Instructional Alignment in Nigeria using the Surveys of Enacted Curriculum

Authors:
Adedeji Adeniran, Sixtus C. Onyekwere, Anthony Okon, Julius Atuhurra, Rastee Chaudhry, and Michelle Kaffenberger

Last updated:
May 2023

Suggested citation:

Abstract:
Despite reports of possible incoherences across education system components in low and middle income countries, there is little systematic evidence on this topic in the literature. Prior research in high income countries has indicated that alignment of key instructional components within the education system is important for improving learning outcomes. In the recent past, the application of the ‘Surveys of Enacted Curriculum’ (SEC) approach to conducting instructional alignment analyses has gained prominence due to its systematically quantifiable methods. This trend is a result of the growing adoption of a systems approach to tackling educational challenges. The current investigation applies the SEC approach to system coherence analysis covering key components in Nigeria’s primary education, including curriculum standards, assessments, and classroom instruction. We cover two subjects mathematics and English language, across all six primary-level grades. We find that key foundational reading and arithmetic skills are covered by all three components, with some notable omissions on the end-of-cycle English exams. While high emphasis is given to the low cognitive demand processes of ‘memorize’ ‘perform’, and ‘demonstrate’, all three components attach very low emphasis on the more demanding cognitive processes of ‘analyze’ and ‘apply to non-routine situations’. Both the curriculum standards and classroom instruction depict a very low pace of content progression across grades, manifested through broad but shallow content coverage architecture. The coexistence of slow pace and high alignment suggest a functioning education system. However, the low performance in mathematics and English suggest otherwise. We conclude by evaluating the implication of a low equilibrium system in which the system is aligned along low cognitive demand.
Contents

1. Introduction 4

2. The Nigerian context: Curriculum standards, classroom instruction, examinations, and student performance 6
   2.1 Basic education in Nigeria 6
   2.2 Curriculum Standards 7
   2.3 Classroom instruction 7
   2.4 Examinations 8
   2.5 Student performance 8
   2.6 Potential sources of incoherence 9

3. Methods 10
   3.1 The SEC methodology 10
   3.2 SEC contextualization in Nigeria 12
      3.2.1 Study dimensions 12
      3.2.4 Data processing and analysis 14

4. Results 15
   4.1 Nigeria Primary Mathematics 15
      4.1.1 Standards: The content and progression of primary mathematics curriculum standards 15
      4.1.2 Learning assessments: The content of the Citizen-Led Assessments (CLAs) and end-of-primary Mathematics National Common Entrance Exams, NCEEs 17
      4.1.3 Instruction: The content and progression of primary mathematics instruction 19
      4.1.4 Student performance: The content and progression of primary mathematics students’ performance in the context of exams 22
      4.1.5 Measuring coherence between mathematics standards, instruction and examinations 24
      4.1.6 Coherence between primary mathematics standards and examinations 26
      4.1.7 Coherence between primary mathematics standards and instruction 26
      4.1.8 Coherence between primary mathematics instruction and examinations 27
   4.2 Nigeria Primary English 27
      4.2.1 Standards: The content and progression of primary English curriculum standards 27
      4.2.2 Examinations: The content and progression of standardized primary English exams 30
      4.2.3 Instruction: The content and progression of primary English instruction 32
      4.2.4 Student performance: The content and progression of primary English students’ performance in the context of exams 35
      4.2.5 Coherence between primary English curriculum standards and examinations 36
      4.2.6 Coherence between primary English curriculum standards and instruction 38
      4.2.7 Coherence between primary English instruction and examinations 38

5. Discussion and next steps 41
1. Introduction

Recent global evidence suggests that disparities between curriculum standards, classroom instruction, and assessments are common and are key contributors to low learning levels (Banerjee et al., 2016; Hwa, Kaffenberger & Silberstein, 2020; Kaffenberger & Pritchett, 2022). In Africa, 90 percent of children between the ages of about 6 and 14 are not expected to meet minimum proficiency levels in reading and mathematics (United Nations, 2022). With regards to children completing primary school (grade 6) in Nigeria, only 17% of such pupils master basic literacy, and 31% basic numeracy standards at the primary school level (Adeniran, Ishaku, and Akanin, 2020). To ensure all children receive an adequate education and master basic education concepts, education systems need to be aligned for learning in all dimensions (Pritchett, 2015).

Crouch and DeStefano (2017) show that improvements to the alignment of instructional components have a large impact on student learning. They find that interventions focused on aligned (‘coherent’) pedagogical practices have a larger impact (0.45–0.50) on improving learning outcomes than interventions focused on structural factors (0.20) such as school autonomy or results-based teacher pay, or interventions focused on improving inputs such as infrastructure or money. This indicates that the alignment of instructional components (i.e. between curriculum standards, teacher classroom instruction, and assessments) is a key part of the solution to addressing the global learning crisis.

Systematic analyses of the alignment of curriculum standards, teacher classroom instruction, and examinations in developing countries are still nascent, especially in Sub-Saharan Africa (Atuhurra and Kaffenberger, 2022). To date, such studies have been conducted in four low- and middle- income countries and have used the Surveys of Enacted Curriculum (SEC) methodology: these are the analysis of curricular alignment in primary-school level in Kenya, Tanzania and Uganda, and the analysis of a new integrated curriculum in Nepal (Atuhurra and Kaffenberger, 2022; Atuhurra et al., 2023).

This study seeks to evaluate the extent of alignment across instructional components in primary level literacy and numeracy in Nigeria by leveraging the SEC methodology, thereby providing reliable and robust evidence to inform policy decisions for promoting learning and long-term improvements in the education sector. In particular, this study assesses the content and progression within instructional components, the alignment between instructional components, and the alignment with student learning levels in Nigeria. By paying particular attention to content progression in the curriculum standards and classroom instruction, a key contribution of this study is the investigation of curriculum pace across grades (Primary 1 - 6), which provides deeper insights into the nature of the problems manifesting as low learning in Nigeria.

Four major findings emerged from the study. First, key foundational literacy and numeracy skills are covered both as prescribed content on the curriculum standards and taught content in the classroom. These include ‘phonemic awareness’, ‘phonics’, ‘vocabulary’, ‘comprehension’ and ‘fluency’ for foundational reading and ‘number & numeration’, ‘basic operations’ and ‘measuration’ for foundational numeracy. As a critical foundational reading skill, ‘fluency’ attracts relatively low emphasis in the curriculum standards and much less coverage during instruction. Both the standards and instructional coverage for numeracy allocate minimal focus on the two everyday math application topics ‘everyday arithmetics’ and ‘everyday statistics’. While the end-of-cycle numeracy exams consistently cover all seven content areas appearing on the math taxonomy, the English language exams do not cover three of the five foundational reading skills - ‘phonemic awareness’, ‘phonics’, and ‘fluency’. All three components allocate majority emphasis to the first three cognitive processes of ‘memorize’, ‘perform’ and ‘demonstrate’. While some minimal emphasis by the standards and teachers goes to ‘analyse’ and ‘apply to non-routine’, the exams do not focus on these higher cognitive domain processes.
Second, both the curriculum standards and classroom instruction depict low levels of content progression across grades on both dimensions - topic/subtopic areas and cognitive demand levels. With grade-level content coverage touching on almost all topic areas throughout the six grades, the low progression primarily results from spreading emphasis too broadly in each and every grade - that is, a low focus on achieving depth in specific areas. With progression alignment measures ranging between 0.72 and 0.92, classroom instruction depicts extreme levels of low stretch between-grades and little focus on achieving depth along with breadth.

Third, both subjects present with high levels of cross-component alignment between curriculum standards and classroom instruction - with coarse grain alignment measures of 0.65 and 0.73 for English and math respectively. Math alignment measures remain high at 0.72 between curriculum standards and exams, and fall to 0.57 between classroom instruction and the exams. Alignment with the exams is very low for English, at 0.42 for the curriculum standards and 0.34 for classroom instruction. These low measures are driven primarily by two aspects - the three foundational reading topics 'phonemic awareness', 'phonics', and 'fluency' are not covered on the exams, and the cognitive demand level 'demonstrate' attracts disproportionately higher emphasis on the exams than the other two components.

Fourth, students’ overall performance achievements are low in both subjects - with significantly lower achievements in English. However, a deeper alignment analysis reveals an interesting contradictory pattern across the two subjects. Better student performance in English was achieved in topic areas of high alignment across the three components, that is ‘comprehension’ and ‘grammar’. On the contrary, students performed better on math topic areas that attracted relatively lower emphasis on both the standards and classroom instruction, namely ‘everyday arithmetic’, and ‘trigonometry and geometry’.

The subsequent sections of the paper are structured in the following manner: The second section presents an overview of the state of Nigeria’s basic education systems, focusing on the three key instructional components: standards, instruction, and exams. Section 3 provides an in-depth explanation of the SEC methodology, along with its contextualization to the Nigerian setting. The fourth section of the paper presents the findings of the study, while the fifth section discusses the results and offers a conclusion.
2. The Nigerian context: Curriculum standards, classroom instruction, examinations, and student performance

2.1 Basic education in Nigeria

Nigeria is governed under a federal system, which influences the structure, actors, and relationships within the education system. Early childcare development and education is provided by the private sector with operating guidelines and oversight from the government, while pre-primary, primary, secondary, and post-secondary education are provided by the government (both state and local governments) or the private sector under standards set by the federal government. The sub-national government controls and manages the operational aspects of basic education in Nigeria.

Basic education in Nigeria consists of schooling through the first 15 years of childhood, which include early childcare development and education (0-4 year olds), one year of pre-primary education (5 year olds), six years of primary education (6-11 year olds) and three years of junior secondary education (12-15 year olds) (Federal Republic of Nigeria, 2013).

Early childhood education (children aged 0 to 5) is voluntary, and as a result, enrollment rates in creches, nurseries, and kindergartens fall below 40 percent [Statista, 2023]. However, both private and public institutions offer Early Childhood Care and Development Education (ECCDE) programmes. Between 2012 and 2020, an average of 36% of Nigerian children participated in early childhood education programmes [Statista, 2023].

The start of formal primary education and mandatory education occurs at age six. Primary and junior secondary education are free in public schools and compulsory under the Universal Basic Education Act (2004). Of the 28 million pupils who enrolled in primary school in 2019 (WorldBank 2023), public schools remain the popular destinations, with 22.7 million enrollments, while private schools accounted for 5.4 million (Statista, 2023). Nevertheless, the provision of quality education at scale across Nigeria remains a challenging task, particularly with regards to the finances required, which are enormous and difficult to fulfill under the limited fiscal capacity of subnational governments. This capacity gap is well recognized and has resulted in the creation of the Universal Basic Education Acts of 2004, which allow the federal government to support sub-national governments through matching grants for infrastructural and teacher development needs at the primary and junior secondary school. These Acts have supported the drive towards improving access to education with net primary school enrolment rate increasing from 63 percent in 1999 to 67.9 percent in 2004 and to 71.6 percent by 2007. Progress has also been recorded in more recent times by achieving about 86% gross enrollment of school aged children in 2019 (World Bank, 2023), however this represents an 8% decline over the last decade. Nevertheless, there are still an estimated 10.5 million out of school children in Nigeria (UNICEF, 2022).

Basic education is under the control of the State Universal Basic Education Boards (SUBEBs), which is an agency of the state government that receives federal government grants and support and regulates basic education. The state Ministry of Education also plays an important role in policy setting for the state, and provides oversight over education parastatals and state academic institutions. National policy coordination is undertaken through the National Council of Education (NCE), which is headed by the Federal Minister of Education, and includes all state commissioners of education as members.
Nigeria has implemented several reforms to revamp the education system in accordance with the national development policy and global agenda. While these reforms have been designed to address many education challenges, the reforms are mostly skewed towards expanding access to education and improving ‘inputs’, such as better school infrastructure (Federal Ministry of Education, 2022). Only in a few instances have reforms attempted to address the classroom environment and translate curriculum into effective practice and learning which include EdoBest, Kaduna state intervention on teacher development, etc. (Saavedra and Simone, 2023; Kaduna State Education policy, 2019). Previous reform initiatives, however, have not attempted to understand or address more complex systemic issues such as the alignment between curriculum standards, classroom instruction and examinations, and how this impacts learning achievements.

2.2 Curriculum Standards

Curriculum standards and teaching guidelines for basic education are developed at the national level by the Nigerian Education Research and Development Council (NERDC). Following the adoption of the Universal Basic Education Act in 2004, NERDC developed a new curriculum in 2008 to reflect the needs and structure of basic education at the time. This led to the development of the nine-year Basic Education Curriculum (BEC). The curriculum was revised in 2015 to extend the content and coverage of the curriculum standards and to align the curriculum with the 2013 National Policy on Education.

The BEC is divided into three levels. The lower basic education level covers Primary 1 - 3. At this level, the emphasis is on proficiency in foundational literacy, numeracy, and communication. The approach at this level is child-centered, participatory, and localized, with instruction in the mother tongue and teaching aids drawn from the child’s immediate environment. The middle basic education level covers Primary 4 - 6, and builds on the foundational skills learned in the previous level while also introducing students to pre-vocational subjects. The upper basic education marks the transition from primary to secondary education and covers Junior Secondary 1 - 3.

The goal of the BEC is to ensure that students receive nine years of quality education under which they acquire essential foundation skills either for education advancement or vocational enterprises. This curriculum is usually complemented with teacher guides and other materials to support implementation in the classroom. In most cases, teachers do not engage directly with the curriculum but instead derive its content through teacher guides and textbooks. These textbooks are produced by private publishing companies and state governments.

2.3 Classroom instruction

Classroom instruction is informed by teaching methods and learning activities that a teacher uses to deliver the prescribed curriculum in the classroom (International Bureau of Education, n.d.). The institutions responsible for the hiring and professional development of teachers vary across states between either the Ministry of Education or the state’s SUBEB. Policies around promotion, deployment and capacity development also vary across states, but SUBEB plays a more central role in teacher deployment, evaluation and monitoring of classroom instruction. Overall, the gaps between education policies and plans and the day-to-day operationalization are large and make effective classroom improvement hard to gauge or target for reforms. Only 62.18 percent of the primary school teaching force are appropriately qualified (having obtained the Nigeria Certificate in Education, NCE) (Universal Basic Education, 2018).

There is an overarching assumption of alignment between curriculum standards and classroom instruction, however this is hardly the case (UK Department for International Development, 2017). In Kaduna state for
example, 75% of primary school teachers did not pass a competency test equivalent to the Primary 4 curriculum (Guardian Nigeria, 2022).

Interruption either on the part of the learners (such as absenteeism) or competing school activities can also lead to disconnects between the intended, enacted and learned curricula. There are some government regulations in place which require teachers to prepare lesson notes and maintain weekly diaries of their work. The quality of teachers in terms of competencies in subject matter and pedagogy however play a role in curriculum implementation.

### 2.4 Examinations

The learned curriculum is assessed through ongoing formative assessments in the classroom, annual low-stakes examinations and high-stakes end-of-cycle examinations used for placement into secondary schools.

At the primary level, the end-of-cycle examinations are conducted by the National Examination Council (NECO) in federal government schools, by state examination boards in state schools, and private schools end-of-cycle examinations are conducted in private schools by the management. At the end of the nine years of basic education, a mandatory high-stakes end-of-cycle assessment is conducted by NECO called the Basic Education Certificate Examination (BECE) which is to be taken by both public and private school students.

These high-stakes examinations are less effective for diagnosing and evaluating the state of the education system (see Rossier et al., 2021; Suen & Yu, 2006). As a result, the following survey-based and large-scale learning assessment are used for monitoring learning in Nigeria: Monitoring Learning Assessment (MLA) by the Ministry of Education, the National Assessment on Learning Achievement in Basic Education (NALABE) by UBEC, Multiple Indicator Cluster Survey (MICS) by UNESCO and Let’s Engage, Assess and Report Nigeria (LEARNigeria) a citizen-led assessment by the TEP Centre.

### 2.5 Student performance

Learning trajectories are quite flat in Nigeria. The most recent education performance data based on UNICEF MICS 6 (2021) indicates that only 23.1 and 23.7 percent of school aged children (7-14 year olds) can demonstrate foundational reading and numeracy skills respectively. Among those at the final grade of primary education, the results show 38.8 percent and 42.2 percent proficiency in literacy and numeracy respectively.

Nigerian national policy on education clearly emphasizes acquisition of foundational skills at the end of primary school. Similarly, the primary education curriculum is designed to inculcate numeracy and literacy skills at the lower and middle education levels. Low student performance therefore points to possible misalignment between curriculum, instruction and assessment.
2.6 Potential sources of incoherence

Incoherence in the system can manifest in many dimensions and from multiple sources. In Nigeria, this could be due to an overambitious curriculum. The learning trajectory from Figure 1 shows that children have difficulties in learning foundational skills at the start of schooling cycle (Primary 1), which then persists into low learning at the end of primary school, with less than a 40 percent increase in foundational skills despite the 5 additional years of schooling.

School systems structured along the age-grade system as in the Nigerian case are susceptible to such issues as the instruction and curriculum move to more difficult concepts on the assumption that learners have acquired the necessary skills taught at the lower level. However, the performance data shows that this is not the case. Banerjee et al. (2016) and Kaffenberger and Pritchett (2020) have argued that the learning problem in developing countries is an instance of curriculum misalignment, as children’s skill level is below the grade-level standards in which they are enrolled. This study evaluates the nature and scale of this misalignment in the Nigerian education system.

*Source: UNICEF MICS6 Nigeria (2021)*
3. Methods

3.1 The SEC methodology

The Surveys of Enacted Curriculum (SEC) methodology enables researchers and practitioners to systematically analyze and quantity the academic content and alignment of instructional components, such as curriculum standards, assessments, teachers’ classroom instruction, and more, as well as analyzing alignment of these components with children’s academic performance (Blank, Porter & Smithson, 2001; Porter, 2002; Smithson 2013).

Implementing the SEC methodology is a multistep process and is best summarised in Figure 2 below. While the methodology is described in this section, full details on the methodology upon which this study was conducted can be found in Atuhurra et al. (2023a).

![Figure 2: Ten steps for conducting an SEC study in low- and middle- income country contexts](source)

The SEC methodology is based on recruiting a panel of experts who code and rate document-based instructional components, such as curriculum standards and assessments, and surveying teachers who report on classroom instruction.

The tools that inform the study include a context-specific, subject-level taxonomy for each subject that will be analyzed, which is either adapted or produced by the expert panel. This taxonomy contains all the topics and subtopics that could be covered for the subject and school level under analysis (for instance, the primary level mathematics taxonomy would contain all topics and subtopics that may be covered during mathematics instruction in the primary school grades). Tools also include a set of performance expectations or levels of cognitive demand that will also be used in the analysis, also adapted by the expert panel. These levels of cognitive demand are on a five-point scale, from least demanding (as in memorise or recall) to most demanding.
(as in evaluate or apply knowledge to non-routine problems). An illustrative definition (using performance descriptors) for each level is provided in Table 1.

Table 1. Levels of cognitive demand and illustrative definitions of each

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

Based on this taxonomy and levels of cognitive demand, the panel of experts codes (for topics/subtopics) and rates (for cognitive demand level) document-based instructional components along these two dimensions. Each curricular objective or assessment item is coded based on the subtopic it is covering and the level of cognitive demand expected of students. At the end of this process, a rich dataset is produced with each expert’s individual codes and ratings for each document-based instructional component, providing insight into the content coverage and cognitive demand requirements in each document-based instructional component.

For analyzing teacher instructional content, teachers are trained on the SEC methodology, the taxonomy of topics and subtopics, and levels of cognitive demand. Teachers are then tasked with completing self-report surveys on the topics and levels of cognitive demand covered in their instruction. Surveys are typically conducted at the end of a school year and cover content taught in the year that just ended.

To further enrich the study, data on student performance is collected to illuminate what students have learned, and how the content of instructional components aligns with or supports students’ learning. This data on student performance is generally comprised of results from the examination(s) being analysed in the study, and is collected as secondary data from the examination body.

The outputs of the SEC methodology are three-dimensional content maps with topics/subtopics on the Y axis, levels of cognitive demand on the X axis, and level of emphasis (percent of total coverage) on the Z axis (Smithson, 2015). These three-dimensional figures visualize the content in the instructional component being analyzed. Utilising a simple two-step process to interpret the maps, specific data points are first identified at the intersection of topic/subtopic and cognitive demand level, and then emphasis is determined by variations in color schemes for each data point (Atuhurra & Alinda, 2017). Student performance content maps are modified versions of the rest of the content maps in this paper. This is due to a different Z axis used on the student performance content maps which intentionally uses a different colour-scale and different definitions in
traffic-light style colours to illustrate that these charts are different and to make their interpretation more intuitive.

Alignment across instructional components is reported using alignment indices. Alignment index values range from zero to one, with zero indicating perfect misalignment (no overlap in content) and one indicating perfect alignment (perfect overlap in content). There is not an expectation that instructional components would be perfectly aligned. For instance, assessments may cover a sample of the total items prescribed in the curriculum. A value of 0.5 on the alignment index has often been used as an indication of a reasonable level of alignment between instructional components (Smithson, 2015). However, an appropriate threshold will be context specific, and in some contexts a higher level of alignment may be desired. Analysis of SEC data is a quantitative exercise, but interpretation, including of the alignment indices, is a qualitative undertaking. Finally, SEC is a descriptive tool, describing academic content; the methodology itself does not contain a normative stance on what a correct content map ‘should’ look like. Instead, it is a tool to be interpreted and used by experts in the study context to understand and inform change to improve instructional content’s alignment for learning.

### 3.2 SEC contextualization in Nigeria

This study applies the SEC methodology to Nigeria in two states (Oyo and Jigawa) across two subjects (mathematics and English language) for lower primary (Primary 1-3) and upper primary (Primary 4-6). Oyo and Jigawa were intentionally chosen to represent two geo-political zones in Nigeria, with Oyo State from Western Nigeria being known as being the best performing region in terms of education, and Jigawa State from Northern Nigeria being known as being the worst performing region in the country.

#### 3.2.1 Study dimensions

The instructional components which were coded and rated for this study were as follows:

- **Curriculum standards**: The curriculum standards for Primary 1-6 were sourced from the Nigerian Educational Research and Development Council (NERDC). The sourced curriculum is standard across the 36 states and FCT.
- **Teacher classroom instruction**: Teacher classroom instruction data was reported and directly coded and rated upon during a survey of teachers from the two states.
- **Examinations**: Assessment instruments for both mathematics and English language for 2017, 2018, and 2019 were obtained for the National Common Entrance Examination (which covers Primary 1 - 6 and is conducted at the end of Primary 6) from the National Examination Council (NECO). While the assessment is pitched at the national level, their use and standardization across all 36 states and the FCT makes it applicable for the two states (Oyo and Jigawa) in this study.
- **Student performance**: Data on student performance was collected as secondary data provided by NECO for the NCEE high-stakes assessment conducted at the end of primary school (Primary 6) to inform

---

1 As explained in Atuhurra et al., 2023: “The z-axis of the student performance content maps is split between four categories of increasing height and uses traffic-light style colours to illustrate their different meaning and to make them more intuitive: grade-average scores of less than 40 percent on a particular topic/cognitive demand level combination are displayed as red, greater than or equal to 40 percent but less than 60 percent are yellow, greater than or equal to 60 percent but less than 80 percent are green, and 80 percent and above are blue.”
admission into lower secondary school. This data was for both states (Oyo and Jigawa) for 2017 and 2019.

3.2.2 Expert panel composition

Two expert panels were formed for this study: one composed of experts in numeracy, and the other experts in literacy. These experts coded and rated the curriculum standards and examinations. The experts involved in these two panels were:

- Three curriculum experts
- Two assessment experts
- Two teachers
- One school administrator
- Two from civil society

The selection of these experts brought together actors in assessment, curriculum design, education research, and school practices. The diversity of experts provided richness to the study and more robust results as different levels of expertise were consulted in the coding and rating process.

3.2.3 Teacher surveys

This coding and rating of the teacher instructional content was achieved by teacher survey. The survey tools were first designed, pretested modified before it was administered

200 teachers were surveyed under this study, of which 100 were randomly sampled from Oyo and 100 randomly sampled from Jigawa. The teacher sample was selected from a random sample of 25 schools in urban areas and 25 schools in rural areas in each state, making a total of 50 schools per state. Each school in the sample nominated one teacher from lower primary for one subject (i.e. mathematics) and a teacher from upper primary for the other subject (i.e. English language). This resulted in a sample of 12 lower primary English language teachers, 12 lower primary mathematics teachers, 13 upper primary English language teachers, and 13 upper primary mathematics teachers from each of the two states.

The teacher survey instrument (a standard instrument under the SEC methodology which was adapted by the expert panel to incorporate the adapted taxonomy and levels of cognitive demand for the study context) was pre-tested with 30 teachers from different schools and districts from across the two states before finalisation of the tool and roll-out of the full teacher survey.

Teacher survey fieldwork was conducted with the support of the State Universal Basic Education Board (SUBEB) and the Ministry of Education, where SUBEB and the Ministry supported the participation of teachers in the survey. The data collection process was facilitated by trained field coordinators and two staff from the local implementation partner (Centre for the Study of the Economies of Africa)

Eight teacher surveys had to be omitted from the sample due to incompletion, reducing the sample size from the surveyed 200 teachers to 192 teachers.
3.2.4 Data processing and analysis

Data processing and analysis was undertaken in partnership with CCA as the intellectual property owners of the SEC analysis methodology and software. The result of this process were content maps, alignment indices, marginal tables, and more granular data from which results were generated.
4. Results

4.1 Nigeria Primary Mathematics

4.1.1 Standards: The content and progression of primary mathematics curriculum standards

Figure 3 shows three content maps depicting the intended topic-level emphasis structure of content embedded in the Nigerian primary curriculum standards. The panel on the left is an aggregation of prescribed content for lower primary (Primary 1-3), the middle one for upper primary (Primary 4-6), and on the right for all of primary (Primary 1-6). Overall, three topics dominate emphasis: ‘Number & Numeration’ (NN) at 36%, ‘Basic Operations’ (BO) at 20%, and ‘Measurement’ (ME) at 20%. While the intended emphasis structure for NN across the two cycles (lower & upper primary) is steady, there are notable differences for the other two topics (BO is emphasized less in lower primary while ME is instead emphasized less in upper primary). The other four topics account for 25% coverage in the curriculum standards – with 13% almost equally split between ‘Everyday Arithmetic’ (EA) and ‘Everyday Statistics’ (ES), 8% for ‘Trigonometry & Geometry’ (TG) and 4% for ‘Algebraic Processes’ (AP). Between lower and upper primary, emphasis on EA and AP remains steady while ES doubles as TG falls by half.

Emphasis on cognitive processing on the curriculum standards is heavily skewed towards the lower levels of ‘memorize’ at 22% and ‘perform procedures’ at 50%. Whereas at 18% similar emphasis is given to ‘demonstrate’ as ‘memorize’, only 10% total emphasis goes to the two highest levels of ‘analyse’ and ‘apply’. Overall, this cognitive emphasis structure is maintained in lower and upper grades, except that at upper primary ‘demonstrate’ is more emphasized (22%) than ‘memorize’ (14%), a reversal of the emphasis structure in lower primary, i.e. ‘memorize’ (29%) and ‘demonstrate’ (13%). In summary, a large 80% majority emphasis in lower primary goes to ‘memorize’ and ‘perform procedures’, whereas in upper primary the emphasis on ‘memorize’ falls by more than half in favor of ‘demonstrate’ - switching the majority emphasis (72%) in upper primary to ‘perform procedures’ and ‘demonstrate’.

Figure 3: Nigeria topic level mathematics curriculum standards: Lower (P1-P3), upper primary (P4-P6), and aggregation (P1-P6)

Math Standard, P1-P3 Math Standard, P3-P4 Math Standard, P1-P6
Table 2: Primary mathematics standards - Nigeria: Content progression alignment measures

<table>
<thead>
<tr>
<th>Grade / Cycle</th>
<th>Coarse grain alignment measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P1</td>
</tr>
<tr>
<td>P1</td>
<td>1.0</td>
</tr>
<tr>
<td>P2</td>
<td>0.56</td>
</tr>
<tr>
<td>P3</td>
<td></td>
</tr>
<tr>
<td>P1-P3</td>
<td></td>
</tr>
<tr>
<td>P4</td>
<td></td>
</tr>
<tr>
<td>P5</td>
<td></td>
</tr>
<tr>
<td>P6</td>
<td></td>
</tr>
<tr>
<td>P4-P6</td>
<td></td>
</tr>
</tbody>
</table>

Analysis of content articulation across grades is important for understanding the intended learning experience for children as they progress from one grade to the next. To learn new content, children need to build on what they already know, hence the cumulative and spiraling nature of content layout or sequencing. There is always a need to maintain a delicate balance, as curricula that progress so fast might leave many children behind, whereas going too slow will also lead to low learning due to boredom. Table 2 shows the between-grade content alignment measures, which are indicative of the prescribed content progression pace in the curriculum standards. Topic-level coarse grain alignment measures appear above the main diagonal, and subtopic-level fine grain measures below the diagonal.

As might be expected, coarse grain measures are always higher than fine grain measures since topic-level analyses reflect aggregation across the many subtopics within a topic. The higher the between-grade alignment measure, the lower the content progression pace between the two grades - since it implies high levels of content...
overlap between the two grades. The highest levels of overlap are seen between Primary 1 and 3, at 0.75 coarse grain for both P1-P2 and P2-P3. This means that at topic level, the prescribed content for each subsequent class varies from the content for the previous class only about 25% of the time. This suggests that the curriculum standards intend low levels of stretch in the first three classes - possibly to give children an opportunity to gain sufficient mastery of foundational content in the early grades and thus set the stage for faster progress in subsequent grades. The transition from P3 to P4 however, indicates a slightly higher level of stretch with 31% variation in prescribed content. This slightly faster pace of prescribed content coverage coincides with the lower-to-upper primary transition in Nigeria, which comes with a change in the Language of Instruction (LoI) from ‘language of immediate environment’ to English and the increase in number of subjects from 7 to 9. The content progression pace between P4 and P5 is, qualitatively, similar to P3 to P4, with the unique observation here being that of a higher level of stretch driven by the subtopic content covered between the two grades. At 0.56 coarse and 0.31 fine grain, the P5 to P6 transition depicts the highest level of prescribed content stretch. This might be reflective of the fact most of the basic content has already been covered and so students can progress to new content areas as they begin to prepare to transit out of primary school. Alternatively, it could be indicative of the need to cover whatever other content that had not been covered in the earlier grades or to review content covered in earlier grades as the students prepare to sit the common entrance exam at the end of P6. With the P4+P5 versus P6 progression measures at 0.66 coarse grain and 0.35 fine grain, both reasons seem valid.

4.1.2 Learning assessments: The content of the Citizen-Led Assessments (CLAs) and end-of-primary Mathematics National Common Entrance Exams, NCEEs

The National Common Entrance Exam (NCEE) from NECO, which is a P6 end-of-primary cycle national-level exam was used in this study. The NCEE is a standardized national examination that all students completing P6 are required to sit and pass before they can join junior secondary school (grade 7) in Nigeria.

The NCEE for 2017 covered all seven topic areas, with NN, ME, and TG accounting for 73% of coverage. Sixty percent of cognitive processing emphasis on the NCEE for 2017 was on ‘perform procedures’ and about half of that (31%) to ‘memorise’. The subtopic areas accounting for most coverage on the NCEE are ‘fractions’, ‘percentages’, ‘ratios & proportions’, ‘length & perimeter’, ‘area & volume’, ‘time & temperature’, ‘derived measures’, ‘angles’, ‘triangles’, ‘quadrilaterals’ and ‘polygons’.
Although the NCEEes are standardized, content coverage may vary across years - in this case we have NCEEes for 2017, 2018 and 2019. Figure 3 shows content maps for NCEEes for 2018 and 2019, and an aggregation of all the three years’ NCEEes (2017 - 2019). As shown in Table 3, the coarse-grain alignment measures between these assessments are 0.67 (2017-2018), 0.60 (2018-2019), and 0.58 (2017 - 2019) - confirming year-to-year content emphasis variations. Over these three consecutive years, the emphasis structure over the seven topic areas can be categorized into four levels - consistently high priority (NN), high priority (BO & ME), intermittent coverage (AP & TG) and low priority (EA & ES). Conversely, the emphasis structure for cognitive processing on the NCEEes for all three years is highly consistent - with ‘perform procedures’ accounting for majority coverage (60 - 70 percent), followed by ‘memorise’ (20 - 33 percent) and finally ‘demonstrate understanding’ at a low 5 percent. The two higher order cognitive demand levels ‘conjecture’ and ‘apply to non-routine’ are never covered on the NCEEes.
Figure 5. Content maps for NCEEs 2018 and 2019, and an aggregation of all the three years

Table 3: Primary mathematics exams - Nigeria: Cross-year alignment measures

<table>
<thead>
<tr>
<th>Exam/year</th>
<th>Coarse grain alignment measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NECO 2017</td>
</tr>
<tr>
<td>Fine grain alignment measures</td>
<td></td>
</tr>
<tr>
<td>NCEE 2017</td>
<td>1.0</td>
</tr>
<tr>
<td>NCEE 2018</td>
<td>0.40</td>
</tr>
<tr>
<td>NCEE 2019</td>
<td>0.39</td>
</tr>
</tbody>
</table>

4.1.3 Instruction: The content and progression of primary mathematics instruction

Figure 3 shows content maps for teachers’ classroom coverage, with aggregations for g1-g3 on the left, g4-g6 in the middle and g1-g6 on the right. All the seven topic areas are covered throughout the primary cycle, with the exception of ‘everyday statistics’ which is not covered in lower primary grades 1-3. The two foundational topics NN and BO attract most emphasis in both lower and upper primary grades totaling 67% and 57% respectively. These are followed by ME at 15% and TG at 10%. Emphasis on the remaining three topics of EA, AP and ES picks up from a total allocation of 9% in lower to 17% in upper primary. Teachers’ instructional emphasis on cognitive demand shows an identical structure for both lower and upper primary, with 90% coverage almost
equally distributed among the three lower levels ‘memorise’ ‘perform’ and ‘demonstrate’ and the remaining 10% mostly going to ‘analyse’.

*Figure 6: Nigeria mathematics teachers’ instructional content – Lower (P1-P3), upper primary (P4-P6), and aggregation (P1-P6)*

Table 4 below shows alignment measures for instructional content coverage by teachers across grades. These illustrate the content progression pace experienced in the classroom as students move from one grade to the next. Ranging between 0.72 and 0.92 at coarse grain, and 0.51 and 0.80 at fine grain, these relatively high progression alignment measures are indicative of a slow instructional pace. Since teachers are covering almost all content areas in all grades, the high progression alignment measures point towards an emphasis on achieving broad content coverage at the expense of depth.

*Table 4: Primary Mathematics Instruction - Nigeria: Content progression alignment measures*
Table 4 also shows the teacher location and gender-based content coverage alignment measures. With coarse and fine-grain measures of 0.92 and 0.83 respectively, there are minimal differences attributable to location. Similarly, the gender-based measures of 0.94 coarse grain and 0.82 fine grain imply minimal content coverage differences between female and male teachers.
4.1.4 Student performance: The content and progression of primary mathematics students' performance in the context of exams

Student performance data is influenced by the scope, coverage and purpose of an assessment, and is thus always analysed in conjunction with examination content maps (Atuhurra et al., 2023). As explained in 3.2.1 Summary of Instructional Components, student performance data was obtained for the NCEE high-stakes assessment conducted at the end of primary school (primary 6) for both states (Oyo and Jigawa) for 2017 and 2019.

Figure 7 provides a birds-eye view of student performance and reveals that the average score obtained on the NCEE examinations was just under 50% in both Oyo and Jigawa (49% in 2017 and 47% in 2019). As expected, these scores differ greatly across Oyo and Jigawa, with the high-performing state of Oyo having grade averages of 53% and 50% in 2017 and 2019 respectively, and the low-performing state of Jigawa having grade averages of 25% and 28% in 2017 and 2019 respectively. This data provides meaningful context for our analyses: (i) scores do not differ greatly across the two assessments, and (ii) even students from the high-performing state are getting only over half of the exam questions correct, and students from the low-performing state are getting only around a quarter of the exam questions correct.

*Figure 7: Overall summary scores representing student performance on NCEE 2017 and NCEE 2019 in mathematics*

Figure 8 displays student performance data by topic-level and cognitive demand-level, and side-by-side with the content maps of other instructional components. Note that the shape of student performance content maps mimics the shape of the NCEE content maps as the same items are in question, but with different Z axes (where Z axis is emphasized in examination content maps, and grade average in student performance content maps).²

---

² Closer observation will reveal that student performance maps in this study slightly spill outside the bounds of examination content maps. This is due to different sensitivity parameters that produce these two content maps, owing to different Z axes for the two.
Student performance was highest on everyday arithmetic (50% grade average), followed by trigonometry and geometry (around 45%), and then measurement and algebraic processes (41% and 40% respectively). Student performance was lowest on number and numeration (32%). These trends are similar across states for each exam, while the scores are proportionally lesser for students from Jigawa than for students from Oyo (for more, see Figure A5 in Appendix).

With regards to cognitive demand, student performance was highest on memorize / recall questions (44%) and performance gradually reduced as cognitive demand levels increased (until 16% for solving non-routine problems). These trends also persist across the two states (see Figure 17 in Appendix y).

Figure 8. Mathematics Standards, Instruction, Exam and Student Performance

The key takeaway from Figure 18 is student performance in relation to alignment between instructional components. While we see high levels of emphasis and alignment particularly at the number and numeration and basic operations topics across all three components (standards, instruction, and examinations), student performance in number and numeration is not the topic students perform best on. Everyday arithmetic and trigonometry and geometry, the two areas with best student performance, are also areas without high levels of emphasis.

One factor driving these unexpected results could be the design of assessments and the reliability of student scores based on topic and cognitive demand emphasis level in the examination. Scores from topic and cognitive demand combinations with high emphasis are more reliable in theory due to repeated testing than scores from low emphasis areas, which are more at risk of being impacted by the design of the chosen assessment item. This however needs to be further evaluated.
4.1.5 Measuring coherence between mathematics standards, instruction and examinations

Figure 9: Coherence between standard, Instruction and Exam

Panel A (Standard Vs Exam)

Math Standard, P1-P6
Math NCEE, 2017-2019

Panel B (Standard Vs Instruction)

Math Standard, P1-P6
Math Instruction, P1-P6

Panel C (Instruction Vs Exam)

Math Instruction, P1-P6
Math NCEE, 2017-2019
### Table 5: Mathematics – Nigeria: Coherence across standards, Examination and instruction

<table>
<thead>
<tr>
<th>Grades/Cycles</th>
<th>Overall Alignment indices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standards vs Exams</td>
</tr>
<tr>
<td></td>
<td>Fine</td>
</tr>
<tr>
<td>P1-P3</td>
<td></td>
</tr>
<tr>
<td>P4-P6</td>
<td>0.44</td>
</tr>
<tr>
<td>P1-P6</td>
<td>0.41</td>
</tr>
<tr>
<td>P1</td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td></td>
</tr>
<tr>
<td>P4</td>
<td></td>
</tr>
</tbody>
</table>
4.1.6 Coherence between primary mathematics standards and examinations

As reflected in Figure 9 (panels A and C), the three-year aggregated content of the NCEEs for 2017, 2018 and 2019 are used for alignment analyses of exams and the other two components – standards and instruction.

The coarse grain alignment measure between the curriculum standards and exams is 0.72 (table 4), a high level of content overlap across the two components. Both allocate most emphasis to the three topics NN, BO and ME, and to the three lower cognitive domain processes – ‘memorise’, ‘perform’ and ‘demonstrate’. However, the 28% variation in content overlap between the two components also highlights some interesting features. First, within the common high emphasis areas lie some unique patterns. The standards present more extreme emphasis on the three topics (i.e. 75% of total coverage as opposed to 59%) while the exams present even more extreme coverage of the three cognitive processes (i.e. 99% of total coverage as opposed to 90%). Second, a significant 40% of coverage on the exams goes to the remaining four topics AP, TG, EA and ES, with a fair topic-level average allocation of about 10% each. On the other hand, almost zero emphasis is given to the two higher order cognitive processes on the exams. Only 25% coverage is prescribed for the four topics on the standards, three of them averaging at about 7% each and AP attracting only 4%. The standards prescribe 10% of total cognitive coverage towards the two higher order cognitive processes ‘analyse’ and ‘apply’.

The coarse grain alignment measure falls to 0.64 when the prescribed curriculum content is restricted to upper primary grades 4-6. This suggests that items appearing on the NCEEs cover content prescribed for all primary grades, not just the final three. The fine grain alignment measure increases from 0.41 to 0.44, implying a higher number of subtopic areas prescribed for upper primary grades features on these end-of-cycle exams.

4.1.7 Coherence between primary mathematics standards and instruction

The middle columns of Table 5 show both grade-level and aggregated alignment measures between the curriculum standards and teachers’ content coverage in the classroom. The aggregated coarse grain alignment measure for all grades (P1-P6) is 0.73, suggesting that teachers’ content coverage matches the curriculum prescriptions most of the time. This is also true at the fine grain level where the level of overlap exceeds 50%.

Across all grades, the coarse grain alignment measures exceed 0.5 with the highest being 0.76 at grade 4. Three topics dominate both the standards and instruction, NN, BO and ME – all three accounting for 75% of the total topical coverage for each of the two instructional components. Also, the three lower levels of cognitive demand are clearly the most emphasized on both components – accounting for 90% of total cognitive coverage for each component.
Despite the high levels of alignment, an in-depth analysis reveals some component-specific peculiarities. Throughout all grades, the curriculum standards prescribe at least one-third of topic-level emphasis to NN, and emphasis on BO and ME is quite dynamic – at 26% ME is emphasized twice as much as BO in lower primary and vice versa in upper primary. About one-half of cognitive processing on the standards goes to ‘perform procedures’ while ‘memorise’ is more emphasized in lower primary and ‘demonstrate’ in the upper primary grades. On the other hand, teachers’ classroom practice reveals a more balanced emphasis structure across the three topics and cognitive processes throughout the grades. In both lower and upper primary grades, teachers’ coverage for each of the two topics NN and BO averages at around 30% while ME accounts for 15%. At an average of 30% emphasis for each, teachers allocate equal instructional emphasis to the three lower cognitive demand processes in both lower and upper primary grades.

4.1.8 Coherence between primary mathematics instruction and examinations

The coarse grain alignment measure between instruction and the NCEE exams is 0.57 (Table 5, extreme right column) and reflects the lowest of all the aggregated measures for primary math in this study – even though in absolute terms this measure does not suggest low alignment. This relatively low measure suggests that overall, teachers are not focusing their classroom coverage on the exams. The alignment measure increases to 0.59 when the analysis is restricted to upper primary grades 4-6, providing some remote evidence that might indicate upper primary teachers trying to target their teaching to the exams.

There are two key sources of misalignment between instruction and the exams. First, while most topical coverage on both components is attributed to the three dominant topics NN, BO and ME, the extent of their dominance sharply differs across the components – a significantly large 76% of total instructional coverage and a moderate 59% of total exam coverage. Second, even though both components portray overall dominance of the three lower levels of cognitive processing, there are sharp distinctions between them that warrant an in-depth analysis. The exams are exclusively limited to these three levels, with ‘perform’ clearly allocated the lion’s share of 67% coverage. On the contrary, instructional coverage reflects a fairly balanced emphasis structure for the three lower levels (average of 30% for each) and includes 10% allocation to the two higher levels of ‘analyse’ (at 8%) and ‘apply to non-routine’ (at 2%).

4.2 Nigeria Primary English

4.2.1 Standards: The content and progression of primary English curriculum standards

Figure 10 contains three content maps which show the intended topic-level emphasis structure of content embedded in the Nigerian primary English curriculum standards. The panel on the left is an aggregation of the
prescribed content for lower primary English (Primary 1-3), the middle one for upper primary English (Primary 4-6), and the map on the right represents all of primary (Primary 1-6). The topics that received the most emphasis were: ‘Comprehension’ at 21%, ‘Grammar’ at 15%, and ‘Phonics’ at 14%. While the intended emphasis structure for Comprehension and Grammar across the two cycles (lower & upper primary) is steady, there are notable differences for Phonics (it is emphasised less in the upper primary). Notably, the other ten topics account for only 50% coverage in the curriculum standards, which shows that only three topics out of 13 dominated the primary English language.

In the English curriculum standards, the lower cognitive demands (memorise/recall and perform procedures) receive the majority of the emphasis, accounting for 74% of the total cognitive demand, while other cognitive demands accounted for only 26% of the total emphasis. At the lower primary level, the cognitive demand for English Language is skewed towards memorise/recall, which received the highest emphasis, amounting to 43%, followed by perform procedures with 30%. This implies that the lower levels of cognitive demand account for 73% of the total emphasis, with Solve non-routine problems/Make Connections getting the least emphasis with only 1%. Similarly, at the upper level, the positions switched, as perform procedures received the highest emphasis with 45%, while memorise/recall got 28%, still accounting for a significant 73% of the emphasis.

*Figure 10: Nigeria topic level English curriculum standards: Lower (P1-P3), upper primary (P4-P6), and aggregation (P1-P6)*
Table 6: Primary English standards - Nigeria: Content progression alignment measures

<table>
<thead>
<tr>
<th>Grade / Cycle</th>
<th>Coarse grain alignment measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P1</td>
</tr>
<tr>
<td>P1</td>
<td>1.0</td>
</tr>
<tr>
<td>P2</td>
<td>0.42</td>
</tr>
<tr>
<td>P3</td>
<td>0.47</td>
</tr>
<tr>
<td>P4</td>
<td>0.50</td>
</tr>
<tr>
<td>P5</td>
<td>0.49</td>
</tr>
</tbody>
</table>
As stated earlier, learning new contents requires children need to build on prior knowledge, hence the cumulative and spiraling nature of content layout or sequencing. There is a need to have a balance as curricula that moves so fast might leave many children not learning, while going progressing too slow also negatively impacts as a result of boredom. Table 5 shows the between-grade content alignment measures for English Language, which are indicative of the prescribed content progression pace in the curriculum standards. The coarse grain (topic level) alignment indices are above the main diagonal, while the fine grain (subtopic level) indices are below the main diagonal.

The Coarse grain alignment indices between grades range between 0.58 and 0.72 (Table 5), indicating a smooth progression over the given content topics, as the learners advance through the grades from P1 to P6. This is because over half of the topics introduced at each grade to the students had been previously taught. However, the sharp decrease in primary 5 to 0.58 which indicates a faster pace of the curriculum could be as a result of mastery of foundational knowledge, and the need to introduce new topics at this higher level as the students prepare to leave primary school. This could also lead to students being taught topics that were not earlier taught to them at lower levels, to ensure that they are ready for the common entrance examination at the end of primary school. At the fine grain level, the alignment measures are lower and range from 0.33 to 0.50. This can be linked to the fact that within each topic, there is variation in the subtopics and their contents covered across grades.

4.2.2 Examinations: The content and progression of standardized primary English exams

NCEE from NECO which students take at the end of primary school was used in this study. The end of primary NECO assessment has an observed pattern over the 3 years under review (2017, 2018 and 2019). In each of the years, three topics accounted for over 90% of the total focus. Grammar had the highest focus (45% in 2017, 46% in 2018 and 47% in 2019), followed by Vocabulary in each of the years (29% in 2017, 30% in 2018 and 29% in 2019) and Comprehension (23% in 2017, 19% in 2018 and 21% in 2019). In terms of cognitive demand, from 2017 to 2019, demonstrate understanding had the highest emphasis in each of the years, with memorize/recall and
perform procedures also having significant level of emphasis. Jointly, these three levels of cognitive demand accounted for at least 97% of the total emphasis for each of the examinations.

*Figure 11: Nigeria topic level English examination: NCEE P1-P6*

The NECO exams from 2017-2019 are highly aligned across these years, with coarse grain alignment ranging from 0.74 to 0.83 and fine grain alignment ranging from 0.60 to 0.69. This is expected, as in all the three years of the NECO exams under review, three topics (Comprehension, Vocabulary and Grammar) accounted for over 90% of the total spread of the examination each year. The emphasis structure for cognitive demand on the NCEEs for all three years is consistent with the lower order cognitive demand levels getting the most attention over the 3 years.

*Figure 12. Content maps for English NCEEs 2018 and 2019, and an aggregation of 2017 to 2019*
Table 7: Primary English exams - Nigeria: Cross-year alignment measures

<table>
<thead>
<tr>
<th>Exam/Year</th>
<th>Coarse grain alignment measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NECO 2017</td>
</tr>
<tr>
<td>Fine grain alignment measures</td>
<td></td>
</tr>
<tr>
<td>NECO 2017</td>
<td>1.0</td>
</tr>
<tr>
<td>NECO 2018</td>
<td>0.60</td>
</tr>
<tr>
<td>NECO 2019</td>
<td>0.57</td>
</tr>
</tbody>
</table>

4.2.3 Instruction: The content and progression of primary English instruction

The Teacher instructional coverage shows a wide coverage of contents, as all the topics were covered, although at varying levels of emphasis, as seen in figure 7. It is observed that the same set of topics that received most
emphasis at the lower primary also received the highest emphasis at upper primary. Across both lower and upper primary, the topics Phonics, Vocabulary, Comprehension and Grammar received the highest emphasis, with each of them accounting for at least 10% of the total coverage. With regards to cognitive demands, at both lower and upper primary, the pattern was the same and when aggregated, the most emphasised were Memorise/recall (34%), Perform procedures (30%), and demonstrate understanding (24%), which means these 3 accounted for 84% of the total emphasis, while the least emphasized were Conjecture/Generalize/Prove and Solve non-routine problems/Mak Connections, receiving only 8% and 4% of the total emphasis respectively, and when combined, making up only 12% of the total.

*Figure 13: Nigeria English teachers’ instructional content – Lower (P1-P3), upper primary (P4-P6), and aggregation (P1-P6)*

From Table 8, values between 0.76 to 0.90 at coarse grain, and 0.67 to 0.79 at fine grain, these high progression alignment measures show a slow instructional pace across grades. This can be advantageous to the learners, as it allows them become experts from repeatedly being taught the same content. However, since teachers cover almost all content areas in all grades, the trade-off of having high progression alignment measures would be having broad content coverage at the expense of going in-depth in their delivery.

*Table 8: Primary English Language Instruction - Nigeria: Content progression alignment measures*
<table>
<thead>
<tr>
<th>Grade</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
<th>P6</th>
<th>P1-P3</th>
<th>P4-P6</th>
<th>R</th>
<th>U</th>
<th>M</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>1.0</td>
<td></td>
<td>0.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>0.65</td>
<td>1.0</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td>0.74</td>
<td>1.0</td>
<td>0.90</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P4</td>
<td>0.77</td>
<td>1.0</td>
<td>0.84</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P5</td>
<td>0.73</td>
<td>1.0</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P6</td>
<td></td>
<td>0.74</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1-P3</td>
<td></td>
<td></td>
<td>1.0</td>
<td>0.84</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P4-P6</td>
<td></td>
<td></td>
<td>0.79</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td>1.0</td>
<td>0.93</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U</td>
<td></td>
<td></td>
<td></td>
<td>0.83</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.0</td>
<td>0.83</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.76</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R=Rural, U=Urban, M=Male, F=Female (for all grades P1-P6)
With a Coarse grain index of 0.93 and fine grain index of 0.83, Table 7 also shows that the instructions according to the location of the school (urban or rural) and the gender (Male or Female) of the teachers shows that regardless of location and gender, the contents delivered by the teachers have minimal disparities. Also, in terms of cognitive demand, both rural and urban teachers have almost the same level of emphasis across each cognitive skill, with the maximum disparity in emphasis being 2%.

4.2.4 Student performance: The content and progression of primary English students’ performance in the context of exams

As explained in 4.1.4 Student performance, the scope, coverage and purpose of an assessment impacts student performance data and thus student performance analyses must always be done in conjunction with examination content maps (Atuhurra et al., 2023), and student performance data was obtained for the NCEE high-stakes assessment conducted at the end of primary school (primary 6) for both states (Oyo and Jigawa) for 2017 and 2019.

Figure 14 provides an overview of student performance on English language in NCEE 2017 and 2019 by state. As expected, student performance was significantly lower in the low-performing state of Jigawa than it was in the high-performing state of Oyo. That being said, absolute performance is low overall: the highest grade average is 20%, meaning that on average students only got a fifth of exam questions correct. Further, while scores in Jigawa barely change from NCEE 2017 to NCEE 2019 (11% both years), scores in Oyo decline over the two years (from 20% to 15%). This context is crucial for correctly interpreting student performance in this section.

*Figure 14: Overall summary scores representing student performance on NCEE 2017 and NCEE 2019 in English language*
Figure 15 displays student performance data by topic-level and cognitive demand-level, and side-by-side with the content maps of other instructional components. Student performance was highest on grammar at 54%, followed by verbal reasoning and comprehension at 42% and 41% respectively. Student performance was lowest on literature at 27%. These trends are similar across the two states albeit scores in Jigawa are much lower than scores in Oyo.

**Figure 15: English Standard, Instruction, Exam and Student Performance**

Student performance results for English language are more intuitive when analysed in conjunction with level of emphasis and alignment across the three instructional components (standards, instruction, and examination). There are high levels of emphasis and alignment across grammar, comprehension and verbal reasoning, which are also the three areas of highest student performance. Ambiguity does arise from the lack of performance data on phonics and writing processes, which also seem to have aligned emphasis and in theory should also have good student performance.

That being said, while student performance does mimic areas of high emphasis and alignment, the question of low absolute student performance then becomes even more perplexing and should be evaluated. Students are not performing well overall, even though instructional components are aligned and this is translating to ‘learning’.

**4.2.5 Coherence between primary English curriculum standards and examinations**

As reflected in Figure 16, the three-year aggregated content of the NCEEs for 2017, 2018 and 2019 are used for alignment analyses of exams and standards. The coarse grain alignment measure between the curriculum standards and exams is 0.42 (table 8), and the fine grain alignment ranges from 0.27 to 0.30. implying that only a
few topics out of all the content areas covered in the curriculum standards are found in the NCEE end-of-primary examinations, translating into the very low alignment indices shown in Table 9. There are notable large differences in emphasis for topics. The top two topics in the exams that received the highest focus (Grammar and Vocabulary), received over double the emphasis in the exams than what they received in the standards. Grammar received 46% focus in the exams but only 22% emphasis in the standards, and vocabulary also received 29% emphasis in the exam but only 6% emphasis in the overall primary standards, implying that the standards may not be giving adequate emphasis required for exams to these topics. These differences could be because teachers allocate almost equal emphasis to all subtopics within each topic they cover (regardless of the prescribed subtopic coverage in the curriculum standards) and place disproportionately little emphasis on the few subtopics that are most emphasised in the exams.

In terms of the cognitive demand, both the standards and the exams prioritise the same set of cognitive skills, which are memorise/recall, perform Procedures and Demonstrate Understanding which accounts for at least 90% emphasis in both standards and curriculum, while placing the remaining emphasis (less than 10%) on the remaining two sets of cognitive skills.

*Figure 16: Nigeria English Standards and examinations content – aggregation of P1-P6 standards and 2017-2019 NECO exams*
4.2.6 Coherence between primary English curriculum standards and instruction

The middle columns of Table 9 show both grade-level and aggregated alignment measures between the curriculum standards and teachers’ content coverage in the classroom. The aggregated coarse grain alignment measure for all grades (P1-P6) is 0.65, suggesting similarity in teachers’ content coverage and the curriculum prescriptions most of the time. Across all grades, the coarse grain alignment measures exceed 0.5, with the highest being 0.68 at grade 3. This is low at the fine grain level, where the level is below 50%, implying that there is no alignment at the subtopic level.

There are similarities in terms of cognitive demand, as both the curriculum standards and the teacher’s instructions focus on the first three cognitive skills which are memorize/recall, perform Procedures and Demonstrate Understanding, which jointly accounts for over 80% of the cognitive skills emphasized by both the instructions and the standards.

Figure 17: Nigeria English Standards and teachers’ instructional content – aggregation of P1-P6

4.2.7 Coherence between primary English instruction and examinations

The alignment of classroom instructions and exams are very low at both the topic and subtopic level, pointing to significant incoherence. According to Table 9, the coarse grain values for lower, upper and all primary range
between 0.30 and 0.37, which are all below the benchmark of 0.50, implying a misalignment between what the topics the teachers teach or place emphasis on and the contents of the exams. Also, at the subtopic level, there is a misalignment between the instructions and the exams, as table 4 also shows that the fine grain figure for lower, upper and all primary range between 0.12 and 0.16. The content mismatches can be traced to differences topic and subtopic level emphasis, and could have a significant negative impact on the performance of students in the exams.

There are major discrepancies across topics. For example, the instructions prioritize phonics, giving it the highest emphasis, but Phonics is not included in the contents of the exams at all. This implies that the teachers place the highest emphasis on teaching a topic which does not even feature in the exams. Also, at the subtopic level, since teachers allocate almost equal emphasis to all subtopics contained in each topic they cover, they end up placing little emphasis on the few subtopics that are most emphasized in the exams. The exams are limited to only very few topics, while the teachers have widespread coverage of all the topics recommended in the curriculum standards, which results to the misalignment at all levels.

However, on cognitive demand, the exams and the instructions place emphasis on the same cognitive skills. The teacher’s instructions and the exams focus on the first three cognitive skills which are memorize/recall, perform Procedures and Demonstrate Understanding, which jointly account for over 80% of the cognitive skills emphasized by both the instructions and the exams.

*Figure 18: Nigeria English Instruction for primary (P1-P6) and NECO Exams (aggregated 2017-2019)*
<table>
<thead>
<tr>
<th>Grades/Cycles</th>
<th>Overall Alignment indices</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Standards vs Exams</td>
<td>Standards vs Instruction</td>
<td>Instruction vs Exam</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fine</td>
<td>Coarse</td>
<td>Fine</td>
<td>Coarse</td>
<td>Fine</td>
</tr>
<tr>
<td>P1-P3</td>
<td></td>
<td></td>
<td>0.45</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>P4-P6</td>
<td>0.28</td>
<td>0.40</td>
<td>0.38</td>
<td>0.65</td>
<td>0.16</td>
</tr>
<tr>
<td>P1-P6</td>
<td>0.30</td>
<td>0.42</td>
<td>0.42</td>
<td>0.65</td>
<td>0.14</td>
</tr>
<tr>
<td>P1</td>
<td></td>
<td></td>
<td>0.37</td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td></td>
<td></td>
<td>0.31</td>
<td>0.60</td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td></td>
<td></td>
<td>0.30</td>
<td>0.68</td>
<td></td>
</tr>
<tr>
<td>P4</td>
<td></td>
<td></td>
<td>0.26</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>P5</td>
<td></td>
<td></td>
<td>0.24</td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td>P6</td>
<td></td>
<td></td>
<td>0.30</td>
<td>0.66</td>
<td></td>
</tr>
</tbody>
</table>

Table 9: Primary English - Coherence across standards, examinations and instruction
5. Discussion and next steps

To most educators, an ideal education system is that which ensures alignment between various learning components from curriculum to classroom instructions to assessment. With the SEC framework, this study has evaluated how the Nigerian primary education system follows this ideal system. Broadly, the results show relatively high alignment between the curriculum and instruction but weaker alignment with assessments. The topics covered in the curriculum were mostly taught in the classroom but only a subset of this is tested. The analysis of curriculum progression also indicates a slow pace transition in topics from one grade to the higher one. At the face value, this indicates the Nigerian education system is not far from ideal. Specifically, the pace of the curriculum and its alignment with instruction imply that student performance should be high if the assessed topics were adequately taught and learned.

The performance data however, shows an average score of 48% in the end of the cycle tests. High performance is expected at 70% score. There is a need to highlight three caveats to draw comparison between this assessment and global learning assessment like PISA or learning poverty. First, unlike learning poverty, the assessment used in this study only relates to in-school children hence overestimates the performance of the entire education system which will have included the out-of-school children. Second, compared to PISA, the knowledge spectrum covered in the NCCE assessment is lower domain mostly around conceptual understanding. This again implies that performance of overestimates given the higher domain were absent. Third is the self-selection issue as the test is conducted for those who want to proceed to secondary education and seeking admission to Federal Government Colleges. With these caveats, we can conclude that assessment data shows that the alignment at the frontend does not translate into learning and high performance.

We are therefore left with the paradox of a system that has alignment between curriculum and instruction, but does not align with assessment. Education literature has been centered around attainment of parsimony between curriculum and instruction as these two levers that educators and policymakers can control. It is sometimes assumed that such parsimony should translate into effective learning outcomes. However, the results contradict this optimist.

There are two pathways to unlocking this paradox. One insight directly drawn from the analysis is the importance between alignment along low and high cognitive demand. This is also reflected in the assessment with higher scores in the questions around procedural knowledge. The lack of competencies in high cognitive demand areas (conceptual understanding) reflects a system that is aligned towards the lower cognitive demand domain. We illustrate this Table 10 to show two possible types of alignment and implication for learning outcomes. First, a system can exist in low equilibrium alignment in which curriculum, instruction are all focused on the conceptual knowledge domain. This will reflect higher performance in assessment areas relating to such domains. As the analysis shows, student performance was higher in Mathematics than English, which is also the subject with higher alignment and slower pace. In the second alignment system, there is alignment between all learning components toward procedural/application of concept and knowledge. This is an ideal system as it ensures children are able to apply the concept from classroom to relevant real life context.
Table 10: Alignment Matrix

<table>
<thead>
<tr>
<th>Standard and instruction</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Memorization/Conceptual</td>
</tr>
<tr>
<td></td>
<td>Procedural/Application</td>
</tr>
</tbody>
</table>

The SEC analysis points to the Nigeria education system being trapped within the low equilibrium in which alignment is focused on the lower knowledge domain. This begs the question about what prevents the system from transitioning from this lower equilibrium to the higher one given that with adequate conceptual understanding, application of the concepts should be a natural next step. While this research does not evaluate this, there are two possible factors that will be of interest in resolving the paradox. Lower teacher’s quality might restrict transition to higher domain where the teacher is less competent. This can be due to both deficiencies in subject matter and pedagogy. Assessment can also influence the concentration of classroom instructions in certain areas. For example, if the assessment is focussed on conceptual understanding, instruction will likewise follow a similar pattern. Overall, this suggests an alignment problem in the Nigeria system due to concentration on low cognitive demand. Understanding the reason for weak transition across the knowledge domain will be key to designing an appropriate intervention.
References


