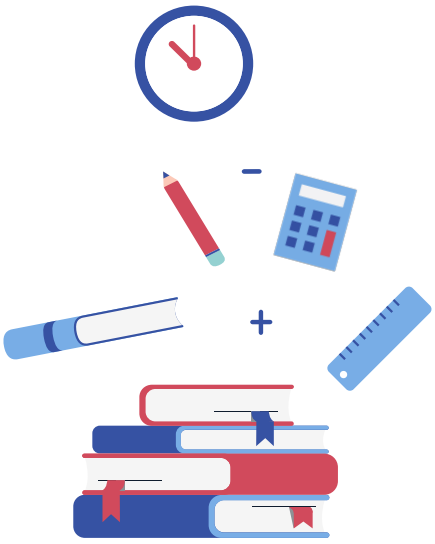
IEA

LaNA

An Overview of the Content and Skills Assessed in the LaNA Mathematics and Reading Assessments

IEA TIMSS & PIRLS BOSTON COLLEGE

Contents



Introduction

IEA's LaNA (Literacy and Numeracy Assessment) is an international assessment that measures mathematics and reading comprehension skills at the end of primary school. Grounded in and linked to IEA's flagship studies TIMSS (Trends in International Mathematics and Science Study) and PIRLS (Progress in International Reading Literacy Study), LaNA is a paper-and-pencil assessment designed to align with a variety of educational contexts. LaNA has a targeted assessment design to more accurately measure foundational learning, allowing education systems to gain deeper insights into their students who are in the process of developing reading comprehension and mathematics skills, as well as those who are reaching higher levels of proficiency.

The LaNA mathematics assessment is grounded in the TIMSS mathematics assessment framework, mirroring its definition of mathematics—particularly its content and cognitive domains. Specifically, the development of LaNA mathematics items followed the TIMSS 2019 mathematics framework for the fourth grade. Similarly, the LaNA reading comprehension assessment is based on the PIRLS 2021 reading framework, aligning with its definition of reading, including assessment purposes and reading comprehension processes. Both TIMSS and PIRLS serve as well-established essential measures used for reporting against the UN's Sustainable Development Goal (SDG) Indicator 4.1.1b. LaNA is an offical source for reporting on SDG Indicator 4.1.1b, with LaNA data having first been added to the UNESCO Institute for Statistics Data Browser in 2026.

Although the LaNA assessment was developed from the TIMSS and PIRLS frameworks, some adjustments to the scope of what is measured were necessary. These modifications reflect LaNA's emphasis on emerging mathematics and reading comprehension skills and its paper-and-pencil format, which cannot capture framework components that depend on digital content or processes.

The LaNA 2023 Linking Study established a psychometric link between LaNA and the TIMSS 2019 mathematics and PIRLS 2021 reading achievement scales. This linkage provides a basis for reporting student proficiency on the TIMSS mathematics and PIRLS reading scales and in relation to the TIMSS and PIRLS International Benchmarks. In addition, the linking study established new Basic International Benchmarks for mathematics and reading that are located below the lowest TIMSS and PIRLS International Benchmarks. These new Basic Benchmarks describe what students know and can do at the lower end of the scales where evidence of emerging skills is most prevalent.

The purpose of this document is to provide an overview of the content and skills assessed in the LaNA mathematics and reading assessment booklets. It describes the content and cognitive domains assessed by LaNA mathematics items and the reading purposes and comprehension processes assessed by the LaNA reading items, and how these relate to the TIMSS 2019 and PIRLS 2021 frameworks, respectively.

LaNA Mathematics

The LaNA mathematics assessment is composed of items that reflect a subset of the content and skills articulated in the TIMSS mathematics framework, reflecting more foundational mathematics knowledge and skills and facilitating valid measurement of what students know and can do in LaNA countries.

The TIMSS 2019 Mathematics Framework at grade 4 has two main components: content domains and cognitive processes. The content domains Number, Measurement and Geometry, and Data describe the specific mathematics content, while the cognitive processes Knowing, Applying, and Reasoning describe the type of thinking processes to assess. Each content domain is defined by topic areas, which contain content-specific topics that guide item development.

LaNA Mathematics Content Domains

Whole Numbers and Operations

Whole numbers and operations are predominant components of mathematical knowledge with respect to emerging skills. LaNA items focus on the knowledge and understanding of the representation of whole numbers, including understanding place value. Operations using whole numbers include addition, subtraction, multiplication, and division, including in simple contextual word problems. Pre-algebra concepts also are part of the assessment, including understanding the concept of variables (unknowns) in simple equations and initial understanding of relationships between quantities.

Fractions

Because objects and quantities are often not expressed solely in terms of whole numbers, it is also important for students to understand fractions as parts of a whole or collections; represent fractions using words, numbers, or models; and compare, order, add or subtract simple fractions.

Measurement and Geometry

Measurement is the process of quantifying attributes of objects and phenomena (e.g., length and time). LaNA items require students to measure and estimate the length of objects; solve problems involving mass, volume, and time; identify appropriate types and sizes of units; and read scales. Items ask students to solve problems involving the calculation of perimeters and areas of simple polygons (e.g., rectangles).

Geometry helps students visualize and understand the relationships between shapes and sizes. LaNA items include geometry topics such as identifying the properties and characteristics of lines; comparing angle sizes; using line and rotational symmetry to describe and compare common two-dimensional shapes; and analyzing geometric relationships.

Data

The rapid growth of data in today's information society has resulted in the widespread presentation of visual displays of quantitative information. The Internet, newspapers, magazines, textbooks, reference books, and articles often present data in charts, tables, and graphs. LaNA items include data-related topics such as reading and recognizing various forms of data display, such as tables and bar graphs, and using data to solve problems.

Mathematics Cognitive Domains

To respond correctly to LaNA assessment items, students need to be familiar with the mathematics content being assessed, but they also need to draw on a range of cognitive skills across the content domains. Each content domain includes items developed to address each of the three cognitive domains. LaNA, like TIMSS, includes items assessing the following three cognitive domains:

- **Knowing** covers the facts, concepts, and procedures students need to know (e.g., recalling definitions, recognizing numbers, classifying quantities, carrying out algorithmic procedures for +, –, ×, ÷, retrieving information from graphs, and using measuring instruments)
- **Applying** focuses on the ability of students to apply knowledge and conceptual understanding to solve problems or answer questions (e.g., determining efficient or appropriate operations, strategies, and tools; representing data with tables or graphs; and implementing strategies and operations to solve problems)
- **Reasoning** goes beyond the solution of routine problems to encompass unfamiliar situations, complex contexts, and multistep problems (e.g., determining relationships among numbers, evaluating alternative solutions, drawing conclusions)

Each LaNA mathematics item targets the measurement of both a content domain (and topic area within that content domain) and a cognitive domain. In LaNA, there are four content domains, as shown in Table 1. The first two, Whole Numbers and Operations and Fractions, derive from the broader TIMSS Number domain and represent just over half of the LaNA mathematics assessment, while the Measurement and Geometry domain is 30 percent and the Data domain is 15 percent of the assessment. Given the focus of LaNA on assessing foundational mathematics, most items call on the Knowing and Applying cognitive domains.

Table 1: Distribution of LaNA Items by Content Domain and Cognitive Process

	Percent of Items*
Content Domains	
Whole Numbers and Operations	46%
Fractions	9%
Measurement and Geometry	30%
Data	15%
Cognitive Processes	
Knowing	54%
Applying	43%
Reasoning	4%

*Totals may not sum to 100 due to rounding.

Refer to the TIMSS 2019 mathematics assessment framework for more information about the TIMSS grade 4 assessment.

LaNA Reading

LaNA focuses on assessing the developing capacity to derive meaning from text through early mastery of decoding, vocabulary, and text structure. Consistent with PIRLS, LaNA adopts a broad conception of reading comprehension—one that includes reading as a **literary experience** and as a means of exploring diverse worlds, cultures, and ideas, and also recognizes reading for **informational purposes** as a functional tool for achieving personal and societal objectives, often termed "reading to do."

Reading Purposes

Reading for Literary Experience

In literary reading, readers engage with the text to become involved in events, settings, actions, consequences, characters, atmosphere, feelings, and ideas, and to enjoy language itself. To understand and appreciate literature, each reader must bring to the text his or her own experiences, feelings, appreciation of language, and knowledge of literary forms. For young readers, literature can offer the opportunity to explore situations and feelings they have not yet encountered.

Events, actions, and consequences depicted in narrative fiction allow readers to experience vicariously and reflect upon situations that, although they may be imagined, illuminate those of real life. The text may present the perspective of the narrator or a principal character, and a more complex text may even have several viewpoints. Information and ideas may be described directly or through dialogue and events. Short stories or novels sometimes narrate events chronologically or sometimes make more complex use of time with flashbacks or time shifts.

As is the case for PIRLS, the main form of literary texts used in LaNA is narrative fiction. Given differences in curricula and cultures across the participating countries, it is difficult for PIRLS to include some forms of literary texts. For example, poetry is difficult to translate and is therefore avoided.

The LaNA literary texts are complete short stories with supportive illustrations. The texts include contemporary and traditional stories with one or two main characters, a simple plot, and an explicit overall theme or message. The LaNA literary texts are approximately 300—500 words long, with a clear linear structure, explicit meanings, and simply described characters. The language features everyday vocabulary and straightforward sentence structures.

Reading to Acquire and Use Information

When reading for information, texts serve multiple purposes, such as learning about a topic, solving a problem, or completing a task. Texts encountered for these purposes may include articles, explanations, or short procedural texts. Through these texts, LaNA assesses students' ability to use reading as a tool for learning across disciplines and for engaging with and making connections to real-world topics, events, and situations.

To understand, evaluate, and apply information presented in these texts, the reader must bring to the text a knowledge of typical forms of informational texts. This includes an understanding of how different text features, such as headings, diagrams, tables, and captions may be used by an author to support meaning. As in PIRLS, LaNA requires students to locate relevant information, distinguish between central points and supporting details, recognize relationships among concepts, and draw conclusions about ideas and information using evidence from what they have read.

The LaNA informational texts include a variety of (paper-based) expository texts about the natural world. These texts also present information in diagrams, illustrations, or tables. Texts are structured in several ways, including by logic, argument, chronology, and topic. Several include organizational features such as subheadings or text boxes. The informational texts are approximately 300—500 words in length with a clear structure and explicit meanings, and straightforward sentences with everyday vocabulary.

Processes of Comprehension

LaNA, like PIRLS, measures how students construct meaning from texts using four broad processes of comprehension:

- Focusing on and retrieving explicitly stated information
- Making straightforward inferences
- Interpreting and integrating ideas and information
- Evaluating and critiquing content and textual elements

The four comprehension processes provide the foundation for developing assessment items linked to each passage. The variety of questions allows students to demonstrate their ability to construct meaning from texts. The complexity of comprehension also depends on text length, structure, language, and cognitive demands, which interact with the type of comprehension process being assessed.

Table 2 summarizes the distribution of LaNA items by reading purpose and comprehension process. As in PIRLS, LaNA conceives of the reading comprehension domain in primary school as reflecting a balance of reading for literary experience and reading to acquire and use information. However, the LaNA assessment design (described below) includes a common (informational) block across all LaNA booklets, to support the analysis of the achievement data. As a result, 40 percent of the items across the reading assessment are associated with literary texts and 60 percent are associated with informational texts.

As an assessment of emerging reading comprehension, LaNA emphasizes having students retrieve information and make inferences (more than 80 percent of items), while also including items that require students to engage in more advanced comprehension processes.

Table 2: Distribution of LaNA Reading Comprehension Items by Reading Purpose and Comprehension Process

	Percent of Items*
Reading Purposes	
Literary Experience	40%
Acquire and Use Information	60%
Comprehension Processes	
Focus on and Retrieve Explicitly Stated Information	58%
Make Straightforward Inferences	25%
Interpret and Integrate Ideas and Information	7%
Evaluate and Critique Content and Textual Elements	9%

*Totals may not sum to 100 due to rounding.

Refer to the PIRLS 2021 reading assessment framework for more information about the PIRLS assessment.

LaNA Assessment Design

LaNA mathematics item blocks (collections of assessment items) and reading passages (the text and associated assessment items) are assembled into student booklets so that each student is administered two mathematics item blocks and two reading passages during a test session. The blocks appear in varying positions across booklets to help balance exposure and ensure reliable measurement.

LaNA Mathematics Item Blocks

The LaNA mathematics assessment is organized into a series of item blocks, each containing 20 multiple-choice items. These blocks are not full tests on their own but are used in a matrix sampling design so that each student completes only two of the item blocks while the full set of blocks together covers the entire mathematics item pool.

Each item block is designed to include items that reflect the range of mathematics content and cognitive domains described above, and the distribution of items within each block is intended to match the overall distribution across those domains.

LaNA Reading Passages

The LaNA reading assessment comprises five distinct text passages, each with 10–11 multiple-choice reading comprehension items. Each LaNA reading passage (equivalent to a mathematics item block) comprises a single reading passage distributed across multiple pages, with 2–3 comprehension items per page. Each page presents a segment of the text, so students read in manageable portions rather than all at once.

This "page-by-page with associated items" structure helps keep students engaged, reduces cognitive overload, and allows assessment of comprehension at multiple points throughout the passage. Each block includes either a literary passage or an informational passage. The items focus on different reading comprehension processes shown in Table 2 (retrieving information, making inferences, interpreting meaning, evaluating content).

LaNA Assessment Booklets

Altogether, the LaNA assessment comprises four LaNA booklets containing a total of 80 mathematics items and 54 reading items. Each booklet consists of two parts, each 40 minutes, for a total of 80 minutes per booklet, with a short break between the two parts. Each LaNA booklet contains two regular LaNA mathematics blocks, one common reading passage, and one unique LaNA regular passage. All LaNA mathematics blocks appear twice, in different positions. All LaNA reading passages appear once; the updated common reading passage (L0_Common) appears in all four LaNA booklets and is always presented at the first position in either part 1 or part 2. The LaNA booklet design is provided in Tables 3 and 4, respectively.

Table 3: LaNA Item Blocks

Blocks	Block Label	Items
LaNA Mathematics Blocks	N1	20
	N2	20
	N3	20
	N4	20
LaNA Reading Passages	L0_Common	11
	L1	10
	L2	11
	L3	11
	L4	11

Table 4: Booklet Design for LaNA Booklets

LaNA Booklets	Part 1		Part 2	
Booklet 1	N1	N2	L0_Common	L1
Booklet 2	L0_Common	L2	N2	N3
Booklet 3	N3	N4	L0_Common	L3
Booklet 4	L0_Common	L4	N4	N1
Key: L—Reading; N—Mathematics				

Supplemental Assessment Booklets (Optional)

The LaNA booklets can be complemented with four supplemental booklets which comprise 52 mathematics items from TIMSS 2019 and 66 reading items from PIRLS 2021. The supplemental booklets provide countries where a substantial portion of students would have some success with more challenging content, with broader coverage of the mathematics and reading constructs. Including the supplemental booklets would provide these countries with more information about what their students know and can do by providing a stronger connection between LaNA and the upper ranges of the TIMSS and PIRLS scales. In countries opting to include the four supplemental booklets, half of the students in a class receive a LaNA booklet and the other half receive a supplemental booklet. These supplemental booklets are those used in the 2023 Linking Study to establish the link between LaNA and the TIMSS and PIRLS achievement scales.

Each supplemental booklet contains two mathematics blocks and one reading passage. All supplemental mathematics blocks appear twice and at different positions, while all supplemental reading passages appear only once. While LaNA booklets comprise multiple-choice items only, the supplemental booklets comprise multiple-choice and constructed-response items. The supplemental booklet design is provided in Tables 5 and 6, respectively.

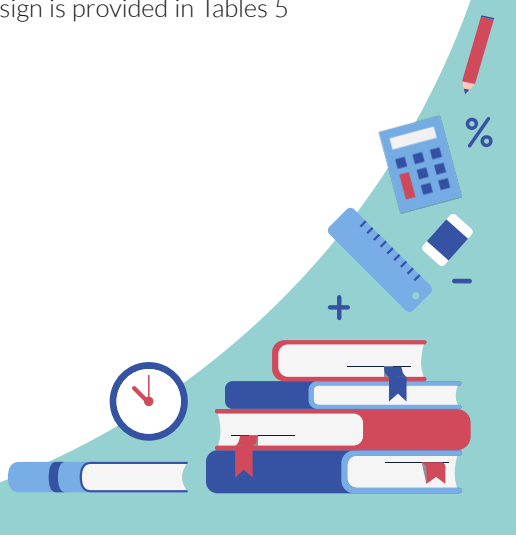
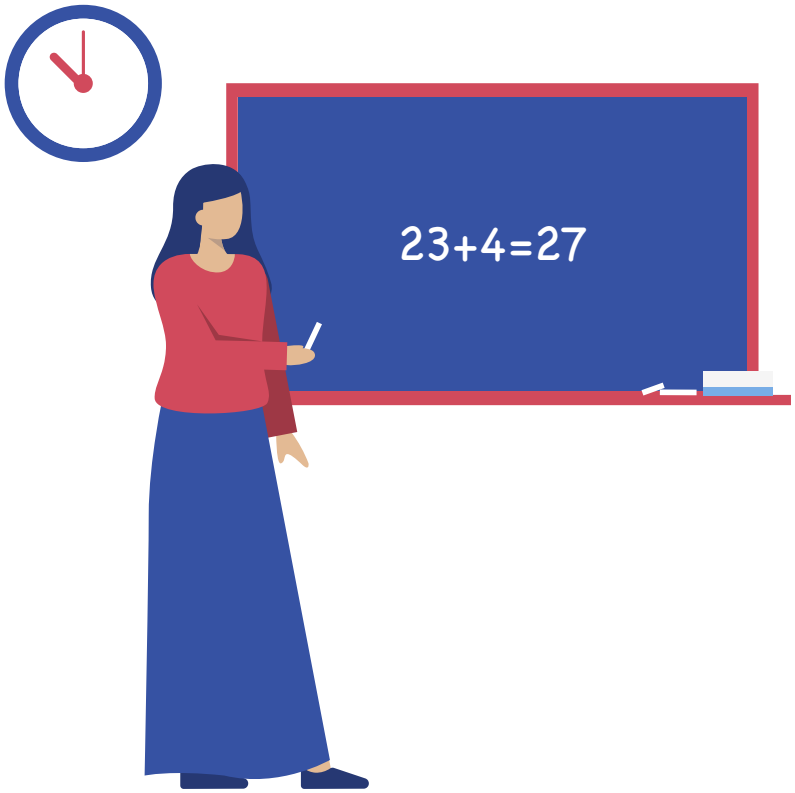


Table 5: Supplemental Item Blocks

Blocks	Block Label	Items
Supplemental Mathematics Blocks	NL1	13
	NL2	13
	NL3	13
	NL4	13
Supplemental Reading Passages	LL1	18
	LL2	17
	LL3	16
	LL4	15

Table 6: Booklet Design for Supplemental Booklets

Supplemental Booklets	Part 1		Part 2	
Booklet 5	NL1	NL2	LL1	
Booklet 6	LL2		NL2	NL3
Booklet 7	NL3	NL4	LL3	
Booklet 8	LL4		NL4	NL1
Key: LL—Reading Supplemental; NL—Mathematics Supplemental				



LaNA Context Questionnaires

In addition to the assessment of reading and mathematics achievement, LaNA collects information on contextual factors associated with learning through questionnaires administered to students, teachers, and school principals. The LaNA context questionnaires are designed to support policy-relevant interpretation of learning outcomes, with a particular focus on low resource contexts.

Development Approach

The LaNA context questionnaires were developed through a dedicated research and development (R&D) process that aimed to balance continuity with established IEA context frameworks and responsiveness to learning conditions in LaNA countries. Building on the TIMSS and PIRLS context questionnaire framework and the LaNA student and school questionnaires used in the LaNA 2023 Linking Study, the R&D effort involved:

- systematically reviewing international and regional assessment frameworks and questionnaires commonly used in low- and low-middle-income contexts
- identifying contextual domains and indicators shown in the literature to be particularly relevant for understanding learning in resource-constrained and linguistically diverse settings
- formulating and refining questionnaire content through expert consultation and country feedback
- empirically reviewing candidate items for analytical usefulness and interpretability.

This approach ensured that LaNA contextual data are broadly comparable to TIMSS and PIRLS, while extending coverage to better reflect the realities of education systems participating in LaNA.

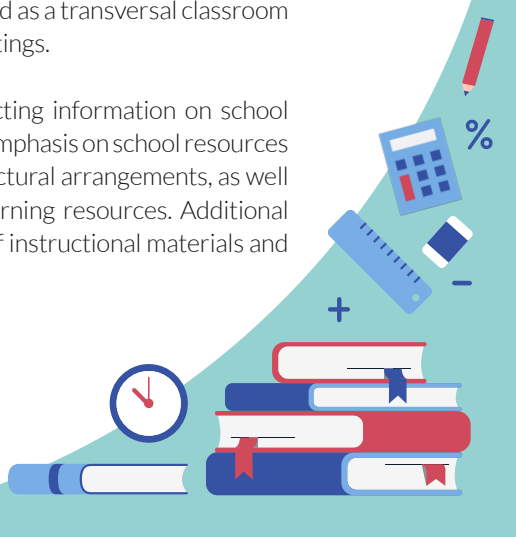
Conceptual Coverage of the LaNA Context Questionnaires

Consistent with the TIMSS and PIRLS questionnaires, LaNA organizes contextual information around key areas of influence on student learning, spanning the home, school, classroom, and student levels. Within each area, the LaNA student, school, and teacher questionnaires include TIMSS- and PIRLS-aligned constructs and constructs particularly relevant in low-resource contexts.

Student-level contexts. At the student level, LaNA covers background characteristics and learning-related experiences commonly included in TIMSS and PIRLS, such as schooling trajectories, home background, and engagement with learning. Building on this foundation, LaNA places additional emphasis on factors that may shape students' opportunity to learn in LaNA countries, including experiences of interrupted schooling (e.g., absence and grade repetition), demands on students' time outside school, and aspects of health, nutrition, and well-being that may affect learning readiness and attendance. The questionnaires also capture predictors of home educational resources and wealth that are particularly relevant in low- and middle-income country contexts.

Classroom and teacher contexts. LaNA's teacher questionnaire aligns with TIMSS and PIRLS coverage of teacher characteristics, preparation, instructional practices, and classroom conditions. In addition, the LaNA questionnaires incorporate themes that reflect structural and employment-related conditions of teaching that are particularly relevant in many low- and middle-income country contexts. These include aspects of teacher assignment across subjects and grades, employment status and workload, teacher attendance, and confidence in teaching under constrained conditions. Language of instruction is also addressed as a transversal classroom factor, recognizing its importance for instructional accessibility in multilingual settings.

School contexts. At the school level, LaNA follows TIMSS and PIRLS in collecting information on school organization, resources, and learning environment, with a comparatively greater emphasis on school resources and infrastructure. LaNA extends coverage to include school ownership and structural arrangements, as well as policies related to student progression, academic support, and access to learning resources. Additional attention is given to school-level support mechanisms, including the availability of instructional materials and facilities that are relevant to opportunities to learn.



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IEA's LaNA is an international assessment that measures mathematics and reading comprehension skills at the end of primary school.

Grounded in and linked to IEA's flagship studies TIMSS and PIRLS, LaNA is a paper-and-pencil assessment designed to align with a variety of educational contexts.

LaNA was developed to support countries in need of reliable, nationally representative, and internationally comparable data on educational quality and opportunity. LaNA has an assessment design targeted at measuring foundational learning, allowing education systems to gain deeper insights into their students who are in the process of developing these emerging skills as well as those who are reaching higher levels of proficiency.

IEA

The International Association for the Evaluation of Educational Achievement (IEA), with headquarters in Amsterdam, is an independent, international cooperative of national research institutions and governmental research agencies. It conducts large-scale comparative studies of educational achievement and other aspects of education, with the aim of gaining in-depth understanding of the effects of policies and practices within and across systems of education.

PARTNERS

LaNA has been developed by the TIMSS & PIRLS International Study Center at Boston College's Lynch School of Education and Human Development and is implemented in partnership with IEA.

IEA TIMSS & PIRLS BOSTON COLLEGE

Keizersgracht 311
1016 EE Amsterdam
The Netherlands
Phone: +31 20 625 3625
Email: secretariat@iea.nl
Website: www.iea.nl

IEAResearchInEducation
IEA
@ieaeducation.bsky.social
@iea_education