OPTIMIZING ASSESSMENT FOR ALL:

Assessment as a Stimulus for Scaling 21st Century Skills in Education Systems

BROOKINGS

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Optimizing Assessment for All (OAA) is a project of the Brookings Institution. The aim of OAA is to support countries to improve the assessment, teaching, and learning of 21st century skills by increasing assessment literacy among regional and national education stakeholders, focusing on the constructive use of assessment in education, and developing new methods for assessing 21st century skills.

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INTRODUCTION

Background

Assessment has been identified as a driver in education in several ways. Often seen negatively affecting teaching and learning through the "teaching to the test" notion, it also has more positive effects: One of these is through the use of results from large-scale assessment for change in policy and consequent education reform. Another is through the implementation of formative assessment approaches (Black & Wiliam, 2009) to inform teaching strategies and practice in the classroom. For both functions, assessments that generate information that is reliable and valid for purpose are required. International large-scale assessment programs—such as the Trends in International Mathematics and Science Study (TIMSS, of the International Association for the Evaluation of Educational Achievement [IEA]) or the Programme for International Student Assessment (PISA, of the Organisation for Economic Co-operation and Development [OECD])—commit a great deal of effort to ensuring that their assessments target the constructs (knowledge, skills, or competencies) of interest, and sample the populations of interest, to ensure that the information derived from the programs truly represents the realities of student achievement and in turn reflects the goals and effectiveness of national education systems.

As more countries include 21st century skills (21CS) among their educational goals (Care & Kim, 2018), attention is moving to the role played by assessment. Since early in this century, the IEA and OECD have increased their assessments of general competencies beyond literacy, numeracy, and science to include computer and information literacy, problem solving, civics and citizenship, and global competence. These initiatives have made more visible the interest in developing these competencies in students. Progress at the classroom level, however, is less clear.

For teachers to nurture and guide students' development of 21CS, many pieces of the education puzzle must fall into place. The Optimizing Assessment for All (OAA) project set out to focus on one of these pieces: development of assessments for use in the classroom. These assessments would inform teachers' formative practices to nurture 21CS, as well as the design and development of assessments for use at larger scale. Larger-scale assessment in turn would inform evaluation of system progress in implementation of 21CS policies and practices. Six countries engaged in the OAA project: Cambodia, the Democratic Republic of Congo, The Gambia, Mongolia, Nepal, and Zambia.

Embedding new education goals within existing systems may be an additive model if the goals are similar to the preexisting ones. If they are not, each contributing component of the system must be reviewed to evaluate whether some adaptation or change is necessary. Arguably, the 21CS learning goals are qualitatively unlike those associated with traditional curricula that focus on language, mathematics, social sciences, and science. The difference emanates most directly from the transferable, or transversal, nature of 21CS, which implies that the skills will be enacted across and through existing academic programs.

Effective education systems tailor their curricula, pedagogical practices, and assessment strategy mechanisms in alignment with the learning goals. For many decades, these mechanisms have typically been aligned with the predominant model of "transmission learning." The nature of 21CS, and the aspirations for how they will not only equip students with more-adaptive competencies but also change teaching and learning paradigms, means that the alignment of learning goals with the remainder of the system needs to be reviewed.

Scope

From the steps taken within OAA to establish practical approaches to development and use of 21CS classroom assessment, the next stage is to consider optimal pathways for the power of such assessment to shift teaching and learning more generally to reflect and nurture 21CS.

Several paradigms can help clarify this shift, including:

- *Research-to-practice models* (for example, Coburn & Penuel, 2016; Trivette & Dunst, 2013);
- *Theory of change models* (for example, Hargreaves et al., 2010); and
- *Scaling-up models* (for example, Cooley & Linn, 2014; Uvin, 1995).

This report leans on the scaling-up models, aspects of which in turn rely on research-to-practice paradigms. Unlike many reports that focus on scaling of nongovernmental or nonprofit organizations' education initiatives (for example, Perlman Robinson & Curtiss, 2018; Uvin, 1995), this report presents the 21CS case as situated within mainstream education systems.

Assuming that the definition of scaling-up—"expanding, adapting, and sustaining successful policies, programs, or projects in different places and over time to reach a greater number of people" (Hartmann & Linn, 2008)—is generally agreed upon, then what we are faced with in the case of OAA is not scaling; it is a process of change. Notwithstanding, the scaling literature provides several useful models for conceptualizing the challenge of integrating 21CS into education. Early discussion within OAA adopted the terminology of scaling because some countries might be enabled to trial the assessments developed at larger scale.

In fact, as the project rolled out, what became a clear priority was how to roll out the requisite conditions under which the assessment approach would be functional in supporting teaching and learning. The OAA project in this sense achieved its aim—to develop and produce an assessment approach that would act as a lever for the system.

Many frameworks to describe scaling include similar categories or types. These may be labeled differently despite reflecting similar content. Simply, there are two base types:

- *Horizontal*: Descriptions include terms such as quantitative, or multiplicative, and refer to increasing the number of target units, whether they be regions, organizations, students, or other types of units.
- *Vertical:* Descriptions refer to activity at different levels of a system and may include concepts of organizational scaling.

These two scaling types contribute to combined types, which may be referred to as *organizational* (reflecting both classroom and policy spaces) or *functional* (such as increasing the scope) and reflect additive components both vertically and horizontally.

So the concept of horizontal scaling—developing *more* assessments—is less of a priority than analyzing the implementation sequence of required conditions for that scaling, such as the establishment of teaching approaches and explicit curriculum integration.

Figure 1. OAA integration model

OAA goal	OAA outcomes	21CS integration
How to assess 21CS	Identification of scaling components	Development and implementation of components
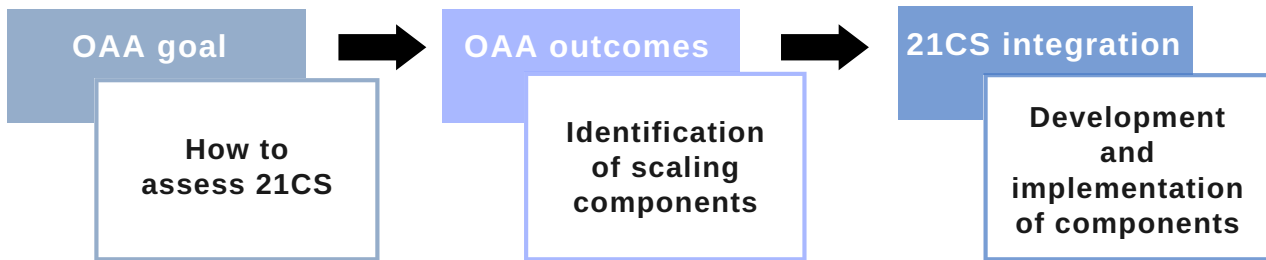
As depicted in Figure 1, the immediate goal of OAA was to identify and explore ways to develop assessment tasks that could capture students' 21CS capabilities. Although the explicit aim was to develop tasks that could be used in the classroom, the knowledge built in that process could be extended to assessment at larger scale and across the spectrum from formative to summative assessment. Achievement of the initial goal would build knowledge about which associated processes, products, and proficiencies would be needed at the system level to integrate 21CS into teaching and learning. This identification would then feed into advocacy at the policy level to initiate the technical processes required across the education delivery system.

## Organizational and substantive multidimensionality

The concept of 21CS in education encompasses principles, materials, activities, and the way teachers and learners interact. This multidimensional scenario directs how initial implementation, as stimulated by the 21CS assessment lever, can be managed. Coburn (2003) drew attention to the unidimensional nature of research on scaling in education reform, focused on number of schools. For 21CS, although the long-term goal is to affect all classrooms, the initial challenge is to integrate the inputs from different levels of the system: policy, planning, finance, technical services, and teaching and learning services. In the latter case—teaching and learning services—there is also the challenge of integrating inputs from the different sections within these (Figure 2).

The work of Dunst and colleagues (Dunst, Trivette, Masiello, & McInerney, 2006) recognizes that scaling is typically a multifaceted and multilayered set of activities. The authors identify preconditions that are particularly salient to the view that OAA is one component of a longer-term scaling initiative. These pre-conditions include (a) that the innovation and its consequences be valued by those who will promote the innovation, the users of the innovation, and the intended beneficiaries; and (b) that the practice be linked to socially and educationally important and desired outcomes. These preconditions present major problems to cases of education reform that lack robust evidence of the value of the proposed changes. The lack of evidence is not unusual with most educational reforms, but that does not neutralize the need for justification with each new candidate for reform. Coburn's (2003) conceptualization of *depth, sustainability, spread*, and *ownership* casts some light on the issue.

Depth: A horizontal focus on scaling, in Coburn's (2003) view, does not encompass *depth*—the nature and quality of the reform. Nature and quality are central to 21CS reform, which requires a set of both substantive and philosophical changes that become explicit through the weaving together of curricular reform, pedagogical practices, and assessment strategies. A surface manifestation, such as curricular reform alone, is insufficient to change practice. What is central is the classroom dynamic in which teachers and students engage with each other through the curriculum.

Figure 2. Multidimensionality of 21CS across organization and activity
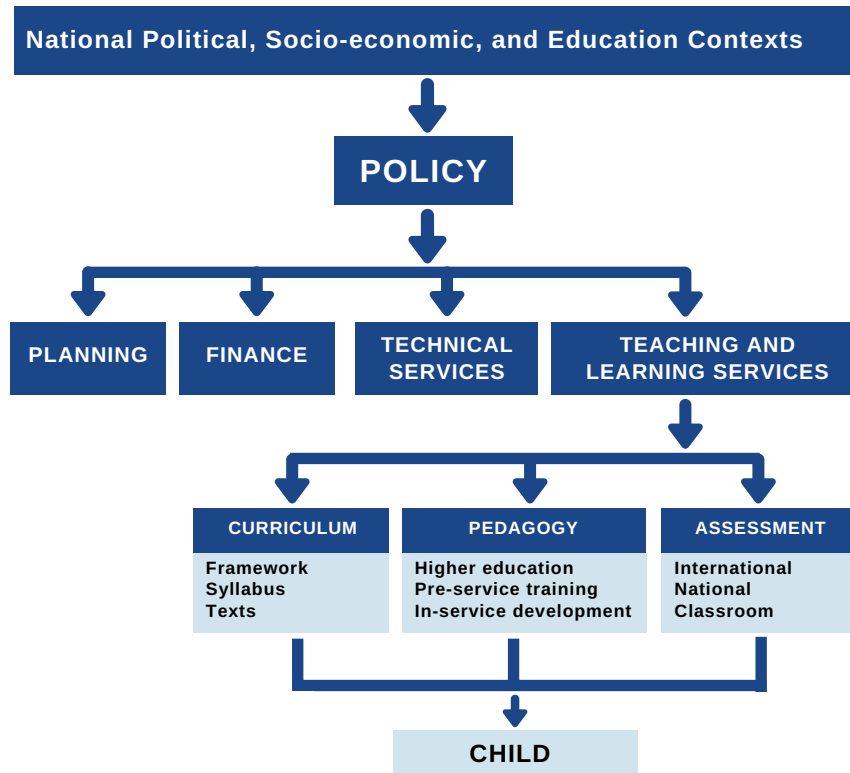
This engagement changes the representation of curricular materials, processes, and understandings in ways that vary over time, by student, and by cohort. Reform implementation requires that the student experiences a changed learning environment. Therefore, the focus is on the facilitating classroom *processes*, not classroom *inputs*.

Coburn (2003) suggests that any reform that promotes change in classroom practice must be viewed through the depth lens. Depth can describe how curriculum is transformed as it is enacted —precisely the paradigm represented by 21CS.

Sustainability: For multidimensional reforms —such as 21CS—sustainability is of particular interest. The challenges lie not only in how to align these dimensions but also in the sequence of reforming each of them and then in maintaining the alignment in practice. A real challenge to 21CS lies in their very generality. Because 21CS are cross-disciplinary, they do not "belong" to any one faculty, and so ensuring coherence is a potential difficulty.

After the initial messaging, enthusiasm, or "alert" response to change, maintenance of vision needs to be planned for within school structures that are organized according to traditional subject areas.

Spread: The concept of spread is germane to 21CS in the vertical context. Stakeholders across the education community are essential to the success of the reform. There are two sets of processes to achieve—the organizational and the substantive. The organizational processes involve the policymakers, planners, finance groups, and educators. The substantive processes involve the teaching and learning specialists. With deep understanding of the nature of 21CS, curriculum experts can identify opportunities for developing the skills; textbook developers can draft materials that stimulate the skills; teacher educators can show teachers how to capture opportunities for modeling and demonstrating the skills; and assessment experts can develop tasks that replicate real-life models for students to exercise their skills.

Ownership: Finally, how is the enthusiasm for, the belief in, and the commitment to an idea and its realization shared such that it becomes joint *ownership*? It is in joint ownership that sustainability is optimized. A 21CS vision initially "owned" by policymakers, or assessment experts, or pedagogical experts must translate into a shared ownership across each relevant sector in the education system. How to sequence the contributing components of 21CS introduction depends on the structure of the system in which the reform is taking place and on the political, socio-economic, and educational contexts. This is apparent in the OAA country perspectives described later in this paper.

In summary, through a scaling lens, the most useful models for exploring and describing the assessment leverage approach for integrating 21CS are those that focus on vertical integration and take a multidimensional approach.

IDENTIFICATION

Challenges to introduction of transversal competencies

Students experience formal education (in terms of the substantive learning processes and products) through the mechanisms of curriculum, teacher instruction, and assessment. Of course, other factors affect the student experience as well, including physical environment, peers, and socio-cultural norms. However, it is through the three mechanisms that the most direct communication of educational expectations occurs. Accordingly, when expectations change because of changes in learning goals associated with education reform, these need to be mirrored across all three (Figure 3).

The implications of this reality for the educational change associated with 21CS are considerable. The most frequently recognized consequences are for curriculum.

Typically less recognized is the need for change in teaching approaches and assessment strategies (Care, 2019). So, what are the upstream conditions for optimizing 21CS teaching and learning in classrooms?

Analyses of this issue in the Asia Pacific region (Care & Luo, 2016) classified the elements of education systems needed to support integration across three categories: definitions, operations, and systems. This reflected the same tripartite structure used in the UNESCO (2015) study dedicated to policy-to-practice issues associated with introduction of "transversal competencies," a term used in the region to describe a set of competencies similar to those often included under the 21CS umbrella term. The study reflected the inputs from 10 countries in the region.

The three categories were framed as groups of challenges to introduction of transversal competencies. These categories have been adapted from their original conceptualizations to provide a framework for exploring the necessary components of and conditions for 21CS implementation (Table 1). As with most classification schemes, their components do not all sit discretely within just one category.

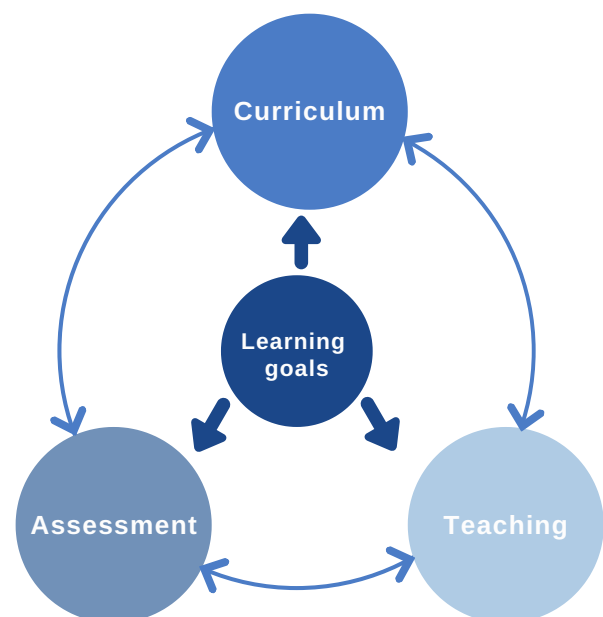Figure 3. The three mechanisms of formal education

Table 1. Categories of challenges to introducing 21CS transversal competencies

Category	Lead issues	Description
Definitional challenges	What are 21CS?	What are the discrete skills or competencies that are referred to as 21CS? Each country or jurisdiction may define these differently. Within each education system, these must be clearly identified, defined, and described in such a way that the education community would recognize exercise of a skill as illustrative of that skill. Many countries have identified the skills of interest to them, although not all have moved to the steps of definition or description (Care & Kim, 2018). The IEA's planned 21CS MAP[1] study will collect education data from its participating countries to identify shared identifications and descriptions of 21CS as well as information about their integration into curricula.
	How will 21CS be reflected in the education system?	How are the new learning goals to be integrated into the curriculum, and how will achievement of these goals be evaluated? There are several models for articulation of 21CS in curricula (Nieveen & Plomp, 2018) but no well-recognized achievement standards that describe student proficiencies across the social and cognitive skills typically identified as 21CS. This gap reflects the state of the art, in which there has been insufficient research and practice to identify what can reasonably be expected of students at different ages and stages of education.
	Why do we need this change?	How does the education system articulate the reasons for the proposed adoption of 21CS learning goals? Countries may refer to reasons such as (a) industry calls for students to be better equipped to contribute to the world of work; (b) dissatisfaction with current learning outcomes given the system's focus on academic skills; and (c) belief that 21CS will equip the next generation of students to respond more adaptively, creatively, and constructively to the problems that face us. Without a strong, well-reasoned explication of the reasons for change, it will be difficult to overcome systemic-cultural barriers.
Operational challenges	Policy stimulus	Which sector in education governance takes responsibility for endorsing and stimulating change toward 21CS? With the source of the original stimulus typically emanating from one sector—but having implications for multiple sectors of the education community—representation of the issue at the policy level may not lie clearly with only one "owner."
	Pathways for implementation	Given the variety of pathways to follow for implementation of 21CS, what is the optimal approach in mobilizing expertise across the curriculum, assessment, and pedagogical components? Decisions include whether these should be approached concurrently, or whether there is a natural sequence to follow. Beyond the theoretical perspective, each country has a separate set of preexisting conditions and are at different stages of education rollout or reform, which may also impinge on this set of decisions.

[1] "21CS Map" IEA Studies, International Association for Evaluation of Educational Attainment (IEA) website: https://www.iea.nl/studies/iea/21csmap.

	Assessment	Is there a clear approach to assessment of 21CS, and is this congruent with current assessment philosophies that underwrite the education system? Decisions include (a) whether a country wishes to assess 21CS at all, and if so, whether to assess from classroom to school to the national and international levels; (b) the primary function of such assessments (formative to summative) across levels; and (c) whether the technical capacity to develop, implement, and interpret assessments is available.
	Curriculum structure	How will the curricula reflect 21CS? Some countries may include the following strategies in their wider approach: (a) audit their curricula to identify opportunities to focus on the skills within the existing approach (as in the Philippines); (b) introduce stand-alone life skills programs (as in Kenya); or (c) restructure curricula to more intentionally integrate skills (as in Norway). The different approaches follow different assumptions about transfer of learning and the degree to which 21CS learning goals are equally applicable across discrete learning domains.
	Teaching resources	Do current teaching resources, including student texts, account for 21CS? The need for innovative teaching approaches may vary according to whether texts are regarded as equivalent to curriculum or whether texts are designed to *facilitate* 21CS within the specific learning domain. Where traditional texts are relied on as the primary sources of curriculum, and where supply chains are slow, there may be challenges to teachers in changing pedagogical strategies.
	Teacher capabilities	How are teachers to include a 21CS perspective in their teaching? The question derives from concerns that introduction of 21CS into classrooms—whether as a pedagogical and modeling approach or as an explicit learning goal intention—requires sets of skills with which teachers are either unfamiliar or unaware. In either case, ensuring that teachers understand the nature of the skills, can model these in the teaching and learning process, and can intervene to nurture them are concerns held by teachers who have been trained in a different teaching and learning paradigm that is discipline-specific.
	Higher education	What responsibility does the higher education sector take for changes in basic education systems? Higher education is less visible than basic education in accountability debates about educational quality, but it is responsible for equipping teacher candidates to educate future citizens. Keeping an eye on major innovation in their market, however, presents obstacles to the higher education sector. Teacher education systems are frequently under extreme time and resource pressure to "qualify" teacher candidates to enter the job market, such that taking time out for research into new paradigms, or providing study leave for teacher educators to upskill, may not be prioritized.

Systemic and cultural challenges	Educational philosophy	How will integration of 21CS into teaching and learning provide students with better learning outcomes? Education ministries require good reasons to change practice. The belief that 21CS and its association with constructivist pedagogical practices will improve learning outcomes is not well demonstrated in practice. Although it is logical to assume that experiencing a problem solving scenario and engaging in metacognitive activities about that scenario will prove more instructive than being told there is a problem and shown a solution, for example, there remain evidential gaps. The argument for introduction of 21CS lies mainly in dissatisfaction with current learning outcomes and in the logical argument as outlined above. What is required is champions of the approach within systems who can motivate stakeholders to consider these alternative approaches to education.
	Learning theory and education culture	Countries' education vision and mission statements communicate their systems' values and aspirations. Behind these statements lie systems in which entrenched practices direct resourcing, on the one hand, and concepts of citizenship on the other. The educational philosophies relevant to integration of 21CS may be illustrated by the valuing of "recitation literacy" (Edgar, 2012) in some education systems. Moreover, moving away from teacher-centered instruction and rote learning approaches and toward competency-based systems may reduce advantages for those who have traditionally benefited from the education system. These include not only families and students who have committed to the traditional pedagogical model, but also interests such as "shadow teaching" (which reflects economic incentives) and the sustainability of an education system infrastructure that cannot provide education for all at the upper secondary levels and beyond (assuming that introduction of constructivist and/or 21CS approaches would improve learning outcomes for more students).
	Political	How can governments reconcile the promise of long-term returns on short-term losses? An administration that oversees the introduction of innovation will not see its success, or failure, within five years or more (Care & Beswick, 2016). As countries introduce 21CS and assess them, national performances on tests may decrease: with 21CS not previously taught or learned, assessments that include 21CS test items would affect scores. As a result, unless the messaging is carefully managed, education reforms present a short-term political risk.

The problem of evidence

OAA, through the mere process of developing assessment tasks, instanced a microcosm of many of the issues listed in Table 1. The magnitude of the task now facing the six OAA countries can be seen through the lens of seven characteristics outlined by Glaser, Abelson, and Garrison (1983): sound *evidence, observable, relevant, relative advantage, easy to install, compatible,* and *testable*.

Evidence: There is yet no robust evidence that integration of 21CS into classroom teaching and learning will deliver different learning outcomes that are congruent with what industry and society hold is essential for functioning effectively in 21st century society.

Observability: Although implementation of the innovation itself is observable—through either changed curriculum or assessment and teaching practices—the long-term outcomes of these are not yet visible. The OAA case, as with much education reform, is one based in logic rather than evidence. It is logical that we should be taught and assessed in ways that are clearly aligned. It is also logical that we teach the behaviors that we want to see. If the world of work and our own existential struggles in the world are saying that: education is not equipping youth with the competencies to navigate their lives and difficulties adequately; and are identifying the competencies that they need to see; then it is logical that we teach those behaviors. We do not have the robust evidence that establishes the way ahead; we merely have logic.

Relevance: Again related to the lack of evidence, the innovation's relevance for addressing current inadequacies in educational outcomes remains contested. Many believe that a focus on literacy and numeracy, particularly in countries with lower educational outcomes, should remain the priority.

Relative advantage: The matter of relative advantage concerns not only advantage of one set of practices over another but also the advantage of individuals or groups of individuals over others. The advantage of practices gets caught up in the evidence problem: although the learning approach implied by classroom integration of 21CS is hypothesized to provide greater opportunities for students to acquire 21CS as well as to deepen their learning in traditional subjects through the application of those skills, there is little research evidence to this effect. This is not owing to the opposite being found but because of the recency of the innovation. The relative advantage for individuals or groups of individuals, however, rests on a different argument. Where groups have learned how to benefit from one set of conditions, and these conditions are changed, the opportunity may be optimal for other groups. In more concrete terms, students who prefer to learn by doing, as opposed to traditional teacher-centered techniques, may benefit from the different approach.

Ease of installation: Integration of 21CS is multidimensional and multistakeholder, as described in Table 1 and depicted in Figure 2. The need to attend across the dimensions and stakeholders makes installation complex.

Compatibility: The inherent complexity of 21CS integration is linked with the matter of compatibility with established values, norms, and facilities. Education is, increasingly, one phenomenon that most people in a society will be familiar with, whether through their own experience or that of others they know. Education is associated with—and to a variable degree, predictive of—success in society, whether this success is identified through status, employment, or wealth.

Changes to the nature of education at the overarching level, or just changes to the nature of assessment on the ground, may represent societal shifts that are not compatible with everyone's values or views.

Testability: After this troubled travail through the seven characteristics of Glaser et al. (1983), the matter of testability strikes a note of optimism. There is no doubt that what OAA seeks to leverage is testable without long-term commitment. The integration of skills into the curriculum, the inclusion of constructivist pedagogies in teaching repertoires, the development of assessments that capture not only subject knowledge but also how students can manipulate and use that knowledge —these can be tested without abandoning the learning goals of the past. The main difference lies in the path traveled to reach those goals.

THE OAA MICROCOSM

Cross-cutting goals and issues

The initial invitation to which countries responded for participation in the OAA study included three aims:

- To support regional and national stakeholders to measure learning across transversal competencies, with consequent capacity for teaching these skills;
- To demonstrate how to align assessment of skills with how they are written into curriculum and how they are to be taught;
- To strengthen education systems' capacity to integrate 21CS into their teaching and learning in order to better help education systems develop their students' readiness for work and lifelong learning.

The main objective was to create common assessment tasks through two collaborative processes—one with three Asian countries and the other with three African countries.

All six countries had previously engaged in OAA's "ministudies" (Care, Vista, & Kim, 2019; Kim, Care, & Vista, 2020). The two ministudies drew on ministries and researchers from some 20 countries across the two regions and collected examples of assessment materials used in classrooms and at the national levels. These examples were analyzed to evaluate the degree to which they might directly target 21CS or, particularly in the case of Africa, be modified to do so.

The main studies focused on development of tasks that (a) would target specific 21CS; (b) were framed by curricular studies; and (c) would be administrable in classrooms. Whether the tasks would be used, in the longer term, as models for classroom use or for large-scale assessment was not a primary focus or concern. Such decisions were the province of the countries. The lack of planning for scaling of the assessment initiative therefore led each country to analyze its particular education priorities and status quo, and thence to different perspectives about the countries' intended use of the collaborative initiative and the most appropriate steps to take with the accumulated learning from the OAA process.

The six countries expressed their goals at the beginning of the project. These were articulated within the parameters of the stated goals of the initiative, as follows:

- Cambodia's interest was in both formative and summative functions of assessment, with formative assessment being the most immediate goal. Longer-term aspirations included how to support teachers in administering standardized tests and how to develop technical standards to support teachers' realistic expectations of students. Linked with these latter aspirations was the wish to include 21CS student performance in semester results.

- Mongolia's interest was in the form of the assessments themselves—how to design innovative assessment strategies that would capture student skills. The anticipated function was formative assessment to diagnose the current state of student performance as an input to development of strategic teaching interventions.
- Nepal's interest was twofold—to explore how to set benchmarks and standards, and similarly to Mongolia, to explore how the assessment results might be used diagnostically to identify strategic interventions for remediation.
- All three sub-Saharan African countries endorsed the goals of using 21CS assessment results for formative and summative functions as well as for system-level accountability and policy purposes.

Toward the end of the project, as discussion about use of the project learnings increased, greater diversification of country goals was expressed. In Asia, the focus remained closely aligned with assessment per se. In the African countries, the focus within the collaboration centered more on the challenges associated with equipping teachers with the practical expertise of using the assessments and integrating 21CS into their teaching practice. In both regions, the development and piloting of 21CS assessment tasks stimulated analysis of the system-level processes necessary for implementation.

The most immediate challenges noted by the countries were the continued lack of understanding of the nature of 21CS and how to align teaching models with the learning goals. These were recurrent themes throughout the project, initially made explicit by the national teams as they collaborated to generate common definitions and descriptions of selected 21CS, and later as they saw teacher responses to the tasks and their pilot administration in the classrooms.

The first workshop in Asia provided early insights. After three days of working on definitions, a Nepali team of 12 sixth- and seventh-grade teachers across social studies, science, and mathematics discussed visibility of skills in the classroom and whether these varied across grade levels and subject areas. The team foreshadowed the challenges encountered repeatedly during the project (Table 2) and reflected in country experiences during the piloting of the developed assessment tasks.

Table 2. Contextualizing the 21CS teaching and assessment issues

Issues identified	Context
Confusion between the generic skill of problem solving and "problems in mathematics"—the latter being typically just mathematics tasks to which routine procedures or formulae needed to be applied	This specific case reflects general lack of knowledge about the nature of 21CS and the risks posed by merely identifying skills by label without systematic study of their definitions, descriptions, and behaviors.
Belief that placing students in groups to complete tasks directed by the teacher is equivalent to empowering students to participate in collaborative activities	This case reflects a common misunderstanding of the nature of collaboration (Scoular & Care, 2019), reflecting the more general issue of lack of familiarity with 21CS as areas of development in their own right.
Belief that 21CS were a part of classroom teaching but not recognized as such, with the consequence that deliberate facilitation of different skills and their components does not occur	This reflects the limitations on teachers to include 21CS, reflecting the limitations imposed by their lack of deep understanding of the nature of the skills.
Uncertainty about how to encourage students to engage in generating alternative solutions, against the customary education culture of following clear guidelines to reach correct answers	This reflects the need to apprise teachers of different pedagogical strategies, but it also reflects the dominant teaching-learning paradigm, which values reaching correct solutions in specified ways.
The view that "higher-order skills," which implicitly are seen to include cognitive 21CS, can be activated in students in higher grades only	This reflects inadequate understanding of cognitive processes, exacerbated by the ubiquity of taxonomies such as those of Bloom and colleagues (Bloom, 1956) and SOLO (Biggs & Collis, 1982). These latter have tended to equate the different levels of the hierarchies with higher achievement.
The limitations of textbooks insofar as they did not provide real-life scenarios to which 21CS could be applied	Reliance on textbooks as the sole source of curriculum (which the NISSEM group of academics and practitioners has been addressing) exacerbates this issue. Although varying somewhat, in some countries, this reliance may be intended at the system level, while in others it may be due to funding limitations. In either case, the outcome is that teachers adhere to the textbooks. This may restrict the number of pedagogical strategies being implemented and does not account for the new learning goals represented by 21CS.

NISSEM is a structured networking initiative for academics and education practitioners (NISSEM standing for Networking to Integrate SDG Target 4.7 and Social and Emotional Learning into Educational Materials). For more about NISSEM's work on revising textbooks to cover 21CS, see its Principle 3 web page, "Engage Diverse Stakeholders to Develop Locally Relevant Materials to Promote Target 4.7 Themes": https://www.nissem.org/engage.

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The predominant mode of teaching and learning, which relies on rote learning to "cover the curriculum"	This reflects cultures of teaching and learning in many countries where traditional models—in which the teacher delivers content for the learner to ingest —is the norm. Although this transmission model may be appropriate in some learning contexts for particular purposes (Zuzovsky, 2013), it does not allow for the social and cognitive exploration processes associated with constructivist approaches to learning.
Need to teach to the textbook to maximize results in the traditional assessment system	The downward pressure of high-stakes assessment in many countries (UNESCO, 2018) incentivizes teachers to adhere closely to textbooks provided by the system. Completion of multiple exercises of routine tasks and drilling of information to maximize memorization are assumed to optimize assessment results. The consequence may be less time to engage with learning materials in dynamic ways associated with 21CS.
Norms around teacher-student relationships and dynamics that inhibit critical thinking and problem-solving discourse	Engagement in interrogation of information (a hallmark of critical thinking) and generation and testing of hypotheses (an indicator of problem solving) may counter to prevailing modes of teacher-student interactions. There are perceptions that critical discourse is contrary to respectful teacher-student relationships (Cagasan, Care, Robertson & Luo, 2020).
Classroom conventions and physical environment that preclude the use of nonroutine teaching methods	The physical environment may strengthen cultural norms associated with pedagogical practices. Large class sizes are frequently cited as a barrier to diverse classroom management practices.

These elements inform the larger question of 21CS integration into the education delivery system. The OAA assessment focus did indeed act as a lever, which made the other parts of the machinery evident—how to assess and how to teach, the practical matter of classroom management, the greater fluidity in classroom practices, and the instructional time needed to implement a 21CS integrated curriculum (IBE-UNESCO 2017).

Linn's sequence model (Cooley & Linn, 2014), adapted as in Figure 4, provides a context for thinking about how the OAA learnings contribute to the larger picture of 21CS integration. If OAA acts as Project 1 in this model—"Innovation"—it stimulates identification of the elements that need to be put in place. Project 2 —"Learning"—would constitute the scaling-up pathway by institutionalizing alignment of the assessment mechanism with curriculum and teaching—a vertical process. Project 3—"Scaling-Up"—would constitute a horizontal scaling process.

If Project 1 in this model were not scaled up to the wider infrastructure, it would remain as an innovation of assessment only. As such, it would likely follow the dotted path because it would fail in the vacuum of an aligned curriculum and teaching system.

The differences in post-OAA approaches planned by the OAA countries illustrate the multiple pathways that populate Linn's hypothetical Project 2. All six countries participated in Linn's Project 1 similarly, albeit with some philosophical and practical differences in project implementation between the Asia and Africa regions. Notably, the countries' scaling plans represent integration both organizationally and substantively. Themes include integration across departments within ministries, integration with existing programs, and integration with teacher development.

Figure 4. OAA as "Project 1"
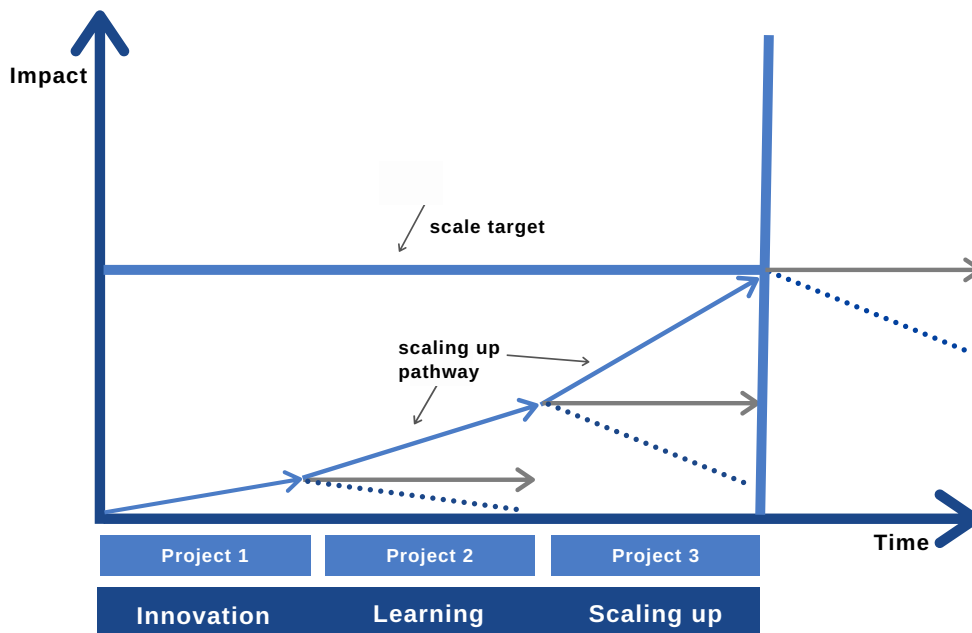
Source: Adapted from Cooley & Linn, 2014.

Country approaches

Program alignment: Lens on Cambodia
Ung Chinna, Sarin Sar, and Khou Hav

The priority of Cambodia's education system is to develop all citizens to reach their full potential in terms of behavior, knowledge, and physical appearance and to contribute to national, regional, and global development (MoEYS, 2015). Although most Cambodian educators recognize that 21CS are practical and useful for students, this is not reflected in classroom teaching and learning (Harsheim, 2016). The curriculum framework emphasizes that students develop 21CS as related to their subjects. In addition, 21CS concepts have been integrated into the curriculum framework in the form of a life skills program (MoEYS, 2011, 2016). This program includes problem solving, communication, teamwork, analysis, critical thinking, and global citizenship as competencies that learners need for their daily lives and professional work.

The Cambodian national OAA team was constituted by the Education Quality Assurance Department (EQAD). EQAD is broadly responsible for assessment in the country and is part of the General Inspectorate of the Ministry of Education, Youth and Sport (MoEYS). Not a part of the General Department of Education (responsible for education delivery, curriculum, and pedagogy), EQAD nonetheless has strong connections with these sections.

EQAD has developed a scaling plan in which OAA learnings and results are to be used as a model and baseline for the country. Directions for both teaching and assessment have been informed by OAA. One of the observations from OAA was that 21CS could be adopted within the existing teaching activities in the classroom. The corollary to this is the need for teachers to handle subject content creatively and engage students actively. This also builds teacher expertise in new ways of teaching to nurture the skills.

Assessment generally, as well as assessment at the national level, has reflectexd textbook content, with items mainly targeting knowledge and comprehension. The OAA assessments, while challenging for teachers and students to engage with, demonstrated ways in which the "content" emphasis of assessment could be enhanced with 21CS.

The scaling-up plan includes:

- *Dissemination* of OAA reporting to the participating schools and MoEYS stakeholders to raise awareness about the activities, findings, and future plans;
- *Alignment* of the OAA concepts and philosophies with the existing life skills program that is supported by the United Nations Children's Fund (UNICEF);
- Development of *additional tasks* and their items to generate an item bank of 21CS for teachers to draw upon in their formative assessment activities;
- Development of *guidelines* by the teacher training center to help teachers to align 21CS with inquiry-based learning instruction; this instruction has been introduced in the most recent education reform and provides students with reflection opportunities to think through concepts; and
- *Identification of existing* Grade 6 national assessment items to link with 21CS, especially critical thinking and problem solving, for next year's national assessment.

This plan will be participated in by the Primary Education Department, Curriculum Development Department, Technical Training Department, and new generation schools and public schools. The EQAD implementing team has developed detailed plans for seeking support from MoEYS leaders at the national and subnational levels, and is working actively with the Provincial Offices of Education through in-field delivery of training in assessment.

Evidence-based approach: Lens on the Democratic Republic of Congo
Juvence Kasang Nduku

The Congo's 2016–25 Sector Strategic Plan for Education (SSEF) outlines three strategic objectives:

- Promote an equitable education system for growth and employment by providing all children with free primary education, which will be gradually extended to eight years; and adapting learning to promote social integration;
- Create the conditions for a quality education system by developing monitoring and quality assurance mechanisms;
- Develop a transparent and efficient education system.

Beyond these strategic infrastructure goals as well as efforts to improve the teaching and learning of national languages and French (supported by the United States Agency for International Development [USAID] and the Global Partnership for Education [GPE]), educators are concerned about the quality and relevance of daily learning. Although the importance of 21CS has been recognized, their assessment has been problematic because of the transversal nature of the skills, transcending the disciplines taught. Prior to OAA, the education system had not sought to categorize or assess transversal skills; rather, the National Education Framework and its programs have been limited to statements concerning the role that these skills play in children's learning and development.

The interest in 21CS emanates from the belief that skills development must start from primary school onward to establish a base for later learning. Congo has traditionally focused on academic competencies, which although agreed to be essential, are not sufficient. While calling for children to acquire competencies such as critical thinking as well as analytical, communication, and collaboration skills, the anticipated path is to teach and assess these within the disciplinary subjects.

The government vision according to the National Law (La Loi Cadre) strongly promotes 21CS in the following ways:

- It promotes the diversity and richness of local cultures while developing intelligence, initiative and creativity, mutual respect, tolerance, and protection of the environment.
- The 2016–25 SSEF places particular emphasis on communication skills, in particular through the mastery of information and communication technology (ICT).
- The aims, goals, and general objectives of the national program of Primary Education advocate for the acquisition of several transversal values for individual and collective development.

The immediate plan for Congo is to reflect on approaches aimed at integrating 21CS into the national teaching program through teacher training, the development of guides for teachers, and the development of methodological guides for 21CS assessment. These activities are intended to improve the quality of education at the primary school level, drawing on the learning and findings of the OAA pilot before further representation at the policy level within the Ministry of Education.

The OAA pilot coincided with crises in the country, which impeded larger rollout and prepilot training. Now Congo can take advantage of the full OAA Africa data analysis to review the characteristics of the different task and item types before conducting larger-scale preparation and capacity building with teachers. The findings from this extension of "Project 1" will inform stakeholder consultations with ministry officials. These consultations will focus on integration of 21CS into the national curriculum and national assessments.

Shift in the teaching model: Lens on The Gambia
Ousmane Senghor and Momodou Jeng

In The Gambia, the pedagogical approach is largely teacher-centered, especially in large urban centers with large class sizes. Class sessions are typically 30–35 minutes, which may preclude the accomplishment of certain activities and learning strategies. The result is that teachers cannot address students' individual needs or use flexible and creative teaching strategies adapted to the context and syllabi.

The effective introduction of 21CS to the classroom requires a radical shift from teachers who are currently more concerned about subject coverage and fulfilling examination requirements. This shift should address issues related to:

- Modification of pedagogical methods that can enhance learning;
- Training to adapt the national curriculum to the local context and to promote skills development in the classroom;
- Breaking the focus on the examination syllabi, which prepares students for passing examinations rather than achieving the broader curricula objectives; and
- Extending the content and learning within core subjects beyond the focus of examinations.

Much of the shift is dependent on providing more support to teachers, particularly by familiarizing them with the functionality of the skills through:

- Discussion of the theoretical framework;
- Identification of skills demonstrated by students in performing a task;
- Task development; and
- Training in approaches to scoring and drawing information from assessments to inform teaching.

The Gambia's concern about the appropriateness of teaching strategies emanates from recognition of several points:

- Traditional teaching aids and textbooks are not capturing these new skills.
- The nurturing of the skills represents a new experience for teachers and students, to which adjustments must be made.
- Classroom management strategies need to be explored to enable teachers to conduct collaborative tasks for large class sizes.
- Teachers currently cannot relate what a child is doing or saying to a specific skill.
- The expected level and degree of achievement of particular skills are not defined.
- Teachers are finding it difficult to detach themselves from traditional and routine ways of doing things.
- It is difficult to access reference materials to guide development of assessments.

Collaboration across agencies: Lens on Mongolia
Munkhjargal Davaasuren

Mongolia's national core curricula for basic education were developed from 2013 to 2016 and introduced eight general, or 21CS, skills. Of concern has been the need to strengthen the curricula and associated teaching and learning materials, assessment, professional development for teachers and school leaders, planning and management systems, and increase in enrollment capacity.

A noted subcomponent of completing the curriculum and assessment reform is the review of preservice teacher education programs. Aid-supported programs to improve assessment have focused on new assessment procedures, item banking, automated scanning and scoring, and so on. Associated recent increases in test items are predominantly of multiple-choice and closed-type response items that are designed to measure knowledge and subject-specific skills rather than 21CS.

The Ministry of Education, Culture, Science and Sport (MECSS) can support the scaling-up of 21CS assessments at the policy level because of the current focus on improving, inter alia, the country's assessment capabilities and practices. Under MECSS' supervision, there are educational assessment and monitoring agencies including the Education Evaluation Center (EEC), Mongolian National University of Education (MNUE), Mongolian Institute of Educational Research, and Institute for Professional Development of Teachers (IPDT). These agencies are supportive at the management level.

At the local level, the Education Department of Ulaanbaatar city and the Provincial Education and Culture Centers are responsible for implementing and coordinating education policies and standards as well as the national core curricula. Additionally, nongovernmental organizations in the education sector such as the Teachers' Association of Mongolia and the Trade Union of Teachers of Mongolia cooperate with the government agencies. Table 3 shows the role allocation appropriate for certain of these parties.

Table 3. Roles of agencies

MECSS and agencies	Main duties and responsibilities
MECSS	Development of education sector policy
Education Evaluation Center (EEC)	Evaluation, monitoring, and assessment of education standards and curriculum implementation
Mongolian National University of Education (MNUE)	Preservice and graduate-level teacher education
Mongolian Institute of Educational Research	Education standards and curriculum development, and research on education policy and its implementation
Institute for Professional Development of Teachers (IPDT)	In-service teacher and administrator training and continuing professional development
Education Department of Ulaanbaatar city	Implementation and coordination of education policy and standards at the Ulaanbaatar city level
Education divisions of districts of Ulaanbaatar city	Implementation and coordination of education policy and standards at the district level of Ulaanbaatar city
Provincial Education and Culture Centers	Implementation and coordination of education policy and standards at the provincial level

Both the MECSS and the EEC are engaged in activities parallel with the OAA activities and goals, and they are aware of the need to establish a steering committee for implementation of a new master plan that targets both assessment and curriculum—the latter remaining a weak point in terms of engaging with the eight general skills. A recent World Bank survey (2019) indicates that teachers' knowledge of and attitudes toward the general skills are inadequate. OAA provided an example of how primary school teachers particularly could work with the skills, highlighting the need to scale the pilot activities. This effort feeds into current preparation of the new Education Sector Master Plan 2020–2030 and specifically proposes three scenarios:

- Continuing professional development of primary school teachers in terms of teaching 21CS ("eight general skills" in the curriculum). This scenario includes:
  - Developing holistic training modules for teachers regarding how to teach 21CS at the classroom level;
  - Developing classroom-based methodological packages for teachers and teaching manuals for particular skills such as problem solving, collaboration, and critical thinking; and
  - Training teachers through the holistic training modules and methodological packages.

- Introducing reliable tools for 21CS ("eight general skills" in the curriculum). This scenario includes:
  - Developing reliable tools for assessing 21CS;
  - Piloting and implementing the developed tools at the classroom level; and
  - Introducing these assessment tools into the assessment system.

- Closing the assessment gap through reliable large-scale testing in primary education. This scenario includes:
  - Conducting a current situational analysis on the assessment gap;
  - Developing large-scale testing to close the assessment gap;
  - Piloting and implementing the developed tools at the national level; and
  - Introducing these assessment tools into the current assessment system.

The OAA national technical team was constituted from the EEC and MNUE. The procedural steps below would be implemented by a team representing the EEC, MNUE, MECSS, and IPDT:

- Disseminate OAA project results and reach common understanding on 21CS assessment through other project activities;
- Describe this statement in the government's action plan for 2020–2024, mindful of the 2020 parliamentary election;
- Engage international donor agencies for support;
- Establish a steering committee under MECSS supervision;
- Describe the project activities in annual plans of participating agencies.

Program alignment:
Lens on Nepal
Shyam Prasad Acharya and Deviram Acharya

In 2016, the government of Nepal's Ministry of Education, Science and Technology (MoEST) endorsed the School Sector Development Plan (SSDP) 2016–23. In this plan, 21CS are considered important competencies. The plan is intended to enable Nepal to achieve Sustainable Development Goal 4 (SDG 4, Quality Education) by 2030 and to complete the unfinished agenda of Education for All.

Through the engagement of national stakeholders, scaling of the OAA initiative takes place in the context of the nation's socio-economic condition, education culture, and national priorities, and through the conduits of national and local curricula, teacher development programs, pedagogical approaches, and awareness programs.

Scaling approaches will be horizontal with people and places, vertical in policy adoption, organizational by strengthening capacity development, and functional by activities.

The scaling will draw on OAA's bottom-up approach of building teachers' capacity—practicing in the classroom, learning how to assess students' 21CS, preparing and evaluating test items, and collaborating with national and international experts.

Nepal's plan assumes an alignment model between the three education delivery mechanisms (Figure 5):

- *Pedagogical practices*: MoEST (2016) states that the teaching culture should shift from one that is "textbook-focused, lecture-oriented" to one that "foster[s] creative thinking and enable[s] core skills" (p. 9) and adopts more child-centered, interactive teaching strategies.

Figure 5. Alignment model for 21CS scaling in Nepal
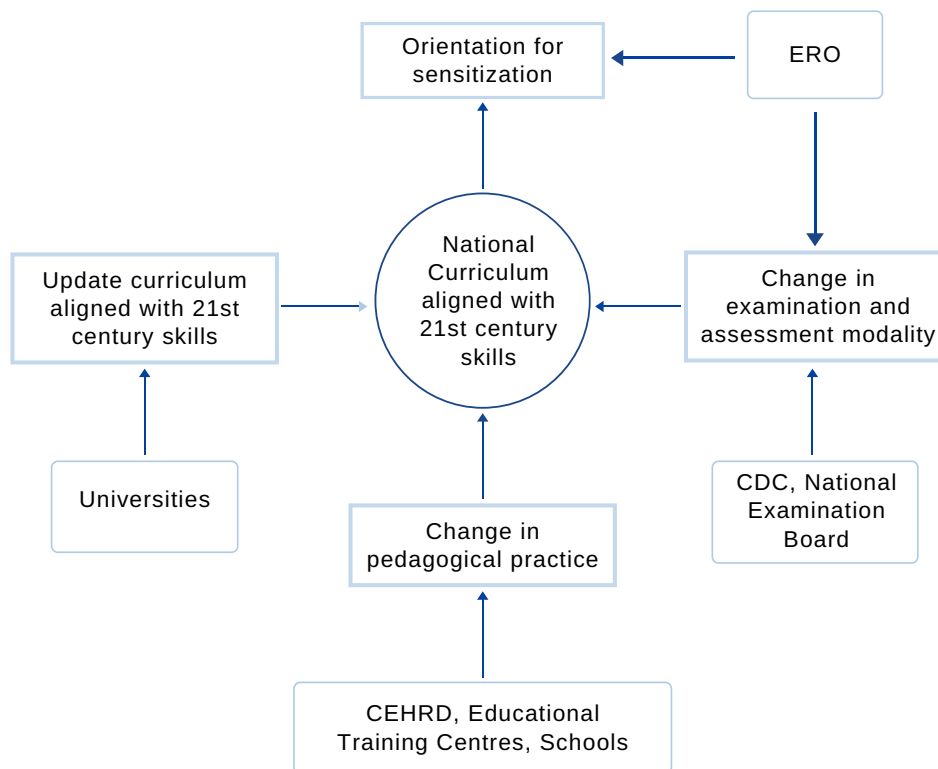
Key: round shapes = responsible stakeholders or agencies; rectangular shapes = actions planned; rounded rectangles = agencies. CDC = Curriculum Development Centre; CEHRD = Centre for Educational Human Resource Development; ERO = Education Review Office.

- *Curriculum:* The SSDP plans to improve the quality of secondary education by revising the National Curriculum Framework of the entire school cycle (Grades 1–12) by "including core skills such as critical thinking and collaboration while promoting the use of digital and interactive teaching-learning resources and the integration of life-skills, soft skills and values-based education" (p. 49). The new integrated Grade 1–3 curriculum incorporates "soft skills.

- *Assessment:* The Education Review Office (ERO) strategy is to select a subset of 21CS skills for measurement, based on practicability of operationalizing. The initial subset includes creative and critical thinking, problem solving, communication, and collaboration. The ERO has proceeded with item development and piloted problem-solving and critical-thinking items for incorporation in the National Assessment of Student Achievement (NASA). The recent proposal for the Grade 5 Mathematics and Science NASA incorporates 21CS as a block. According to the framework, creativity, critical thinking, and problem solving will be assessed formally in 2021.

Nepal's alignment model hence includes six main components: policy-level orientation and dissemination, materials development, teacher capacity building, regional and local orientation, university collaboration, and incorporation of 21CS in national assessment and evaluation.

Guidance from the curriculum:
Lens on Zambia
Victor Mkumba and Lazarous Kalirani Kays

The movement toward the integration of 21CS into Zambia's education system has been underway for some time—as seen in legislation, national policy documents, and the revised curriculum framework. Notwithstanding these achievements, the movement is less evident in the assessments at the national and school levels and in the teaching at the classroom level. The immediate strategy for Zambia is to produce the 21CS Teaching, Learning, and Assessment Guidelines, accompanied by countrywide orientation and "train the trainer" workshops to include teachers, lecturers, and education officials.

The Ministry of Education's 1996 document, "Educating Our Future: National Policy on Education," recognized life skills as an important component of the school curriculum: "The school can make a notable contribution here through helping pupils to develop life skills which equip them for positive social behavior and for coping with negative pressures. A core set of life skills for the promotion of the health and wellbeing of pupils includes decisionmaking, problem solving, creative thinking, critical thinking, effective communication, interpersonal relationships, self-awareness, stress and anxiety management, coping with pressures, self-esteem and confidence" (p. 43). The Zambian curriculum (2013) identifies six critical competencies that learners need:

- Critical thinking and problem solving
- Creativity and innovation
- Entrepreneurship
- Self-management
- Communication
- Cooperation.

At the same time, Zambia has committed since 2005 to the practice of "Lesson Study" (renewed through the 2011–15 Strengthening Teachers' Performance and Skills [STEPS] project) and to pilot introduction of a Science, Technology, Engineerng and Mathematics (STEM) curriculum. The latter includes focus on scientific skills across the categories of acquisition, organization, creativity, and manipulation—and hence draws on similar competencies to those central to the main curriculum. These initiatives have seen improvements in teachers' lesson planning and in students' examination performance. However, there remains superficial understanding and delivery of learner-centered pedagogies as well as, until now, an absence of assessments of 21CS acquisition.

In 2013, the Ministry of General Education published the "Teachers' Curriculum Implementation Guide" to enable teachers to make best use of the revised curriculum, which was fully implemented by 2017.

Notably, although the Guide includes the curriculum aims of developing appropriate values, attitudes, and competencies as well as subject expertise, it does not fully explicate these competencies or how to develop them.In late 2019, the minister of education forcefully and strenuously argued that competencies such as problem solving, creativity, and critical thinking must be front and center in teaching. Curriculum audit information shows how some skills are embedded in subjects (Table 4). The descriptions clearly signal the relevance and use of 21CS, but as yet, the curriculum neither provides detail about the nature of increasing competencies nor delineates the levels of performance.

The Teachers' Curriculum Implementation Guide provides a comprehensive description of learning theories and strategies to support teacher practice, but it does not give the teacher workforce more pragmatic advice about nurturing the 21CS competencies. Post-OAA, the plan is to refinalize the Guide, undertake large-scale training in 21CS, and continue the development of assessment resources with the support of the Examinations Council of Zambia.

Table 4. Expectations for integration of 21CS in Zambian subject syllabi for mathematics

General outcomes	Key competencies
- Provide clear mathematical thinking and expression in the learner - Develop the learners' mathematical *knowledge* and *skills* - Enrich the learners' understanding of mathematical concepts to facilitate further study of the discipline - Build up an appreciation of mathematical concepts so that the learner can apply these for *problem solving* in everyday life. - Enable the learner to represent, *interpret,* and use data in a variety of forms - Inculcate a desire to develop different career paths in the learners	- Assimilate necessary mathematical concepts for use in everyday life such as environment and other related disciplines - Think mathematically and accurately in *problem-solving skills*, and apply these skills to formulate and solve mathematical and other related problems - Develop the necessary skills to apply mathematical concepts and skills in other discipline - Produce *imaginative* and *creative* work from mathematical concepts and ideas - Develop abilities and ideas drawn from mathematics to reason logically, communicate mathematically, and learn independently without too much supervision (*self-discipline*) - Develop positive attitudes toward mathematics, and use it in other subjects such as science and technology - Apply mathematical tools such as information and communication technology in the learning of other subjects - Use mathematics for *enjoyment* and *pleasure* - Develop understanding of algebra, geometry, measurements, and shapes

Summary of strategic activities

The integration of both organizational and substantive themes can be seen in the country plans outlined in this report. Table 5 summarizes only the *key targets* of the country plans. Some of these key targets require additional downstream activities.

These targets are defined as follows:

- *Targeted dissemination* refers to advocacy and educational activities directed primarily to education ministries' leaders. These activities demonstrate the recognition of organizational scaling needs.
- *Structural collaboration* refers to the intention to work across distinct sectors within ministries of education to ensure that higher education, curriculum, and pedagogy units, for example, are part of the strategy for 21CS integration.

- *Alignment* is a concept closely linked with structural collaboration, whereby some countries are explicit in their intentions to ensure coherence across curriculum and assessment, or across curriculum and pedagogy at the substantive level.
- *Alignment* with existing programs refers to countries' identification of coherence between the philosophies or activities of current programs being delivered in-country and those of 21CS.
- *Formative and summative assessment* both refer to the intention to continue the development and trialing of assessments, including at national levels.
- *Pedagogical development* involves the intention to provide support and guidelines for teachers for their classroom practice, distinct from the training support to teachers in the use of formative or summative assessments.
- *Curriculum development* refers to the analysis and audit of curricula to identify opportunities for inclusion and enhancement of 21CS.

Table 5. Strategic activities identified as key targets within country plans

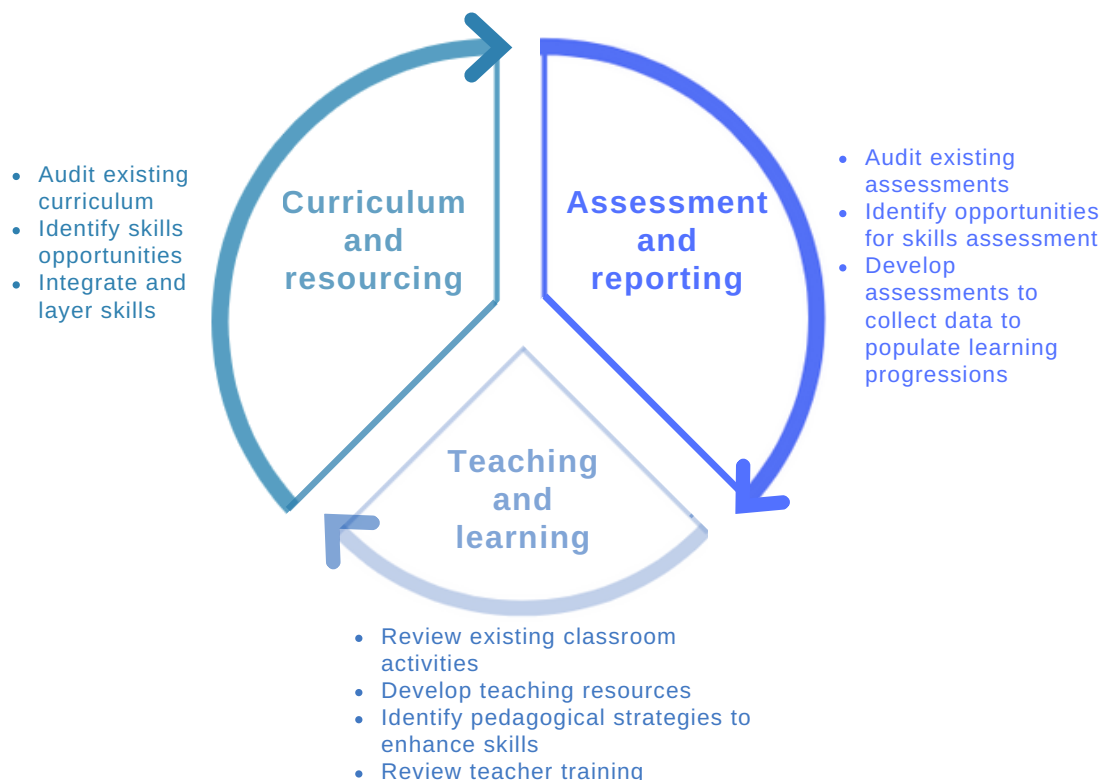| Key target	Cambodia	DRC	The Gambia	Mongolia	Nepal	Zambia
Targeted dissemination	X	X			X	
Structural collaboration	X		X	X	X	
Alignment			X		X	
Alignment with existing programs	X					X
Formative assessment development	X	X		X		
Summative assessment development	X	X		X	X	X
Pedagogical development			X	X	X	X
Curriculum development		X			X	

CONCLUSION

Returning to Linn's sequence model (Cooley & Linn 2014), what is required in terms of the OAA hypothetical "Project 2 - Learning"? The three questions for Project 2 are these: What processes need to occur? What is the sequence of the processes to be undertaken? Who will be involved?

There are two sets of processes, which are not necessarily discrete. First, there is the set of processes at the policy level —where many of the substantive, or technical, issues play significant roles in the decisionmaking. These processes, therefore, engage not only the policymakers but also the education specialists. Beyond these specialists, the planning, finance, and technical services sections must consider how to respond to, drive, and resource the change. For this set of processes, the overlap into the question of identifying the key stakeholders becomes salient.

The nontechnical processes involve articulation across multiple departments or units within the system. Of course, education system structures and concomitant responsibilities vary across countries.

The second set of processes lies within the province of the substantive—or technical teaching and learning— elements, some of which are illustrated in Figure 6. Although the complexities posed by the first set of processes are seminal in that they confront challenges of philosophy, engagement, and dissemination, it is the second set of processes that is of interest in terms of how the three education delivery mechanisms (curriculum, pedagogy, and assessment) function and interact. Various responses to this required interaction are illustrated by the perspectives of the six countries, outlined earlier, and demonstrate the impossibility of endorsing one model for Project 2.

Figure 6. Activities within the three education delivery components

- Audit existing curriculum
- Identify skills opportunities
- Integrate and layer skills

Curriculum and resourcing

Assessment and reporting

- Audit existing assessments
- Identify opportunities for skills assessment
- Develop assessments to collect data to populate learning progressions

Teaching and learning

- Review existing classroom activities
- Develop teaching resources
- Identify pedagogical strategies to enhance skills
- Review teacher training

The prioritization of different strategies post-OAA by participating countries highlights issues related to interdependency across the activities within the three education delivery mechanisms of (a) curriculum and resourcing, (b) assessment and reporting, and (c) teaching and learning. The rollout sequence of these three sets of activities remains unresolved at a model level, although country plans do include sequencing assumptions. Although ideally concurrent efforts would be initiated, the differential status of reform efforts across the three areas within countries, and the existence of specific programs and concomitant philosophies, affects these possibilities.

For the technical processes, although there may be a logical research-oriented or technical sequence, the realities of the different stages and statuses of education systems are such that the sequence will vary. The one absolute is the establishment of the learning domains (that is, identifying the skills of interest and defining and describing them). Reasonably speaking, this step should include development of performance expectations at different educational stages— the (research) step notably lacking in many current applications. The sequence would ideally start with the establishment of learning goals through the curriculum. This would naturally lead to the identification of aligned pedagogies, including the pedagogical strategies associated with formative assessment. And to ensure consistent approaches, summative assessments, if developed, would reflect the modes of learning made explicit through the pedagogical strategies.

If OAA is seen as purely an exercise in development of 21CS assessments, the scaling-up process is relatively straightforward: develop the measures, pilot and trial them, and then replicate the trial to reach more individuals, schools, and districts, up to the national level—a multiplicative approach.

However, given the leverage goal of OAA, the task is to move beyond assessment, to integrate old and new, and to act across delivery sectors and mechanisms. There are organizational choices and decisions to be made.

Simmons, Fajans, and Ghiron (2006) summarize organizational options in scaling, such as the use of:

- *Additive versus multiplicative strategies:* 21CS clearly requires a multiplicative approach.
- *Centralized versus decentralized, bottom-up approaches:* OAA took a bottom-up approach in terms of the technical work, but to leverage assessment, the next stage of 21CS integration requires centralized action that draws the complementary sections of an education ministry together.
- *Flexible and adaptive strategies versus a standard package:* Reflecting the very nature of 21CS, and the variable conditions across complementary sections, integration must be flexible and adaptive to ensure shared ownership and responsivity.
- *Gradual versus rapid implementation:* The changes in practice that would be associated with 21CS integration are deep and require research, planning, and capacity building across sectors.
- *Participatory versus management-dominated approaches:* Again reflecting the very nature of 21CS, it may be possible to mandate changes in curriculum and new forms of assessment, but it is extremely difficult to mandate changes in classroom practice; teachers need to own the change and to develop their capacities in supportive environments.

The country plans illustrate multiple pathways and priorities, reflecting their perceptions of need, capacity, and aspiration. Among the country teams, there is understanding of the innovative nature of their efforts and of the reality that there is no established route to follow from idea to outcome. Rather than looking for scaling pathways off-the-shelf, based on examples from countries that may have gone before, the national teams are in the enviable position of knowing what the different parts of the 21CS integration are. The challenge lies in bringing the parts together.

Glaser et al. (1983) identify the facilitating conditions for implementation of innovation, including:

- Perception of need for the innovation from the "user" organization;
- Implementation capacity within the organization;
- Timeliness and readiness; and
- Effective leadership and advocacy.

These conditions played out in various ways among the OAA countries. They embarked on their work because of their perception of need to act on the 21CS aspirations being expressed by their countries and by many others worldwide (Care & Kim, 2018). With each country taking into consideration its own needs and priorities, the OAA teams have a clear agenda at a technical level and know what technical capacities must be brought to bear—because they have unearthed them. Timeliness and readiness are more complicated: "readiness" will vary across the different sections within an education system and is influenced strongly by the systemic and cultural factors outlined in this report. Similarly, the matter of leadership is vexed: how to manage the "ownership" (Coburn, 2003) and advocacy challenges in order to proceed remains at question, although they will clearly vary by country because of the different organizational and decisionmaking structures. As with the variation in selection of pathways and priorities, there will be variation in how and when to proceed—taking into consideration politics, governance, socio-economic issues, and health and crisis situations.

REFERENCES

Biggs, J. B., & Collis, K. F. (1982). *Evaluating the Quality of Learning: The SOLO taxonomy (Structure of the Observed Learning Outcomes).* New York: Academic Press.

Black, P. & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability, 21*(1), 5-31.

Bloom, B. S. (1956). Taxonomy of Educational Objective: *The Classification of Educational Goals.* New York: Longmans, Green.

Cagasan, L., Care, E., Robertson, P., & Luo, R. (2020). Developing a formative assessment protocol to examine formative assessment practices in the Philippines. *Educational Assessment*, 1-17.

Care, E. (2019). Working towards a common framework for assessing 21st-century skills. In Benavot, A., Bernard, J. Chabbott, C., Russell, G., Sinclair, M., Smart, A., &. Williams, J. H. (Eds). *NISSEM Global Briefs: Education for the Social, the Sustainable and the Emotional.* https://www.nissem.org/globalbriefs.

Care, E., & Beswick, B. (2016). Comparison and countries. In D. Wyse, L. Hayward, & J. Pandya (Eds.), *The SAGE handbook of curriculum, pedagogy and assessment* (Vol. 2, pp. 928-945). London: Sage.

Care, E., & Kim, H. (2018). The explicit nature of educational goals for the 21st century. In C. Wyatt-Smith & L. Adie (Eds.) *Innovation and Accountability in Teacher Education: Setting Directions for New Cultures in Teacher Education*. Springer.

Care, E., & Kim, H. (2020). *Optimizing Assessment for All: Framework for Understanding Project Goals and Scope.* Washington D.C.: The Brookings Institution.

Care, E., Kim, H., & Sahin, A. G. (2020). *Optimizing Assessment for All: Developing 21st Century Skills Embedded Curriculum Tasks*. Washington D.C.: The Brookings Institution.

Care, E., Vista, A., & Kim, H. (2019). *Assessment of Transversal Competencies: Potential of Resources in the Asian Region.* Bangkok and Paris: UNESCO.

Care, E., Vista, A., & Kim, H. (2020). *Optimizing Assessment for All: Focus on Asia.* Washington D.C.: The Brookings Institution.

Coburn, C. E. (2003). Rethinking scale: Moving beyond numbers to deep and lasting change. *Educational Researcher, 32*(6), 3–12.

Coburn, C. E., & Penuel, W. R. (2016). Research–practice partnerships in education: Outcomes, dynamics, and open questions. *Educational Researcher, 45*(1), 48-54.

Cooley, L., & Linn, J. F. (2014). I. Washington DC: Results for Development Institute.

Dunst, C. J., Trivette, C. M., Masiello, T., & McInerney, M. (2006). Scaling up early childhood intervention literacy learning practices. *Center for Early Literacy Learning (CELL) Papers, 1*(2), 1-10.

Edgar, D. W. (2012). Learning theories and historical events affecting instructional design in education: Recitation literacy toward extraction literacy practices. *SAGE Open, 2*(4).

Glaser, E. M., Abelson, H. H., & Garrison, K. N. (1983). *Putting knowledge to use: facilitating the diffusion of knowledge and the implementation of planned change*. San Francisco, CA, Jossey Bass Inc.

Hargreaves, A., Lieberman, A., Fullan, M., & Hopkins, D. (Eds.) (2010). *Second International Handbook of Educational Change*. Dordrecht: Springer.

Harsheim, A. O. (2016). *The Policy Practice of Life Skills Education in Cambodia* (Master's thesis, University of Oslo, Norway). Retrieved from https://www.duo.uio.no/handle/10852/52392

Hartmann, A., & Linn, J. F. (2008). *Scaling up: A Framework and Lessons for Development Effectiveness from Literature and Practice.* Wolfensohn Center for Development Working Paper, (5).

Kim, H., & Care, E. (2020). *Optimizing Assessment for All: Classroom-based Assessments of 21st century Skills in the Democratic Republic of Congo, The Gambia, and Zambia.* Washington D.C.: The Brookings Institution.

Kim, H., Care, E., & Vista, A. (2020). *Assessing 21st Century Skills: A Snapshot from sub-Saharan Africa.* Dakar and Paris: UNESCO.

MoEST (2016). *School Sector Development Plan, Nepal, 2016–2023.* Kathmandu: Ministry of Education, Government of Nepal.

MoEYS (2015). *Curriculum Framework of General Education and Technical Education.* Phnom Penh: Department of Curriculum Development, Government of Cambodia.

MoEYS (2011). *Curriculum for Local Life Skill for Primary School (*unofficial translation). Phnom Penh: Department of Curriculum Development, Government of Cambodia.

Nieveen, N., & Plomp, T. (2018). Curricular and implementation challenges in introducing 21st century skills education. In E. Care, P. Griffin & M. Wilson (Eds.) *Assessment and Teaching of 21st Century Skills: Research and Applications*. Cham: Springer.

Perlman Robinson, J., & Curtiss, M. (2018). *Millions Learning Real-time Scaling Labs: Designing an adaptive learning process to support large-scale change in education*. Washington, DC.: Brookings Institution.

Scoular, C., & Care, E. (2019). *Analysis of 21st Century Skills Integration in Philippines K to 12 Program: UNICEF Philippines*. Melbourne, Australia: ACER.

Simmons, R., Fajans, P., & Ghiron, L. (Eds.) (2006). *Scaling up health service delivery: from pilot innovations to policies and programmes.* World Health Organization.

Trivette, C. M., & Dunst, C. J. (2013). From research to practice in early childhood intervention: A translational framework and approach. *Evidence-Based Practices*, 173-196.

UNESCO (2015). *Transversal competencies in education policy and practice (Part 1): Regional synthesis report.* Paris and Bangkok: Education Research Institutes Network (ERI-Net), UNESCO.

UNESCO (2016). *Assessment of Transversal Competencies: Policy and Practice in the Asia Pacific Region.* Authors: Esther Care and Rebekah Luo. Bangkok and Paris: UNESCO.

UNESCO (2018). *The Culture of Testing: Sociocultural Impacts on Learning in Asia and the Pacific*. Bangkok: UNESCO.

Uvin, P. (1995). Fighting hunger at the grassroots: Paths to scaling up. *World Development*, *23*(6), 927-939.

Zuzovsky, R. (2013). What works where? The relationship between instructional variables and schools' mean scores in mathematics and science in low-, medium-, and high-achieving countries. *Large-scale Assessments in Education*, *1*(2), 1-19.