomy development or adaptation process.

¹³ The complete version of this coding and rating form is provided with this toolkit and can be found via the Appendix.

¹⁴ The complete reflection surveys used in the Nigeria study are provided with this toolkit and can be found via the Appendix.

- Mistaking the taxonomy to be the same as the curriculum standards.
- Failing to simplify the technical jargon in the teacher survey tool, e.g., ‘cognitive demand’.
- Failing to allocate sufficient time for teachers to complete the survey tool. Rushing teachers to complete their surveys in a short time will likely compromise the quality of their responses.
- Failing to ensure uniformity of item references as coded and rated by the panel of experts through the use of coding and rating forms.
- Forgetting to develop and use participant reflection tools because this activity tends to take place after the main field activities are completed.

3.4 Convene expert panel to review academic content

The principal role of the panel of experts is to systematically review the academic content embedded in the instructional components being analysed in the study. This process generates a dataset of (sub-)topic ‘codes’ and cognitive demand ‘ratings’ that describes the content. To achieve this goal, the panel of experts must first gain an in-depth understanding of both the theory and application of the SEC methodology. Without this understanding, the experts will find it difficult to comply with key methodological demands, which will thus compromise the goals of the study. One such key demand is the requirement for experts to first work individually and then revisit the same content as a group.

3.4.1 Train the panel of experts on the SEC methodology

Two to three days of in-person training are required to fully orient members of the panel of experts on the SEC methodology. By the end of this training, the experts should have gained an in-depth understanding of the theoretical and practical underpinnings of the methodology and should be able to effectively conduct content analysis tasks as individual experts and engage in group discussions with other members.

The training of experts is targeted at achieving six specific objectives.

First, to introduce the SEC as a descriptive approach that maps academic content from different instructional components onto a common analytical framework. The training must explain the various applications of the SEC tools for reform analysis, alignment analysis, school improvement and teacher development.

Second, to explain at great length the key concept of ‘cognitive demand’ and how the SEC methodology’s five levels of cognitive demand align with other frameworks, such as Bloom’s revised taxonomy with six levels and Webb’s depth of knowledge framework with four levels (see **Figure 5**)¹⁵.

Figure 5: SEC as a hybrid of Bloom’s Taxonomy (2001) and Webb’s Depth of Knowledge framework (1997 and 2002).

Bloom's Taxonomy (2001)	Remember	Understand	Apply	Analyze	Evaluate	Create
SEC (Porter & Smithson, 2002)	Memorize	Perform procedures	Demonstrate understanding	Analyze	Integrate	
Webb's DoK (1997, 2002)	Recall	Concept	Strategic thinking	Extended thinking		

¹⁵ For more information, see attached slide deck SEC Approach & Methods_Coding & Rating_Part 1.pptx. This can be accessed via the Appendix.

Third, to clearly define the tasks experts will undertake and the respective timelines within which experts are expected to accomplish the tasks. This includes specifying the instructional resources or documents experts will be reviewing, the years and grades to be covered, and the outputs that are expected from the experts as individuals and subject groups. It also includes practicing the key activity of ‘coding and rating’ at the individual level and discussing codes and ratings at the academic subject level.

Fourth, to explain the ‘how’ of accomplishing the above tasks by linking to the taxonomy, specifying procedures, conventions and norms of coding and rating, agreeing the level at which coding and rating for each document is to be done, explaining the working environment, and highlighting likely issues that may come up and how to address each one of them. Several considerations and decisions to be made in establishing the panels ways of working include:

- Will experts work in Excel on their PCs or through an online data tool?
- Will individual experts work on their own or they will adopt a workshop format?
- Will the experts converge for group discussions after completing coding for a portion (batch) of the work or after all of the work is complete?
- Will the group discussions be conducted in person at a common venue or virtually?

Fifth, to explain how the experts’ work connects with the survey of teachers’ instruction and what role the experts will play in the conduct of that survey. Along with this, experts will be introduced to the 3-step design of the teacher survey tool.

Finally, to direct the experts to further resources on the SEC methodology and studies for optional further study to gain deeper conceptual and practical understanding.

Effective training of the panel of experts requires a significant portion of the training to be devoted to practical work of describing levels of cognitive demand. When doing the practical work, experts should be placed into their subject panel teams and should engage with the relevant subject documents and tools. As much as possible, peer-led question and answer sessions should be used to mimic the situation they will face when doing the work.

Training of the panel of experts in previous SEC studies have lasted between two and five days.¹⁶ In-person training was used in four of the five instances, with the fifth one being done virtually due to unavoidable circumstances¹⁷.

3.4.2 Content analysis: Individual analysis followed by group discussions

The work of reviewing the academic content embedded in the document-based instructional components is called ‘content analysis’. Deriving from their subject knowledge, members of the panel of experts code each portion of content (this could be learning objectives in curriculum documents, items in assessment documents, or paragraphs of text in textbooks) for each document. For each portion of content, they code at least one sub-topic that is being covered and rate the level of cognitive demand expected of students. A minimum of one set of codes and ratings must be generated for each agreed portion of content.¹⁸ Content analysis is a cognitively engaging task, and so experts are advised to allocate sufficient time for this exercise and avoid other distractions.

The SEC methodology requires each expert to first develop their own individual codes for the agreed content and then to come together as a group to discuss their decisions. All experts must first complete coding and

¹⁶ In Nigeria, the training took five days. The first day was devoted to training staff of the lead organisation. The second, third and fourth days were devoted to the training of the panel of experts on SEC methods. The fifth day was devoted to the contextualisation of the two taxonomies—primary mathematics and English.

¹⁷ Travel disruptions resulting from the outbreak of the COVID-19 global health pandemic meant that the training for the panel experts in Nepal was done virtually using the online application ‘Zoom’.

¹⁸ This can go up to a maximum of three sets of codes for assessment items and up to a maximum of six sets of codes for learning objectives on the curriculum standards.

rating the agreed portion of content before a group discussion is held. **Group discussions are not meant to lead to a group consensus**, but rather serve as a quality assurance process for the individual experts to consider if their earlier codes and ratings need to be amended or not after independently considering the views of other subject experts. Individual experts must exercise their own judgement to amend or not amend their individual codes following the group discussions.

From experience, group discussions can sometimes get tense, and therefore the presence of a neutral facilitator whose main role is to ensure the discussion proceeds calmly and smoothly and to remind experts of the objectives of the discussion not as a fault-finding mission but rather a reflective process meant to support individuals' work is imperative. To succeed in this role, the facilitator needs to have also conducted the coding and rating work themselves as well.¹⁹

Experts can accomplish their individual coding work by working through scheduled workshops in a central location or separately, each one fitting the work in their personal schedules. Depending on time availability and other logistical constraints, this decision needs to be discussed and agreed jointly by all expert panel members and the lead organisation. Another choice concerns whether to conduct individual coding and rating in batches or to complete the whole coding and rating task before experts come together for group discussions. Whereas coding and rating in batches is thought to result in high-quality group discussions with less tension, it is logistically more demanding to implement especially in circumstances when experts live in geographically dispersed regions.

Previous SEC country studies have included both coding and rating workshops and experts working separately when developing individual codes. In all five cases, experts first completed all the individual coding and rating before they came together for group discussions. Staff from the lead organisation who were also members of the panel of experts played the role of facilitating and ensuring smooth group discussions in two of the five studies. There were no group facilitators in the earlier studies conducted in East Africa, where this role was instead played by the subject team leader.

3.4.3 Finalisation and submission of each expert's work

Following the completion of group discussions, each expert will undertake a quality assurance process in which they thoroughly review all their coding and rating forms for both completeness and accuracy. First, each form must be labelled to clearly identify the expert, instructional document, subject, and grade. Second, experts must double check that they adhered to the coding conventions, the most important being that all content is coded at the sub-topic (not topic) level and that the correct form of cognitive demand ratings have been used. Finally, each portion of content that experts were meant to code and rate must have at least one set of codes and rates.

3.4.4 Potential pitfalls

Some potential pitfalls under this step are as follows. Following the guidance provided in this subsection should help avoid these pitfalls.

- Failure to allocate sufficient time to training the expert panel, resulting in experts being unsure of what they are required to do or why they are asked to work in a certain way.
- Failure to conduct sufficient practice with coding and rating, leaving the subject teams ill prepared for both individual and group-level tasks.
- The temptation for the experts to take group discussions to mean they must amend their codes and ratings to a group consensus, preventing the richness that is embedded in each expert's individual codes and ratings.
- Experts waiting to code and rate difficult content areas until after the group discussion, resulting in a skewed set of results.

¹⁹ This role is best played by experts who are employees or closely affiliated with the lead organisation.

- Experts submitting coding and rating forms that have inaccuracies or are incomplete, such as missing codes or ratings, mixed-up codes or ratings, etc.

3.5 Survey teachers on content coverage

Teachers will be surveyed on their coverage of instructional content for a specific subject and grade they have been teaching during the current school year (or previous school year if the survey is conducted at the end of the academic year). As mentioned in ‘**3.3.2 Survey instrument for teachers’ instructional content**’, teachers will also be asked to report on some important variables that provide a clear description of their classroom environment. The teacher survey instrument should be piloted with a small group of teachers prior to conducting the full survey, to allow for modifications to ensure quality responses.

3.5.1 Bring teachers to a central location: by region or district

Teacher surveys can take place at either a central location or in their individual schools. If few schools will be covered and the number of teachers per school is large, it can be reasonable (financially and logistically) to survey teachers at their schools. However, the typical survey conducted in LMICs involves many schools and few teachers per school, which justifies the need to bring teachers to a central location.

There is also a substantive benefit to a centralised training for teachers. The training given to teachers before they are surveyed on their instructional content coverage provides a unique form of professional development that teachers do not usually experience in their teaching career. SEC provides a means for reflecting on the content of instruction, and teachers often express appreciation for this new way of thinking about the content they cover in the classroom. Centralised training also allows teachers to discuss with and learn from fellow teachers, enriching the experience and quality of this training.

A full day of training for teachers is required before they can be surveyed on their content coverage. Depending on how far the furthest teacher must travel to get to the central venue, there might be a strong case for having all teachers arrive at the venue on the eve of the training day.

In all the previous SEC studies conducted in LMICs, teachers were brought to a central location, which tended to be a venue where teachers usually gather for other activities such as attending in-service professional development sessions or teacher union meetings.

3.5.2 Orient teachers on the methodology and the survey

Teacher training and orientation on the SEC methodology should be viewed in a similar way as the training given to members of the panel of experts (see ‘**3.4.1 Train the panel of experts on SEC methodology**’). Unlike the experts, however, teachers are asked to complete the survey in one sitting and will benefit from being trained by members of the panel of experts, who tend to have a clear understanding of the methodology, the tools, and the context, and can closely relate with teachers due to their accumulated experiences of teaching in similar settings.

At the start of the training, it is critical to clearly state the objectives and goals of the training and survey. Even though the main goal of the survey is to collect data on classroom instruction, it is important to highlight to teachers the direct value to them as participants in this activity: that the training is intended as a professional development opportunity for them and will focus on critical concepts that will enrich their teaching practice, such as ‘reflecting on cognitive demand’.

A clear explanation of how the participating teachers were selected must be given. This is important in many LMIC settings where the opportunities for attending professional development sessions are quite limited. Teachers might think that they were selected for certain reasons, such as being rewarded (or punished) for good (or poor) performance. Related to this is the need to **assure teachers that their responses to the**

survey questions will never be used for teacher performance evaluation purposes. Indeed, often the teacher surveys are completed anonymously, with no personally identifiable teacher information captured, to facilitate teachers answering honestly and openly.

In a plenary setting, explain to teachers what SEC is, highlighting the important applications of measuring alignment and facilitating teacher reflection and peer support. Elaborate in detail how teachers can use SEC outputs such as content maps to discover how their teaching aligns with the curriculum, which topics and levels of cognitive demand they are giving high and low emphasis, and what types of professional development they may need to improve their teaching practices.

Following this initial training, move teachers to breakout subject teams where the remainder of the orientation will be subject-specific. Within the subject groups, share and discuss at length with teachers the topic and sub-topic content areas reflected on the taxonomy, noting if there are specific content areas that teachers highlight as strange or unfamiliar. Introduce and define the concept of cognitive demand as the type and level of ‘thinking and doing’ that the teacher expects of the learner (‘what learners should be able to do’). Begin from Bloom’s taxonomy and Webb’s ‘depth of knowledge’, since teachers might be more familiar with these frameworks of cognitive processing, and link these to the SEC five categories of cognitive demand. Discuss each of the levels in detail, dwelling on the descriptive definitions given in the subject-specific cognitive demand tables.

Within the subject teams, spend the majority of the time focusing the training on the concept of cognitive demand. The session should be dominated by practical exercises with smaller groups of teachers exploring, discussing and debating cognitive demand ratings using various supports such as flash cards, cognitive demand wheels, and sticky notes. Design activities that illustrate applications of the cognitive demand concept to the development of schemes of work and lesson plans and to the interpretation of learner performance.

Finally, explain what the teacher survey tool is, highlighting three critical aspects.

1. The structure of the tool has two major sections: one on class description and the other on classroom content coverage. Teachers are expected to complete both sections.
2. There is a three-step process that teachers must follow in completing the teacher content coverage section. As a recap, teachers will first mark whether they covered a topic over the course of their instruction; then, they will mark how much relative emphasis the sub-topics received; finally, they will mark the level of cognitive demand at which they taught the sub-topics. Make sure to clearly show the link between the previous discussions on taxonomy and cognitive demand to the survey tool.
3. The ‘target class’ is the class that teachers have been teaching in the current school year and for which they were selected to participate in the survey. For instance, even if a teacher teaches multiple subjects, they may be completing the survey for only one specific subject for which they were selected from the sampling exercise.

Remind teachers that the survey is not an evaluation of their performance and that there are no right or wrong answers. Each teacher is answering for their specific class, where instruction can be impacted by the unique composition of students in the class. It is also important to emphasise that the surveys are anonymous and that results will help improve support provided to teachers, and therefore it is critical that teachers answer honestly.

3.5.3 Teachers complete survey

Teachers should complete the survey tool on the day after the training. This is because the nature of this task is cognitively engaging and demanding, and teacher survey tools tend to be heavy on detail since teachers are responding on all sub-topics reflected on the taxonomy.

From the very start, teachers should be encouraged to mark (sub-)topic areas as ‘not covered’ if indeed they were not covered. During survey completion, teachers should be freely allowed to consult the facilitator when

in need of clarification and the facilitator should give as much guidance as possible to enable the teacher to make the appropriate selection in relation to their class. Additionally, teachers should be given sufficient time to complete the survey and where necessary, they should be allowed to take a short break.

3.5.4 Potential pitfalls

Some potential pitfalls under this step are as follows. Following the guidance provided in this subsection should help avoid these pitfalls.

- The wrong teachers show up for the survey, either because the selection process had some inaccuracies or there was no clarity on which teachers were needed. Sometimes, uninvited teachers might show up just because they heard about the activity from their peers who were selected to participate. Others will come in place of the selected teachers who might be unable to come due to various reasons. Depending on the reason, unexpected teachers may be asked to leave. If an administrative decision is made for them to stay and participate, their tools must be marked as being from unexpected teachers, and appropriate subsequent actions must be taken to include or exclude them from the analyses.
- Teachers show up at the central venue late, after orientation sessions have begun. This will compromise the quality of the data. Time will have to be allocated for these teachers to catch-up on the portions of the training they missed.
- Failing to explain to teachers the goals and objectives of the survey, and failure to convince teachers that their responses will not be used for performance evaluation or other accountability-related goals.
- Failing to spend sufficient time on practical activities around the concept of cognitive demand.
- Failing to clearly explain the three-step process of completing the teacher survey tool.

3.6 Conduct data entry, process data, and report results

The process for entering and processing data, and reporting results is described in **Figure 6** below.

Figure 6: Process of entering and processing data, and reporting results



SEC data processing requires a close collaboration with CCA as CCA holds the intellectual property rights for data processing approaches in the SEC methodology.²⁰ The expert panel records their coding and rating decisions directly in a Microsoft Excel workbook that has been specifically designed, which CCA then inputs into the Excel-based data analysis tool. Teacher surveys can be conducted either through a digital survey or on paper. If teacher surveys are conducted on paper, the data must be entered into an Excel-based workbook. Either way, teacher data is also input into the data analysis tool by CCA. CCA then provides the lead organisation with macro-enabled Excel data viewers which are used to conduct analysis and produce visualisations of the results.

3.6.1 Data entry for paper-based teacher surveys

Note: This step only applies if paper-based teacher surveys are used.

The lead organisation must plan for data entry to be done after the completion of a paper-based survey of teachers' instructional content coverage. Through the collaboration with the CCA, an online or offline Excel form will be developed for this purpose. The lead organisation must decide who will undertake this task, such as data entry assistants or inhouse by employees of the lead organisation.

²⁰ The [Center for Curriculum Analysis](http://www.centerforcurriculumanalysis.org) can be contacted by email at support@curriculumanalysis.org.

Both online and offline forms have been used in previous studies, and both options of outsourcing and use of inhouse data entry assistants have worked well in previous LMIC SEC studies.

3.6.2 Panel of experts' Microsoft Excel work environment

The panel of experts inputs their coding and rating into an Excel-based template created by the lead organisation.²¹ All members of the panel of experts must have basic Excel skills that allow them to easily navigate cells and worksheets, use the keyboard to name worksheets and label cells, type codes in the appropriate cells, and rename and save Excel files.

The experts should also be trained and able to adhere to the agreed coding procedures or conventions, such as using sub-topic numbers as content codes and uppercase letters (B / C / D / E / F) as cognitive demand codes, providing at least one set of two-dimensional codes for each item reference, and maintaining the sequencing of item references in each worksheet.

Early SEC studies involved training some panel members on the basics of working within Microsoft Excel environments.

3.6.3 Data cleaning and quality assurance

Data cleaning will be needed for the expert panel's datasets before the datasets can be forwarded to CCA for further processing. The lead organisation must check for completeness, compliance to coding procedures, uniformity of item references across experts, and identification and labelling. This cleaning and quality assurance includes:

- Initial cleaning involves checking that all the agreed coding procedures, conventions and norms were complied with, with the most important being that each expert panellist has coded and rated all assessment items or curriculum standard objectives to at least one sub-topic and at least one performance expectation rate. The coding and rating data from all experts is then transferred into a processing template that computes inter-rater reliability. Inter-rater reliability measures the extent of agreement in coding the content embedded in a component across experts. Depending on the number of experts involved, a threshold for inter-rater reliability must first be defined.
- At this stage, the data is provided to CCA for further processing. CCA adapts the data using existing programming code in Visual Basic Applications.²² This process transforms each expert's data into normalised proportions and generates averages across all experts that reveal measures of relative emphasis across instructional components. Alignment measures between any two components are then generated as zero-to-one indices that reflect a comparison of the proportion of content coverage in each content cell across the two components.²³
- Finally, CCA provides Excel-based viewers back to the lead organisation. These viewers produce content maps, marginal charts, and alignment tables for each component, and produce alignment indices comparing components on-demand. The lead organisation then uses the viewers to conduct analysis and determine results.

Regarding data entry for teacher responses, the form should have some inbuilt quality assurance aspects that significantly reduce the need for extensive review. However, random backchecks should still be undertaken to establish completeness and accuracy of completed entries.

²¹ A sample of this tool is provided with this toolkit and can be accessed via the Appendix.

²² Proprietary license and intellectual property rights for this VBA programming code is held by CCA.

²³ The alignment index is a scaling (reduction) of the perfect alignment situation (alignment = 1) by the absolute mean deviation of the cell-by-cell differences in emphases across the two components. It is calculated using the formula $Alignment\ index = 1 - \frac{\sum |x-y|}{2}$, where x is the cell proportion in one matrix and y is the cell proportion in another matrix. For more details, see Porter (2002).

3.6.4 Data processing and upload

SEC data processing is predominantly undertaken by CCA. That said, it is possible to have this task undertaken by the lead organisation working in close consultation with CCA. When this in-depth involvement approach is adopted, CCA will share detailed processing and analysis instructions that can be followed to generate the SEC outputs.

3.6.5 Results reporting using macro-enabled Excel viewers

A pre-analysis plan should be developed and shared with CCA to guide the data aggregations that are needed to address the study aims and objectives.²⁴ The pre-analysis plan should include a plan for choosing which individual content maps will be reported (e.g., grade 1 curriculum standards, grade 2 curriculum standards, etc.); which aggregate content maps will be reported (e.g., a content map for grades 1-3 combined curriculum content, representing lower primary, or a content map aggregating all rural teachers' instruction content; etc.); and which alignment results will be reported. The data aggregations specified in the pre-analysis plan will be included in the Excel viewers that CCA will share with the lead organisation.

The lead organisation can then use these Excel viewers to generate outputs including content maps, marginal charts, and alignment tables at both topic and sub-topic analysis levels (see '**3.9.2 Content maps and marginal charts**' and '**3.9.3 Alignment tables and indices**' for examples). Since the Excel viewers are macro-enabled, users must have Excel macros enabled on their computers to gain full access and easily generate results and outputs of their interest. In previous studies, using such macro-enabled files has proven difficult on Mac laptops, so a PC may be needed.

3.6.6 Potential pitfalls

Some potential pitfalls under this step are as follows. Following the guidance provided in this subsection should help avoid these pitfalls.

- Failure to ascertain Excel skills of members of the panel of experts or to make provisions for training those who lack the required skills.
- Forgetting to plan for or make a provision for the 'data entry' step when the teacher survey is paper-based.
- Members of the panel of experts failing to adhere to the agreed coding procedures, conventions and norms, resulting in heavy data cleaning required.
- Failure to develop a pre-analysis plan to guide CCA in adapting the Excel viewers to the specific study needs. This will lead to delays in generation of results.
- Challenges associated with working with macro-enabled Excel viewers.

3.7 Collect item-level student performance data

An SEC study provides a unique opportunity to link various instructional components to children's learning by identifying content areas in which children are struggling to keep up with the content prescribed in those documents. Such rich policy analysis work can be conducted if item-level child performance data is available for the assessments coded by the panel of experts. Two of the five SEC studies conducted in LMICs have included analyses of item-level child performance data.

Including and analysing student performance data in an SEC study requires a somewhat different approach than the expert panellists and teacher survey inputs. Unfortunately, a full explanation of this process is outside of the scope of the current toolkit, but descriptions of how this was done in Nepal and Nigeria are available in Atuhurra et al. (2023) and Adeniran et al. (forthcoming).

²⁴ A sample pre-analysis plan is provided with this toolkit and can be accessed via the Appendix.

3.7.1 Potential pitfalls

Some potential pitfalls under this step are as follows. Following the guidance provided in this subsection should help avoid these pitfalls.

- Difficulties associated with accessing item-level child performance data.
- Lack of national-level standardised learning assessments data covering children in lower primary or foundational grades.

3.8 Collect participant feedback

Collecting and analysing feedback from participants in an SEC study is critical for achieving effective design and implementation of subsequent studies in LMICs. Feedback can be gathered from each of the groups involved in the study: those involved in developing subject taxonomies, the panel of experts, the lead organisation, local government and other field-based actors involved in mobilising and coordinating teachers for the survey, and the schools and teachers who participate in the survey.

It is important to consider both the nature and focus of feedback to be collected from the different participant groups. In the early stages of conducting an SEC study in LMICs, process and value-focused feedback is critical for achieving the goal of informing better design and implementation of future studies. From teachers, it may be useful to ask them to reflect on their participation in terms of how it will influence their classroom practice. From local government and field-based actors, asking them to reflect on both the administrative aspects of mobilising or coordinating teachers for the survey and the quality of their post-survey interactions with the participating teachers may provide valuable insight. From the panel of experts, it is useful to ask them to reflect on the policy-relevant insights they may have gained from the experience of coding and rating various instructional documents and the approaches they might employ if given a second opportunity to complete similar tasks. The lead organisation may reflect on the key aspects of the study, both technical and logistical.

To collect reflective feedback requires that participants are given time to reflect before they are asked for feedback. This, however, makes it difficult to collect feedback from certain participants, notably teachers. It is critical therefore, to not only consider when (and how) to collect teacher feedback but also what questions teachers will adequately respond to conditional on the timing decision.

All previous SEC studies have collected reflective feedback from most participants involved in the studies. In earlier studies, teacher feedback was collected from all participating teachers immediately after completing the main survey. Later studies collected teachers' reflective feedback by following up with a sample of participating teachers. Reflective feedback from other participants was collected at a later stage after their involvement in the study.

3.8.1 Potential pitfalls

Some potential pitfalls under this step are as follows. Following the guidance provided in this subsection should help avoid these pitfalls.

- Failure to collect feedback from key actors involved in the study.
- Low response rate due to requesting feedback after a long time-lag.
- Taking too long to follow up with participants, resulting in inaccurate or shallow responses due to participants forgetting or struggling to recall their experience.

3.9 Analyse, interpret and report results

The Excel-based macro-enabled viewers that CCA shares with the lead organisation contain all the processed data from the experts' work, teachers' survey, and item-level child performances. The user is able to generate or replicate any results using these files. The results can then be interpreted, paving the way for subsequent reporting.

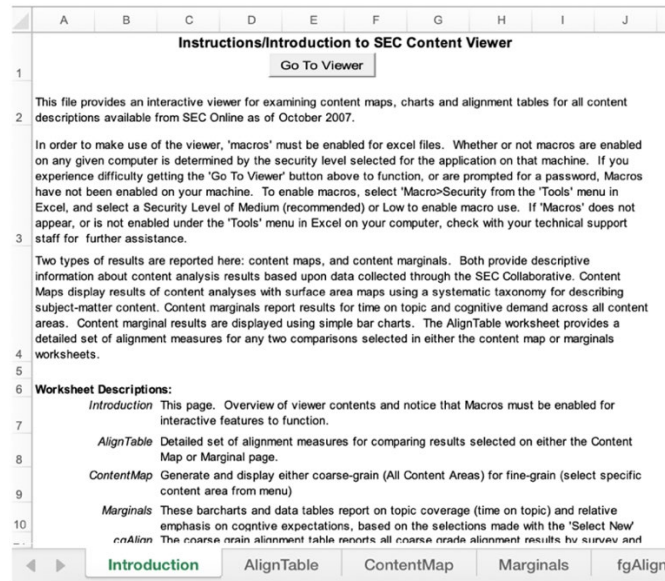
3.9.1 Navigating the Excel viewers

Generally, one Excel viewer file is generated for one SEC study and contains data for all the different components of the study. The viewer file comes with several sheets, four of which are critical and will form the main reference for the user: introduction, content map, marginal charts, and alignment table.

'Introduction' tab

The 'introduction' tab introduces the viewer file giving a summary of each of the other tabs and basic guide notes for the user to begin interacting with the various tabs on the file.

Figure 7: A screenshot of the 'Introduction' tab



'AlignTable' tab

The 'AlignTable' tab displays the detailed breakdown in alignment measures and overall alignment summaries at coarse and fine grain levels.

Figure 8: A screenshot of the 'AlignTable' tab using data from the Nigerian study for literacy curriculum standards for grades 4-6 and three-year assessment.

Course Grain	0.40	0.54	0.49	0.76
P4-6 Literacy Curriculum	Alignment	Balance of Representation	Topic Coverage	Skill Coverage
TO: NECO 3 Yr. Summary				
Phonemic awareness	NA	NA	NA	NA
Phonics	0.01	0.08	0.04	0.27
Vocabulary	0.44	0.30	0.51	0.83
Concepts of Print	NA	NA	NA	NA
Fluency	NA	0.00	NA	NA
Comprehension	0.45	0.47	0.49	0.70
Verbal Reasoning	0.17	0.38	0.20	0.71
Literature	0.32	0.17	0.79	0.37
Writing Processes	NA	NA	NA	NA
Elements of Presentation	NA	NA	NA	NA
Writing Applications	NA	NA	NA	NA
Grammar	0.46	0.36	0.62	0.54
Listening and Speaking	0.31	0.07	0.33	0.75
Fine Grain	0.28	0.17	0.31	0.40

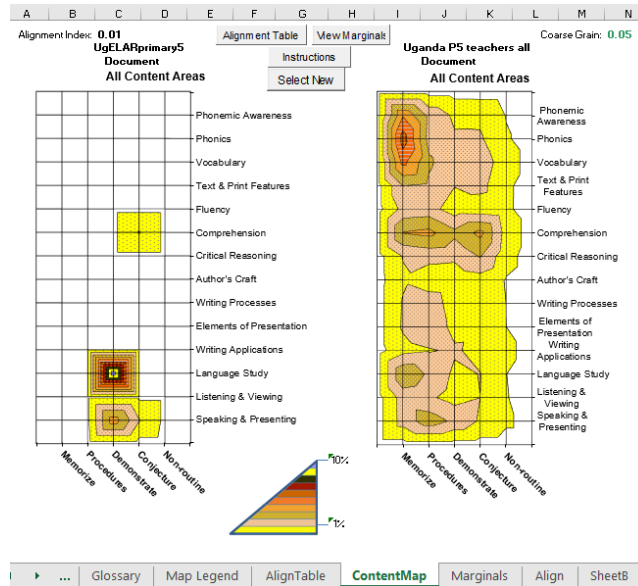
Alignment Measures:

Alignment The alignment column reports "re-centered" alignment indices for each content area. The re-centering excludes the amount of time spent in other content areas from the alignment calculation. The "Overall" Alignment measure in the second-to-last row of the table is the summary alignment measure typically used to describe alignment. A "re-centered" alignment measure for a specific content area that drops below the overall alignment measure is highlighted in pink, and indicates a content area that is detracting, rather than contributing (relatively speaking) to the overall alignment

‘ContentMap’ tab

The ‘ContentMap’ tab generates and displays content maps following user defined analysis specifications.

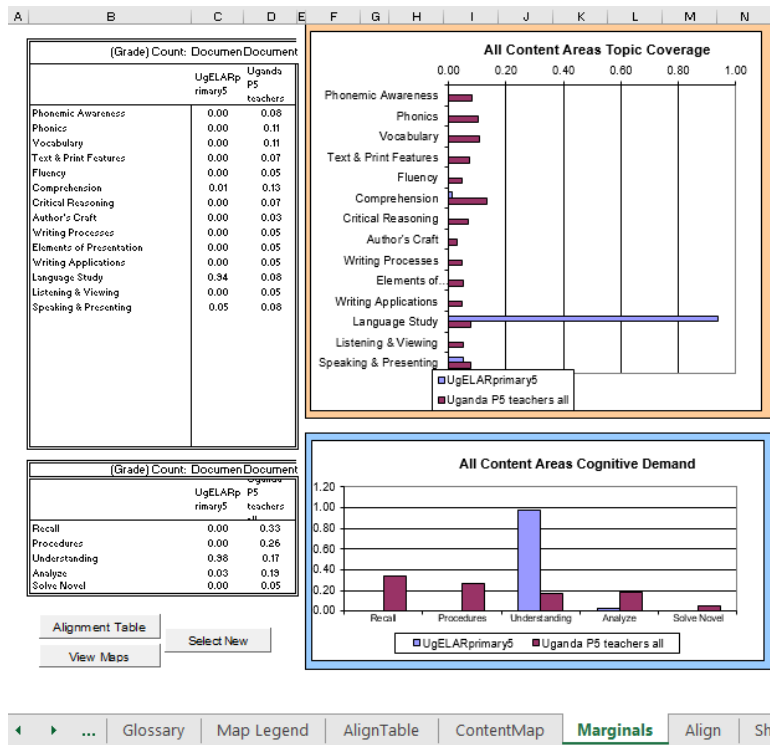
Figure 9: A screenshot of the 'ContentMap' tab using data from the Uganda study for reading curriculum standards and teacher instruction for grade 5.



‘Marginals’ tab

The ‘Marginals’ tab displays two-dimensional bar charts and data tables for level of emphasis on (sub-)topics and cognitive demand.

Figure 10: A screenshot of the 'Marginals' tab using data from the Uganda study for reading curriculum standards and teacher instruction for grade 5.

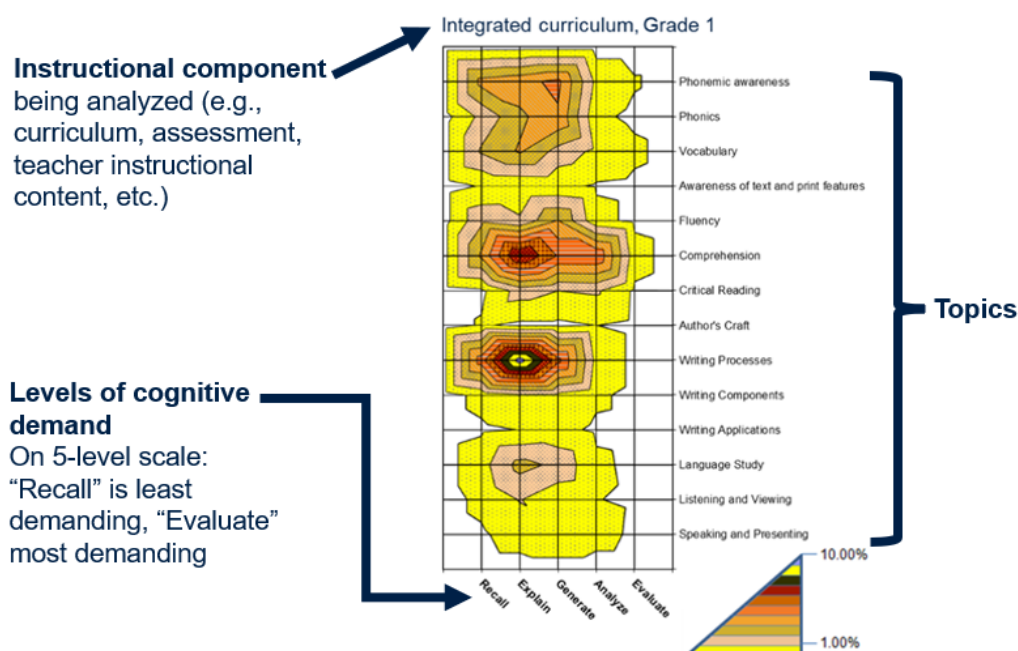


Other tabs in the viewer file contain more detailed computations and outputs that the user might want to reference to gain deeper understanding of the results. However, these are not typically used for the main analysis and reporting. If the lead organisation wishes to explore the detailed computations in more depth, it might be necessary to reach out to CCA to obtain first hand guidance on how to use the data in those tabs.

3.9.2 Content maps and marginal charts

One of the three key outputs of an SEC study are three-dimensional content maps (see **Figure 11**). Three-dimensional content maps form the main visual output that can be generated from an SEC study. These maps portray the overall descriptive picture of the content embedded in each instructional component. They show topics or sub-topics on the y-axis, cognitive demand levels on the x-axis, and the level of emphasis on the z-axis. Using a two-step process, an intersection point on the y- and x- axes is first identified and then the level of emphasis is determined by looking at the relevant colour scheme at that intersection point. The content maps are read like topographical maps, with peaks indicating higher levels of emphasis.

Figure 11: An example of a topic-level content map for language arts and reading.



Depending on the data that has been processed and included in the viewer, up to three content maps may be displayed simultaneously. Where child performance content data has been included in the data, the child performance map will be displayed as the third map. The colour schemes used to describe performance data adopt a different colour pattern than the others, using a traffic light colour system to describe children's learning achievement levels.

The second type of output are marginal charts, which are two-dimensional counterparts of the content maps. These use bar graphs to show the proportion of content allocated to each (sub-)topic and the proportion allocated to each level of cognitive demand. See **Figure 10** above for an example of this.

SEC results are interpreted descriptively: the results are descriptions of what is embedded in the component under review. Results can be produced at two levels: the topic-level results, which are sometimes referred to as 'coarse-grain' results, and the sub-topic level, which are sometimes referred to as 'fine-grain' results. Content maps can be generated for different groupings, including by school, district, or state, and can be compared across different groups, such as comparing rural and urban teachers' instructional content.

3.9.3 Alignment tables and indices

The alignment table provides the most important result summaries for alignment analysis purposes. It reports quantified alignment measures based on alignment of topics or sub-topics, levels of cognitive demand, and levels of emphasis between two instructional components. The table reports the overall fine-grain (sub-topic level) and coarse-grain (topic level) alignment measures. Detailed interpretative notes for reading the different indices shown in the alignment table are available in the 'AlignTable' tab in the Excel viewer (see **Figure 8** above).

SEC alignment results can be interpreted both within and across components.

- Within a specific component (such as the curriculum standards), the alignment results compare the prescribed content between periods such as weeks, terms, and grade levels. A high alignment measure within a component suggests similar content is covered from one period to another (low levels of content progression), and vice-versa. This alignment measure is typically used to measure the pace of progression of content.
- Across components, the alignment results portray the extent of overlap between the content in the two components being compared, such as classroom instructional content versus the prescribed content on the curriculum standards for a specific term or grade. A high cross-component alignment measure suggests high levels of overlap and vice versa.

Alignment is reported on a zero to one scale, where zero represents perfect misalignment (no overlap in content across two components) and one represents perfect alignment (complete overlap in content across two components). As a simple rule-of-thumb, previous studies have used 0.5 (the middle of the alignment index range) as a reasonable measure of acceptable cross-component alignment. This is premised on the understanding that assessments may not cover all content areas prescribed on the curriculum standards and teachers face high levels of student-level knowledge and ability variation in the classroom, which affects their coverage of prescribed content.

Although a quantitative measure, the alignment index is interpreted qualitatively — suggesting that the 0.5 rule is not a hard threshold. When tied to interventions that intend for teachers to tightly follow the prescribed content (such as structured pedagogy), a higher measure (such as 0.9) may be set as a reasonable target for acceptable cross-component alignment. Depending on the type of alignment analysis under consideration and other contextual variables, a minimum or target level of alignment should be discussed and debated among relevant experts to inform later analysis and interpretation.

3.9.4 Reporting

SEC reporting follows the results interpretation. The structure of the report will be determined primarily by the main goals of the study, which could be alignment analysis, curriculum articulation and sequence analysis, education policy reform, teacher development and school improvement, and so on. Results of SEC analyses are descriptive depictions of current emphasis, providing an objective basis for discussion by relevant authorities. It is important to emphasise that SEC results are *descriptive*, not *prescriptive*. There are no right or wrong content maps. The results must be interpreted based on contextual expectations and requirements.

SEC results can be reported at two levels: 'coarse grain' at the topic level, and 'fine grain' at the sub-topic level. To recap, coarse grain analyses are analyses that portray relative emphasis of academic content at the more aggregated topic-level, while fine grain analyses are sub-topic level analyses that underlie the coarse-grain and enable a detailed diagnosis of the sources of misalignment.

Child performance results must be analysed and written about with caution. Performance can only be captured on content that was included on the assessment: if a topic or level of cognitive demand was not tested, child performance on that topic cannot be known. Child performance must therefore always be analysed in conjunction with the content tested on assessments. Further, care must be taken to study the format of assessments and qualitative factors that influence performance outcomes, such as multiple-choice

questions allowing students to get questions right by guessing, or testing conditions that increased the likelihood of cheating. Lastly, the density of questions on the assessment must also be considered. For example, if there was only one question on a certain topic at a certain cognitive demand level, the results might not be as reliable as when there are multiple questions on a certain topic at a certain cognitive demand level.

For additional information and examples of the SEC methodology being applied to various contexts, see Blank, 2005; Atuhurra & Kaffenberger, 2022.

3.9.5 Potential pitfalls

Some potential pitfalls under this step are as follows. Following the guidance provided in this subsection should help avoid these pitfalls.

- Failure to critically evaluate results to make sure they make sense.
- Failure to interpret three-dimensional content maps and alignment table measures correctly.
- Not considering the bigger picture in the analysis. This could be due to relying solely on the data for analysis and not considering contextual elements that could impact the data.
- Trying to interpret content map results simply as ‘good’ or ‘bad’, such as based on an alignment index threshold, rather than through qualitative, nuanced analysis with reference to the goals and objectives for alignment in the context.

3.10 Disseminate SEC study findings

Evidence from SEC studies conducted in LMICs is still rare. Broad dissemination of study findings is critical for informing key actors involved in the education sector and education system reforms. Experiences from previous dissemination events suggest that SEC studies have great potential for filling an important knowledge and policy gap in LMICs.

3.10.1 Disseminating to study participants

Two categories of participants are critical as primary targets for study findings dissemination and validation: the panel of experts and surveyed teachers. Prioritising dissemination to members of the panel of experts ensures that experts have sufficient time to internalise the results and will be available to facilitate subsequent dissemination sessions. Dissemination to teachers serves both feedback and professional development goals.

3.10.2 Disseminating to government and other policy actors

Spend time explaining the SEC approach when disseminating findings to government and other education policy actors not previously involved in the study. Focus more on sharing the topic-level results to give an initial overview and leave open the possibility for an in-depth discussion at the sub-topic level that can be had with relevant experts. It is important to establish from this group the extent to which findings meet or don't meet policy intentions and discuss reasons and possible areas for improvement.

3.10.3 Disseminating to academic audiences

Conducting SEC alignment studies provides a powerful way to demonstrate a system-wide approach to analysing education systems and system alignment in LMICs. Sharing this evidence with academic audiences will likely draw more research attention to education system coherence, about which current evidence is limited.

3.10.4 Potential pitfalls

Some potential pitfalls under this step are as follows. Following the guidance provided in this subsection should help avoid these pitfalls.

- Failure to conduct teacher dissemination sessions.
- Failure to consider the audience during dissemination and to pitch dissemination activities at the right level.

4. Lessons Learned from Conducting SEC Studies in Low- and Middle- Income Countries

This section discusses some key lessons learned during the implementation of SEC studies over the last eight years in five LMICs from East Africa (3), South Asia (1) and West Africa (1). This section draws heavily on the reflections of different participants in these studies.

4.1 Lessons drawn from teachers' reflections

There are three main lessons learned from reflective feedback from teachers. First, participation in the survey offered teachers a great professional development opportunity. In all countries, the most appreciated aspect of the survey was the introduction of the concept of cognitive demand. A majority of teachers noted encountering this concept for the first time and shared that they had gained new ideas about how to better plan and vary instructional emphasis in the classroom and assess learning.

In countries where teachers' reflective feedback was collected at a later date post-survey, some teachers reported having made adjustments to their classroom practices following the insights gained from understanding 'cognitive demand'. In line with this contribution, many teachers voiced a need for such training to be extended to all teachers and highlighted the potentially high value for teachers discussing the influence of this new knowledge on their lesson planning and classroom delivery with peer teachers.

On the other hand, some teachers noted that embedding cognitive demand principles in their teaching would slow them down and thus affect their ability to cover the prescribed curriculum standards in the available time. Ultimately, this would affect their ability to adequately prepare students for national-level exams.

Second, participation in the survey afforded teachers a better understanding of what a learner-centred curriculum meant. Using the concept of cognitive demand as a lens for interpreting the curriculum, some teachers reported gaining a better understanding of how to focus on students' cognitive demand expectations to implement learner-centred approaches. Such realisations led teachers to reflect on certain aspects of the curriculum that needed to be reviewed, such as a perceived insufficiency of prescribed activities in curriculum documents and lack of clarity on the target cognitive processes by topic areas and grades.

Finally, teachers shared some difficulties encountered in completing the survey. Many teachers stated that the time given was too short not only for the training but also for the completion of such a lengthy survey, with some suggesting 3-4 days as sufficient. Additionally, the font size used in the tool was reported as being quite small, which meant that teachers felt greatly strained by the end of the survey. Finally, some teachers wished they had access to the curriculum standards when they were completing the survey, suggesting that it was difficult to establish a match between what was in the taxonomy and the prescribed content in the curriculum standards.

4.2 Lessons drawn from reflections of the panel of experts

There are two key lessons learned from the reflective feedback by the members of the panels of experts. First and quite similar to the reflection by teachers, the experts described their participation in the study as a deeply enriching professional development experience. The approach adopted by SEC in analysing academic content alignment was new to all experts and introduced new ideas and insights. Experts noted that the two-dimensional approach of focusing on both topic/sub-topic areas and levels of cognitive demand to describe content was much superior to others that are commonly used for reviewing curricula documents and analysing teaching quality. They noted that an in-depth understanding of the country-level education context was critical for ensuring maximum benefit, for teachers and learners, from the application of SEC methods.

Second, experts highlighted some technical aspects of the SEC approach that require a careful implementation review for the effective conduct of future studies. Taxonomy development or adaptation needs to be given critical emphasis since it takes place quite early in the process when most of the participants are only getting to grips with the SEC approach. To the greatest extent possible, technical terminology used in the SEC tools should be eliminated or translated into more locally familiar terminology. Where this is not possible, descriptive definitions should be given. This also implies a real need to pre-test the SEC survey tools before conducting the teacher survey. Finally, experts noted that it takes time to develop the skill of coding and rating academic content, implying the need for extensive practice during the training sessions and possibly some take-home practice tasks to be completed by the experts before the work begins.

4.3 Lessons drawn from reflections by lead organisations

In all five countries, the lead organisation was at the centre of planning and overseeing the implementation of all activities – administrative, logistical and technical. There are five critical lessons learned from the reflections of key staff of the lead organisations that were at the centre of coordinating the SEC studies. First, as in the reflection by experts and teachers above, involvement in the SEC studies came with significant professional growth and gaining of a deeper understanding of curriculum analysis. At a broader country level, the lead organisation deepened its understanding of the primary education context and connections to other actors in the sector.

Second, while adaptation of existing tools such as the K12 subject taxonomies and teacher survey tools allows faster progress in the conduct of an SEC study than if creating such tools from scratch, it is critical to take the necessary quality assurance steps. After the K12 subject taxonomy has been locally adapted and contextualised, it is critical to have the contextualised version go through a review phase by subject experts that were not part of the contextualisation process. This step was taken in Nigeria with very positive results. Similarly, after adapting the K12 teacher survey tool it is critical to pre-test it with a few teachers to ascertain their ability to correctly interpret and complete the tool. Where language translation is required (as was the case in Nepal), then a subject-matter specialist translation service must be engaged for this task.

Third, composing the panel of experts is by far one of the most important tasks the lead organisation has to get right. It helps greatly if the lead organisation has existing ties with key education institutions such as the curriculum body, assessments body, and teacher training or mobilisation institutes. Existing ties with any one of these are also quite helpful in establishing the necessary linkages to the others. On aspects related to contracting the experts to undertake the work, it is wiser to consider designing contracts to cover longer periods since it is likely that even after they have submitted their primary outputs, there might be need to have them involved in activities such as validation and dissemination.

Fourth, since training the panel of experts takes place quite early in the process, the experts need an additional, later training prior to their role in training teachers. The structure of the teacher survey tool is different from that of the coding and rating forms with which experts will be familiar at that point. This is likely to make it challenging for the experts to support the teacher survey if they are not oriented to the teacher survey tool.

Finally, the survey of teachers is done over two days, with the first day fully focused on training the teachers on the SEC approach and methods. This two-day model has been appreciated by lead organisations as representing the absolute minimum possible. Lead organisations noted that it is difficult for teachers to complete the survey by the end of the first day due to an intensive training schedule lasting the full day. If possible, more time should therefore be allocated for teacher training in future studies. Regarding data entry after the teachers have been surveyed, this step needs to be given deeper prior thought for smooth progression of the study. It is important for the lead organisation and CCA to closely collaborate, following completion of the pre-test, on the design of the data entry application.

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6. Appendix: Overview of Attached Documents

The appendices to this toolkit are located in a .zip folder provided alongside this toolkit document. This folder can be accessed at :<https://riseprogramme.org/sites/default/files/inline-files/SEC-Toolkit-Appendices.zip>.

Details of the files within the folder are given below. Note that all of these resources are provided as examples and will need to be adapted to the context in which they will be used.

#	Location	File	Description
1		Conducting SEC in LMICs_Toolkit Overview.pptx	Slide deck presenting an overview of this toolkit.
2	0. Pre-analysis Plan > 0.1 Adapted to Nigeria study	Nigeria Pre-analysis Plan.pdf	Pre-analysis plan to guide data processing and analysis under the Nigeria study.
3	1. Slides > 1.1 Expert Training and	SEC Approach & Methods_Overview.pptx	Slide deck presenting an overview of the SEC approach and methods.
4	Other	SEC Approach & Methods_Coding & Rating_Part 1.pptx	Slide deck training on the coding and rating exercise (part 1).
5		SEC Approach & Methods_Coding & Rating_Part 2.pptx	Slide deck training on the coding and rating exercise (part 2).
6		Interpreting SEC outputs.pptx	Slide deck training on the interpretation of SEC outputs. This will be particularly useful for the implementation lead organisation.
7		SEC Implementation Plan_Nigeria.pptx	Slide deck presenting the implementation plan of the SEC study in Nigeria.
8	1. Slides > 1.2 Teacher Training	Teacher Training.pptx	Slide deck for teacher training.
9	2. Taxonomy and Cognitive Demand >	Cognitive Demand Table_English Language.pdf	Comprehensive cognitive demand table for the English language.
10	2.1 Comprehensive (K-12)	Cognitive Demand Table_Mathematics.pdf	Comprehensive cognitive demand table for Mathematics.
11		Comprehensive (K-12)_Taxonomy_English Language.pdf	Comprehensive (K-12) taxonomy for the English language. This is used as a reference / starting point from which taxonomies are created / adapted to a country context.
12		Comprehensive (K-12)_Taxonomy_Mathematics.pdf	Comprehensive (K-12) taxonomy for Mathematics. This is used as a reference / starting point from which taxonomies are created / adapted to a country context.
13	2. Taxonomy and Cognitive Demand > 2.2 Adapted for Nigeria study	Nigeria Primary School (1-6)_Taxonomy and Cognitive Demand_Mathematics.pdf	Adapted taxonomy for Mathematics to Nigerian primary schools (grades 1-6).
14		Nigeria Primary School (1-6)_Taxonomy and Cognitive Demand_English Language.pdf	Adapted taxonomy for English language to Nigerian primary schools (grades 1-6).
15	3a. Panel of Expert Coding and Rating	Coding and Rating Sheet.xlsx	Coding and rating sheet to be used individually by each member of the panel of experts.
16	3b. Teacher Surveys > 3b.1 Adapted for Nigeria study	Nigeria Primary School (1-6)_Teacher Survey_English Language.pdf	Teacher survey for English language content coverage by teacher during classroom instruction, adapted to Nigeria study.
17		Nigeria Primary School (1-6)_Teacher Survey_Mathematics.pdf	Teacher survey for Mathematics content coverage by teacher during classroom instruction, adapted to Nigeria study.

18	4. Post-Study Reflection Tools >	Post-Study Reflection Survey_Expert Panel.pdf	Post-study reflection survey for the panel of experts in the Nigerian study.
19	4.1 Adapted for Nigeria study	Post-Study Reflection Survey_Field Coordinators.pdf	Post-study reflection survey for field coordinators from the Nigerian study.
20		Post-Study Reflection Survey_Implementation lead organisation.pdf	Post-study reflection survey for the implementation lead organisation in the Nigerian study.
21		Post-Study Reflection Survey_Nigerian Ministry of Education.pdf	Post-study reflection survey for the Nigerian Ministry of Education.
22		Post-Study Reflection Survey_Teachers.pdf	Post-study reflection survey for teachers from the Nigerian study.