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The Latin-American Laboratory for Assessment of the Quality of Education: Measuring and comparing educational quality in Latin America

The *Laboratorio Latinoamericano de Evaluación de la Calidad de la Educación* (Latin-American Laboratory for Assessment of the Quality of Education or LLECE) is the network of national systems for the assessment of education quality in Latin America, created in 1994, and coordinated by UNESCO's Regional Bureau for Education in Latin America and the Caribbean (OREALC). LLECE's purpose is to produce data and knowledge that inform educational policy in the region, contribute to capacity building, and serve as a forum for reflection, exchange and generation of new ideas and good practices in education evaluation (UNESCO, 2013).

Origins and context

To provide useful information for education policymaking and implementation, LLECE organises comparative studies aiming to measure the quality of education in the region.

Regional assessments have common indicators that allow comparisons between countries, acknowledging the particular features of the Latin–American context. Regional assessments also enable comparisons with those countries that do not participate regularly in large-scale international studies such as the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS).

The First Regional Comparative and Explanatory Study (PERCE, by its Spanish acronym) was implemented by LLECE in 1997 in 13 countries. Nine years later, in 2006, the Second Study (SERCE) tested students in 16 countries plus one Mexican state. The Third Study (TERCE) was implemented in 2013 in 15 countries and the same Mexican state. In the fourth study (ERCE) 18 countries are participating, with data collected in 2019.

PERCE and SERCE results are not comparable because the latter introduced a series of modifications resulting from the experience and knowledge gained from the implementation of PERCE. Some of the changes relate to sampling, test design, target population and knowledge domains covered by the assessment. However, through the inclusion of common item material, SERCE, TERCE and ERCE provide comparable data to monitor changes over time for countries that have participated in more than one assessment administration.

The implementation of LLECE assessments is agreed between a National Coordinators Council and UNESCO's Regional Office of Education for Latin America and the Caribbean. Together these two groups define and decide all aspects of the study including instrument design, administration and analysis. The UNESCO regional office is responsible for deciding on the more technical aspects of the implementation and analysis.

Quality assurance is also provided by an external Technical Consultative Committee consisting of international experts in measurement and evaluation, who provide advice and support on technical matters during the different phases of the assessment. Each country is expected to contribute financially to participate in LLECE, but countries appear to vary considerably in the resources they have available. Countries not able to fully finance their participation are still encouraged to participate in the assessments; UNESCO provides the additional funding (Bilagher, 2013; Solano-Flores & Bonk, 2008).

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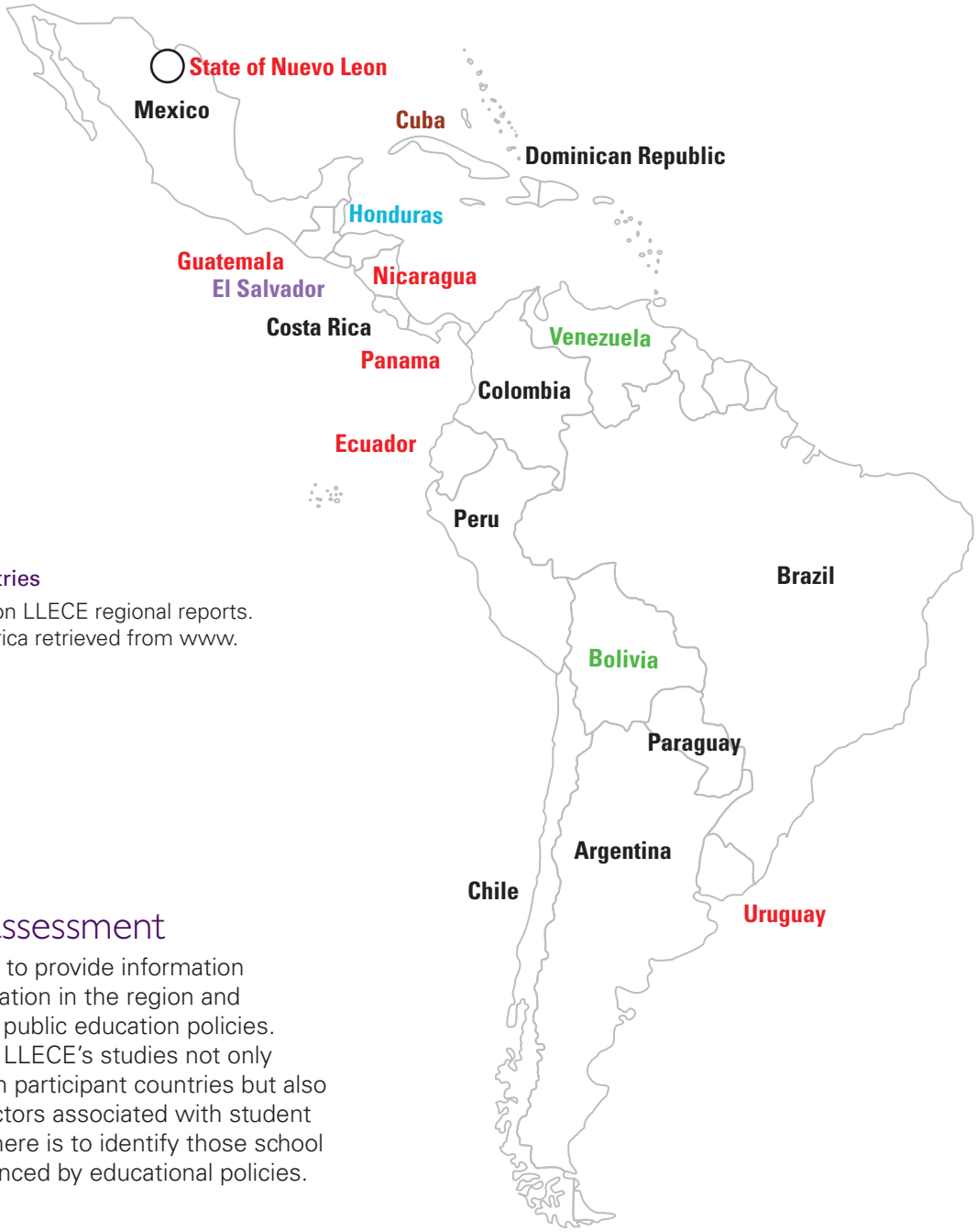

Figure 1: Participant countries

Compiled by author based on LLECE regional reports. Outlined map of Latin America retrieved from www.worldatlas.com

Purpose of the assessment

LLECE assessments aim to provide information about the quality of education in the region and guide decision-making in public education policies. In line with this purpose, LLECE's studies not only compare results between participant countries but also investigate contextual factors associated with student achievement. The focus here is to identify those school factors that can be influenced by educational policies.

Measurement objectives

Cognitive domains

LLECE's assessments measure student achievement in relation to curriculum objectives. In designing each round of assessments, LLECE's members review countries' curricula in the subjects and grades to be assessed, and identify the common content and cultural roots embedded in the curriculum of the participating countries. From SERCE (2006), these assessments have also included material related to the 'skills for life' approach promoted by UNESCO. This approach considers that schools should provide knowledge and develop skills, values and attitudes that students will need for active participation in society as individuals and citizens (LLECE, 2008).

- Participating in PERCE
- Participating in SERCE
- Participating in PERCE & SERCE
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- Participating in PERCE, SERCE, TERCE & ERCE

PERCE assessed students in two key areas of the curriculum: Language and Mathematics. Language is essential for developing knowledge and learning, and gives access to further knowledge and critical thinking. Mathematics is crucial for logical reasoning, problem solving and accuracy in data analysis (LLECE, 2000).

In designing PERCE tests, LLECE defined five conceptual domains to be assessed in each subject, as shown in Table 1.

SERCE widened the scope of areas to be assessed by including Writing and Science, and also integrated the 'skills for life' approach into the tests. Since this second study, LLECE's assessments have not only identified what students have and have not learnt but also how they use this knowledge to understand, interpret and solve problems in a variety of real-life situations and contexts.

From the analysis of participant countries' curricula, SERCE defined content domains and cognitive processes to be assessed in each subject, as shown in Table 2.

Table 1: PERCE, conceptual domains assessed

Language	Mathematics
• Identify different types of text • Distinguish between text author and audience • Identify the message in the text • Recognize specific information within the text • Identify vocabulary related to the text meaning	• Numeracy • Operations with Natural numbers • Common fractions • Geometry • General skills (reading graphs, pattern recognition, probabilities, and relationships between data)

Table 2: SERCE, content domains and cognitive processes

Subject	Conceptual domains	Processes
Reading	• Reading of paragraphs and texts • Reading of statements and words	• Literal understanding • Simple inferences • Complex inferences
Mathematics	• Numbers • Geometry • Measurement • Statistics • Variations	• Recognition of objects and elements • Simple problem solving • Complex problem solving
Sciences	• Living beings and health • Earth and environment • Matter and energy	• Recognition of concepts • Application and interpretation of concepts • Problem solving
Writing	• Aims to describe in detail children's abilities and knowledge regarding writing a text according to given directions.	

For TERCE, content domains and cognitive processes were modified as shown in Table 3.

Table 3: TERCE, conceptual domains and processes assessed

Subject	Content domains	Cognitive processes
Reading	• Text comprehension of texts • Metalinguistic and theoretical understanding	• Literal comprehension • Metalinguistic and theoretical understanding • Inferential understanding • Critical understanding
Mathematics	• Numerical domain • Geometrical domain • Measurement domain • Statistical domain • Variational domain	• Recognition of objects and elements • Simple problem solving • Complex problem solving
Sciences	• Health • Living beings • Environment • Earth and solar system • Matter and energy	• Recognition of information and concepts • Comprehension and application of concepts • Critical thinking and problem solving
Writing	• Aims to describe in detail children's abilities and knowledge regarding writing a text according to given directions.	

Contextual information

Along with the cognitive tests, LLECE assessments collect information about the context of learning by administering questionnaires to students, their parents, teachers and school principals. These questionnaires are crucial for the identification of contextual factors associated with student achievement.

Among other topics, the student questionnaire aims to collect information about the family and socio-cultural environment in which children live, the dynamics and interactions in the classroom, and the satisfaction the student has with the school, classmates, and teachers.

The teacher questionnaire addresses aspects of teachers' socio-demographic and education background, work conditions, teaching experience, satisfaction with the school, and teaching strategies and practice.

The questionnaire for principals collects information about their personal characteristics, education background and experience, approach to school management, expectations, and satisfaction with the school and its members. The principal is also asked to provide information on school facilities and geographic location.

The parent questionnaire aims to collect information regarding socio-demographic family characteristics, the availability of services and resources in the household, and the participation and support of parents in their children's education, among other topics.

TERCE introduced a 'national section of associated factors' to the context questionnaires in some countries[1]. Through these national sections, each country could further investigate the factors affecting

1 The relationship between learning and ethnic and cultural diversity of an indigenous population was investigated in Ecuador and Guatemala. The relationship between learning and school violence was investigated in Paraguay and Guatemala. The relationship between learning and use of ICT was investigated in Costa Rica. The relationship between participation in full-day schooling and achievement of learning outcomes was investigated in Uruguay

learning that are specific to the national context (such as learning and cultural diversity, learning and school violence). TERCE also introduced two new sections in some of the questionnaires to address the impact of ICT in the quality of learning, and the relationship between eating habits and learning.

Target population and sampling method

LLECE's assessments are grade-based and students in the grades defined as the target population are tested regardless of their age.

The PERCE target population was students in Grade 3 and Grade 4, who were tested in Language and Mathematics. Grade 3 was included because this is the level at which most Latin-American curricula expect that children have acquired the basic reading-writing and mathematics skills that they will need to continue their studies. Grade 4 was included to collect information about the progress in achievement between these two grades (LLECE, 2001).

With the purpose of having a better picture of student achievement in primary education, SERCE and TERCE's target populations were students in Grade 3 and Grade 6 (Bilagher, 2013). The younger group was assessed in Reading, Mathematics and Writing; Grade 6 students were tested in the same three subjects plus Science.[2]

LLECE administers tests to a stratified sample of students in each country. However, the three studies used different sampling procedures.

PERCE defined three strata based on school location (mega-city/urban/rural) and two strata based on school management (public/private); these strata were also used for reporting results. The planned sample size was set at 4000 students per country and the. Within a school, a minimum of 20 students per grade were randomly selected and the minimum number of schools per country was 100. In total, nearly 55 000 students were tested from 1500 schools (LLECE, 2001).

SERCE used a random-sampling procedure for selecting schools from explicitly stratified samples. Two strata were defined based on school location (urban/Rural), two based on school management (public/private), three based on school size (small/ medium/large), and four based on the grades per school grades per school, as represented by the ratio between Grade 6 and Grade 3 enrolment numbers. Within selected schools, all students in Grade 3 and Grade 6 were tested. In SERCE strata were not used for reporting.

2 The Science test was only administered in nine countries (Argentina, Colombia, Cuba, Dominican Republic, El Salvador, Panama, Paraguay, Peru, and Uruguay) and the Mexican state of Nuevo León.

At the national level, the minimum number of students required for Grade 3 was set at 5300 and for Grade 6 at 4700. The minimum number of schools per country was set at 150. In total, there were nearly 196 000 students tested from 3065 schools (LLECE, 2010).

TERCE's sampling approach introduced modifications to the sampling frame of the assessment by modifying the exclusion criteria, the number and type of strata, and the approach for selecting schools and students within schools (LLECE, 2013a).

In previous studies, LLECE excluded from the target population those schools with fewer than six students enrolled in the targeted grades. Students whose mother tongue was different to the language of the test and who have not received at least two years of instruction in the language of the test were also excluded from the sample.

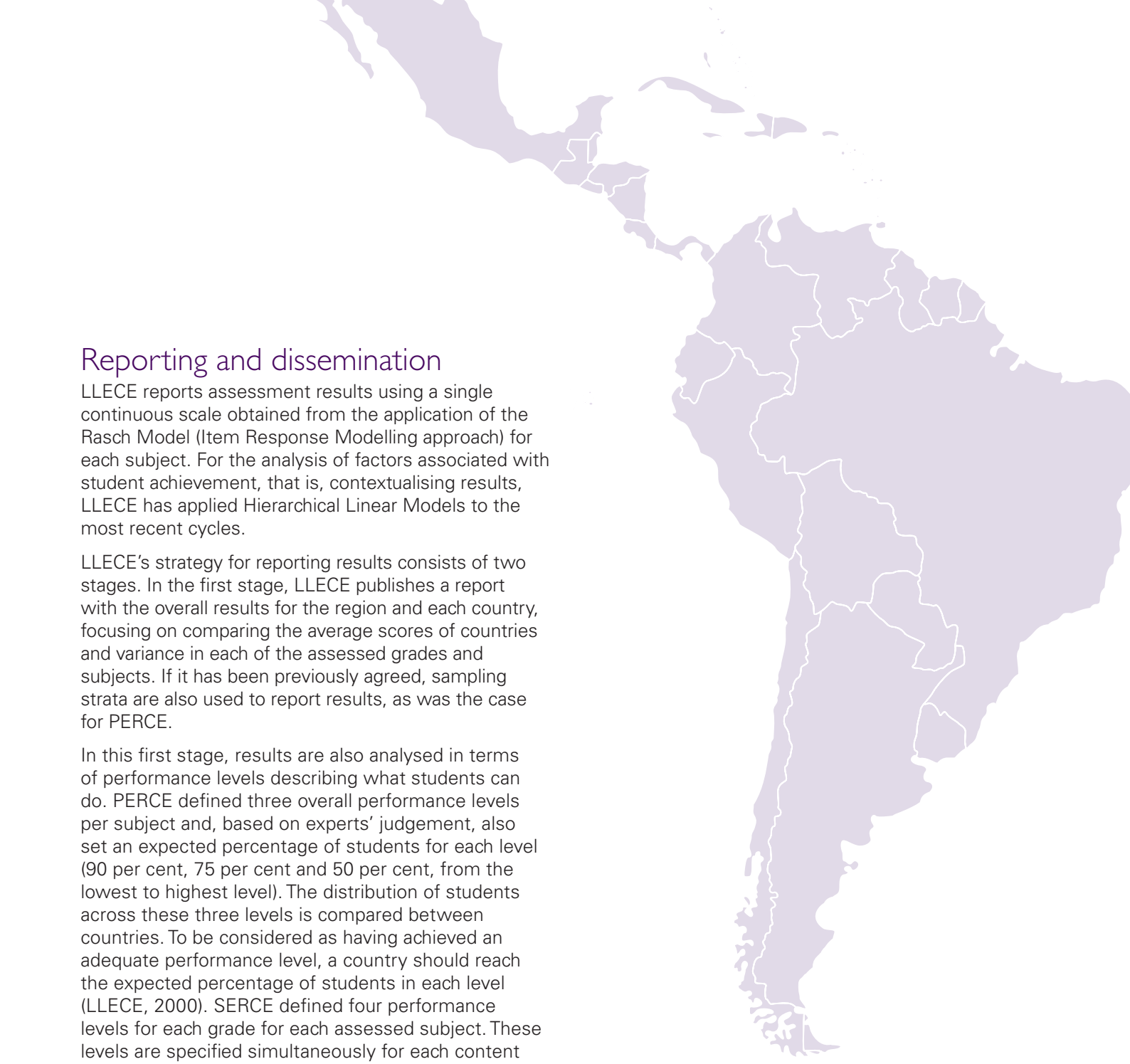
TERCE removed this last criterion with the aim of studying the effect of mother tongue on student achievement. Furthermore, considering that in some countries small schools are a structural characteristic of the education system and their exclusion would reduce the representativeness of the sample, it was decided to exclude only the two per cent of smallest schools from TERCE.

TERCE maintained the school location and school type strata; modified the definition of the stratum referred to grades per school (only Grade 3/only Grade 6/Grade 3 and Grade 6); and no longer used the school size stratum. This last information was incorporated as part of the school selection process: within each stratum, schools were selected proportionally to their size. Within each selected school one intact classroom per grade was randomly selected. The minimum number of participant schools per country was set to 150. The final number of participants will be known when LLECE releases TERCE's results.

Assessment administration

LLECE's assessments are administered during school hours near to the end of the school year (May–June for northern countries and August–December for southern countries). Each country must hire and train independent test administrators. UNESCO's regional office provides detailed manuals outlining the profile and responsibilities of the National Coordinator and test administrators.

The test and corresponding context questionnaires are administered in a paper-and-pencil format. Most of the test items are multiple choice but some open-ended items are also included. The booklets are scanned at the national level before they were sent to UNESCO's regional office for analysis. As of November 2013, there is no defined frequency for LLECE assessments.



Reporting and dissemination

LLECE reports assessment results using a single continuous scale obtained from the application of the Rasch Model (Item Response Modelling approach) for each subject. For the analysis of factors associated with student achievement, that is, contextualising results, LLECE has applied Hierarchical Linear Models to the most recent cycles.

LLECE's strategy for reporting results consists of two stages. In the first stage, LLECE publishes a report with the overall results for the region and each country, focusing on comparing the average scores of countries and variance in each of the assessed grades and subjects. If it has been previously agreed, sampling strata are also used to report results, as was the case for PERCE.

In this first stage, results are also analysed in terms of performance levels describing what students can do. PERCE defined three overall performance levels per subject and, based on experts' judgement, also set an expected percentage of students for each level (90 per cent, 75 per cent and 50 per cent, from the lowest to highest level). The distribution of students across these three levels is compared between countries. To be considered as having achieved an adequate performance level, a country should reach the expected percentage of students in each level (LLECE, 2000). SERCE defined four performance levels for each grade for each assessed subject. These levels are specified simultaneously for each content domain and cognitive process assessed (see Table 2), and reflect progressive levels of difficulty. Countries are compared based on the percentage of students reaching each of these levels (LLECE, 2008). A similar approach was taken to the presentation of TERCE results (LLECE, 2016).

During a second stage, normally two or three years after the assessment has been completed, LLECE publishes a report on associated factors, aiming to explore the relationship between student and school variables (obtained from the context questionnaires) and student achievement. The purpose is not only to relate contextual factors to student performance, but also to identify influential factors that could be modified by educational policy, particularly at the school level.

Influence

Due to its regional nature, it is difficult to evaluate the impact that LLECE assessments have had in each participant country. LLECE reports always conclude with a chapter on recommendations for education policy development (LLECE, 2013b); however, no information is available about whether these recommendations have triggered any changes in policy or practice.

Arguably, LLECE's most important achievement is the strengthening of technical capacity regarding the design and administration of large-scale assessments in member countries, particularly in hose with recently established assessment units (Diaz & Flores, 2008).

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